

RRI (ISR)
**– The Rapid Response Instrument
to Bankruptcy Risk
in the Non-Financial Sector:
Design and Implementation**

Edited by
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Ladies and Gentlemen,



At the times of progressive economic globalization, Polish companies are not only exposed to various uncertainties in their local microeconomic and macroeconomic environments, but to the fluctuations in the global and European economic situation, as well.

Conclusions drawn from the economic downturn in Europe are highly valuable to governments, as they serve as directions in the shaping of economic policies and policies in support of enterprises. The economic slowdown has shown that, today, we must be able to react quickly to early symptoms of recession; the crisis has also proved that a flexible and effective economic policy should not only be based on good planning, but primarily on being able to carefully observe trends and uncertainties before companies or industries are caught in a spiral of difficulties.

To minimize the effects of recession, states engage in different intervention measures. In 2007, the European Commission launched the so called second chance policy. The conviction behind the policy is to support those industries which are potentially endangered by business distress, but are not yet "at risk" in the meaning of the guidelines on the provision of aid to secure and restructure enterprises. One of the instruments to implement the policy is a rapid response tool.

It is better to monitor, issue early warnings and react fast, rather than cure the consequences, i.e. help the companies and industries jeopardized by bankruptcy. The Rapid Response Instrument stems from such an approach. It is a pilot project developed by the Polish Agency for Enterprise Development (PARP) and the Malopolska School of Public Administration, Cracow University of Economics (MSAP UEK). The project shows that analytical tools, which facilitate decision making under conditions of increased risk, are extremely important and – from the practical point of view – may lead to operational stability of Polish companies, especially the small and medium-sized enterprises.

Experiences gained under the project are the source of numerous inspirations as to how a state may effectively intervene in the period of economic slowdown. They are also a starting point for the development in Poland of a modern early warning and rapid reaction system in the circumstances of economic instability.

PARP's systemic change is based on the belief that intervention should be replaced with prevention. I hope that this publication will not only explain it further, along with the rapid response instruments mechanism, but will also become an inspiration to develop future solutions.

Bożena Lublińska-Kasprzak

President of the Polish Agency for Enterprise Development

Foreword

The Rapid Response Instrument (RRI, Polish acronym ISR) is a modern tool of economic policy or, in a broader sense, a tool in the domain of public policies concerned with short-term operational activities. It is an instrument expressly designed to undertake focused public interventions, which, under certain conditions, seek to prevent the negative effects of economic downturns related, in particular, to the risk of bankruptcy faced by a significant number of major enterprises.

Contemporary economic policy (indeed any public policy) must be carried out simultaneously along several spatial and temporal dimensions. Authorities that implement such policies must be able to recognize the fact that the developments in question occur simultaneously along those dimensions and to respond appropriately. Certain important phenomena in the economy occur instantaneously, such as huge cash flows, while others take an epoch, such as climate change. Some appear locally, while others have a global reach.

It appears, therefore, that economic policy should have at least five time horizons: the current, short-term one (2–8 quarters), medium-term (2–10 years), long term (10–20 years or one generation) and extra long-term or long lasting one (over 20 years or at least two generations). And at the same time, it must be conducted along a number of territorial dimensions: local, regional, national, cross-border, international, global and extra-global ones (e.g. problems related to space exploration). If we were to build a matrix (model) of economic policy based on this assumption and use it to recognize economic phenomena, it is clear that no one will ever be able to grasp it (regardless of the technical equipment at their disposal). The point is not that such a pattern should be used to analyse everything that is happening at a given time, but that it should be applied to the problems that appear on the agenda of economic policy and as such constitute an area of its operation. It must be the result of a conscious choice, a recognition what is really important for the operation and development of a given economy.

A specific public policy responds to three kinds of questions: (1) What is the purpose of the action to be taken?, (2) What are the rules under which we operate?, and finally (3) How to act, by what means or using which instruments? The third question is related to the operational dimension of public policy. Without descending to this level nothing can be achieved, yet bringing policies down to the instrumental (technical) level condemns it to failure.

In order to appropriately answer these questions we need knowledge. It is a varied knowledge, one which is generated and obtained in a different way. When we go down to the operational level, we need expert, hands-on knowledge generated through practical experimentation and research. In this case, invoking the concept of evidence-based policy is justified. Armed with such knowledge, we can select appropriate instruments (measures), calibrate them properly and verify the effectiveness of their application. Such knowledge can systematically accumulate over time thereby increasing the effectiveness of public interventions.

Instrumental knowledge essentially consists in professional expertise – it is generated by people who specialize in a given field of study, moreover, its practical application also requires such specialization. It circulates primarily within a given occupational group and among representatives of different professional groups. Policymakers who want to use it must be experts themselves and must be able to work with experts.

The problem is essentially posed by correctly targeting economic policy, which occurs at the operational level and consists in instrumental and parametric action. In this case, the decision-maker shaping economic policy primarily seeks to affect the current behaviour of market participants. The desired response horizon is relatively short, although interventions in this area generally tend to have longer-lasting effects. The decision-maker operates by producing specific and specifically targeted impulses; therefore he must adopt a certain response model and to a greater or lesser extent adjust to it the planned actions.

This particular dimension of economic policy is legitimized by the fact that the market economy operates through business cycle fluctuations. It is characterized by inherent processes of an oscillatory nature, but there are also automatic business cycle regulators. Accordingly, all interventions along this dimension of the market economy may be fairly effective, but must be cautious and calculated so as not to disrupt the natural economic cycle without a good reason. A serious disruption of the existing balance primarily on the macroeconomic but also on the microeconomic scale, especially one that may lead to a deep economic downturn, is perceived as such a good reason. In this respect, the objective of economic policy is to mitigate the cyclic fluctuations. The policy is not so much meant to stimulate the economy as to limit its fluctuations which may throw it off its natural cyclical balance and result in a loss of its self-steering capacity. Hence the objective of economic policy in this area tends to be a negative one – to prevent the occurrence of conditions which can be defined using certain parameters. A positive aspect of such a policy consists in ensuring the necessary level of stability in terms of international openness and globalization of economic flows.

A good example of this kind of policy is monetary policy. In this case – as long as the policy is carried out in a conventional way – we parametrically designate a direct target and determine the tolerance band, which should be interpreted as a justification for abandoning corrective interventions, since inflation remaining within the desired range indicates that the market mechanism is efficient. Here we are dealing with a clear example of evidence-based policy. It is important, however, to note that in such a case it is more important not to intervene provided that inflation remains within the prescribed range in the perspective under consideration (in this case it is a short-term perspective). It is therefore an example of evidence-based non-policy. In the case of a policy that affects the economic cycle, the primary aim is not to take unnecessary action, especially, to do no harm. Action is to be taken only when necessary, ideally as a warning signal (an Early Warning System, EWS) rather than a follow-up intervention.

The idea of a Rapid Response Instrument (RRI) consists in transplanting this way of thinking into the area of the real economy and the sphere of entrepreneurial activity. In general, it is based on the belief that certain public policy response algorithms can be developed, as is the case with fiscal policy and other aspects of current (cyclical) policy. The RRI is primarily about the high bankruptcy risk and the resulting potential disruptions on the labour market. The RRI is meant to eliminate the discretionary aspect from the response of public authorities in this area, to determine its admissibility and offer the right tools. The belief that during an economic slowdown or recession intervention in the sphere of business activity can be avoided is obviously false. Experience consistently shows that such interventions tend to come too late, be disorganized, expensive and mostly ineffective.

Undeniably, a policy geared towards preserving economic stability cannot be separated from its other dimensions and objectives, particularly from the structural policy, but the latter has different aims and methods of operation. Only by accomplishing its primary mission – ensuring stability of the economy – can business cycle policy promote the achievement of the other objectives of overall economic policy, such as economic growth. If it is directly subordinated to such objectives, it often results in a disruption of economic stability and fails to achieve those objectives in the medium term.

The difficulties in executing economic policy along the operational dimension involve the fact that we cannot easily distinguish between cyclical phenomena – cyclical oscillations around equilibrium points deemed to be natural for a given economy – from structural change processes that result in shifting the equilibrium points. Moreover, conducting an effective economic cycle policy requires comprehensive expert knowledge and not inconsiderable skills to apply it in practice. It also requires something else, something that is difficult to achieve in parliamentary-cabinet political systems – the independence of expert and operational activities from the political rivalry for power. What works fairly well in the case of monetary authorities and independent central banks, is notoriously difficult to apply to e.g. fiscal and government structures. Hence the idea of creating national fiscal councils based on the model of monetary policy councils.

Today a good economic policy stems from the belief that its structural dimension is more important than its cyclical dimension. If economic policy is to be effective, it must be carried out within the institutional order rather than within the operational order since the objectives of structural policy cannot be achieved within the stimulus-response pattern. They may not be induced directly, because they result from much more complex relationships, including interactivity, i.e. the process in which crucial roles are played by communication, interpretation and reflective learning. This process leads to an identity transformation on the part of participants in the economy and only thus may bring about the desired and expected economic changes. These are developmental, not oscillating changes, and, as such, disrupt the balance of the economic cycle. They are not automatically reversible and shift the natural economic balance points. We do not deal with these issues in this publication, even though in our quarterly research reports we invoke them in a systematic and practical manner.

The RRI also constitutes a tool that facilitates appropriate matching of the macro- and microeconomic public policy planes. The initial analyses are carried out at the micro level and concern the degree of bankruptcy risk faced by enterprises representing individual NACE sections and regions of Poland. When combined with supplementary macroeconomic analyses, they permit the formulation of inferences regarding the general economic climate in Poland. Analyses prepared within the framework of our project are based on original econometric models developed by our team and are explained in more detail below.

The results of econometric modelling are regularly commented upon and discussed by a panel of eminent experts, who themselves are excellent economic analysts, represent varied backgrounds and expertise in the practical and theoretical aspects of economic policy. As a result, we provide decision-makers both in public administration and in enterprises with reliable analyses and recommendations.

The practical application of the RRI requires various kinds of experts to liaise with decision-makers. The instrument itself proves to be useful only when professional expertise is combined with good communication and a high level of trust. Thus, the RRI constitutes a good model tool of modern public governance as it facilitates combining the powers of a public authority (the state) and the market.

Jerzy Hausner

Introduction

Bankruptcies in a market economy constitute an inevitable and in some cases even a beneficial phenomenon since they lead – or at least should lead – to the permanent elimination of inefficient enterprises, which may contribute to a better use of their resources in other ways. The recent global financial crisis, however, painfully reminded us that one of the most serious effects of strong negative shocks may be a significant increase in the scale of bankruptcies in the economy and their economic consequences. Such events demonstrate that in such circumstances the said phenomena and processes may affect not only single entities, but even entire sectors and give rise to unacceptable social consequences. Additionally, individual victims of such disturbances are not only firms of minor importance; crises may also reveal structural flaws or other kinds of problems in the largest enterprises, which would find it easier to devise survival strategies or otherwise adapt in more normal times. Economic problems affecting large companies usually cause further consequences via the so-called domino effect, resulting in secondary waves of bankruptcies (e.g. among cooperating entities) and a sharp rise in unemployment thus triggering a vicious circle of problems. A spectacular example of such a situation was the bankruptcy of General Motors announced on June 1, 2009. The U.S. administration considered the potential consequences of the company's liquidation to be so serious that on July 11 of that year the company was bought by the Treasury Department. The aid granted by the U.S. administration reached the astronomical amount of approximately 49.5 billion dollars (of which ca. 38 billion was subsequently recouped), but the move is estimated to have saved a total of approximately 1.2 million jobs.

Bankruptcies may cause serious economic and social problems not only in the economy of a given country as a whole, but it may also exert extremely detrimental local effects on individual cities, municipalities or counties. Such situations occur in the event of bankruptcy of the largest local employer or if insolvency problems are experienced by several smaller businesses at the same time. Poland has seen its share of similar developments. One of the best known examples are the consequences of the liquidation in 2008–09 of the two main employers in Łapy (a city in the Region of Podlasie) – of the Rolling Stock Repair Works – a company with almost 150 years of tradition and the closure of the local sugar factory.

Both the possible undesirable macroeconomic effects as well as local bankruptcies raise the question of whether and how economic policy should respond. It cannot be easily answered, not least due to the fact that economists are sharply divided on the subject. However, despite such differences of opinions one thing appears to be beyond dispute – it is always worth knowing in advance where and how large the risk of bankruptcy is, and what its consequences may be, including its economically quantifiable costs. Thus, early warning systems against bankruptcies appear to embody universal values. Owing to the effects of the recent financial crisis mentioned above and the current level of development of the Polish bankruptcy system, which still has a number of elements that reduce its effectiveness, it is reasonable to develop not only nationwide warning solutions, but also those comprising procedures aimed at an active economic policy response to such events known as rapid response systems.

The construction of such a system is a complex, multi-layered task, which requires a proper synergy of analytic and research procedures, business practices and institutional legitimacy. The pilot systemic project called the Rapid Response Instrument (RRI, Polish acronym ISR) constitutes an undertaking of this kind, which takes into account the above prerequisites. This project was executed from April 1, 2009 to June 30, 2014 by the Polish Agency for Enterprise Development in partnership with the Malopolska School of Public Administration at the University of Economics in Krakow under the Human Capital Operational Programme – Priority II: 'Development of human resources and adaptation potential of enterprises and improvement in the health condition of working people' financed by the European Social Fund. Its primary purpose is to create a comprehensive system of support for enterprises and their employees aimed at mitigating the negative impact of economic downturns on the economic situation of these entities, including threats to the continuity of their operation. The aim of the scheme is to ensure positive outcomes of such interventions both ex-post and, to the greatest possible extent, to prevent untoward developments.

As was already mentioned, it is a challenging task both in terms of design and implementation. Therefore the project combined inputs from several closely related areas and consisted of several stages. The purpose of this monograph is to describe its main pillars both in the area of its starting premises and the solutions developed. Since even such a narrowing down of the scope of work due to the comprehensive character of the issue would have been insufficient for an effective treatment of the topic, certain additional restrictions have been adopted. First, we focused on the presentation of the absolutely crucial components from the point of view of the structure of the system. In this context, the following appear to be particularly significant:

- The premises justifying the construction of such a system,
- Feasibility of its objectives, including appropriate sets of instruments,

- Admissibility of active measures implied by the RRI under the existing law, especially due to possible conflicts between the interventions themselves and the principle of free competition,
- The crucial methodological solutions and tools adopted in the system,
- The key empirical results arising from the application of methods and tools.

Second, when choosing the areas for further study, we assigned high priority to topics as universal as possible to ensure that the solutions developed could be used by different institutional structures. In the case of the RRI, it is particularly important that such solutions can be included in business practice in a manner largely independent of the varying political and institutional circumstances.

Third, particular attention was given to solutions developed not only in conceptual terms, but for which we managed to collect a sufficiently large body of experience during the project and which yielded results that may already provide the basis for specific business recommendations.

Considering that one of the first and essential steps of the RRI project is the research component, it was given the most extensive treatment in this monograph. Due to the general objective of RRI systems, it is particularly important to predict and determine the level of risk of such distortions that justify the implementation by the government and its agencies of special preventive and assistance measures on the scale of the national economy and its various sectors. The natural centre of gravity of the research component presented here therefore involves problems associated with measuring and forecasting such risk.

The extent and complexity of the RRI, on the one hand, and organizational factors, timing, and volume associated with the preparation of this monograph on the other hand, meant that despite the strong substantive links between its parts the book does not constitute a complete presentation of RRI system concepts, while individual chapters are mainly original essays devoted to key issues. It should also be noted that despite the breakdown of issues related to the RRI, their complexity in a number of chapters is still considerable enough that their subject matters themselves could constitute the basis for further extensive investigations. As a result, our limited resources meant that a number of thematic areas may have only been acknowledged in passing in individual chapters, although in this case they are usually supplemented by suggestions for further reading.

The monograph consists of four sections containing a total of fifteen chapters. The layout and design are subject to the principles stated above.

Part I: 'Bankruptcy – the concept, its measurement, causes and effects' – begins the discussion of the concept of bankruptcy itself. We demonstrate that from an economic point of view it is ambiguous, while its criteria and their verification procedures are, to a certain extent, arbitrary. Such conventionality results from several factors, but the main one is the importance of certain axiological choices underlying the design of a bankruptcy system. The choices affect especially the fundamental goals of insolvency proceedings which, given the essence of the problem, may grant more prominence either to the protection of creditors or debtors. In view of the above-mentioned dilemmas, we attempt to take a more general look at the issue of the bankruptcy system.

From the point of view of the economy, bankruptcy systems can be built on different principles, hence it is difficult to objectively indicate the best, model solutions. In business practice, however, it is necessary to endow such systems with a dimension of universal applicability. Such a function, among others, is fulfilled by bankruptcy law, whose Polish model is also outlined in this chapter. It should be emphasized that the solutions adopted in the legal system have a number of consequences relevant to the objectives and the possibilities of building early warning and early response systems. Here we mainly emphasize the fact that the choice of specific legal procedures within a given socio-economic system is related to two basic outcome parameters of bankruptcy procedures, which remain in harmony with each other, namely their cost effectiveness and duration.

Even unsatisfactory efficiency of bankruptcy procedures does not constitute sufficient reason for the construction of early warning/early response systems (EWS/ERS) as long as they affect only individual, isolated cases, since their total social costs are not big enough to justify interventions. The discussion presented in Chapter 2 of Part I is thus an attempt to determine the scale of the phenomenon, including the construction of various ways of measuring it. This would not be possible without a deeper analysis of the information systems on enterprise demographics, including bankruptcy. The results obtained demonstrate that the Polish system still has a long way to go before it achieves the results considered as standard in other countries. Due to the solutions adopted in Poland, including those arising directly from the provisions of the bankruptcy law, it is quite possible that the available data on the incidence of bankruptcy significantly underestimate its magnitude. Early warning systems can therefore fulfil an additional function by expanding the scope of information regarding the actual scale of the problem and its intensity in different socio-economic cross-sections.

The necessary condition for the construction of any warning system is the awareness of the circumstances and mechanisms for predicting the risk of interest to the system. Such a system requires the provision of relevant advance information as soon as possible, which allows for a timely implementation of EWS activities. Systems that contain an additional response component also require appropriate instruments with which to influence the phenomenon in question. For this reason, Chapter 3 contains

an overview of research results in both areas. The chapter is mostly synthetic because of extensive worldwide research in this area and noteworthy achievements in Poland. Such a synthesis is possible since, despite the abundance of research publications, in terms of methodology they belong to only a few principal categories. Due to the anticipated use of the planned EWS, a strong emphasis was placed on macroeconomic circumstances of bankruptcy, including the phenomenon of synergy of individual bankruptcies. Given that many models of bankruptcy are constructed primarily for microeconomic use, including the prediction of bankruptcies of individual companies, such an enhancement appeared to be necessary. In particular, it is shown that the correlation of the economic condition of several entities may considerably increase the likelihood of their collapse.

In the final chapter of Part I we strive to deepen the analysis of bankruptcy costs and against this background to examine the efficiency of the process. It appears that one of the most common reasons for underestimating the importance of EWS/RRI systems in the area of bankruptcy is rooted in overestimating the efficiency of the natural selection mechanisms while underestimating the magnitude of costs that arise when such mechanisms work less than perfectly. It is important that the reason for such an underestimation is quite often the fact that bankruptcy costs are often limited only to the so-called direct costs. Likewise, not all indirect costs are recognized, and even if they are enumerated appropriately, it is often extremely difficult to measure some of them in practice. As a result, they tend to be overlooked in the cost-effectiveness account. Moreover, the analyses presented in Chapter 1 demonstrate that bankruptcy law invariably comprises a number of elements that may limit its effectiveness and generate excessive costs. If this conclusion is supplemented with the data on the actual scale of bankruptcy in the Polish economy, the issue of advisability of developing RRI-type solutions appears to be settled. This statement was verified empirically using data on the effectiveness of the bankruptcy process in Poland, which show that although our country ranks average in this respect, there is still a considerable distance separating us from the very best, including several European countries.

Part II of the monograph – ‘Bankruptcy vs. public policy’ – is devoted to the issues of potential opportunities available within public policy in reducing the scale of bankruptcy risk and its consequences. We note that the existing barriers arise not only from the financial constraints which we always deal with in the public sphere, but also from another fundamental problem. One of the most obvious effects of state aid directed to individual companies granted with a view to providing temporary support and enabling them to regain full economic efficiency after surviving a difficult period, may be the distortion of the principle of free competition in certain areas of the economy. State aid may therefore be granted only to the extent and in such a way that such a distortion does not occur, and if it does occur, it should be within an acceptable scale and in a controllable form.

One of the solutions that meet the above-listed criteria is called the second chance policy. It aims, among others, to increase the survival rate of businesses and help those who have suffered a business failure to start a new business. These issues are dealt with in Chapter 5 of the monograph, which characterizes, among others, the assumptions behind this policy ensuing from relevant EU regulations, as well as the recommendations of the European Commission. It offers a comparative analysis of the consequences of judicial and extrajudicial procedures concerning such entities. This constitutes the background for a brief outline of the special role of EWS/RRI-type systems in providing effective support for such a policy.

In view of the fact that state aid constitutes an influential intervention instrument, and, as was already mentioned, it cannot interfere with the principles of free competition, appropriate regulations constitute an extremely important component of the second chance policy. Chapter 6 of the book is devoted to these issues. First of all, it defines state aid in its legal sense, as well as the conditions for its admissibility. The regulatory aspect plays a crucial role in the actual practice of RRI-type systems, since under EU regulations state aid is inadmissible in principle. Nevertheless, it may be granted in specific situations detailed in this chapter. The accompanying legal analysis, however, concerns not only the conditions of the Treaty (Treaty on the Functioning of the European Union), but also the national legislative frameworks governing the provision of such aid.

Part II of the monograph ends with a chapter devoted to state aid instruments and the synthetic evaluation of its scale and scope in Poland with particular attention paid to *de minimis* aid. It also presents the rules for regional, horizontal and sectoral aid. It is worth noting that in a RRI system interventions are frequently triggered by the social consequences of bankruptcy at the regional or sectoral level. The analysis of state aid in Poland shows a clear need for a programme for rescuing and restructuring firms in the SME sector. In particular, it is necessary to develop systemic solutions in the area of state interventions with respect to SMEs in difficulty sector. The RRI project is an example of an attempt to address this need.

Part III of the book – ‘Models of the Rapid Response Instrument’ – is technical in nature and includes both a discussion of various models of such a system and a description of their fundamental structural components. It begins with Chapter 8 outlining the basic aspects of early warning systems. The proposed approach is based on the so-called cost avoidance rule, which means that the system is activated only when the costs of inaction are greater than the expenses incurred in the reverse situation. An important element of the discussion in this chapter is the complex matter of selecting the optimal sensitivity level of the warning system. If the system is designed so that it only responds to very expressive stimuli, the negative effect may involve omitting the early and often faint indications of later disturbances. If, in turn, such a system is too sensitive, it will raise false alarms. This may undermine the confidence of EWS stakeholders in the operation of the system and as a result, lead to ignoring information about the actual

risks and threats. The chapter also discusses examples and classifications of response systems, as well as the relationships between early warning systems and early response systems. The chapter ends with the analysis of effective implementation of such systems. Quite often, this extremely important element tends to be overlooked in similar projects, which results in a limited practical effectiveness of such an instrument, or even its complete absence. On the other hand, we must emphasize very strongly that such circumstances to some extent determine the range of possible models and tools to be used in an EWS. What it means in practice is that there do exist more accurate kinds of analysis or forecasting of certain phenomena, but they are of limited practical utility from the vantage point of EWS construction. This may occur, for example, if such models are too complex in terms of social communication, their preparation takes too much time or they are expensive to operate.

The next chapter (Chapter 9) provides an overview of the most important practical experiences of the United Kingdom and the USA in the construction and application of EWS/RRI-type systems. This review is valuable for at least a handful of reasons. First, such systems are not very common, which means that in the process of devising a new one it is difficult to refer to a repository of ready-made solutions and practices. Likewise, and quite understandably, literature on the subject is still fairly limited. Hence the construction of such a system in Poland is in many ways a pioneering challenge. Second, the review reveals a certain important feature of these systems – although they should ideally be created in order to achieve certain specific objectives within a pragmatic structure of action, they often reflected attempts to find immediate solutions to serious problems. The RRI project is also unique in that it provides a consistent structure operating from top to bottom, yet at the same time capable of dynamic adjustments. Third, international experience, in spite of its limitations and shortcomings, may offer certain insights relevant to the construction of such a system in Poland.

The next two chapters (10 and 11) contain detailed accounts of data sources, models and procedures for the assessment and prediction of bankruptcy risk in the micro- and macroeconomic perspectives, respectively. It is worth noting that although fairly classical solutions outlined in Chapter 3 have been applied in microeconomic analyses, the approach adopted in the project has two distinguishing characteristics, especially in comparison with other microeconomic bankruptcy models. First, the models used here were estimated using much larger learning data sets than those presented in other publications. Second, it makes effective use of the 'double forecasting' method. Traditional approaches utilize current economic data on businesses in order to anticipate their problems on the basis of models which allow them to do so effectively within the time horizon of approximately one year. Numerous international experiences show that this class of tools rarely permits the horizon to be extended since such attempts usually result in a considerably decreased accuracy of forecasts. In early warning systems this is unacceptable, since it compromises their credibility. On the other hand, forecasting risks well in advance is extremely important for warning systems. In the approach discussed here it was thanks to the development of effective procedures for forecasting the explanatory variables in bankruptcy prediction models. An additional advantage of the solutions adopted in the microeconomic block is the capacity to obtain bankruptcy risk assessments across different sections of the economy (including the territorial ones) and the direct costs of such risk (excluding the elements resulting from economic linkages) for various cost categories (loss of jobs, decreased industrial output, etc.).

The chapter on macroeconomic analyses of bankruptcy risk focuses on three groups of topics. First, it contains an overview of methods for analysing the economic cycle with a particular emphasis on the specific features of the Polish economy. Second, it presents the design principles underlying the forecasts of the basic macroeconomic indicators in Poland. International experience shows that both factors are extremely important in predicting bankruptcy risk in the entire economy. Third, it contains a description of the scenario analyses methodology of the impact of potential impulses affecting Poland's economy on its performance, especially in the enterprises sector. Analyses of this kind are especially important for the RRI for at least two reasons. Firstly, they allow researchers to assess the future effects of the basic kinds of macroeconomic shocks. Secondly, they offer a convenient tool for an initial assessment of certain macroeconomic policy options from the perspective of their impact on economic growth and the degree of bankruptcy risk.

It is worth noting that in the macroeconomic analyses and forecasts block the authors adopted measures to ensure the 'scalability' of certain tools in order to ensure their applicability not only at the level of the entire economy (macroeconomic aggregates), but also mesoeconomic ones (individual industries or sectors). The selection of tools was also guided by other principles contributing to the effectiveness of the EWS. Substantial emphasis was placed, among others, on the transparency of solutions, which included on the one hand good communicability of procedures, and on the other hand, the highest possible intersubjectivity of those tools, including their significantly greater 'resistance' to exogenous assumptions than is the case with the classical structural approaches. It should be noted, however, that these principles were used in the forecasts of micro- and macroeconomic bankruptcy risk in a dynamic way, i.e. in order to ensure that the tools based on them could be subjected to ongoing verification from the point of view of their relevance and – where necessary – to the necessary modifications. Both chapters include a documentation of the procedures used.

The subject matter of Chapter 12 is the so-called starting mechanism, i.e. a set of procedures on the basis of which decisions are made regarding when to start implementation activities in specific enterprises qualified for support under the RRI. The mechanism employs, among others, information provided by the micro- and macroeconomic components of the Project. The solutions used are based on the principle of a three-level scoring system which provides a synthesis of information from the macro-, meso- and microeconomic components. We have also adopted the principle that the system should make use of all available information, including feedback from outside the RRI. As a result, the primary scoring based on data generated by the RRI modules is supplemented by an auxiliary information system.

Part III of the monograph ends with Chapter 13 devoted to the issues of communication within the RRI system. Let us start by saying that, paradoxically, numerous warning systems neglect or even ignore them, although for obvious reasons good communication is a prerequisite for the effectiveness of such systems. At least three interlinked characteristics of the communication processes must be analysed: the credibility of the message, its timeliness and coverage. All these elements are subject to continuous monitoring within the RRI. Chapter 13 explains both the construction principles of this systemic functionality and the accompanying ratings of the communication process. It also provides a description of a unique solution devised for the RRI, namely the so-called interpretation panel. The panel consists of a group of eminent experts in the areas covered by RRI analyses, whose responsibilities include: a systematic validation of tools and solutions employed in the system, qualitative and quantitative evaluations of analyses and forecasts generated in macro- and microeconomic blocks as well as anticipatory inspirations.

The final, fourth part of the monograph – ‘Medium-term bankruptcy risk in the Polish economy – forecasts and recommendations’ – presents the evaluations and predictions of bankruptcy risk obtained using the macro- and microeconomic modules covering both the entire economy and its selected sub-aggregates. In particular, the part offers a thorough analysis of the current situation and levels of bankruptcy risk broken down by individual divisions of the economy. A particularly important result of the synergies of macro- and microeconomic procedures developed within the RRI is the so-called ‘Top 10’ – a list of sectors most vulnerable to bankruptcy, yet at the same playing a crucial role in the Polish economy. Within the microeconomic component the authors have included heat maps for individual NACE divisions reflecting the degree of retrospective bankruptcy risk, i.e. from 2007 to 2013. Such maps permit, among other things, an easy identification of areas of business activity consistently exposed to a high bankruptcy risk.

In conclusion of this brief introduction it should be added that, although most authors of this monograph are professionally affiliated with institutions that directly or indirectly deal with the problems of bankruptcy in the economy, the views expressed here are individual and represent only personal beliefs, including those developed during the Project.

Apart from the authors of the present monograph, a number of people, who unquestionably formed an effective interdisciplinary research and project team, were involved in the RRI (ISR) project. Here we wish to thank all the project participants for their contributions:

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Part I

Bankruptcy – the concept, its measurement, causes and effects

Chapter 1

THE CONCEPT OF BANKRUPTCY – SELECTED ECONOMIC AND LEGAL ASPECTS

1.1. Introduction

It may appear that formal and legal issues related to bankruptcy law do not play a leading role in the design of early warning systems (EWS) against bankruptcies in the economy. This is not the case, however, because the solutions adopted in the context of insolvency procedures affect several extremely important elements related to the phenomenon in question.

First, it is difficult to imagine such a system without an in-depth analysis of the phenomenon of bankruptcy. This raises the number of issues, but the key one is that we witness mostly bankruptcies in the legal sense. Causes of bankruptcy, however, are economic in nature. Therefore, without reflection on the mutual relationships between the strictly economic and legal components we will be unable to achieve the necessary knowledge for the construction of an EWS. In particular, it will be difficult to determine the causal relationships necessary for modelling, including forecasting bankruptcies. We must also remember that bankruptcy is always to some extent a condition determined by convention. Thus, without a proper understanding of the relevant existing conventions, it is not possible to model the phenomenon.

Second, warning systems should be developed for phenomena that may entail significant costs or other negative impacts on society. The legal system, as we will show, has a significant effect on the level of such costs and the efficiency of the bankruptcy process. We therefore need to understand the sources of those costs. It is also important, because it is often argued that a well-functioning legal system may render any EWS unnecessary. By discussing the bankruptcy system in-depth we will show, however, that although such a course of action is unquestionably required, the system always contains a number of subjective and discretionary elements. This situation is to a large extent independent of the solutions adopted in a particular bankruptcy law. For that reason, in this section we present not only an outline of the provisions of the Polish law, but we shall do so against the background of a more general reflection on the construction of bankruptcy systems themselves.

Third, all bankruptcy systems always generate a certain temporal structure of the process – both in terms of its duration and individual stages. This feature of the system is also crucial from the point of view of the design of an EWS. Such systems are developed, among others, in order to enable us to promptly anticipate risks on the basis of the available information. For a number of economic phenomena, including bankruptcy, it also makes sense to have sufficient long-term knowledge, since activities undertaken as part of economic policy are usually characterized by delayed effects of the instruments applied.

Fourth, both the analysis of the bankruptcy system and the Polish law are necessary in order to develop an appropriate terminological apparatus.

1.2. The bankruptcy system – an outline

The problem of unpaid financial obligations appeared concomitantly with the first loans and necessitated the development of procedures to deal with such cases. Solutions in this area have evolved over the centuries. In ancient times, failure to pay was often treated as a crime, in keeping with the Roman tradition. Such a view led to the development of appropriate remedies – creditors were typically treated in a very restrictive manner, with dominant tools being different types of retribution, including capital punishment. Failure to pay one's obligations was also often associated with loss of freedom, and almost always with considerable damage to the social reputation of the debtor (cf. e.g. Levinthal 1918, Efrat 2006). Still, we must remember that certain ancient legal and ethical systems provided for a periodic forgiveness of debts, which in some ways, constituted a further-reaching solution than the modern rule of limited liability for debts.

A number of such components of the system survived in Europe until the end of the 19th century including the practice of imprisonment for debt, and the strong social stigmatization of insolvent debtors (cf. e.g. Gratzner, Stiefel et al. 2008). In modern times, however, bankruptcy is treated to a considerable extent as an economic phenomenon inherent in the operation of the free market, competition and various other mechanisms resulting from these risks, not as an ethical flaw on the part of the creditor (although in the opinion of various social groups the effect of the stigma associated with bankruptcy remains quite strong, cf. e.g. Oldfield 2005).

The objective of this section is to briefly characterize the fundamental elements of the bankruptcy system, by which we mean a set of rules and procedures essential and useful in dealing with bankruptcy. This obviously is a very complex system; consequently,

we have to settle for sketching out only its most important elements, focusing on those whose significance from the perspective of construction of early warning systems against bankruptcy appears to be crucial. We shall discuss especially those solutions that have a significant impact on the characteristics of bankruptcy procedures, such as their time, cost and other elements contributing to its efficiency. This review, although it naturally touches upon legal issues, is conducted mainly from the vantage point of economic and process analysis of the matter at hand. Their judicial implications will be covered in the next section. Here we shall discuss only the issues of bankruptcy of non-financial companies.

The basic components of the system are shown in Figure 1. The system rests on three main pillars: the normative base, the design principles of bankruptcy procedures and the procedures of bankruptcy proceedings.

As regards the normative base, it specifies the basic constitutive elements of any bankruptcy system. The starting point for its construction is a conceptualization of the basic purpose of the bankruptcy system (cf. e.g. Gutiérrez, Olalla et al. 2005), since the occurrence of unpaid obligations in itself does not have to provide a stimulus for the development of dedicated tools to solve the problem.

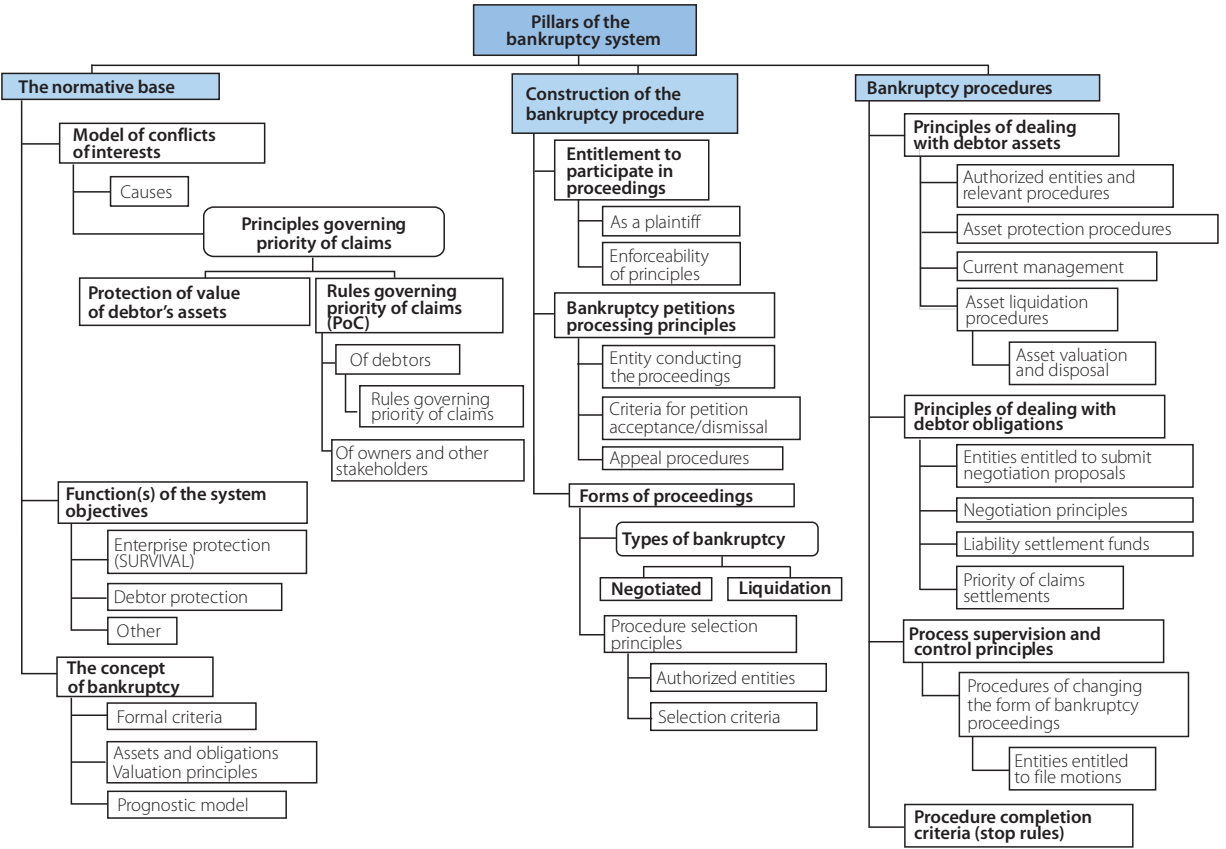


Fig. 1.1. The main components of the bankruptcy system – an overview

Source: own study.

It is assumed that the fundamental premise behind the creation of such a system is the desirability to develop a policy for solving the problem of creditor competition (race for company's assets), especially in the case of limited opportunities to pursue those claims on the debtor's assets. It is believed that the social cost of solving the problem within the framework of such a system is lower than it would be if each creditor individually tried to satisfy their claims.

There are a number of reasons why the mechanism of external coordination 'imposed' by bankruptcy is more effective than bilateral agreements between creditors and the debtor concluded in the spirit of the Coase Theorem: the number of creditors, asymmetry of information, incomplete contracts etc. (cf. e.g. Blazy, Martel et al. 2014). Such circumstances would inevitably give rise to conflicts of interests amongst individual creditors. The main task of the bankruptcy system is therefore to solve it (cf. e.g. Longhofer and Peters 2000). It is obvious that fulfilling this task requires an accurate diagnosis of the causes of conflict and a submission of proposals of tools to avoid or to mitigate it. Therefore, both elements intrinsically linked together are called the conflict of interests model.

As was mentioned before, the second component of the conflict of interests model includes the tools aimed to resolve this conflict, which we shall call the claim settlement principles. While this is a significant simplification of the complex and multidirectional operation of real bankruptcy systems, here we assume that the rules are made up of two main groups of procedures – protection of the debtor's assets and priority of creditor claims (Priority of Claims – PoC). Both are intrinsically interdependent, which sometimes causes errors of omission – the creditor's problem consists not only in whether the principles governing the allocation of the debtor's assets 'will leave something for him,' but that the order of such allocation, and hence the possible date of actual satisfaction of his claims as well as other system-based procedures may have a negative impact on the real value of the divided assets. A system that does not resolve this problem will not constitute a socially acceptable way to resolve conflicts of interest, since creditors occupying further places in the line of priority may claim to be discriminated against not solely because of the effect of the changing value of money in time but also due to the fact that the value of the debtor's assets are likely to erode, which could conceivably be avoided or even reduced if better systemic solutions were to be chosen.

Despite the close connections between both elements, in the literature more attention appears to be devoted to the problem of PoC. It has been widely discussed, but more extensive comments would go beyond the scope of this paper. Let us examine only three elements deemed fundamental in the context of an EWS. First, there are several possible rules governing the PoC. It is worth mentioning three classic solutions: the canonical rule (absolute priority rule – APR), the equal priority rule (equal priority rule – EPR), the Fama–Miller rule (cf. e.g. White 1989). Second, such rules may lead to various costs and influence the efficiency of bankruptcy systems (cf. e.g. White 1980). Specifically, it has long been known that exceptions to the canonical rule (APR), which, in the practice of the operation of real bankruptcy systems are not uncommon, are accompanied by fluctuations in the stock market valuations of risks associated with assets (cf. e.g. Warner 1997). Third, in the literature there are attempts to design optimal systems (cf. e.g. Schwartz 2005), but they still tend to be theoretical constructs difficult to translate into real operating regulations. Thus, since the operation of bankruptcy systems may be subject to numerous disturbances and deviations from the 'optimum' resulting, for example, from disruptions in the proper application of PoC rules, an appropriately designed EWS may decrease some of the social costs associated with these imperfections.

The last remark is particularly important against the background of another element of the system of normative base of bankruptcy – the function of the system's objectives. It is worth noting that the very model of conflict does not have to constitute the basis for the final solutions adopted in the practice of operation of a given bankruptcy system – there can be a number of them. Usually, however, the legislature imposes on the entire system some major conditions (cf. e.g. M. Hummelen 2013, White 2011). Without going into too much detail of this complex subject matter, it can be assumed that there are three such main objectives. They are or should be present in virtually all systems operating in practice, although their priorities may vary considerably (cf. Korobkin 1992). These objectives are: to protect the creditors, to prevent unjustified liquidation of enterprises and other preventive measures aimed at e.g. precluding owners from undertaking activities that may lead to financial difficulties and impending bankruptcy, but such that can be avoided by implementing remedial measures (cf. e.g. Haviv-Segal 2005). When discussing the issue we shall limit ourselves to observing that an EWS can fulfil an important role in each of these three areas. For obvious reasons it is in the interests of creditors to have advance knowledge about the potential risk of bankruptcy, especially if the advance warning is sufficiently long to afford an opportunity to protect the value of the debtor's assets prior to their unnecessary and unwanted depreciation. Such a system not only improves the efficiency of liquidation procedures, but may also warrant a timely restructuring intervention by the enterprise itself and, as a result, may help it to avoid bankruptcy. An EWS supports the preventative role of the bankruptcy system by including pre-emptive identification of areas of higher investment risk. An EWS may also accelerate information flow and improve data transparency within the enterprise itself, which undoubtedly aids the bankruptcy system in its precautionary capacity.

The last element of the normative base of the system is the concept of bankruptcy itself. Since this is also one of the most important categories from the vantage point of an EWS system design, we shall devote a little more attention to it (a more in-depth treatment of the subject is offered by e.g. Armour 2001).

Let us start by saying that, contrary to the common misconception, bankruptcy is, to a considerable extent, a conventional and ambiguous notion. These features come to light upon a more detailed scrutiny of formal bankruptcy criteria, which combine to form an essential component of any bankruptcy system.

Bankruptcy is a systemic (legal) consequence of insolvency. Thus, it is based on the concept of bankruptcy and ways to derive legal action from it. There are two main types of insolvency: balance-based (i.e. balance sheet insolvency) and loss of liquidity (i.e. cash flow insolvency). The first one can be formally represented as:

$$E(D_{t+H} | I_t^1) > E(V_{t+H} | I_t^2) \quad (1.1)$$

where: D_{t+H} represents liabilities due at time $t+H$; V_{t+H} – the value of assets at time $t+H$; I_t^1 and I_t^2 – sets of information available respectively to the creditors and owners of the company; and $E()$ is the expectation operator. The condition means that the expected value of liabilities of an enterprise is higher than the value of its assets.

With respect to formula (1.1) it is worth focusing on several issues. First, it is something of a prediction or a forecast. Open issues include horizon H and the way the forecast itself is constructed. Bankruptcy law must define both components. For reasons discussed among others in subsection 1.4, the debtor may have an incentive to 'move forward' the moment of verification of this condition. This is often due to the strong conviction on the part of the owners of a given firm that in the longer run it their enterprise will financially recover and its current problems will disappear. On the other hand, they are aware that in the event of bankruptcy, the present owners of the firm may be deprived of all existing benefits. A very common argument raised by the debtors in court or on other forums is that bankruptcy was declared too early, that this was the final blow that finished off a good company etc. Thus, the debtor has a rather 'natural' tendency to use H values which are significantly greater than zero. Conversely, looking at H through the eyes of the creditors, who, even in the case of a good bankruptcy law, may be even subconsciously motivated by the syndrome of racing for assets, the parameter is bound to be fairly small. When talking about the potential conflict of interests between creditors and debtors associated with the choice of the length of horizon H , it is also worth noting that the higher the value of this parameter, the stronger the debtor's position may be. A longer horizon H may, in fact, increase the value of a firm in question due to e.g. the future effect of completed investment¹ (cf. e.g. Tong and Reuer 2007), whereby the debtor may appeal to new advantageous business circumstances etc.

The parameter H also affects the left side of inequality (1.1). Here arises, among others, the problem with the future valuation of liabilities. Quite often, a firm's liabilities may, in fact, be conditional. A number of very well-run Polish enterprises experienced the so-called 'futures crisis' (cf. e.g. Konopczak, Mielus et al. 2011). The financial situation of a large group of such entities unexpectedly deteriorated to a significant extent when the appreciation trend of the zloty was suddenly interrupted due to the presence in their portfolios of futures contracts optimized along the path of the strengthening domestic currency.

A practical solution to the above problems associated with the choice of H often leads to the adoption of $H = 0$. In such a situation, it is sufficient that the condition is satisfied now (which, given the often time-consuming valuation procedures, means, strictly speaking, very recent past). Whether and which party benefits from the solution depends, among other things, on the respective rights and obligations of creditors and debtors to verify this condition and to what extent they can or must take action if it is satisfied. Too stringent solutions might be disadvantageous to the creditors, for example, when there are reasonable grounds for them to expect that in the near future inequality (1.1) changes direction. Unfounded restrictions might also be used by the debtors, for whom too automatic fulfilment of such a condition would facilitate their escape from liabilities through the so-called planned bankruptcy. All in all, a way to verify this condition, including the selection of horizon H is a sensitive issue, which should be carefully regulated, among others; within the framework of relevant bankruptcy procedures (see Fig. 1). We will shortly return to this issue.

The other fundamental problem associated with condition (1.1) is that in the most general case the inequality is based on conditional expectations and draws on two sets of information: available to the creditors (left side) and to the owners/debtors (right side). Due to the possibility of information asymmetry (which is more often than not the case under such circumstances) they do not have to be identical sets. Bankruptcy law must decide on which set(s) of information the condition is to be verified and how. Depending on the purpose of the bankruptcy system, it can be based to a greater extent on the set of information available to the creditors (if this is the main entity protected by the bankruptcy system) or to the owners (which may be the case otherwise).

In practice, it is impossible to verify condition (1.1) without the adoption of certain assumptions about the valuation of liabilities and assets on both sides of the inequality (for $H = 0$) or forecasting their values (for $H > 0$). In the first case, their book value is often adopted. Such a solution is simple, but it may lead to undue liquidation of enterprises generating a positive added value, especially those with a large investment portfolio (see footnote 1). This basis for valuation may also be detrimental to the creditors, for example, in the case of the so-called rare assets (with very specialized applications), the liquidation value may even be negative (disposal costs). At the other end of the spectrum, there are purely market-based concepts, in which, in many cases, an auction-based valuation of assets is recommended (cf. e.g. Thornburn 2000). A distinct group of problems is encountered in the case of negotiated bankruptcy caused by the estimation of the value of the so-called 'reorganized' firm (restructuring value) (cf. e.g. Bebchuk 1988). Due to insufficient space we shall not deal with the broader issues of valuation. Suffice it to note, however, that any bankruptcy system, including the legal one, must adopt specific rules of conduct whose task is not so much to theoretically estimate those values as to pass judgement based on available information concerning the firm in question.

An analysis of the nature of information sets $I^{1,2}$ has another important consequence. It helps to draw a distinction between financial and economic bankruptcy. Although in the literature there is considerable conceptual confusion, we say that a company is bankrupt in the financial sense if condition (1.1) is satisfied given the present set of I , but it would not be the case if the company pursued a different financing strategy. By financial bankruptcy, therefore, we understand a situation that occurs only because of a specific financing structure. Although within the M-M paradigm the enterprise value does not depend on such a structure,

¹ The strength of this effect may significantly depend on the method of measuring the value of V , e.g. using the accounting, market or DCF (discounted cash flow) methods.

so if (1.1) holds for a certain structure, it holds for any other, but the limitations of this theory have been known for a long time. By economic bankruptcy we understand economic circumstances under which inequality (1.1) holds regardless of the financing structure. It can therefore be perceived as a situation in which an enterprise does not have a permanent capacity to generate a surplus sufficient to cover the debt that was incurred to fund its activity (absence of economic profitability).

The other type of bankruptcy is insolvency due to the loss of liquidity. We can formally define it (adopting a simplified situation of a single creditor) as the circumstances under which:

$$\forall_{t \in <T-H, T>} CF_t < PD_t \wedge PD_t > 0 \quad (1.2)$$

This relationship describes a situation in which financial flows generated by firm CF do not cover its unpaid financial obligations due by time $t - PD_t$. It is generally acknowledged that such a situation must continue for a period of time H, since points of insolvency may often occur in almost any enterprise. Models of bankruptcy systems usually outline such a horizon or other conditions that confirm the permanence and importance of the situation.

Definition (1.2) is sometimes modified. Let us note fact that it contains an implicit assumption of the objective economic nature of liquidity problems, the cause being insufficient cash flow. In practice, however, debtors sometimes deliberately avoid repaying their obligations or even play games with their creditors, for example, by paying back some of them while disregarding others, or by attempting to bankrupt their own company. For these reasons, this condition is often formulated in such a way that the sufficient condition for the occurrence of bankruptcy is the existence for a certain time of outstanding obligations due by time 't':

$$\forall_{t \in <T-H, T>} PD_t > K_{KRY} \geq 0 \quad (1.3)$$

The basis for insolvency adopted here is constituted only by the existence of due and unpaid obligations. In general, condition 1.3) is supplemented by an additional requirement concerning the scale of these obligations – they should not be less than a certain critical value K_{KRY} . The inequality itself may also refer to absolute and normalized values (e.g. the size of company assets). When using the critical value K_{KRY} it is hard to imagine a threshold not defined as precisely this kind of relationship.

A number of observations formulated in the case of balance-sheet insolvency remain valid for relationships (1.2) and (1.3). Nonetheless, there also exist important differences. The basic one is that this criterion is clearly an ex-post one in nature, while the previous one may have an ex-ante version. It should be remarked that this criterion, especially in systems focused mainly on the protection of creditors, may play an additional role. Now, formula (1.1) seems to be quite difficult to verify quickly. The process of such verification, if only due to the presence of expected value operators, may be complicated and is always arbitrary, at least to some extent. Since the verification of this criterion requires the establishment of a number of items contained in the balance sheets, it may be quite time-consuming to apply in larger companies. In contrast, conditions (1.2) or (1.3) can be tested and applied fairly easily.² The loss of liquidity criterion can thus be considered as a sort of 'shortcut' that a creditor may use to quickly initiate the procedure and avoid the difficulties associated with the verification of condition (1.1).

An interesting and pragmatically important problem is the question of the mutual relationships that hold among conditions (1.1), (1.2) and (1.3). Let us start by saying that in bankruptcy law they often occur together, i.e. the fulfilment of any one of them is treated as a situation that justifies the declaration of an entity as bankrupt. One of the reasons behind using such a solution was discussed above. The other reason may be that condition (1.2), even for a fairly long H, may not be met by a firm in a poor economic condition, the value of whose assets is less than that of its debts. Maintaining liquidity is actually possible even under such circumstances as long as the firm has enough liquid assets and/or maturity periods of some of its obligations are more remote. So if bankruptcy law was limited to conditions (1.2) or (1.3), it would not be sufficiently selective.³

A question arises whether a firm may lose liquidity and yet not be considered bankrupt as provided by condition (1.1). Such a situation is quite common on a temporary basis. Naturally, in the long run the accumulation of unpaid debts will eventually meet condition (1.2), but even in this case it is not inevitable. The company may, in fact, have assets with a prospective value (ongoing investments, natural resources etc.).

As we can see, conditions (1.2) and (1.1) are not automatically interdependent, hence the bankruptcy procedure must provide for a way of dealing with situations when only one of them is met. This issue is analysed in the next section.

² It should not be construed to mean that it occurs without difficulties. The contentious issue may involve determining outstanding liabilities. For example, the company in question may argue that it will not pay for certain services because their quality does not meet the previously agreed standards.

³ More information on the subject can be found in Chapter 4.

Virtually all of the above-mentioned parts of the bankruptcy model are basic and necessary structural components of the decision of creditor 'i' as regards the initiation of the bankruptcy procedure and the choice of its forms and strategies 's'. The rationality of such a decision must meet the following condition:

$$\forall_{u \in S(i) \setminus \{s\}} E(\omega[i, s, V_{t+H}(s)] | I_t) \geq \{E(D_{t+H}(i, u) | I_t) + C(i, s, H)\} \quad (1.4)$$

where function $\omega()$ characterizes rule PoC within strategy 's'; $V(s)$ represents the company value generated in the case of selecting the strategy, whereas function $C(i, s, H)$ characterizes the costs of participation in bankruptcy proceedings for entity 'i' conducted in the form of 's'. $D(i, u)$ represent the value of liabilities of the entity, which can be recovered by selecting strategy 'u'.

Condition (1.3) means that the creditor chooses bankruptcy proceedings in the form of 's' if he expects that the resulting priority of claims ω and company value V and the anticipated net share (after deduction of costs C) in this value exceeds the expected value of claims that could be obtained by pursuing any other strategy 's' regarding 'u' available to him⁴.

Note that for a number of creditor firms the expected 'recovery' value of claims at risk may be zero if they do not undertake bankruptcy proceedings. In this case, the sufficient condition for participation in the procedure is that the left side of the inequality is greater than its costs. On the other hand, it is often the case that these costs, if understood sufficiently broadly, greatly exceed the left side of inequality. A number of hypothetical situations can be quoted, but one of the most common is that the firm that chooses to initiate bankruptcy proceedings may experience negative reactions on the part of the market, for example, by losing certain customers, become ostracized, or the entity in question may be the main recipient of the company products. Such complications affect especially smaller enterprises.⁵ Consequently, a very common way of solving the problem of non-timely payments involves more or less informal activities conducted outside bankruptcy law. Naturally, there may exist many more reasons for (not) meeting condition (1.4), but their discussion is beyond the scope of this introduction.⁶

As regards condition (1.4) and its cost function C , we would like to mention yet another aspect, namely the question how the model should operate if condition (1.4) is met only for a certain group of creditors. This is a very complex problem, which cannot be further addressed here. Let us, however, point to the consequence of fulfilment of this inequality for each of the creditors. Adding up the sides we obtain:

$$E(V_{t+H}(s) | I_t) \geq C(s, H) \quad (1.5)$$

where $C(s, H)$ is the aggregated function of bankruptcy costs. It is a prerequisite for social rationality (given such assumptions) in initiating the bankruptcy procedure. If we remember that bankruptcy costs include⁷ both direct and indirect costs, and if condition (1.5) is met, the expected value of a firm's assets which can be obtained under the bankruptcy procedure 's' must also be greater than the direct bankruptcy costs. If not, initiating the bankruptcy procedure is not socially justified. Since the direct costs of bankruptcy are 'the most tangible' and easily measurable, the principle that the left side of inequality (1.5) should be greater than those costs, it constitutes a natural candidate for a rule of thumb governing social rationality of bankruptcy proceedings.

Condition (1.4) also has another extremely serious consequence. Its verification clearly requires – which can already be seen to some extent even in the light of the previous considerations – the forecasting of categories occurring in the formula as long as we want to consistently follow the principle that the bankruptcy system should have a favourable effect on the level of social prosperity, i.e. eliminate only those entities which are economically inefficient. In particular, these procedures must establish whether a sufficiently long horizon H and/or a different strategy may offer greater chances of debt recovery than bankruptcy. A similar analysis should be carried out once bankruptcy has been considered to be the optimal way of dealing with the debtor; then the problem becomes one of choosing its form. If negotiations are the preferred option (i.e. the enterprise may 'live'), such a choice must be based on its future business opportunities.

A wide range of potential solutions can be discussed. They may include individual methods and procedural solutions, including issues related to the regulation of the powers of individual entities participating in the process to formulate such forecasts and take action on their basis. Consequently, in the context of the normative base of a bankruptcy system, we are talking about a forecasting model. Even though analysing bankruptcy usually does not include expressions related directly to such a term, the model is present there at least implicitly. If, for example, the value of a firm's liabilities exceeds the present value of its assets

⁴ Derived from set $S(i)$.

⁵ This case often represents a forced 'business credit'. The supplier becomes reconciled with the fact that the recipient does not pay on time. Although the supplier could formally apply for a declaration of bankruptcy, equation (1.3) stipulates that such an action may not be beneficial to the creditor.

⁶ More information on the subject can be found, among others, in: (Gilson 1990).

⁷ Cf. Chapter 4.

and a decision to liquidate it is made, it is difficult to imagine such an action as rational, if, at the same time, we believe that such a relationship of debts and assets is likely to reverse in the foreseeable future.

Now we shall discuss the other two pillars of Fig. 1 – the design of the bankruptcy procedure and insolvency procedures. We shall confine ourselves to several crucial observations for two reasons. First, they constitute the more practical elements of the whole system and, as such, will be characterized and discussed in-depth (based on the Polish bankruptcy law) in the next section. Second, several elements of these procedures are closely related to the previously discussed model of a bankruptcy system.

The design of any bankruptcy procedure includes mainly the verification of insolvency conditions (1.1) – (1.3). The key issues include the determination of who has the right and obligation to verify these conditions and what may constitute the possible sanctions in the event that the obligation has not been fulfilled. The creditor's rights are obvious in this respect. We should, however, remember the asymmetry of information that has an adverse effect on the interests of the firm, and quite often also on public interest. It is natural, therefore, to impose an obligation on debtors to take appropriate action. Unfortunately, as was already mentioned, the verification procedure of these conditions is generally not as simple as it may appear at first glance. Additionally, debtors often have a vested interest in manipulating these assessments. A very important component of a bankruptcy system is the collection of instruments and procedures to discipline debtors in the area of timely provision of objective information on the company's problems. The less restrictive and accurate the adopted solutions, the lower the efficiency of the system as a whole.

The second group of components of the bankruptcy procedure includes systemic solutions that define the entities entitled to participate in the proceedings, the criteria for acceptance/dismissal of the bankruptcy petition and appeal procedures. The acceptance/rejection criteria involve both specific rules for the verification of conditions (1.1) – (1.5) and the already mentioned problem of mutual relationships amongst criteria (1.1) – (1.3), including their equal status: do they have to be met concurrently or is it sufficient if only one of them is met? Of particular importance may be the analysis of condition (1.5) since its result provides an assessment of social efficiency of the bankruptcy process. The procedure should therefore expressly include solutions to be implemented in the event that such an efficiency evaluation is negative. The natural direction of the proceedings is to dismiss the bankruptcy petition, but other options may be considered as well.

Since the examination of conditions (1.1) – (1.5) is a complex process that may include a number of subjective, prognostic and other factors, the bankruptcy system must also comprise appeal procedures on the part of the entities involved.

The third family of elements of the bankruptcy procedure comprises solutions in the area of forms of bankruptcy and principles governing their choice. In today's bankruptcy systems, in principle, there are two basic forms of bankruptcy – liquidation and negotiated settlement. A much more complex problem is posed by the operationalization of choice between these two possibilities. Three issues are especially open to debate: the entities authorized to make such a choice (the court of law, the creditors, the debtor), rules of conduct when the preferences of the authorized entities are at variance and the reasons for making such a choice. The last one may pose a substantial challenge since, as our previous remarks have shown, the procedure for verifying conditions (1.1) – (1.3) can be very complicated, require forecasting, expert knowledge etc.

Finally, the last element of the procedure involves the rules of processing the bankruptcy petition, i.e. actions taken once bankruptcy has been declared. This group of solutions is of particular importance from the point of view of efficiency of the bankruptcy process, including its cost and duration. Individual elements contributing to these rules are synthetically presented in Fig. 1. Here we shall confine ourselves to the role of activities related to the protection of the debtor's assets (in the case of liquidation) and the organization and supervision of the restructuring process (if negotiated bankruptcy is the preferred option). Specific solutions in this area are extremely important to the quality of the entire bankruptcy system since some of the key issues which have to be dealt with by the system at this stage include the asymmetry of information and the problem of agency. We should be aware that it is very difficult to develop optimal solutions in this area. It suffices to note that individual participants in the procedure have different knowledge and do not always represent shared interests. If the entire process is supervised by the court of law, one may doubt whether it possesses sufficient knowledge of the specific nature of the enterprise to be restructured. In turn, the creditors frequently have no similar general knowledge, and almost as a rule have no access to inside information related to the specific circumstances, history, contracts, customer base etc. of a particular firm. This group may also exhibit a tendency to recover their debts as quickly as possible, which is often the reason for non-optimal asset management. By and large, this is not a group with homogeneous interests, but this feature may paradoxically constitute the predisposing factor. It is hard to imagine an effective and reasonable bankruptcy procedure in isolation from the interests of this group, internal negotiations amongst its members and ways to reconcile such interests. Finally, the previous owners usually have the most complete relevant knowledge about their firm and its economic environment. Unfortunately, quite often this is a group whose mismanagement was the main cause of bankruptcy. Under such conditions it is difficult to expect it to implement the desired changes. As we can see, there is usually no 'ideal' candidate to be entrusted with the responsibility of organizing and supervising the bankruptcy proceedings.

We have clearly explained the complexity of the bankruptcy process and its dependence on the results of its adopted form, the forecasts, managing the process itself, etc., consequently, it is necessary to supervise the process not only in formal and

legal terms, but also in economic ones. Procedures at work must provide for the possibility of correcting errors, among others, committed due to the complexity of the subject matter, including changing the form of bankruptcy.

Our reflections on the pillars of the bankruptcy system shall terminate with several conclusions concerning terminology. The natural consequences of the adopted model of a bankruptcy system rest in their implied conceptual and terminological network. It must be stressed that this is an area where neither sufficient accuracy nor unification of terminology has been achieved. For example, one of the fundamental concepts is the notion of bankruptcy. It is quite commonly accepted that the term derives from the combination of two Latin words *bancus* and *ruptus* and originally referred to a situation whereby a person conducting banking activity was unable to meet its financial obligations or to continue lending activity. This was symbolized by the breaking of a bench on which such activity was conducted. Currently, however, the term is used in a wide range of contexts and in practice means not only bankruptcy in its legal sense, but also refers to a number of 'problems' associated with the discontinuation of debt service, poor financial standing and others. Likewise, we use the term quite freely throughout this study whenever it does not cause interpretation problems.

Simplifying the issue a little we can say that the Rapid Response Instrument is a system that warns against impending bankruptcies, hence it is quite important how the latter term is understood. We tend to assume that bankruptcy in its broad sense refers to a situation that meets any of the conditions (1.1) – (1.3). In contrast, bankruptcy in its strict sense describes the state resulting from a decision made by the Commercial Court. Our previous considerations concerning the model of a bankruptcy system show clearly that these situations do not have to overlap. In this study, however, we often use the general term 'bankruptcy' in both contexts with clarifications only where necessary. In such cases we also use, with an identical reservation, the term 'insolvency.'

The above convention also implies that the category of bankruptcy in its broad sense may overlap with the term 'insolvency,' which means that any of the conditions (1.1) – (1.3) is met. It is worth noting that the former term is primarily used in situations where conditions (1.1) – (1.3) have a deeper justification for the business circumstances of an economic entity. In the EWS discussed here, an analysis of this situation usually completes the final diagnosis.

The Polish terminology lacks a really good translation of the much-needed term *financial distress*. We interpret this term quite broadly (cf. e.g. Opler and Titman 1994) as an event or situation which significantly increases the probability of a firm's insolvency (i.e. one that meets at least one of the conditions (1.1) – (1.3)). It may also be interpreted as a period of financial distress, a negative financial shock, economic problems or impending bankruptcy. Moreover, in the literature on the subject the term *financial distress* is sometimes identified with the concept of bankruptcy (cf. e.g. Casey and Bartczak 1985).

Situations (1.2) or (1.3) are thus called insufficient liquidity or default and the subject thus affected is deemed to be illiquid.

1.3. Insolvency under the Polish legal system⁸ – basic components

Insolvency under the Polish legal system is defined as a property standing of an enterprisewhich, for economic reasons, is unable to meet its obligations to creditors as ruled by a competent court following insolvency proceedings. During the proceedings the court analyses the enterprise's financial standing in order to determine whether it is appropriate to declare insolvency in a given case. The declaration of insolvency by a court of law starts often lengthy insolvency proceedings. In practice, the term 'insolvency' is often used interchangeably with the term 'bankruptcy'. Such an approach is not always correct from a formal point of view since in a strict sense bankruptcy is primarily a concept in economics, while insolvency is a legal term (Britannica 2014).

As regards the functions and objectives of insolvency law, they are in line with the general rules described in the subsection 1.2. In principle, the insolvency law regulates the proceedings against firms which have become insolvent or whose financial situation may bring about the danger of insolvency in the near future.⁹ The primary function of insolvency law is to satisfy the creditors of an insolvent debtor. This should occur to the largest possible extent bearing in mind, if possible, the prospects of restoring the operation of the business of an insolvent debtor or one already in danger of insolvency. For this purpose the legal regulations provide for two solutions: liquidation or arrangement insolvency. The choice between them depends on the individual enterprise's capacity to satisfy the creditors using a given procedure. In other words, the primary goal is to protect the interests of creditors while the secondary one is to sustain the company's activities.

The law also prevents a enterprise's insolvency from getting worse if it has already found itself in financial distress. An enterprise operates in an economic environment – i.e. the market – and its insolvency more often than not has a significant impact on other entities with which it has formed economic and legal ties. For that reason, it is important for the debtor threatened with insolvency to file an insolvency request in a timely and effective manner and to cooperate with the authorities involved in the proceedings.

⁸ Regulations relating to insolvency and restructuring law are described in the Act of February 28, 2003 Insolvency and Restructuring Law (Journal of Laws of April 9, 2003, as amended; hereinafter: Insolvency and Restructuring Law), which starting from October 1, 2003 replaced the Polish President's decree from 1934 – Insolvency Law and Law of arrangement proceedings

⁹ Article 1 of the Insolvency and Restructuring Law.

Additionally, the Insolvency and Restructuring Law aims to promote fair trade attitudes among the company executives. It is a way of forcing them to act in a manner that does not expose the company to the risk of insolvency and if it has occurred, to file an insolvency request as soon as possible and to cooperate with the authorities conducting the proceedings. It is therefore necessary to institute sanctions against any instances of dishonest behaviour on the part of the firm's executives (Zedler 2004, p. 31).

In summary, the primary goal of insolvency law is to protect the interests of creditors and the economy at large by eliminating dishonest or incompetent entrepreneurs.

The Insolvency and Restructuring Law is based on two main principles: the principle of optimization and the principle of dominance of the collective interest of creditors. In accordance with the principle of optimization, the above-mentioned Law provides that in order to satisfy creditors to the greatest extent possible, the best conditions for the use of the assets of insolvent companies or those facing insolvency risk must be ensured. As long as objective conditions permit, any activities carried out in the process should be conducted in a way that permits the company to continue doing business.

Insolvency proceedings require a compromise amongst the individual, often conflicting interests of creditors of the enterprise in question. Accordingly, the principle of dominance of collective interest of creditors focuses on optimal and in principle proportional settlement of creditors' claims (at least within a single category of creditors).

An important element of insolvency law is the category of capacity for insolvency. Subjective capacity for insolvency of an entity is defined as a privilege to act in insolvency or restructuring proceedings and to be declared insolvent (Cyman 2008, p. 15). Under Polish law, such a capacity is granted to entrepreneurs, physical persons not involved in business activities whose insolvency was due to exceptional circumstances independent of their actions (i.e. consumer insolvency) as well as limited liability companies, joint stock companies not involved in business activity, shareholders of commercial partnerships accountable for the liabilities of the partnership without limitation on their assets and members of partnerships¹⁰.

An insolvent debtor is said to have an objective capacity for bankruptcy. The deciding factors here are the both economic facts (failure to meet one's financial obligations and/or a situation in which the value of liabilities exceeds the value of property) and legal ones (the existence of liabilities of a certain value that have been unmet in due time – the court may dismiss the insolvency request if the delays in payment do not exceed three months as long as the total outstanding liabilities do not exceed 10% of the balance-sheet value of the debtor's business). However, even if such legal facts do not occur, the court should declare insolvency if non-payment is permanent in nature or if the dismissal of an insolvency request may lead to the creditors detriment¹¹.

The Insolvency and Restructuring Law also lists entities that do not have the capacity for insolvency. These include the State Treasury, local government units, independent public health care institutions and legal entities established by law, unless the law provides otherwise, and those established to perform obligations imposed by legal provisions, physical persons running farms and universities¹². The entities mentioned can neither be declared insolvent nor participate in insolvency or restructuring proceedings.

By excluding the above-mentioned entities from the capacity for insolvency the legislators grant legal protection from creditors assuming the risk of default in case of business failure. This is due to the distinctive nature of their activities related to the exercise of state responsibilities or the pursuit of public benefit activities. However, the Polish insolvency law does not define clearly the group of entities that do not have the capacity for insolvency. This applies especially to the provisions dealing with legal entities established by law or the performance of obligations imposed by law. The difficulty in establishing which entities are accorded such a privilege is primarily due to the fact that there is no registry or authority competent to confirm it. Moreover, this kind of protection is often enjoyed by entities pursuing profit-oriented activities, which may raise doubts as to the compatibility of this provision with the principles of fair competition (Sącińska 2006, p. 27-33).

One of the key groups of provisions contained in the Insolvency and Restructuring Law are the prerequisites for insolvency. Insolvency is declared by the court of law when all the formal and substantive law conditions occur together. Under Polish insolvency and restructuring regulations, the substantive law prerequisites include the entitlement to initiate insolvency proceedings¹³ and basis for insolvency declaration pursuant to Article 10 of the above-mentioned Law. Thus, only debtors who

¹⁰ Articles 1 and 5 of the Insolvency and Restructuring Law, *op. cit.*

¹¹ Article 12, items 1 and 2, *ibid.*

¹² Article 6, *ibid.*

¹³ In accordance with Article 7 of the Insolvency and Restructuring Law, in the event of the death of an entrepreneur his company may be declared insolvent if the insolvency request was filed within one year of the date of the event. The insolvency request may be filed by a creditor, the heir, the spouse and each of the children or parents of the deceased even if they do not inherit anything. However, according to Article 20 items 1 and 2 of the Insolvency and Restructuring Law, the insolvency request may be filed by a debtor or any of his creditors. The request may also be filed by:

- 1) with respect to a general partnership, limited partnership, limited partnership and limited joint stock partnership – each partner having unlimited liability for the obligations of the company;
- 2) with respect to legal persons and organizational units without legal personality, recognized as having legal capacity by other legal provisions – anyone who has the right to represent them individually or jointly with other people;
- 3) with respect to a state-owned enterprise – the group also includes its founding body;

have become insolvent can be declared bankrupt. Any debtor who does not meet his outstanding liabilities is deemed to be insolvent. At the same time, it is irrelevant whether or not he fails to meet all or only some of his financial obligations. If the debtor is a legal person or an organizational unit without legal status, whose legal capacity can be established by separate legal provisions, the decision as to its insolvency is made on the basis whether its liabilities exceed its assets, even if it pays its current financial liabilities¹⁴.

In consequence, the legal perspective distinguishes between two approaches to the declaration of insolvency: the perception of insolvency in terms of property and balance-sheet insolvency. Insolvency in terms of property is due to the inability of the debtor to pay his debts, which have become due in the ordinary course of business. Balance-sheet insolvency refers to a situation in which the debtor's total liabilities exceeds the value of his assets (Fletcher 2002, p. 429).

Next, in order to meet the procedural conditions, the debtor must have the capacity for insolvency,¹⁵ be subject to Polish jurisdiction,¹⁶ the court must be material competent (District Court – Commercial Court or the so-called Insolvency Court) and territorial competent (i.e. within whose jurisdiction the main businesses of the debtor is conducted or, if the debtor has no company in Poland, a court corresponding to the residence of the debtor or, in the absence thereof, the court within whose jurisdiction the debtor's assets are located)¹⁷ to institute appropriate proceedings and certain formal requirements of the insolvency request¹⁸ must be fulfilled.

The fundamental basis for the declaration of insolvency is constituted by permanent failure to repay debts. Insolvency cannot be declared solely on the basis of a debtor's inability to satisfy creditors as long as debts are paid even if it was proved beyond reasonable doubt that in the near future the said debtor will be unable to satisfy all his creditors. The cessation of repayments occurs when a debtor has no funds at his disposal and fails to repay most of the debts due. Such a situation may also occur if the debtor does not repay a single creditor who possesses a significant liability (Ruling 2004).

As a rule, once a debtor has ceased all business activity, it is impossible to initiate the proceedings leading to the declaration of insolvency with the exception of a natural person – an entrepreneur in the event of his death or cessation of business activity. This possibility is open for the period of one year from the date of death or removal of a business entity from the relevant register. This provision also applies to persons who have ceased to be shareholders of commercial partnerships.¹⁹

In terms of both legal and economic consequences, a very important role is played by the so-called entitlement to participate in bankruptcy proceedings, i.e. to file an insolvency request. The insolvency request can be filed by the debtor and each of his creditors. Nevertheless it should be borne in mind that, while the filing of the above-mentioned request constitutes the right of the creditor, the debtor is obliged to do so within two weeks from the date on which the cause for insolvency accrued.

If the debtor is not a natural person, the insolvency request with respect to commercial partnerships can be filed by each partner accountable without limitation for the company's obligations; with respect to legal persons and organizational units without legal status with a legal capacity granted by separate provisions – anyone who has the right to represent them; with respect to a state-owned enterprise – the group also includes its founding body; with respect to the sole shareholder company of the State Treasury – the group also includes the minister responsible for the State Treasury; with respect to legal persons and commercial partnerships undergoing liquidation – each of the liquidators; with respect to a legal person registered in the National Court Register – a representative appointed pursuant to the National Court Register Act; with respect to the debtor who was granted aid in excess of euro 100,000 euros – the authority which provided the grant (Jakubecki, Zedler 2006, p. 65-79).

A significant component of Polish legislation involves enterprises 'too poor to be declared insolvent.' The court may dismiss the insolvency request despite the debtor's insolvency if the delay in the settlement of liabilities does not exceed three months, the total amount of default does not exceed 10% of the balance sheet value of the enterprise and if the debtor's property that is mortgaged, put in pledge or register pledge, placed under a tax lien or maritime mortgage is not sufficient to cover the costs of insolvency proceedings. Moreover, the court will dismiss the request if the debtor's assets are insufficient to cover the costs of such proceedings.²⁰ These regulations have important implications²¹ both from the perspective of measurement of the scale

4) with respect to the sole shareholder company of the State Treasury – the group also includes the minister responsible for the State Treasury;

5) with respect to a corporation, partnership, limited partnership and partnership limited by shares undergoing liquidation – each of the liquidators;

6) with respect to a legal person entered in the National Court Register – a representative appointed pursuant to Article 26 item 1 of the National Court Register Act of 20 August, 1997 (Journal of Laws 2007, no. 168, item 1186, as amended³⁾);

7) with respect to the debtor who was granted public aid in excess of euro 100,000 – the authority granting the aid.

¹⁴ Article 11 of the Insolvency and Restructuring Law, *op. cit.*

¹⁵ Articles 5–9 *ibidem*.

¹⁶ Article 382 *ibidem*.

¹⁷ Articles 18–19 *ibidem*.

¹⁸ Articles 22–25 *ibidem*.

¹⁹ Articles 7 and 8 of the Insolvency and Restructuring Law, *op. cit.*

²⁰ Articles 12 and 13 of the Insolvency and Restructuring Law, *op. cit.*

²¹ More information on the subject can be found in Chapter 2 of this study.

of insolvency (the so-called 'hidden' insolvencies occurs) as well as the factual assessment of the effects of insolvency, which may be underestimated if based solely on insolvency statistics.

The actual practice and numerous studies show that in the operation of the insolvency system, including its efficiency, an important role is played by the regulations governing the selection of the type of insolvency proceedings. Following the filing of the insolvency request, the court extends protection over the debtor's assets (if the debtor has submitted a request to that effect) or at the request of a creditor. For this purpose, the court may appoint a temporary court supervisor, manager, receiver/trustee (in the event that the debtor hides his assets or otherwise acts to the detriment of his creditors), suspend all claims against the debtor subject to negotiated agreements under relevant legal provisions or institute other measures to protect the assets.²²

Subsequently, the court may convene the initial meeting of creditors unless it entails excessive costs, the total disputed claims do not exceed 15% of the total debt and there is a prospect that creditors will be satisfied to a greater extent by arrangement than by liquidation of the debtor's assets. At the meeting, the creditors may adopt a resolution on how to conduct further insolvency proceedings (with the possibility of reaching an arrangement or deciding on the liquidation of the debtor's assets), on the appointment of a creditor committee and may express their opinion on the official receiver/trustee, court supervisor or manager. The court conducts insolvency proceedings in accordance with the resolutions made at the initial meeting of creditors provided they comply with the law.²³

The court of law declares the debtor's insolvency with an option of an arrangement if such a solution offers an opportunity to satisfy the creditors' claims to a greater extent than they would be after insolvency proceedings involving the liquidation of the debtor's assets. Otherwise, and if there is a reasonable risk that the arrangement is not likely to be executed or it does not comply with the law, the court declares insolvency involving the liquidation of the debtor's assets. However, even in the course of insolvency proceedings the court is entitled to change the procedure if the grounds for such an alteration emerge only after insolvency has been declared. As of the date of declaration of insolvency, the debtor's assets become an insolvency estate.²⁴

After declaring insolvency with the option of arrangement, the insolvent debtor should submit the proposals for such an arrangement within a month. Such proposals can also be submitted by the court supervisor, manager or the creditor if the court has declared bankruptcy with option to negotiate a settlement at their request. The proposals should include a way of restructuring the liabilities of the insolvent debtor, for example postponement of repayments, debt rescheduling, repayment in instalments, a reduction in the total amount of debt, conversion of debt into shares, a modification or cancellation of a decision safeguarding a specific claim. The terms of debt restructuring should be the same for all creditors, and if a group of creditors votes on its specific provisions, they should be the same for creditors belonging to the same group. These conditions may be less favourable to a particular creditor only on condition that he expresses his explicit consent. It is possible to grant more favourable restructuring conditions to creditors who have smaller debts and to those who after insolvency will provide the loans needed to execute the arrangement. The proposed arrangement approved by a majority of creditors holding a total of at least two-thirds of the total amount of debt and entitled to vote is then subject to approval by the court.²⁵

Arrangement include claims which arose before the date of declaration of insolvency. After the final ruling approving the arrangement comes into force, any security and enforcement proceedings are discontinued by law (Adamus 2009, p. 419-420 and 453-454). There is also an option to enter into an arrangement providing for the liquidation of the debtor's assets in order to satisfy the creditors (the so-called liquidation arrangement).²⁶ Once the arrangement has been executed, the court issues a decision to that effect, which is tantamount to the completion of insolvency proceedings.²⁷

The adopted form of insolvency proceedings need not to be final. The court changes the way in which the proceedings have been conducted from the arrangement option to liquidation of the debtor's assets if no arrangement has been reached.²⁸

In the case of insolvency which consists in the liquidation of the debtor's assets, the officially appointed receiver/trustee takes over its management. The receiver/trustee is responsible for the preparation of the inventory and financial statements as at the day preceding the declaration of insolvency or submits a written report to the judge responsible and conducts the liquidation procedure of the insolvency estate. Liquidation involves, in particular, the sale of the insolvent company as a whole or in organized parts, the sale its property, collection of debts owed to the insolvent company and execution or sale of its property rights. The insolvent company is sold free from all encumbrances. The property is sold by tender or auction in accordance with the provisions of the Civil Code of 23 April 1964.²⁹

²² Articles 36–43 *ibidem*.

²³ Articles 44–48 *ibidem*.

²⁴ Articles 14–17, 61 and 288 *ibidem*.

²⁵ Articles 267, 269, 270, 279, 285 and 287 *ibidem*.

²⁶ Article 271 of the Insolvency and Restructuring Law, *op.cit*.

²⁷ Article 297 *ibidem*.

²⁸ Article 286 *ibidem*.

²⁹ Articles 57, 306–308, 311, 317 and 320 *ibidem*.

The proceeds from the liquidation of the insolvent estate are used to satisfy the claims of debtors as provided by the law. Funds from the sale of mortgaged property, property held in pledge, in registered pledge, tax lien and maritime mortgage are used to pay off the debts secured by the above-mentioned methods (after deduction of relevant costs of the proceedings). Funds from the insolvency estate are distributed according to a plan drawn up by the liquidator. Once the distribution of funds has been completed, the court issues an official decision to that effect.³⁰

Another important aspect of insolvency law is the subjective structure of the proceedings. As far as the entities involved in the insolvency proceedings are concerned,³¹ cases involving insolvency request are heard by the insolvency court (District Court – Commercial Court) competent according to the main seat of the debtor's company. The court declares the debtor's insolvency, convenes the initial meeting of creditors, approves the arrangements made by them, designates the supervising judge, appoints and approves the remuneration of the receiver/trustee, the court supervisor and/or the manager, hears appeals against rulings and decisions made by the supervising judge. After the declaration of insolvency, all the stages of the procedure that remain outside the jurisdiction of the court are carried out by the supervising judge. The judge oversees the course of the proceedings, activities of the receiver/trustee, the court supervisor and the manager, indicating actions that they are allowed perform only with his consent, points to the errors made in the course of the proceedings and investigates complaints against the insolvency-related actions of the bailiff.

If the court declares insolvency involving liquidation of the debtor's assets, all further actions are taken by the appointed receiver/trustee. The receiver/trustee and the court supervisor or manager carry out operations on behalf of the insolvency estate in their own name. The receiver/trustee manages the assets of the insolvency estate, protects it from destruction, damage or removal by unauthorized persons and carries out the liquidation of the assets. Additionally, the receiver/trustee is obliged to notify the creditors whose contact data are known to him.

If the court declares insolvency with the option of an arrangement with continued management on the part of representatives of the insolvency estate, it appoints a supervisor. The court supervisor oversees all the activities of the insolvent debtor and his company until the final approval of the negotiated settlement or until the proceedings have been terminated otherwise. If the court prohibits the insolvent debtor from managing his company, it must appoint a manager. The manager takes over the administration of the insolvency estate, protects it from destruction, damage or removal by a third party, draws up an inventory and financial statements as at the day preceding the declaration of insolvency and makes all management decision associated with the running of an insolvent enterprise.

The creditors' meeting may be invited to participate in the insolvency proceedings and decide whether to agree on a negotiated settlement or liquidate the assets of the insolvent company. Additionally, the creditors' meeting passes resolutions, appoints a board of creditors and issues opinions.

If the meeting of creditors fails to appoint a board of creditors, the supervising judge is entitled to do so. The board of creditors is a subsidiary body that oversees the actions of the receiver/trustee, the court supervisor or manager, examines the insolvency estate's funds, and authorizes activities that may be conducted only with its consent and issues opinions at the behest of the supervising judge, the receiver/trustee, the court supervisor or manager.

The main objective of the Insolvency and Restructuring Law is to protect the creditors of the insolvent debtor. Thus, during the insolvency proceedings they are protected by law. In accordance with Article 189 of the above-mentioned Law, all creditors are entitled to obtain satisfaction from the insolvency estate even if their claims are not notifiable. If a creditor wishes to participate in the insolvency proceedings, he should submit his claim within the specified period (no less than one month and no more than three months), unless the claim does not require notification in order to be included on the list of receivables (e.g. employment receivables, claims of the Guaranteed Employee Benefits Fund for reimbursement of the benefits paid to the employees of the bankrupt company).³² Notification of claims entitles creditors to participate in the meeting of creditors and in the board of creditors.

Debts subject to collection during the insolvency proceedings are be conventionally divided into two groups: insolvency claims (arising before the insolvency), and claims on the insolvent estate (basically arising after insolvency has been declared). The claims of the latter group do not require notification and tend to have a higher priority. In turn, the insolvency claims are satisfied in order of priority (i.e. by category) (Jakubecki, Zedler 2006, p. 687).

If an insolvent enterprise is liquidated, the creditors' receivables are paid off from the proceedings obtained from the liquidation of the debtor's assets. If the funds are insufficient to satisfy all the creditors in full, the creditors belonging to a lower-priority category are repaid only after a full repayment of higher-priority creditors. If the funds are insufficient to satisfy in full all the creditors

³⁰ Article 368 *ibidem*.

³¹ Articles 76, 150-153, 156, 160, 173, 176, 180-184, 191-213 *ibidem*.

³² Articles 236–238 *ibidem*.

belonging to the same group, their claims are repaid proportionally.³³ If the court has approved an arrangement, the creditors are repaid as provided by the arrangement (Jakubecki, Zedler 2006, p. 686). Furthermore, in accordance with Article 93 of the Insolvency and Restructuring Law it is permissible to satisfy some claims by way of a deduction from the claims of the insolvent company as long as both debts existed on the day insolvency was declared. It is a privileged way of paying off creditors outside the division of proceeds.

The institution of insolvency proceedings is not prejudicial to the rights of the creditors against the guarantors and co-debtors of the insolvent enterprise. Both the guarantors and the co-debtors have an obligation to repay the debt of the insolvent entity at the creditor's behest. However, they are entitled to in this respect to claim back the amount that they have repaid. The claim arising thereby is recorded on the list of debts and specifies the amount that the guarantor or the co-debtor has paid to the creditor.³⁴ As regards the legal position of company executives who have failed to exercise due diligence and may be subject to liability for their actions, the debtor responsible for filing the insolvency request who does not submit it within two weeks from the date on which the event constituting the cause for the declaration of insolvency occurred, is liable for the damage inflicted as a result of failure to meet the legal deadline.³⁵ Additionally, the court may ban them for a period of three to ten years from doing business on their own account and to act as a board members, representatives or proxies in commercial companies, state-owned enterprises, cooperatives, foundations or associations. Such a ban is imposed on a person who through his/her own fault has not filed the insolvency request in a timely manner despite the obligation to do so; who after the declaration of insolvency has not released the data concerning the company assets or did not identify them, including account books, correspondence or other documents of the insolvent company despite the legal obligation to do so; who after the declaration of insolvency conceals, destroys or encumbers the property that constitutes part of the insolvency estate, or as an insolvent person fails to fulfil other obligations provided for by the law, a ruling by the court of law or a decision made by the supervising judge. The court may also order the above-mentioned punishment with respect to the person who has at least once been declared insolvent previously with debt forgiveness at the end of the proceedings or declared insolvent within five years of the subsequent declaration of insolvency.³⁶

Providing false information in the insolvency request, in a statement to initiate recovery proceedings or during the restructuring proceedings is punishable by imprisonment from three months up to five years. Failure to disclose to the receiver/trustee all the assets of the insolvency estate, accounting books or other documents relating to those assets and failure to provide the supervising judge with information concerning the insolvent debtor's assets is punishable by similar prison terms.³⁷

1.4. The timeframe of the bankruptcy process

The legal and institutional system has a significant impact on the efficiency/efficiency of bankruptcy mechanisms, including their costs and duration. It should be emphasized that very fast-acting, low-cost bankruptcy proceedings that meet stakeholder needs render the role of an EWS much smaller. A very important element in this context includes the time and 'structure' of bankruptcy proceedings since EWS systems are always characterized by a certain time horizon in the forecasting of threats, or to be more precise, an effective warning timeframe. On the one hand such systems are characterized by a certain delay between the input signal and the warning message, while on the other hand they have a limited perspective of rational prediction. Here, by identifying the individual stages of the bankruptcy process, we shall also specify the time horizons within which EWS systems can be useful.

The basic steps in the bankruptcy process are presented in Figure 1.2. It is based on two perspectives: the timelines applying to internal and external stakeholders, respectively. It should be emphasized that in analysing bankruptcy the key external stakeholders are the company creditors. Our analysis shows, however, that the group may also include potential investors, public authorities, etc.

The starting point of the process is a set of events that trigger certain processes within the enterprise in question which may result in bankruptcy. The period in which these events occur and begin to significantly affect the situation of the company shall be called the contamination (contagion) period.

It is worth noting that the duration of the process may vary as do the type of stimuli that have caused the enterprise's problems. To illustrate the sequence of events, we have included three options: a shock event (negative stimulus on a large scale occurring within a short time), a systematic problem (a distinct trend with a varied slope) and shockwaves (fluctuations in different directions, but within an overall negative trend). It is obvious that the first effect is likely to be felt faster and in a more pronounced way than the last one, where periods of deterioration are interconnected with periods of recovery. In fact, more such sequences of events may lead to an enterprise's problems (cf. e.g. Crutzen 2009, Lukason 2012).

³³ Article 344 of the Act of February 28, 2003, *op.cit.*

³⁴ Articles 248 and 291 of the Act of February 28, 2003, *op.cit.*

³⁵ Article 21 *ibidem*.

³⁶ Article 373 *ibidem*.

³⁷ Articles 522–523 *ibidem*.

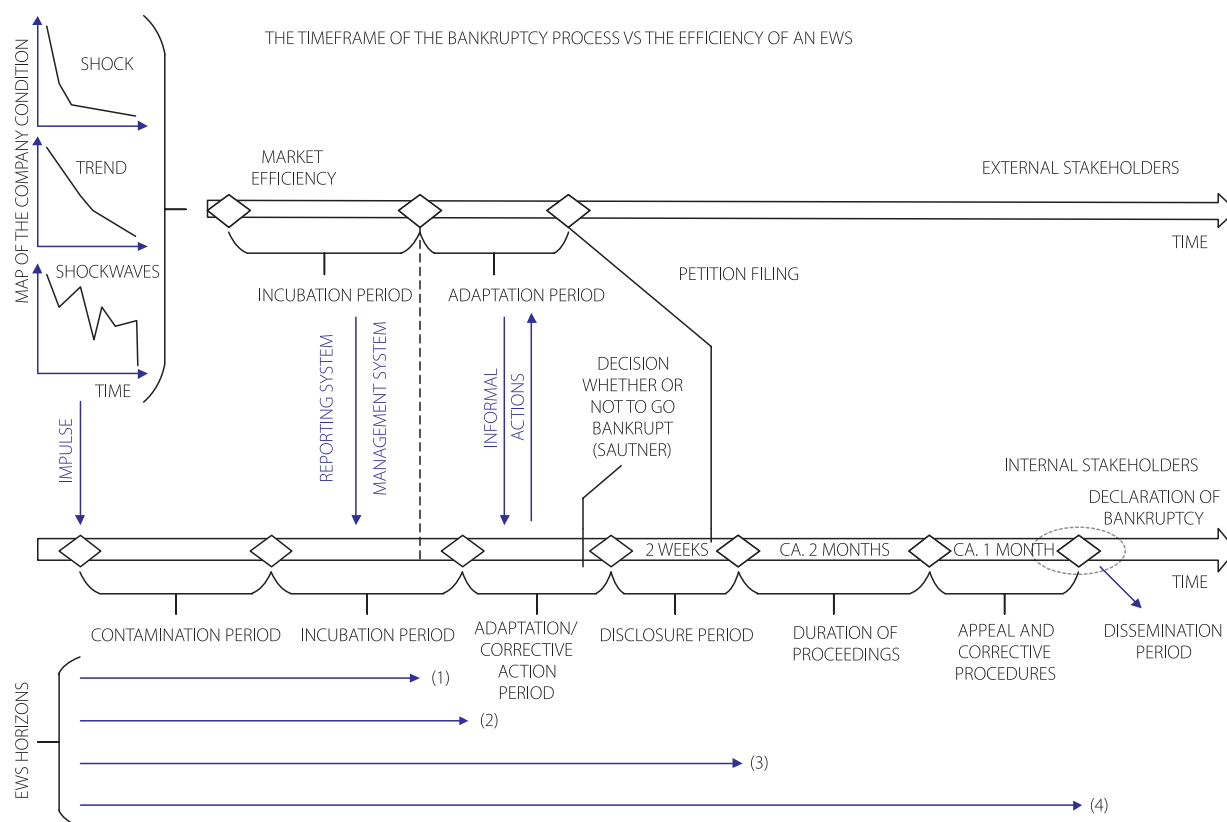


Fig. 1.2. The timeframe of the bankruptcy process vs the efficiency of an EWS

Source: Own study.

The next stage comprises the incubation period. At that time, the effects of the event that has triggered the firm's financial problems are revealed. It can be quite a complex process as there are a number of potential factors affecting the speed and 'clarity' of identification of arising threats by the firm's management. Certain reasons may be purely technical and be related e.g. to the operation of financial and accounting systems reporting some data with delay. Other kinds of threats may become apparent only later against the background of external information such as macroeconomic data, the performance of competition etc. In the case of unfavourable information, an important role may be played by psychological and sociological processes within the framework of ethical and behavioural models prevalent in the enterprise, including a whole range of behaviours such as attempts to cover up certain uncomfortable facts, fear of transmission of negative information to superiors etc. Moreover, the contamination and incubation periods may overlap with certain actions taken during the incubation period, which causes additional problems. The incubation period ends with the firm's decision-makers having sufficient knowledge of the actual problems and their extent.

Next comes the stage of adaptation and corrective action. It covers the activities implemented by the owners and managers of a firm at risk genuinely aimed at solving its problems. They may involve internal reactions (e.g. cost reduction, modifications in the production structure, new investments) or external ones (usually raising additional capital, consultations with creditors etc.).

Activities whose goal is to 'buy time' have specific implications for the efficiency and the timeframe of bankruptcy procedures. There are numerous analyses of such behaviours, yet most of them reflect a sequence of activities illustrated in Figure 1.3 below.

Let us assume that an entrepreneur at time $T = 0$ made an investment funded with debt D to be repaid in two instalments: D_1 and D_2 (disregarding the interest rate). At that time he finds out whether the income from business activity after period X_1 enables him to repay instalment D_1 due at the time ($X_1 > D_1$, probability p) or it does not ($X_1 = 0$, probability $1 - p$). If debt repayment is possible, the company continues to operate until time $T = 2$, where the final result in period X_2 depends on factors known only to the firm and may reach level X_{2H} in the event of success and favourable conditions for doing business, or level H_{2L} if the investment itself is successful, but economic conditions are unfavourable. The project may also fail (without losing generality, we can then assume the profit to equal 0). Let us also assume that only in the case of profits at the level of X_{2H} the company is capable of repaying its liabilities ($X_{2H} > D$). At $T = 0$ the creditor and the entrepreneur are in a situation of information symmetry. In contrast, at time $T = 1$, the creditor does not know the final outcome of investment at time T_2 .

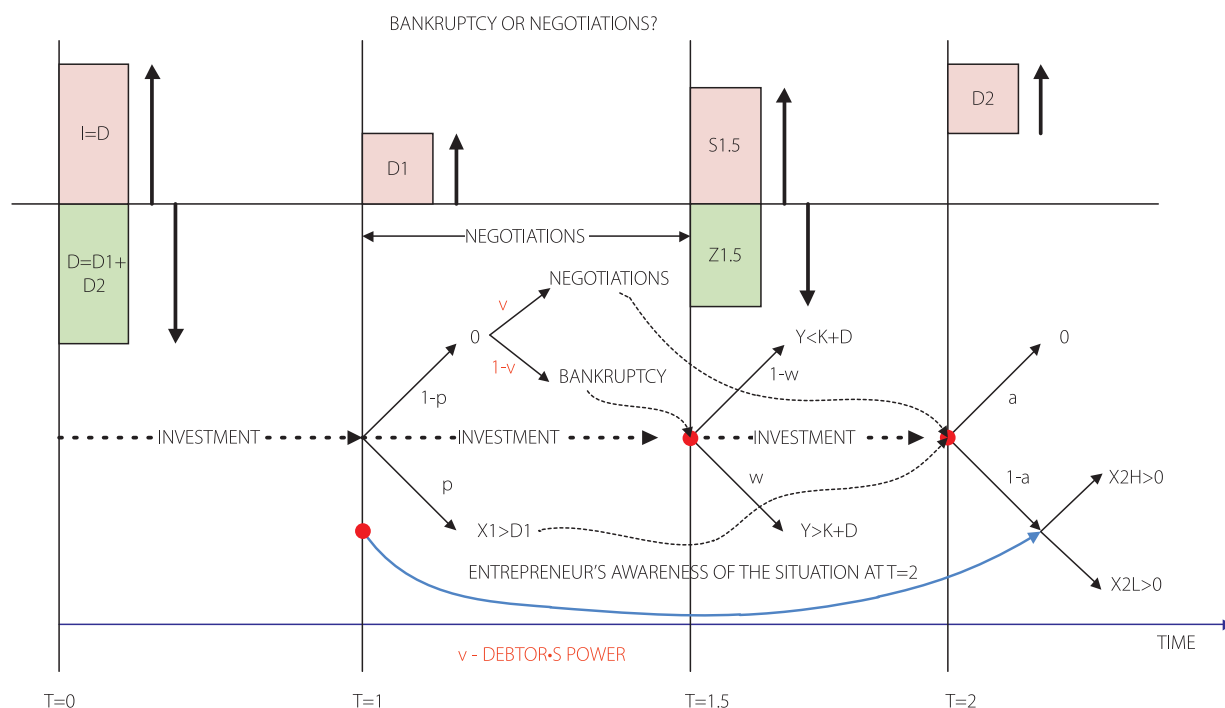


Fig. 1.3. Debtor's actions in the period of bankruptcy risk

Source: own study based on: (Sautner, Valdimirov 2013).

Let us consider the possible actions taken by the entrepreneur in question if at time $T = 1$ he cannot repay the amount of $D1$. Clearly, he has two options. First, he may choose to give up fighting and file a bankruptcy petition. Second, he may try to negotiate an agreement with his creditors. These negotiations may take place between the points represented by $T = 1$ and $T = 1.5$. Note that from the point of view of the entrepreneur such negotiations may have two consequences. One, they may result in an agreement. Two, even though an agreement may not be reached, time $T = 1.5$ may bring about extremely beneficial circumstances for the firm, as a result of which it becomes solvent again (probability ' w '). On the other hand, the firm's situation may become even more complicated and lead to its permanent insolvency ($Y < C + D$, where K is the bankruptcy cost). It should be emphasized that if bankruptcy law provides that in the event of bankruptcy of the firm's owner is left with nothing, he will be always willing to enter negotiate since in this way he either avoids bankruptcy or delays it.

The creditor also benefits from negotiating with the debtor between $T = 1$ and $T = 1.5$. The negotiations help him to at least partly redress the information asymmetry, in other words, the creditor obtains additional information about the actual performance of the firm in $T = 2$. If the knowledge thus gained allows the creditor to believe that the company is capable of performing at the level of $X2H$, he knows that the agreement will permit him to recover the debt in full. It is a tempting alternative to filing a bankruptcy petition because more often than not ' w ' is likely to be small. It is worth stressing that the capacity and the duration of such negotiations depend, among others, on the position of the debtor.³⁸ Naturally, the particular strategy to be adopted also depends on specific probabilities of events described in Figure 3.

To recapitulate, the adaptation period may be characterized by a variety of interactions between the debtors and their creditors, which are not always conducive to the efficiency of the subsequent possible bankruptcy proceedings. In the period spanning $T = 1 - T = 1.5$, the debtor may, in fact, demonstrate a range of behaviours with clearly negative consequences in terms of social impact, including a tendency to over- or under-invest. The consequences of such actions are examined in more detail in Chapter 4.

If the above-mentioned negotiations do not result in an agreement, the bankruptcy petition is filed. In Poland, it may be done by the debtor (within two weeks of $T = 1.5$ ³⁹) or by the creditor (essentially starting at $T = 1$). Afterwards, the court within approximately two months (under the Polish law the deadline is approximate) issues an order declaring the bankruptcy proceedings open and their form. Appeals and other procedures may take another month. Consequently, theoretically within three months of filing the bankruptcy petition a legally binding final ruling in the matter should be issued.

³⁸ It may take longer if the debtor is the main recipient/buyer of products from the creditor.

³⁹ It should be emphasized that the identification of circumstances in which such an action must be regarded as absolutely mandatory is, in practice, difficult.

Figure 1.2 shows that there are at least four useful warning horizons in EWS systems. The first one (H1) may be advantageous due to the opportunity to shorten the incubation period. Quite often, the complicated and unclear internal procedures applied by a firm in distress may actually be replaced by an assessment of the effects of shocks occurring during the contamination period using freely available tools. This option is also attractive to external stakeholders. In their case, the length of the incubation period depends, among others, on market efficiency, which may be significantly improved by an EWS. It should be noted that the basis for solutions used in this process is their public nature. These tools are not only universally available, but also the individual predictive functions are published and can be applied by any stakeholder.

EWSs do not lose their advantages even when the warning horizon extends to H2. In such a case, the solutions offered by an EWS can be very helpful in the process of determining probabilities in Figure 1.2, which decidedly rationalises the procedures involved.

Horizons H3 and H4 are also very useful, especially to public sector stakeholders. Their advantages include:

- In Poland, a number of bankruptcies occur in the form of out-of-court settlements. Accordingly, a warning system whose horizon is even longer than H4 constitutes a valuable source of knowledge about the scale of the phenomenon;
- Information from the National Court Register is scattered, and although individually it appears only with a slight delay relative to the time of issuance of relevant decisions, obtaining aggregated data is not easy;
- Polish law recognizes situations in which a firm is 'too poor to go bankrupt.' Although a portion of insolvency proceedings 'enter' the judicial system, they also 'fall out of it' without an adequate adjudication that corresponds with the economic situation of the entities involved;
- Each and every bankruptcy system needs tools to verify its quality in order to assess whether it correctly identifies companies which are healthy, bankrupt in the economic sense and bankrupt only in the financial sense.
- An EWS may help the courts in adjudication, especially in the period extending between H3 and H4.

In consequence, the area of EWS application can be quite broad and includes systems with markedly different effective warning horizons.

Chapter 2

MEASURING THE SCALE OF BANKRUPTCY IN THE ECONOMY

2.1. Introduction

One of the basic conditions necessary for the development of an effective early warning system (EWS) involves the quantification of bankruptcy risk. In the case of small-scale and/or limited-impact phenomena, the cost of an EWS may actually be out of proportion to its potential benefits. Therefore, the measurement of the scale of bankruptcy in the economy constitutes one of the key objectives of the project and the purpose of this chapter is to provide both the conceptual background for such measurement, including the definition, tools and knowledge concerning metadata related to the measurement of bankruptcy as well as basic information concerning the intensity of the phenomenon.

Let us begin our discussion with an analysis of data sources related to bankruptcy and their quality. The fact that in Poland there are no official and, at the same time, comprehensive databases on the subject proves that this is not an easy task. The situation is partly due to objective reasons that exist in other countries as well, since the category of business demographics includes more potential states than just their birth, period of activity and death. To some extent, however, it is also the result of the lack of centralization, or at least inadequate harmonization of such data sources in Poland. As a result, the most complete demographic picture of Polish companies involves their entries and removals from the official register of companies. For reasons discussed below, removals must not be identified with bankruptcies.

It is also hard to develop relative measures of bankruptcy, i.e. the scale of the phenomenon relative to the size of the population. There are several reasons for this problem, but two of them appear to be of foremost importance. First, for a long time the Polish legal system did not sufficiently well regulate the issue of updating company demographics databases in the National Official Register of Business Entities (REGON). This especially applies to smaller, single-person firms. Second, for a large group of firms litigation is not the dominant method of solving their financial problems. As a result, the relative measures of bankruptcy in Poland may be heavily biased.

We will also demonstrate that it is difficult to construct international statistics of bankruptcy which would meet the comparability requirement. Poland compares favourably with most of such statistics in terms of the scale of bankruptcy. A closer scrutiny, however, reveals that such a conclusion may be misleading.

Significant problems associated with obtaining reliable and comparable data on bankruptcy are not only a challenge that applies exclusively to the planned EWS. Paradoxically, they also explain why the results of analyses of bankruptcy in the economy may to some extent compensate for these problems. This chapter discusses some estimations of the scale of this phenomenon based on the methodology provided by the Rapid Response Instrument (RRI, Polish acronym ISR).

2.2. Business demographics – sources and quality of data

One of the main features expected of early warning systems against bankruptcy is their ability to provide a complete, rapid and accurate identification of the phenomenon of 'deaths' of companies. The anticipatory nature of these systems means that their proper operation requires specific additional knowledge that permits us to analyse the causes of such events and, as a result, to predict them. Very important elements of the EWS are thus various demographic databases that reflect the life-cycle of businesses: their births, growth and deaths, and the option of combining¹ these databases with strictly economic data sets that reflect the economic causes of certain events in the system. Unfortunately, this brief overview of the issues related to business data sources necessary to construct an efficient EWS for this purpose, must start with an observation that there are a number of significant problems and limitations which in themselves have become one of the challenges facing the system. The demographic databases constitute a complex system whose quality depends (at least currently in Poland) on the cooperation amongst several registers and other subsystems. The functioning of this mechanism is formally governed by a fairly large and complex set of different legal provisions which are not entirely consistent with one another. In practical terms, even given the best legal regulations, the efficiency of such a system affected by a number of sociological factors; among others, by those related to business people's attitudes towards disclosure requirements, including the provision of timely and reliable data on economic

¹ An even more convenient solution would be to integrate the database of demographic metrics with the appropriate set of economic data, including financial data, for the firms at risk at the level of the system. However, such a solution may be difficult and costly to implement.

activity or their attitudes towards the problem of bankruptcy. Moreover, the inventory of issues difficult to solve has a permanent and transnational nature since similar problems were discussed nearly 30 years ago even in the USA (Sullivan, Warren et al. 1987).

If, in turn, we were to accept that the measure of current quality and international comparability of demographic data can be gleaned from the information published by Eurostat, the image is not likely to be optimistic either. Data on business deaths are currently (i.e. 2014) available for the period covering 2008–2011 only for 24 of the 29 countries included in the reporting system. Moreover, all the data for 2011 are flagged as preliminary and/or estimates. It is also clear that it is easier to collect data on the births of companies, because the same database includes the information dating back to 2004. Such long delays and short time series lead to the conclusion that the usefulness of data from this source from the perspective of EWS design is very limited. Indeed, there are a number of reasons why the construction of international databases of business demographics, especially with respect to company 'deaths' can be very difficult (cf. e.g. de Koning 1998).

An overall assessment of the extent and quality of demographic data for non-financial enterprises in Poland shall start with a brief discussion of the key sources of data. Poland's fundamental and official business demographics database is the REGON system (the National Official Register of Business Entities). It was founded pursuant to Article 41 of the Official Statistics Act (Journal of Laws 1999, no. 69, item. 763) with a view to providing a general and consistent characteristic of business entities operating in Poland in broad classification groups. Among others, it contains information concerning:

- The name and location of the entity,
- Its legal status and form of ownership,
- The activities pursued,
- The founding date, the dates of starting, suspending and resumption of operation, entry in the relevant registers or records, termination of business or removal from the relevant records or registry and removal from the register of business entities,
- The anticipated number of employees.

The system is primarily fed by forms RG-1 and RG-2 which report the registration and removal of an entity from the register (Journal of Laws 99.69.763, 1999). The process includes the linking of the REGON registry with other registers, mainly with CEIDG (Central Register and Information on Business Activity) and KRS (National Court Register). The CEIDG register includes, among others, data on civil law associations, and the NCR on general partnerships.

Only form RG-1 contains a box corresponding to the state of legal and business activity of a given business enterprise, including activities related to its liquidation or bankruptcy. Information on this subject is absent from form RG-2, likewise, it is impossible to determine on its basis other above-mentioned demographic categories of events which have caused the signing-off of a given entity. In the light of the applicable regulations, the information fed into the REGON system is continuous and therefore should be reasonably up to date. It should also be emphasized that registers of official statistics are governed by certain principal rules (European Communities 2003), in which the notion of change practically comes down to the issue of the so-called administrative change which is not always consistent with actual change (e.g. with respect to the economic condition of an entity). It demonstrates that REGON, even though it may be deemed valuable from the vantage point of business demographics, is affected by significant limitations in terms of its adaptability to the needs of an EWS.

It is also worth noting that the Central Statistical Office (GUS) collects information on the state of economic and legal activity using other forms, such as F-02, SP and SP-3 (to a lesser extent). These are comprehensive (in the sense explained in footnote 1) data sources containing demographic data, but one of their drawbacks is that they are updated only on an annual basis. It constitutes a significant limitation on the analysis of the phenomenon of bankruptcy, and therefore options to use data available from sources updated more frequently are being considered (Chava and Jarrow 2004). Another drawback is the rather long delay associated with making such information publicly available (even up to three quarters from the end of the calendar year covered by a given report). We should also bear in mind the consequences of legislation concerning the protection of individualised information in the official statistics system – in principle, individualised data cannot be disclosed.

A fairly rich and comprehensive collection of data, including demographics, which partly meets the needs arising from their potential use in the planned EWS, is the database of the National Court Register (KRS) (Journal of Laws 2011, no. 273, item. 1616 2011) whose functionality is available as the Central National Court Register Information. This register could even be considered as the fundamental one if the phenomenon bankruptcy is interpreted in its strictly legal sense. It is an integrated electronic system, which includes the information on: the formation of partnerships/companies, their capital, declaration of bankruptcy, termination of insolvency proceedings (forms, dates), suspension and resumption of business activity, liquidation of entities, tax arrears and overdue debts.² The register also contains strictly financial information provided by the Accounting Act, including Articles 64 and 69 (Journal of Laws 1994, no. 121, item 591 1994). Given the restrictions on access to individualised GUS data, the KRS may be the primary source of publicly available information in which demographic data are linked with economic ones at the level

² The range of data submitted depends on the type of company.

of individual records. However, an external user of the system may face a practical problem that consists in having to 'manually' re-create the database using publicly available information. It must be remembered that information on bankruptcy based on court rulings may be available with a delay resulting, among other things, from the provisions of bankruptcy law. The problem is discussed in greater detail in Section 1.4.

From our point of view, a much more modest scope of information is collected as part of the CEIDG database (Central Registration and Information on Business). The form CEIDG-1 contains only data related to the commencement, suspension, resumption of business and removal of an entry from the database. As a result, it is possible that in the case of commercial-law companies we have more demographic information than with respect to civil-law partnerships. Since the latter are usually smaller, it also means that, at least in Poland, the content of demographic data relating to the SME sector is poorer than that of larger enterprises.

Despite the existence of several registers containing information on demographic events in enterprises, it comes as a surprise that none of the organisations that maintain those registers publicizes 'focussed' data on issues related to bankrupt firms. In particular, when it comes to data collated by GUS, its publication includes only demographic information related to the current state of registrations and removals of entities by different sections (GUS Zmiany strukturalne... 2013). Apart from the above-mentioned official demographic business databases, other more comprehensive registers are being developed, among others, by consultancy firms, banks and business organizations. These databases are fed by data from both the different 'portions' of official databases and research and analyses that meet the specific needs of these institutions. These are often valuable collections, the source of their value added being generally the interlinking and structuring of information from different official sources, moreover, they convert the basic data, which is less convenient to peruse, into an electronic format.

It is important to note that a number of features of these demographic databases are not specific to the adopted solutions. Here, we are also dealing with some universal phenomena. First of all it should be noted that maintaining businesses demographics databases is much more complex than 'ordinary' demographics. In the latter case we deal essentially with the three states of entities (i.e. birth, life and death), whereas existing enterprises go through many more states. According to the methodological recommendations by Eurostat and the OECD (OECD–Eurostat 2007) as many as 13 types of 'demographic events' should be distinguished,³ 10 of which may affect the entry and/or removal of an entity in registers of this kind. The case is further complicated if one remembers the differences between the removal of a specific entity from the register (of active companies) and its actual 'death.' For example, acquisition of one firm by another results in its 'disappearance' from the database, but is not tantamount to the liquidation of its resources. Another element that makes it more difficult to evaluate of the demographic status of an enterprise is the fact that businesses often suspend their activities. Such suspension may not, however, result from their economic problems. The main reasons may be due to circumstances of a seasonal nature (e.g. seaside tourist firms in winter months), interruption of activity due to the necessity to obtain or update a license and a number of other reasons. This raises the practical question of how to distinguish a temporary suspension from permanent cessation of business activities if a number of entities fail to fulfil the obligation to update such data in these systems. What comes naturally to mind are the various types of complex supplementary procedures that would force businesses to report more detailed data more frequently. Such a solution, however, would be costly and burdensome not only to entrepreneurs themselves, besides, it would not necessarily be more effective than the existing legal solutions. As a result, in this type of registers it is often easier to follow the principle that, for example, a period of inactivity lasting for two-years (or longer) can be interpreted as the 'death' of a firm in the system⁴ (Journal of Laws 1997, no. 121, item. 769 and 2004, no. 173, item 1807). Nonetheless, from the perspective of an EWS design this approach has noticeable drawbacks. Certain events relevant to the operation of such a may be reported with long delays or even in a discretionary manner.

Another, equally important group of problems, partly related to the above-mentioned issues, is posed by the ambiguity of the concept of bankruptcy. In particular, the phenomenon in question may have a purely legal sense. In such a case, its best descriptions may be based on the court records (KRS-type). We must remember, however, that Polish bankruptcy law precludes the possibility of declaring bankruptcy of an entity which is 'too poor to go bankrupt.' On the other hand, there are a number of situations, especially in small firms, when the legal procedures of bankruptcy are dispensed with, and they terminate their business activity themselves. Quite often, they are simply instances of a 'silent death,' which shall be discussed in more detail below. What it means is that the registers contain no information regarding the causes of such a decision, hence a more broadly conceived bankruptcy would be better served by REGON-type databases. In this case, however, the register includes more general information concerning the removal of a given entity. Obviously, this need not be tantamount to its bankruptcy and many systems consistently attempt to take into account this difference in the design of bankruptcy indicators (The Dun & Bradstreet Corporation 1997). Thus we can see that the full details of bankruptcies actually lie 'somewhere between' the KRS and REGON databases.

³ Such as the founding of a business, its liquidation, division, merger or acquisition by another entity.

⁴ In Poland, appropriate verification procedures in the KRS are initiated after 24 months pursuant to Article 20d of the National Court Register Act. In specific cases regulations also limit the length of suspension periods (cf. e.g. Article 14 of the Freedom of Economic Activity Act).

Our previous considerations demonstrate additionally that the quality of demographic data about businesses largely depends on the attitudes of businesspeople to a reliable and timely supply of information to such databases. It appears that in this respect larger companies tend to be more compliant, to an extent because it is easier to get to them to observe the regulations by using appropriate legal tools. Incidentally, this raises yet another problem related to the EWS, namely that the SME sector plays an ever-increasing role in modern economies. Poorer quality data concerning this sector would thus negatively affect the efficiency of the system as a whole. Failure to update the records by self-employed individuals affects numerous countries. Although the registration of an entity 'pays off', it is more difficult to motivate the firms to remove data from the database in the event of termination of business. Single-person firms 'die' not only because of the entrepreneur's decision to terminate activity or their failure to update the records for a long time, but also the actual death of its owner. In such a situation, the firm itself will not update the register; consequently, the efficiency of the entire procedure will depend mainly on the quality of interlinkage between such a database and other registers. In the case of REGON, these mechanisms did not work sufficiently well, which resulted in an ostensible increase in the number of entries rooted in its sub-optimal dealing with the phenomenon of 'dead souls'. One of the long-term effects of the problem was the ensuing need to remove the accumulated errors, which made it more difficult to compare demographic data from this source over time.⁵

Up to this point we have focused on issues related to the registration of certain demographic events in the business sector. It should be noted, however, that bankruptcy has its roots in economic matters. Hence, if we plan to construct an EWS, we need databases that should also contain financial data of adequate quality in order to enable us to glean the demographic determinants of specific events. The problem of quality financial data of firms in financial distress or bankrupt is very complex and exceeds the scope of this publication; therefore we shall limit ourselves to selected fundamental issues. Such data on this group of firms may be subject to a number of distortions. First, in accordance with Article 5, item 2 of the Accounting Act (Journal of Laws 1994, no. 121, item. 591 1994) the principle of continuity of business activity applies. This principle may, of course, stand in stark contrast to the actual situation of the enterprise facing bankruptcy risk, not to mention the already bankrupt one. Although this provision also states that the rule does not apply if such an assumption is inconsistent with the facts as at the date of drawing up the balance sheet, often it does not solve the problem. After all, at the moment in question the bankruptcy of a given firm can be either a foregone conclusion or a state only to be expected with a considerable error margin. Second, if bankruptcy risk affects entities with a positive option 'to wait', they may have a significant tendency to 'adjust' their balance sheets to make them look better than in reality. Third, even marginal symptoms of bankruptcy risk may cause quite significant adjustment reactions not only on the part of a given firm's creditors but also its other stakeholders. Further, given the existence of different types of risk 'scenarios', the balance sheet and other elements of financial statements of the companies affected may be subject to various distortions and – if they are to be used for the purposes of analysis and research, including forecasting – to all intents and purposes, they should be subject to additional verification.

All the above-mentioned problems build up when attempts are made to devise databases on an international level due to the complex issue of comparability of information obtained from various countries. As a result, all international statistics on bankruptcy should be approached with caution, likewise, the actual reliability of information, particularly from the point of view of EWS design may be, as was already mentioned, problematic (cf. e.g. de Koning 1998).

In summary it can be stated that:

- The business demographic information system in Poland consists of and is fed by a number of databases whose operation is governed by various and not always consistent legislation from the perspective of the bankruptcy phenomenon;
- In some instances, the registration of demographic events it is not an efficient process; more considerable errors affect the statistics that apply to the death of enterprises rather than their birth; the sources of errors include, among others, the suspension of business activities;
- More serious problems may affect the 'death' statistics of smaller entities, whose frequency may be underestimated. This has led (and may still lead) to overestimating the number of entities in the REGON database;
- Obtaining a comprehensive database of demographic data (i.e. one that combines strictly business demographic information with relevant economic data) on the basis of registers is, for users from outside the system of public statistics, limited to the data contained in the KRS;
- The overall quality of demographic information on SMEs is poorer than that on larger companies;
- Observations in comprehensive demographic databases usually occur at most on an annual basis (although strictly demographic data can be virtually continuous);
- The economic data included in these comprehensive databases are by nature prone to various kinds of distortion;

⁵ The process of removing the 'dead souls' from registers has (apparently) resulted in a decrease in the number of active entities. The previous data underestimated both the absolute number of actual 'deaths' of businesses and the percentage of those events.

- It is difficult to talk about international comparability of business demographic data between Poland and other EU countries, at least before 2008. The delays in the publication of the official (Eurostat) statistics in this area are quite considerable (over two years)

Therefore the question arises whether, taking into account the current conditions in Poland, the system of information on bankruptcies in the sense defined by Williamson and Ginsberg (Williamson, Ginsberg et al. 1997) could be easily adapted to the EWS needs. The answer must be negative with certain reservations. Positive examples of such systems are not far to be found. The solutions adopted in Poland pale especially in comparison with the comprehensive information systems in Estonia⁶ that offer detailed and cross-linked databases on the subject. There the problem was solved pragmatically 'across the board', i.e. the system was implemented together with the adoption of the new bankruptcy law. It should also be noted that at present neither GUS (with its public programme of statistical surveys) nor the Ministry of Economy conduct dedicated research on the phenomena of bankruptcy.

In designing the Rapid Response Instrument it was necessary to take into account the above-listed considerations, which was achieved in two ways. On the one hand, a choice of existing databases was made with a view to optimally exploiting their potential.⁷ On the other hand, the project enabled us to develop system functionalities which to some extent fill gaps and remedy certain shortcomings of the currently operating systems. The target solution was to use individualised data from databases F-01/F-02 GUS in close cooperation with the institution. These data sets include, among others, individualised information on:

- A broad range of demographic events;
- The economic condition of enterprise which can be related to the above-mentioned events;
- The classification keys that appear to be very important for the EWS (including information on the size of a given entity, including employment levels, its geographical location, branch of industry represented etc.).

It is also important that the data sets include a representative (since it is complete) population of entities that employ at least 10 staff. The cooperation with GUS guaranteed on the one hand the highest professional competence in the area of data processing, while on the other hand ensuring statistical confidentiality. As a result, it was possible to obtain the largest and most comprehensive data set in the area of research on the scale, causes and consequences of bankruptcy in Poland. In the early stages of the project, a simpler approach was utilized based on the so-called micro-aggregates, i.e. aggregated individualised data for analytical purposes that met the principle of statistical confidentiality. These data were combined with the proprietary database of information on bankruptcy based, among other things, on the available KRS reporting system. Expertise thus gained can be valuable⁸ from the viewpoint of implementation of the future EWS in cases where solutions based on individualised statistical data are impossible to implement.

2.3. Aggregated measures of bankruptcy

The problem of ex-post measurement of the scale of death/bankruptcy of firms in the economy as a whole (or its sectors)⁹ appears to be deceptively simple: why not use aggregated measures constructed as the total of individual cases identified as bankrupt companies (or subject to a serious risk of insolvency)? We must, however, mention at least two groups of problems arising at the very first stages of reflection. One of them concerns the extent of the analysis. Some of the difficulties occurring in this area stem from the problems which were already described and are related to the structure of the relevant demographic databases. It is obvious that the measurement method depends, among other things, on the definition/identification of bankrupt firms and on the way of determining the population of companies. The latter group contains an important new element which results from the need to provide not just point-in-time scores of the phenomenon, but attempts to compare them along a timeline. It is an extremely important element in the EWS design, because the warning signs are always identified on the basis of the observed deviations from their (historical¹⁰) mean values. Accordingly if we plan to construct a measure of intensity of the bankruptcy phenomenon, we must have access not only to absolute variables, but also to relative indicators which take into account the dynamics of change in the population of businesses.

⁶ Cf. E.g. [https://www.lursoft.lv/exec?act=MNR_LSTAT&lang=EN&aid=#aid#].

⁷ It should be emphasized that the project provided for the construction of proprietary databases only to a very limited extent (for example, it was hardly expected to include the development of state registers). Therefore, the selection process has to be based on the existing opportunities.

⁸ Naturally, such a simplified system has a number of flaws and weaknesses with respect to the target solution, but it generates series of sufficiently well-approximated results in comparison with the complete ones.

⁹ Note that the ultimate objective of the EWS is not to determine individual bankruptcy risk but to evaluate the extent of the phenomenon and its effects from a broader perspective.

¹⁰ It is difficult to talk about another source of such a mean value.

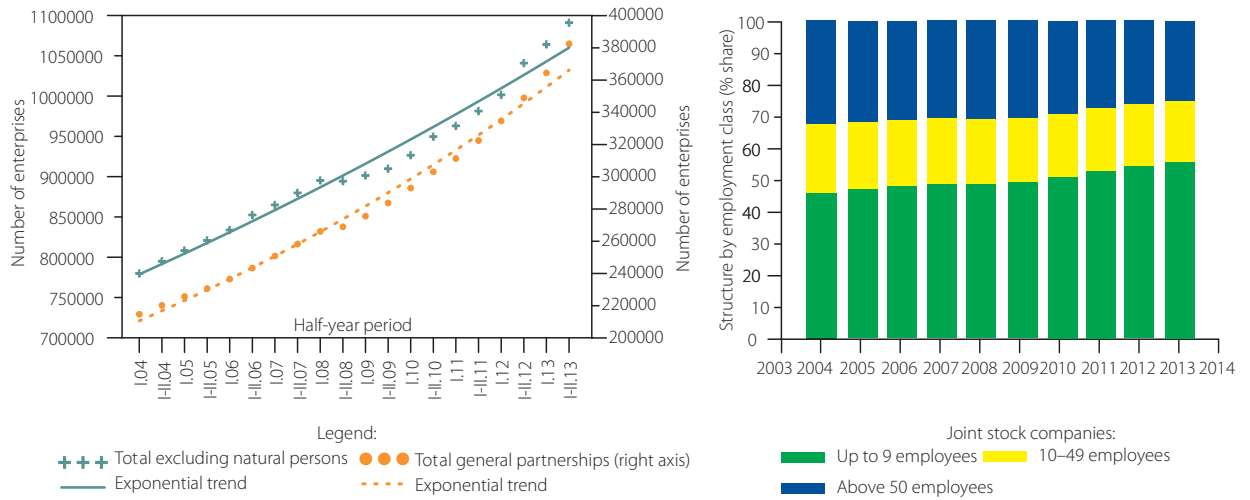


Fig. 2.1. The number of enterprises excluding natural persons and general partnerships (left panel) and the breakdown of general partnerships by number of employees (right panel) in 2004–2013

Source: own calculations based on: GUS Zmiany strukturalne... (2013).

The simplest relative measure of bankruptcy (WMU) can be defined as follows:

$$WMU_t = \frac{DE_t}{AE_{t-K}} \quad (2.1)$$

where DE_t represents the number of bankrupt enterprises at time t (an absolute measure), whereas AE_{t-K} the number of entities active in the period $t-K$ (i.e. those that reported a non-zero turnover or employment). As was already mentioned, the definition of DE depends on the choice of the demographic database. If it was a REGON-type register, we would use the following absolute measure:

$$DE_t = Z_t \setminus (R_t \cup K_t) \quad (2.2)$$

where the individual elements are defined as follows:

$$\begin{cases} Z_t = \{e \in AE_t \wedge e \notin AE_{t+1}\} \\ R_t = \{e \in AE_t \wedge e \notin AE_{t+1} \wedge e \in AE_{t+2}\} \end{cases} \quad (2.3)$$

Set Z can be interpreted as a family of companies suspended (removed) up to time $t+1$; R – companies active in period $t+2$ and inactive one year before. The set K reflects the other adjustments. Note that the structure of measure DE is based on the number of operators inactive in the time horizon $t, t+1$ and its adjustment for the number of entities suspending their activity at time $t+1$, recommencing it in period $t+2$ as well as other reasons for removal from the register unrelated to bankruptcy of a given entity (e.g. takeover, etc.). As a result:

$$DE_t = \{e \in AE_t \wedge e \notin AE_{t+1} \wedge e \notin AE_{t+2}\} \quad (2.4)$$

The application of definition (2.1) actually implies the need to use the data coming from two reporting periods before (two years in our case), which constitutes a serious drawback of this approach from the perspective of EWS design. The measure, however, has at least one advantage – the consistency of the numerator and the denominator of the fraction in the sense that both values are calculated on the basis of the same population (sample). For practical reasons, a simplified measure can also be used (WMUS):

$$WMUS_t = \frac{Z_t}{AE_{t-1}} \quad (2.5)$$

but in comparison with (2.1) this measure is obviously distorted by the fact that it does not take into account the process of resumption of activity of some such firms or other causes of removal from the register (e.g. change of company name).

Quite serious measurement problems also arise when an attempt is made to replace the statistics of the firms' 'deaths' in demographic registers with metrics based on court data related to bankruptcies which have already been declared. Even though the situation is somewhat easier in terms of absolute measurements, the issue becomes even more complicated when relative

measures are sought. As regards the former situation, the measure based on the statistics of court decisions strongly depends on the efficiency of the judicial apparatus and the influx of cases into the system. This may cause the effect of ‘smoothing out’ of data of this kind which consists in the fact that during the period characterised by a marked increase in the number of relevant cases, we do not notice the full effect of the phenomenon in the form of growing numbers of court decisions, since a proportion of those cases will be addressed with a delay due to the system’s limited processing capacity. On the other hand, when the intensity of such disruptions in the economy abates, judicial statistics may still demonstrate large numbers of rulings due to the backlog of accumulated cases being processed. Therefore an absolute measure based on the number of declarations of bankruptcy may be quite problematic from the point of view of its applicability in the EWS. Given these weaknesses it appears that a better solution might be based on the number of bankruptcy petitions filed.

Let us, however, remember that regardless of whether we utilise the number of bankruptcy petitions or the number of actual declarations of bankruptcy, there remain at least two principal weaknesses inherent in such measures, especially if one planned to use them for international comparisons or in order to assess the long-term national trends. First of all, the number of bankruptcies depends not only on the overall situation of the economy and the firms operating in it, but also on the prevailing social tradition/culture in this respect. It should be stated clearly that in Poland the bankruptcy procedure does not constitute the dominant mode of firms’ exit from the market and, consequently, the incidence of bankruptcies in Poland reported annually is similar to that reported... monthly in Belgium (Kartus 2012). Another factor confounding the measure is bankruptcy law itself. Solutions adopted in Poland are deemed to be inclusive, which, according to certain judges dealing with this issue, means that about ¾ of domestic firms consistently meet the statutory conditions for bankruptcy (Pilitowski 2013).

The structure of relative measures (MWU_KRS) is as follows:

$$MWU_KRS_t = \frac{MBU_KRS_t}{POP_{t-K}} \quad (2.6)$$

where: MBU_KRS is the absolute measure of bankruptcy based on the KRS, whereas POP is the regulating factor. An additional problem associated with relative measures consists in the proper selection of the regulating factor, in other words, the population from which the entities involved in such litigation are derived. This is not a trivial issue if we remember that the tendency (and economic capacity) of firms to comply with insolvency proceedings are not uniformly distributed throughout their population. Such actions tend to be pursued by larger enterprises. Accordingly, it would be a questionable solution debatable to base the denominator in formula (2.6) on the AE variable (cf. formula 2.1 – the size of the full population of active enterprises). Using such a solution would be fraught with an additional disadvantage. Figure 2.1 shows that not only the size but also the structure of the population of active enterprises changes in time, with a clear increase in the share of small firms, and therefore less willing¹¹ to participate in the insolvency proceedings. As a result, it would constitute a source of additional burden on the indicator.

So far, we have only discussed the ex-post indicators. As expected, they are useful in a number of situations, but their weaknesses appear to be very difficult, if not impossible to eliminate, since their primary causes stem from the above-mentioned problems associated with the construction and updating of relevant databases. One possible way out of this predicament is to devise indicators based on individual assessments of bankruptcy risk. Such an approach not only has a prognostic dimension but may also be used to assess the current situation and conduct retrospective analyses. In this case, the often questionable and incomplete information on bankruptcy, which additionally concerns firms deriving from an unidentifiable population,¹² is replaced with assessments/forecasts of bankruptcy risk drawn up in accordance with the established methodology for firms that belong to the population/sample defined in advance. Different approaches are possible in this respect, but they are often based on the following formula (Das, Freed et al. 2006):

$$GLOB_PD_t = \frac{1}{N(t)} \sum_{i=1}^{N(t)} PD_i(t) \quad (2.7)$$

where: GLOB_PD is the aggregated indicator of bankruptcy risk; N(t) – the number of firms in the sample at time t, for which the individual indicators of probability of bankruptcy – PD_i – are estimated. Naturally, these idiosyncratic measures can be constructed drawing on different models, including those that make use of both individual financial data and measures of a more aggregated nature, e.g. for individual branches of industry or for the whole economy etc. (cf. e.g. Sobehart, Stein et al. 2000). One of the justifications for such a design solution involves its certain statistical properties (Lando and Nielsen 2009). If the intensity λ of bankruptcy risk for a given firm i is defined as:

¹¹ By the same token, such companies tend to be less ‘attractive’ to the creditors.

¹² In the general population there is a group of firms that never resort to the formal bankruptcy procedures.

$$\lambda_i(t) = \lim_{\Delta t \rightarrow 0} \frac{P(t < \tau_i \leq t + \Delta t | \tau_i \geq t)}{\Delta t} \quad (2.8)$$

where τ is the moment of bankruptcy of the firm and $N(t)$ – the number of such events up to time t , where N is the number of analysed firms, then:

$$N(t) = \sum_{i=1}^N 1 | (\tau_i \leq t) \quad (2.9)$$

and assuming the existence of orthogonality of these events for couples of firms understood as:

$$P(\tau_i = \tau_j) = 0 \quad \leftarrow i \neq j \quad (2.10)$$

then the cumulative function of event intensity $\lambda(t)$ for process (2.9) can be represented as:

$$\lambda(t) = \sum_{i=1}^N \lambda_i(t) * 1 | (\tau_i \leq t) \quad (2.11)$$

After integrating, the function:

$$\Lambda(t) = \int_0^t \lambda(s) ds \quad t \geq 0 \quad (2.12)$$

$$Po(t) = N(\Lambda^{-1}(t)) \quad t \geq 0 \quad (2.13)$$

we may obtain valid results. Given the assumptions adopted above, the cumulative measure of bankruptcy risk described by formula (2.9) is a single-parameter Poisson process (2.13). Further, it should be noted that in order to obtain this result it suffices that the orthogonality condition be met (2.10), whereas conditional independence of these events is not necessary. This result, therefore, also remains true in the case of 'contagious bankruptcy' in the corporate sector, which may be a common situation to be diagnosed by the EWS. Consequently, formula (2.9) is suitable for use in such a system.

The primary direction of research highlighted in the study involves the analysis of the phenomenon of bankruptcy both in retrospective and in prospective terms illustrated by the review of bankruptcy proceedings conducted in Poland in accordance with appropriate formal and legal provisions. It also analyses the course and structure of bankruptcy proceedings from the economic point of view, drawing attention to asset liquidation (winding up of business activity) and negotiated settlements (a business continues its independent economic existence) broken down by region and type of business. Subsequently, regional (voivodship) analyses of bankruptcies have been conducted using indicators such as the percentage of bankruptcies (OU) and the regional bankruptcy barometer (RBU). One of the analytical strands included the variations in the course of the bankruptcy process depending on the legal and organizational form of the participating entities. The final layer is constituted by the analysis of bankruptcies by branch of industry (in accordance with the NACE classification) using measures such as the percentage of bankruptcies and the industry bankruptcy barometer (BBU). The analysis included the absolute number of bankruptcy proceedings announced, the dynamics of their change in terms of total figures and cross-sections by region, by industry and by organizational and legal form. As was the case with the review of the structural changes, our research consisted in the calculation of relevant indicators reflecting the percentage shares of the analysed components and evaluated structures.

In order to determine the scale of bankruptcies we used the percentage of bankruptcies (OU). It is the ratio of the number of companies for which bankruptcy proceedings were initiated to the total number of enterprises per 10,000 calculated on an annual basis. It may take value from the interval $<0; 10,000>$ and indicate a deteriorating economic situation or its improvement in firms. The OU value is calculated using the following formula:

$$OU = \frac{\sum Lu}{\sum Lp} \times 10000 \quad (2.14)$$

where:

OU – percentage of bankruptcies,

Lu – number of enterprises subject to bankruptcy proceedings,

Lp – total number of enterprises.

Changes in the calculated values of those indicators over time assists in the identification of components of the analysed structure whose shares increase, decrease, do not change or only slightly change. The analyses of structural changes in the compared structures in corresponding periods of time are based on the differences between the values of indicators characterizing the same indicators that apply to the compared structures.

Additionally, the analysis comprises the extent of bankruptcies expressed in total figures and then divided by sector and by region. Its aim was to create a ranking list of activities and regions (voivodships) characterized by the highest level of concentration of bankruptcy proceedings. In order to analyse the concentration of bankruptcies we used a measure applied in economic geography taking into account the density of distribution and known as the location quotient (LQ).¹³ By surveying the phenomenon of bankruptcy not only on a national scale but also in the regions, the intensity of the phenomenon can be related to the number of entities registered in a given area. In this way, the measure of bankruptcy proceedings can be related to the actual intensity of the demographic changes in a given region. For the purposes of EWS research, the RBU indicator reflects the concentration of bankrupt firms in a particular region $[Lu_w/Lp_w]$ relative to the total number of firms that belong to the analysed population in the economy in relation to all entities that operate in the national economy $[Lu_o/Lp_o]$. This measure can be expressed in the following way:

$$RBU = \frac{\frac{\sum Lu_w}{\sum Lp_w}}{\frac{\sum Lu_o}{\sum Lp_o}} \quad (2.15)$$

where:

RBU – rate of regional concentration of bankruptcies,

Lu_w – number of enterprises placed in receivership in a given region (voivodship),

Lp_w – number of enterprises in the region,

Lu_o – total number of enterprises placed in receivership,

Lp_o – total number of enterprises.

Since the RBU serves to determine the intensity of the studied phenomenon in the region in relation to the overall economy, it is assumed that its values above 1 indicate an above-average concentration of the analysed phenomena in the region. By using the indicator it is possible to rank the regions, thus indicating areas with an above and below average concentration of bankruptcies.

In order to assess changes in the relative extent of the phenomenon in the different types of business we have used the geographic location quotient (LQ) and called it the Industry Bankruptcy Barometer (BBU) by way of an analogy to the Regional Bankruptcy Barometer (RBU). The computed BBU values enabled us to compile a ranking list of economic activity indicating areas of business with an above and below average concentration of bankruptcies by industry (manufacturing, trade and services).

This measure is calculated on the basis of the following formula:

$$BBU = \frac{\frac{\sum Lu_{rd}}{\sum Lp_{rd}}}{\frac{\sum Lu_o}{\sum Lp_o}} \quad (2.16)$$

where:

BBU – industry bankruptcy barometer,

Lu_{rd} – number of enterprises placed in receivership by type of business (manufacturing, trade, services),

Lp_{rd} – number of enterprises operating in a particular type of business (manufacturing, trade, services),

Lu_o – total number of enterprises placed in receivership,

Lp_o – the total number of enterprises.

Accordingly, both the BBU and the RBU contribute to a relative assessment of the concentration of initiated bankruptcy proceedings with respect to the number of firms operating in the analysed population. It is assumed that their values above 1 indicate an above-average concentration of the analysed phenomena in the region.

¹³ Cf. (Antonowicz 2010).

2.4. Bankruptcy in Poland – selected characteristics

Bankruptcies in the entire Polish economy shall be analysed based on two sources of information: bankruptcy court statistics and data concerning removals from the REGON register (see Figure 2.2). When interpreting the results presented below, the limitations applicable to these data and mentioned in the previous section should be borne in mind.

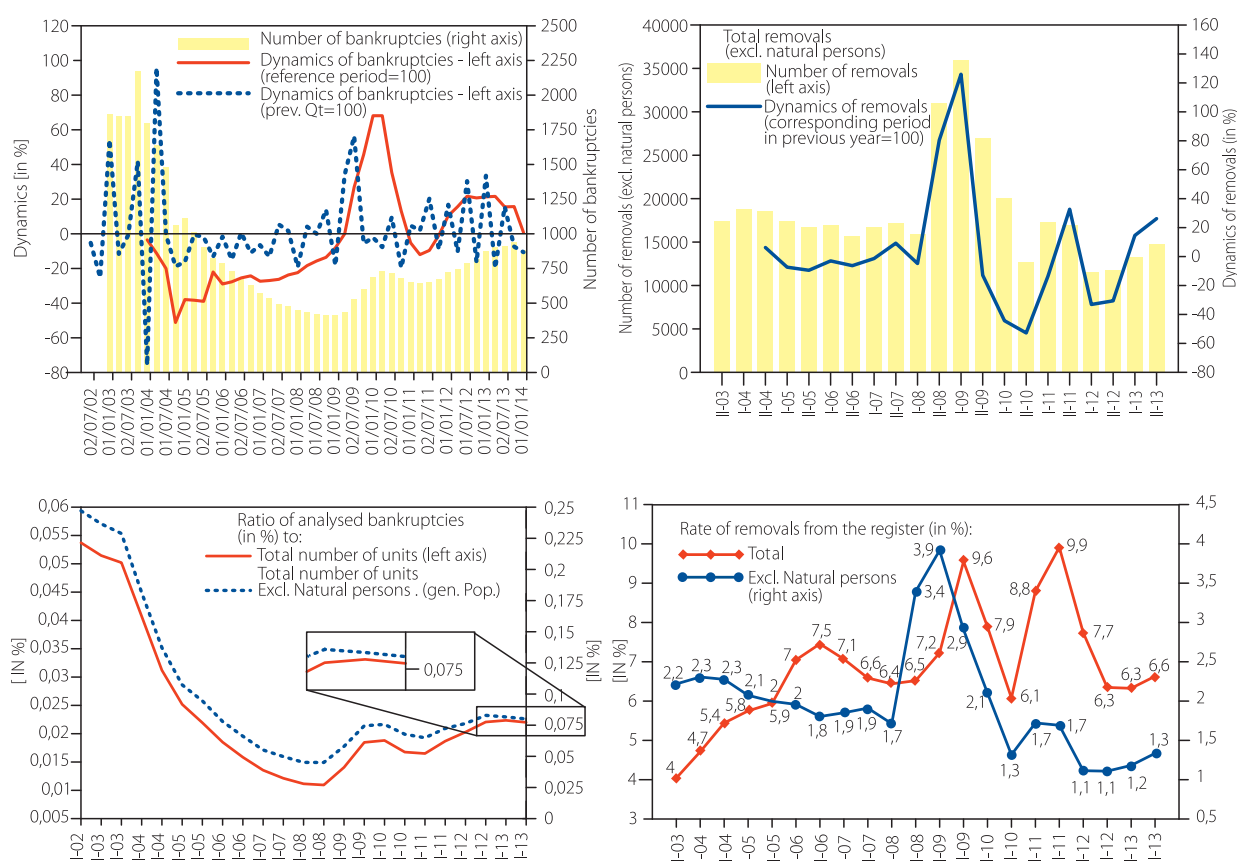


Fig. 2.2. Selected information regarding bankruptcies in Poland in 2003–2013. The number and dynamics of bankruptcies according to COFACE (top left). The number and dynamics of removals from the REGON register excluding natural persons (top right). The rates of removals from the GUS register for the total population and excluding natural persons (bottom left) and the bankruptcy rate based on total COFACE data and excluding natural persons (bottom right) – data in percentage points standardized to the number of entities in the REGON database

Source: own calculations based on data from COFACE and GUS.

When analysing both absolute and relative data on bankruptcies (COFACE) it should be noted that after a long period of decline (since 2003) the end of 2008 marked a growing, although non-monotonic trend affecting both measures with a very strong increase noted in 2009, and a certain slowing down of the process in 2010 related, among other reasons, to the fairly good macroeconomic situation in 2010–2011. Although the increase in the number of bankruptcies after 2008 can be seen quite distinctly, the scale of the phenomenon is significantly smaller than in 2003, when bankruptcies resulted from the marked economic slowdown and major structural changes that occurred place in Poland at the beginning of this century.

A similar picture is painted by the analysis of removals from the REGON register as long as natural persons engaged in economic activity in their own name are excluded. Likewise, after a period of an almost uniform decline until 2008, as of 2009 we can see a sharp rise in the value of the variable, with the current removal rate much lower than in 2003. A certain difference is noticeable only towards the end of the time horizon under review, where the COFACE-based index shows a decreasing trend while the REGON-based one indicates a gradual increase. It is difficult to ascertain the cause of this discrepancy, but it may be due to the higher feed rate of the bankruptcy database than that of the demographic register with new events.

Statistical data on removals from the register involving natural persons conducting economic activity (self-employed) show different trends than the data on bankruptcies. In 2003–2009 quite a clear upward trend can be observed in terms of the relative measure of the phenomenon and an extra strong peak in 2011. This difference may be due to several coinciding reasons. First, it may have been affected by the evolution of the entrepreneurship model in Poland that prompted an increasing tendency

towards self-employment, which also resulted in a greater number of business failures. Second, the restructuring processes undertaken by larger entities improved their financial standing or even allowed them to avoid bankruptcy by reducing costs through outsourcing. Third, the readings may have been affected by an undue accumulation of ‘dead souls’ in the system and their subsequent elimination through intensive verification and updating efforts on the part of GUS.

In summary, both data sources show that the economic crisis caused a perceptible increase in the bankruptcy indicators. In 2009, it was quite marked, but because of the favourable macroeconomic situation in Poland in the previous period the scale of the phenomenon was moderate. In 2003, the impact of the economic downturn on bankruptcies was much stronger, due, among others, to the much worse initial situation of individual firms at the time. It should also be remembered that long-term analyses (e.g. from the United States) demonstrate that even though the average bankruptcy rate totals several percent – even during a slump in the economy – there have been crises when the index reached double digits (Giesecke, Longstaff et al. 2011). The data thus show that an EWS – due to the potential scale of the problems – promises to be an effective solution to improve the security of the economy.

The total number of initiated bankruptcy proceedings (since early 2007) is characterized by a strong irregular upward trend with a peak in the fourth quarter of 2012. Afterwards, the number of insolvency proceedings has slightly decreased. Nonetheless, neither the decrease in the number of cases reported nor the low values of the rate allow us for optimistic forecasts that might indicate a significant improvement in the economic situation of firms, which is due to the still very high numbers of bankruptcy proceedings announced. It is worth emphasizing that the increase in the number of insolvency proceedings was highly dynamic, which has not been observed in the Polish economy since 2003. It is necessary, however, to note that due to their complexity the announced bankruptcy proceedings constitute only a small portion of all insolvency proceedings in relation to the scale of liquidation processes in the entire economy, moreover, the phenomenon is difficult to measure using currently available reporting. The bankruptcy rate (OU) and the number of bankruptcy proceedings has increased since 2009. This confirms both the increasing intensity of the analysed phenomenon and the continued negative trend during the last two years under review. The rate of OU growth has slightly slowed down, which undoubtedly indicates the weakening of the trend.

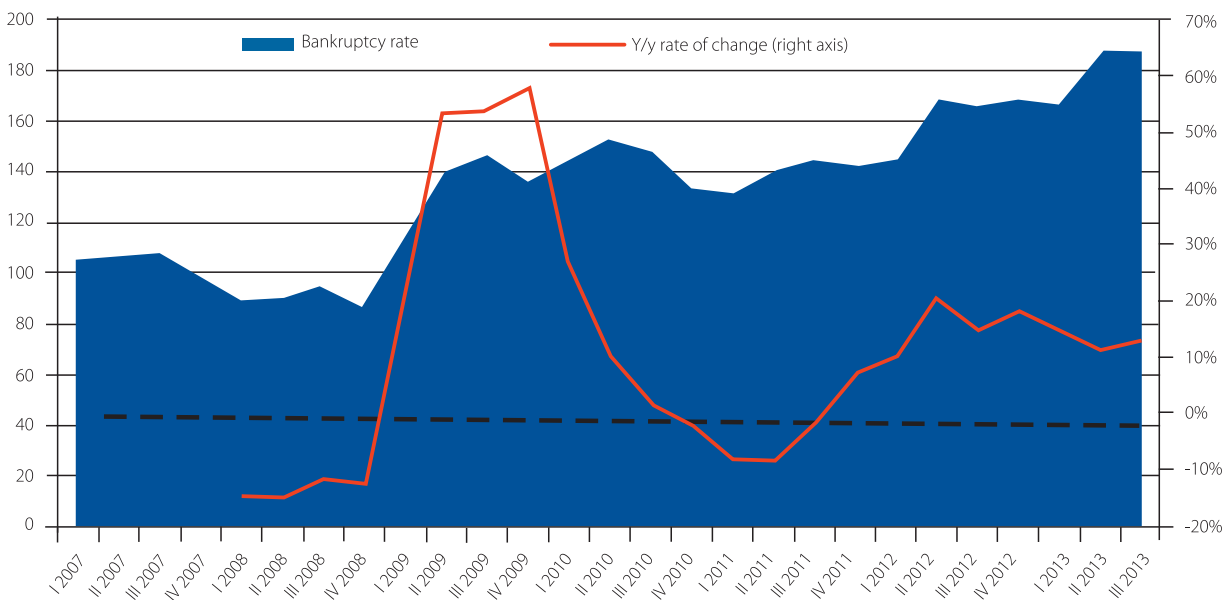


Fig. 2.3. The bankruptcy rate (OU) and its y/y change in Poland from the first quarter of 2007 to the third quarter of 2013
Source: own calculation based on: Kaczmarek, Kolegowicz, Krzemiński, Fijorek, Raport z oceny stopnia zagrożenia przedsiębiorstw upadłością – komponent mikroekonomiczny, Raporty 1–12, MSAP UEK, Kraków czerwiec 2011 – kwiecień 2014; Ogólnopolskie Informatory Upadłościowe, Raporty COFACE.

Regardless of the fact that the law provides for two kinds of bankruptcy proceedings – liquidation of the debtor’s assets or negotiated settlements with creditors – the latter is almost five times less popular. The structure of bankruptcy proceedings shows that asset liquidations accounted for as many as 83% of the total bankruptcy proceedings. The rates of both types of bankruptcy proceedings are characterized by similar patterns of change, which indicate their marked growth in 2009 and 2012. The rate started to decrease gradually in 2013.

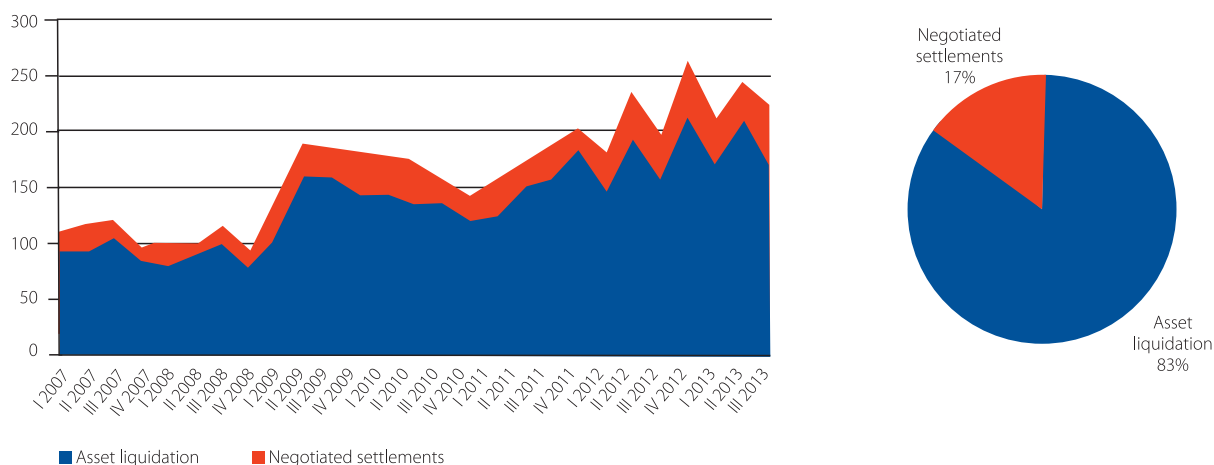


Fig. 2.4. The number of bankruptcies by type of proceedings in Poland from the first quarter of 2007 to the third quarter of 2013

Source: own calculation based on: Kaczmarek, Kolegowicz, Krzemiński, Fijorek, Raport z oceny ... Raporty 1–12, op.cit.; Ogólnopolskie Informatory Upadłościowe, Raporty COFACE.

Despite the fact that natural persons conducting economic activity constitute the largest group of firms, they account for only 20% of all the initiated bankruptcy proceedings. Undoubtedly, most bankruptcy proceedings involved limited liability companies, which account for 63% of all the proceedings followed by joint-stock companies and registered partnerships. The total number of initiated bankruptcy proceedings against limited liability partnerships has increased dramatically since 2009. The trend peaked in 2009 and slowed down in 2013, corresponding to the total number of proceedings.

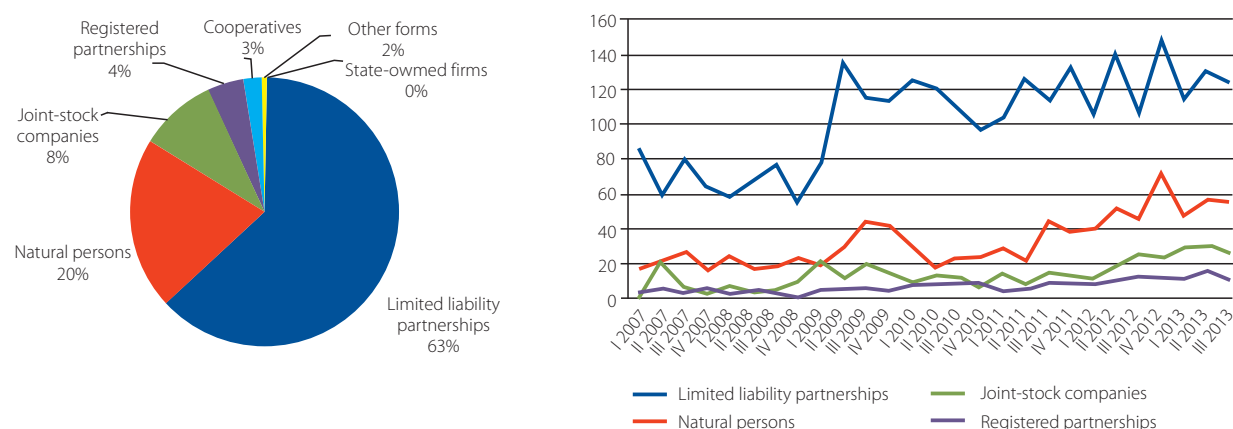


Fig. 2.5. The percentages (left panel) and numbers (right panel) of bankruptcy proceedings by organizational and legal forms in Poland from the first quarter of 2007 to the third quarter of 2013

Source: own calculation based on: Kaczmarek, Kolegowicz, Krzemiński, Fijorek, Raport z oceny ... Raporty 1–12, op.cit.; Ogólnopolskie Informatory Upadłościowe, Raporty COFACE.

A strong upward trend in the number of announced bankruptcy proceedings was observed in all areas of business activity (manufacturing, trade and services). The shapes of respective curves are different in services than in manufacturing and production with changes in their values indicating a deteriorating situation in services and a slight improvement in trade and manufacturing. The number of bankruptcies in services was undoubtedly influenced by the difficult situation in the construction sector, where the number of bankruptcy proceedings constituted 53% of total proceedings involving service firms. A retrospective analysis of manufacturing and trade indicates two periods of growing numbers of bankruptcy proceedings: 2009 and 2013. In contrast to services, the rate of bankruptcies decreases in trade and manufacturing. OU curves for individual types of business are similar to the shape of the curve representing the absolute number of insolvency proceedings, which indicates a strong upward trend and high intensity, especially in the services sector. Unquestionably, the increase in OU in services was influenced by the difficult situation in the construction industry. The analysis of the data leads to the conclusion that services was the sector characterized by the highest average OU levels while the high value of the standard deviation indicated a high level of intensity of change. Trade has the lowest average OU levels and simultaneously the lowest intensity of bankruptcy processes.

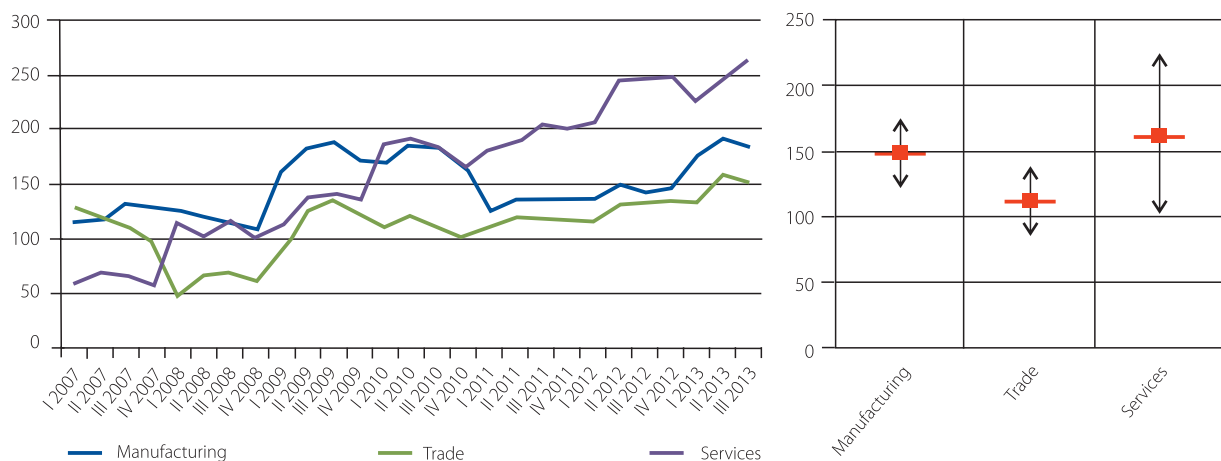


Fig. 2.6. The percentage of bankruptcies (left panel), its mean value and standard deviation (right panel) by type of business in Poland from the first quarter of 2007 to the third quarter of 2013

Source: own calculation based on: Kaczmarek, Kolegowiec, Krzemiński, Fijorek, Raport z oceny ... Raporty 1–12, op.cit.; Ogólnopolskie Informatory Upadłościowe, Raporty COFACE.

The intensity of bankruptcies in selected areas of business activity (BBU) combined with the changes in their environment leads to the conclusion that an above-average (i.e. greater than 1) concentration of the number of bankruptcy proceedings occurred in services (which was also the case with the OU). In manufacturing, the BBU was lower with a clear downward trend. The shape of curves representing the BBU for manufacturing and services differed with respect to both the intensity of the process and its direction. The average BBU values indicate the highest levels and maximum variability in services. A high level of concentration of bankruptcies (greater than 1) was also observed in manufacturing.

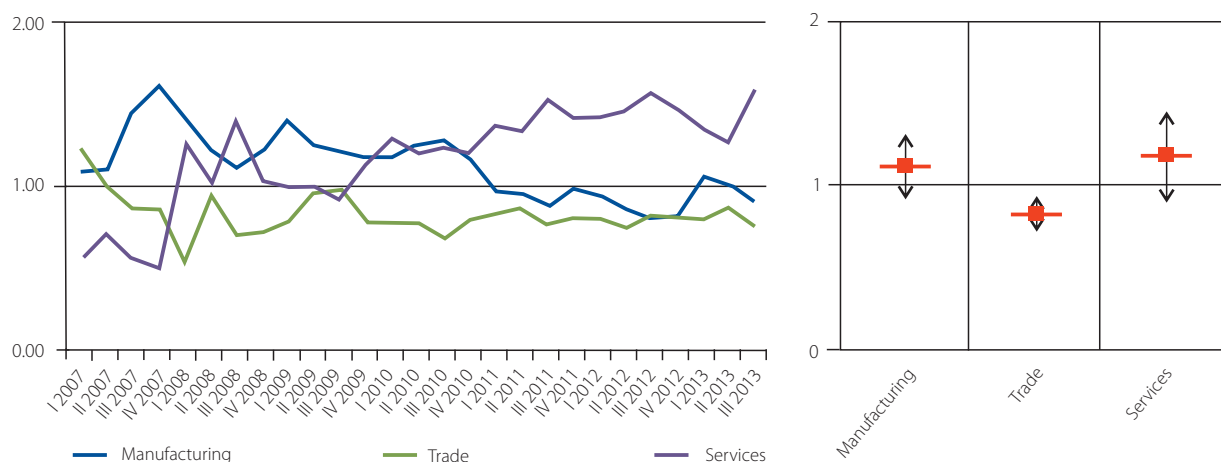


Fig. 2.7. The Industry bankruptcy barometer (left panel), its mean value and standard deviation (right panel) by type of business in Poland from the first quarter of 2007 to the third quarter of 2013

Source: own calculation based on: Kaczmarek, Kolegowiec, Krzemiński, Fijorek, Raport z oceny ... Raporty 1–12, op.cit.; Ogólnopolskie Informatory Upadłościowe, Raporty COFACE.

The highest concentration of bankruptcy proceedings was noted in Mazowieckie, Śląskie, Dolnośląskie and Zachodniopomorskie Regions (voivodships) where 56% of all proceedings were conducted, which appears to be related to the numbers of business entities operating in those regions. The region least affected by bankruptcies was Opolskie Voivodship with 13 times fewer cases than Mazowieckie Voivodship. OU values in individual regions indicate that the process was the most intense in Zachodniopomorskie and Dolnośląskie Voivodships, which is confirmed by a threefold increase in the measure since 2007. Only Lubelskie Voivodship was characterized by a decreased intensity of bankruptcies. The average OU and its standard deviation show the highest values and their variability in Zachodniopomorskie and Dolnośląskie Voivodships.

The highest concentration of bankruptcies was not recorded in Mazowieckie Voivodship (as might have been expected given its highest number of active bankruptcy proceedings), but in Zachodniopomorskie Voivodship. In seven regions the concentration of bankruptcies was above average. The geographical distribution of regions with above-average RBU values centres

around the north-eastern areas of Poland. Above-average RBU values since 2007, as was the case with the OU, were noted in Zachodniopomorskie and Dolnośląskie Voivodships.

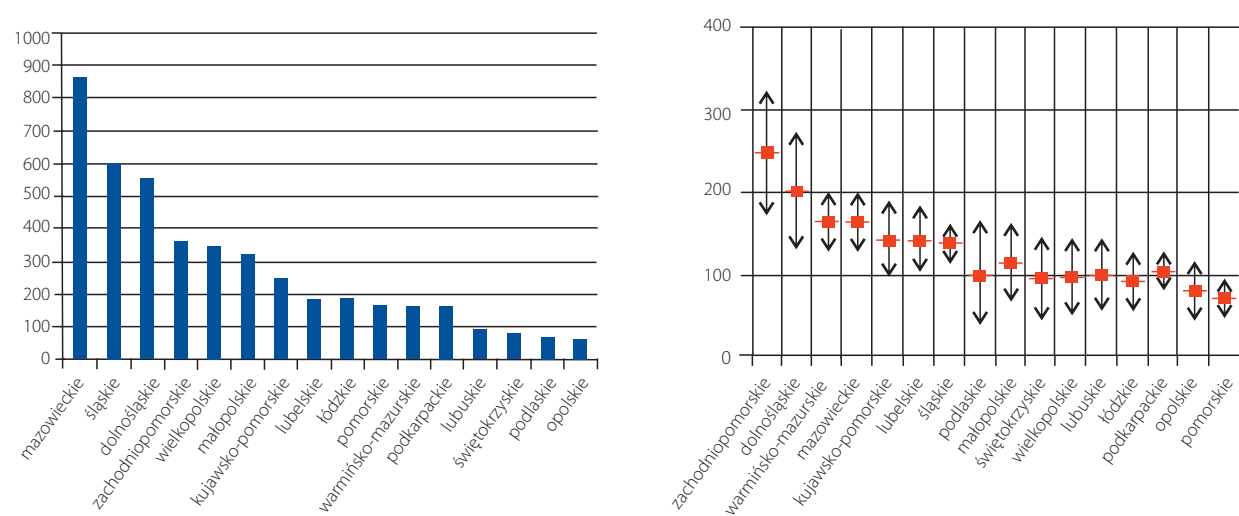


Fig. 2.8. The number of declared bankruptcies (left panel), the average OU value and its standard deviation (right panel) by voivodship in Poland from the first quarter of 2007 to the third quarter of 2013

Source: own calculation based on: Kaczmarek, Kolegowicz, Krzemiński, Fijorek, Raport z oceny ... Raporty 1–12, op.cit.; Ogólnopolskie Informatory Upadłościowe, Raporty COFACE.

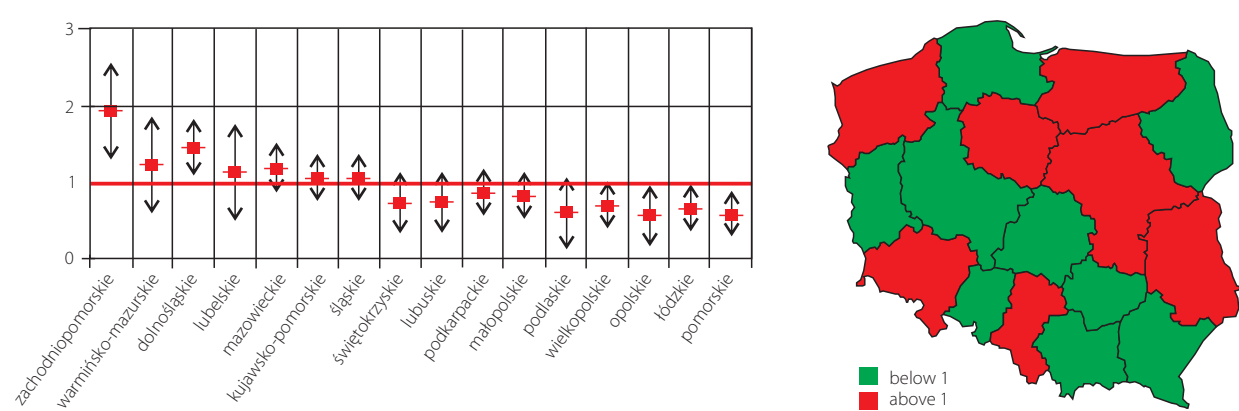


Fig. 2.9. The mean RBU value with its standard deviation (left panel) and its geographical distribution (right panel) by voivodship in Poland from the first quarter of 2007 to the third quarter of 2013

Source: own calculation based on: Kaczmarek, Kolegowicz, Krzemiński, Fijorek, Raport z oceny ... Raporty 1–12, op.cit.; Ogólnopolskie Informatory Upadłościowe, Raporty COFACE.

Information regarding the scale of bankruptcies in Poland in comparison with other European countries is difficult to obtain, is fragmentary and characterized by long delays. The statistics are also virtually incomparable. In the group of countries analysed by Mazurek (2013), the bankruptcy rate in Poland in 2010 (per 10,000 of active firms) was the lowest and totalled 2. For the sake of comparison, at the same time it exceeded 200 in Austria and in Hungary. Considering the data for 2004–2010, the study only warrants the conclusion that the Polish statistics are comparable to those of the Czech Republic and Spain. The problem does not arise from the methods of processing statistical data but from considerable differences in bankruptcy laws in various countries and in social attitudes towards bankruptcy on a transnational scale. A genuine solution in this respect may consist in replacing bankruptcy statistics with measures of bankruptcy risk. In this context, it should be emphasized that the designed EWS can be fairly easily adapted to obtaining data about such a risk to facilitate comparisons on a transnational scale. The easiest solution, although not devoid of certain disadvantages,¹⁴ may rely on the application of production functions (discussed in this study and developed as part of the project) to international microeconomic data available in such databases as AMADEUS.

¹⁴ Studies of Altman's classic models show their acceptable 'invariance' in time and space, yet the question arises to what extent nowadays – given such phenomena as e.g. globalization or widespread financial crises – such solutions can still remain timeless and universal.

Chapter 3

DETERMINANTS OF BANKRUPTCY – AN OVERVIEW OF APPROACHES

3.1. Introduction

The serious and diverse effects of bankruptcy (see Chapter 4) prompted the natural need to seek instruments that might enable people to predict such events. Tools to that end have been constructed for at least several decades. The purpose of this chapter is to provide a brief overview of the solutions commonly applied in this area. Due to the long history of the search and huge numbers of publications, here we can only highlight some problems in this respect and selected possible ways of solving them. For a more in-depth treatment of the issues, the Readers are kindly directed to the References section at the end of this chapter. The selection of approaches discussed here was guided by the need to approximate the logic and necessary intuitions contained in model solutions described in more detail in Chapters 10 and 11, and adopted as the basis for the Rapid Response Instrument (RRI). Since the set of potential tools for forecasting the threat of bankruptcy is quite extensive, somewhat more attention was devoted to the main premises behind the selection of the most appropriate solutions from the perspective of the objectives and characteristics of the RRI in question.

This chapter begins with a discussion of the most common classes of models for predicting bankruptcies presented in the literature. Two of them are characterised here in more detail: the discriminatory models and binary regressions. This is done due to the fact that, first, these two approaches dominate research on predicting bankruptcy, and second, binary regressions constitute the main tool used in Chapter 10. Next, the issue of the selection of explanatory variables used in these models is discussed in some detail, indicating, among other things, the importance of data used to feed the indicators, ideally validated by large-scale international research.

Then we move on to the issue of the synergic effects of bankruptcy and its impact on aggregated measures of this risk for a given industrial sector or the economy as a whole. Based on a simple model we show that the correlation of bankruptcy risk may increase severalfold the likelihood of a negative scenario of widespread bankruptcies. The existence of this effect is an additional motive for the construction of RRI-type systems since warnings generated by them may serve to interrupt such a chain of events. Further we show that there are a number of non-diversifiable reasons for the common threat of bankruptcy, including the role of certain macroeconomic variables. These observations, among other things, entail the need to integrate models combining bankruptcy with the macro state of the economy in such an RRI system. We discuss several types of such models and indicate the criteria for the selection of those deemed most compatible with RRI needs. We also include a brief review of both the potential explanatory and explained variables in such models. The last issue is particularly complex, and we feel that it has gone completely underappreciated in the literature, which is partly due to the problems associated with measuring the scale of bankruptcies in the economy described in more detail in Chapter 2.

3.2. Fundamental aspects of microeconomic modelling of bankruptcy

Modern microeconomic research on predicting bankruptcies started with the works by Beaver and Altman (cf. e.g. Altman 1968), although attempts to apply ratio analysis to the study of bankruptcies had been made before (cf. e.g. Horrigan, 1968). These approaches were based mainly on discriminant methods (Multiple Discriminant Analysis, MDA). The next strand of research was initiated by Ohlson and Zmijewski (cf. Ohlson 1980, Zmijewski 1984), in which Tobit and logit models were used. It soon turned out that it was a very useful method for analysing the group of issues in question. Numerous studies involving the use of this tool also revealed its weaknesses. It can be primarily criticized for being based on observations that do not reflect the evolution path of the object analysed. At the same time, these models were dominated by indicator-type variables based on the financial statements of companies. Potential predictors of bankruptcy, such as market characteristics, were rarely taken into account (cf. e.g. Shumway 2001). An answer to this criticism was provided by the so-called survival models, which examined the probability of 'survival' (or death) of an enterprise until a certain point in time (cf. e.g. Manjón-Antolín and Arauzo-Carod 2008). They employed both approaches based on modelling a single 'cause of death' (single-hazard models) and a number of such causes (competing risks models, starting with the classic survival models proposed by Cox). In the 1990s neural networks began to be more extensively used for modelling bankruptcy. Their attractiveness consisted, among other things, in the fact that they made it possible in a relatively simple way to take into account non-linearity in predicting bankruptcy in multilayer structures, (cf. e.g. Zhang, Hu et al. 1999). In summary, currently in the literature there are at least six distinct kinds of models used for the microeconomic forecasting of bankruptcy:

1. Linear and nonlinear discriminant models,
2. Binary regression models,
3. (Dynamic) survival models,
4. Option models of bankruptcy risk (distance to default),
5. Neural networks,
6. Hybrid approaches.

An in-depth discussion of these approaches exceeds the scope of the present publication. More detailed treatment of the issues can be found e.g. in Altman and Narayanan (1997), or in a very good and comprehensive overview by Gruszczński (2012), especially Chapter 4 which offers valuable insights based on the Polish context. We should, however, take note of several issues important especially in the context of the applicability of these to EWS design. First, review papers tend to suggest a certain equivalence of these solutions in that they usually yield fairly similar results; moreover, there is insufficient evidence to accord unquestionable preference to any of those considered in terms of quality of the forecasts generated by them (cf. e.g. Thevnin 2003, Hall 2002). Undeniably, there are situations in which some models turn out to be more useful than others. Each of these tools also has its natural limitations, for example, traditional discriminant approaches may not be optimal when explanatory variables are not normally distributed (or even log-normal). In the case of financial indicators this is the dominant situation (cf. e.g. Karels and Prakash 1987). Second, from the perspective of EWS design two features of such models offer a significant advantage, namely their relative simplicity and ‘canonicity.’ What we mean by the latter is the existence of a sufficiently large body of work, research and analyses conducted over at least a few dozen years based on such an approach. In this way we obtain an extremely valuable additional source of verification of the quality of tools at our disposal. Additionally, the universal application of a certain class of models makes their results more intuitive and more easily acceptable by a wide range of users. Finally, the suitability of a specific model for an EWS is influenced by the ‘data economics’: the approaches should use fairly easily accessible data both with respect to time and the possibilities of obtaining them, as well as their cost. A violation of this principle has several effects, all of them extremely unfavourable for EWS operation. First of all, data access problems usually significantly shorten the system’s warning horizon, because they often require intricate procedures for accessing/obtaining information on which the entire system is based. On the other hand, high costs of obtaining data may deny some EWS beneficiaries access to their results (if they are supplied commercially) or to the original sources should they wish to verify them.

According to this rationale, we have decided that two approaches are likely to be the most attractive from the perspective of practicability of our EWS, namely the discriminant and regression models (especially logit and probit). A review of the literature proves that approximately 70% of all studies related to bankruptcies were conducted using these two types of models (cf. e.g. Cheng Lim and Gan 2012). Below, we shall characterize both classes of tools in a very synthetic and practical way.

Both approaches operate in a fairly simple way,¹ which is shown in Figure 3.1.

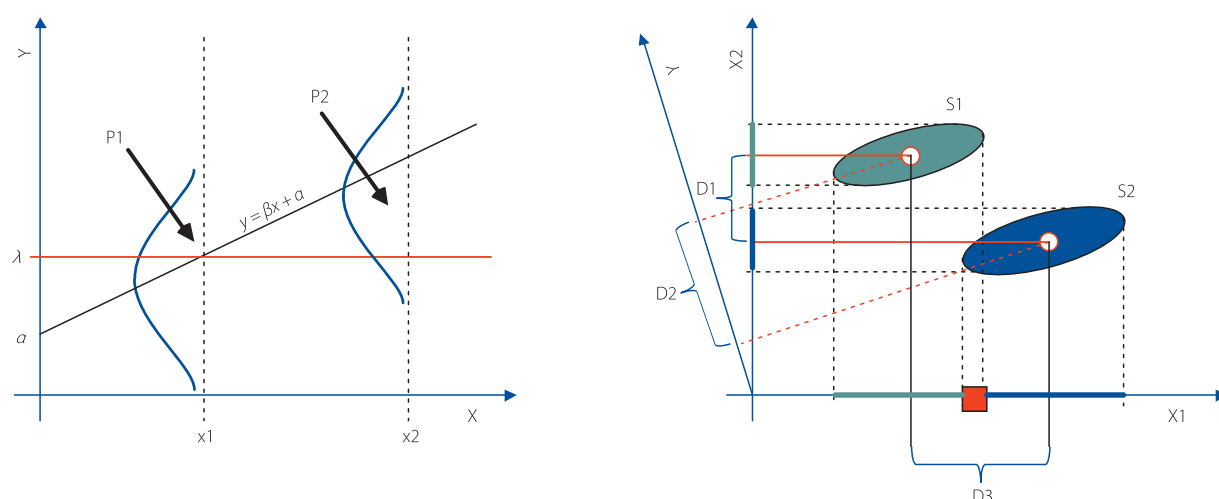


Fig. 3.1. A graphical interpretation of the probit model (left panel) and the principle of linear discriminant (right panel)

Source: own study.

¹ Nonetheless, their application associated with quite a few technical and methodological problems of varying degrees of difficulty. Their discussion, however, exceeds the scope of this study.

As far as models of probit/logit binary variables are concerned, let us assume that the state of subject 'i' is characterized by the following unobserved variable:

$$\tilde{y}_i = x_i\beta + \alpha + \varepsilon_i \quad (3.1)$$

where x is a vector of observable variables affecting $\tilde{y}_i$, and ε_i represents a random variable characterizing uncertainty in model (3.1). Let us further assume that y_i – the already observed behaviour of subject 'i' covering two states, conventionally defined as 0 and 1 – results from the following rule:

$$y_i = \begin{cases} 1 & \tilde{y}_i > \lambda \\ 0 & \tilde{y}_i \leq \lambda \end{cases} \quad (3.2)$$

It means that the entity finds itself in state 1 if the hidden variable takes a value greater than a certain critical level characterized by parameter λ (it can be assumed to be equal to 0), otherwise it finds itself in state 0. Note that model (3.2) is very attractive from the point of view of our objective, which is to model bankruptcy risk. If we interpret variable $\tilde{y}_i$ as the level of economic difficulties faced by a certain firm, the condition means that if these difficulties exceed a certain critical value, the firm will go bankrupt. Obviously, the fact that the firm in question has collapsed (or continues to operate) can be observed. Conversely, the variable defined as 'the level of economic difficulties faced by a firm' (or financial distress) cannot be observed directly, but each company analyst will indicate observable economic variables x , which can quite well approximate the economic condition of the company. Equation (3.1) states that the impact of these variables onto the measure of the firm's condition is linear.

It follows from equations (3.1) and (3.2) that the conditional probability of the firm in question finding itself in state 1, as long as its financial parameters are described by vector x , is:

$$\Pr(y = 1 | x) = \Pr(\tilde{y}_i > \lambda | x) \quad (3.3)$$

hence:

$$\Pr(y = 1 | x) = \Pr(\varepsilon > -[x\beta + \alpha] | x) \quad (3.4)$$

Further application of equation (3.4) obviously depends on our assumptions about the error distribution ε_i . It should be emphasized that since the left side of equation (3.1) is unobserved, the error remains unknown and for this reason it is necessary to make additional assumptions about its nature. In the modelling of bankruptcy (and a number of other binary variables), it is generally assumed that this error is distributed normally with the expected value 0 and unit variance, or it has a logistic distribution. In the first case, from (3.4) we obtain the so-called probit model:

$$\Pr(y = 1 | x) = \int_{-\infty}^{x\beta + \alpha} \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{z^2}{2}\right) dz \quad (3.5)$$

In turn, for the logistic distribution of error ε with variance $\pi^2 / 3$ we obtain the following relationship:

$$\Pr(y = 1 | x) = \frac{\exp(x\beta + \alpha)}{1 + \exp(x\beta + \alpha)} \quad (3.6)$$

or its equivalent:

$$\Pr(y = 1 | x) = \frac{1}{1 + \exp(-(x\beta + \alpha))} \quad (3.7a)$$

When comparing (3.5) and (3.6), it is clear, however, that the latter formula is somewhat simpler. It is one of the reasons why logit models tend to be slightly more common in this line of research. In our EWS bankruptcy model, the family of the type (3.7) is used (see Chapter 10²). Both formulae also have one thing in common, namely:

$$\Pr(y = 1 | x) = F(x\beta) \quad (3.7b)$$

where $F()$ is the cumulative distribution function of variable $\tilde{y}_i$ due to (3.1) being strongly correlated with the distribution of variable ε_i . Let us remember that in our examples these are normal and logistic distributions.

Equation (3.5) has a simple graphical interpretation (see Figure 3.1, left panel). According to formula (3.1), if the value of factor x increases from x_1 to x_2 , the distribution of the unobservable variable $\tilde{y}_i$ also 'shifts' to the right (if the error has a normal distribution,

² Complete with more references devoted to the construction and estimation of this class of models.

the distribution of the unobservable variable is also normal). Probabilities (3.3) for different levels of factor x are represented by areas $P1$ and $P2$ equal to those lying above the critical value of λ under the curves showing the distribution density of the unobservable variable $\tilde{y}_i$. It is clear that as the values factor x (which characterize the situation of entity 'i') increase, there is an increasing probability of occurrence of event 1 ($P2 > P1$).

Formula (3.6) may also be approached in other ways, which may be attractive for at least two reasons. First, it is not always easy to use a research paradigm based on unobservable variables. Some researchers refuse to do it on philosophical grounds. Second, thanks to an alternative method of derivation, equation (3.6) turns out to be easier to interpret. Let us suppose that we intend to model the following relationship:

$$\Psi(x) = \frac{\Pr(y=1|x)}{\Pr(y=0|x)} = \frac{\Pr(y=1|x)}{1-\Pr(y=1|x)} \quad (3.8a)$$

Function $\Psi(x)$ (odds ratio) expresses the relationship of conditional probabilities of events 1 and 2, respectively, as long as the entity is characterized by a state vector x . It is easy to see that the values of function $\Psi(x)$ belong to set $<0, \infty)$. Finding the logarithm of this function (to the base e) we therefore obtain an expression can assume real values. Hence it may be justified to use the following model:

$$\ln \Psi(x) = x\beta \quad (3.8b)$$

Note that the formulae of the type (3.8b) cannot be used for modelling probability $\Pr(y=1|x)$ itself. The right side of expression (3.8b) can in fact take any real value, whereas probability is always limited to the interval $<0, 1>$. In this case, only using the relationship of the type (3.7) is justified.

Mutual correspondence of models (3.6) and (3.8) can be proved, which entails the following natural interpretation of coefficients β . Equation (3.8) can be rewritten as:

$$\Psi(x) = \exp(x\beta) = \prod_{i=1}^n e^{x_i\beta_i} \quad (3.9)$$

hence:

$$\frac{\Psi(x_1, x_2, x_3, \dots, x_i + 1, \dots, x_n)}{\Psi(x_1, x_2, x_3, \dots, x_i, \dots, x_n)} = e^{\beta_i} \quad (3.10)$$

Coefficient β_i indicates therefore how the odds ratio changes if the value of variable x has increased by one unit, other things being equal (the values of other variables remain constant).

The basic ideas of the discriminant approach which underlie the canonical bankruptcy prediction model proposed by Altman can also be presented in quite a simple way. Let us imagine that we have two sets – $S1$ and $S2$ – on a plane and are looking for a real-valued linear function that will 'effectively' separate them (see Figure 31). Let us further assume that it is a projection of:

$$y = \varpi^T x \quad \varpi, x \in R^n \quad (3.11)$$

In the figure, we can see that the task can be solved with varying degrees of success. In the case of projection onto axis $X1$, both images of sets $S1$ and $S2$ have one part in common (the red square). We can obtain a better result by projecting them onto axis $X2$ – the images are completely disjoint. We must note, however, that even better results can be obtained by projecting onto axis Y : not only are the images disjoint, but their 'centres' are more distant from each other than those projected onto axis $X1$ ($D2 > D1$). Obviously, it is not always possible to obtain separate images. A 'good' separation mentioned above means only that the 'centres' of the projections are as distant from each other as possible, whereas the projections themselves are as focused as possible around those centres. Mathematically, it can be expressed in terms of searching for a vector ϖ such that will maximize the value of the expression:

$$G(\varpi) = \frac{|\tilde{\mu}_1 - \tilde{\mu}_2|^2}{r_1^2 + r_2^2} \quad (3.12)$$

where the centres of sets $S1$ and $S2$ are represented by μ_i , the projections of these sets by $\tilde{\mu}_i$ and the measures of dispersion for the projections are defined as follows:

$$\mu_i = \frac{1}{N_i} \sum_{x \in S_i} x \quad i = 1, 2 \quad (3.13)$$

$$\tilde{\mu}_i = \frac{1}{N_i} \sum_{x \in S_i} y = \frac{1}{N_i} \sum_{x \in S_i} \varpi^T x = \varpi^T \mu_i \quad (3.14)$$

$$r_i = \sum_{y \in S_i} (y - \tilde{\mu}_i)^2 \quad (3.15)$$

In order to determine the maximum of the function $G(\varpi)$ it is, therefore, sufficient to find the functional relationship of projection centres and their measures of dispersion from vector ϖ . This can be done fairly easily using the following relationships:

$$(\tilde{\mu}_1 - \tilde{\mu}_2)^2 = (\varpi^T \mu_1 - \varpi^T \mu_2)^2 = \varpi^T \overbrace{(\mu_1 - \mu_2)(\mu_1 - \mu_2)^T}^{S_{BC}} \varpi = \varpi^T S_{BC} \varpi \quad (3.16)$$

and:

$$r_i^2 = \sum_{x \in S_i} (\varpi^T x - \varpi^T \mu_i)^2 = \sum_{x \in S_i} \varpi^T (x - \mu_i)(x - \mu_i)^T \varpi = \varpi^T S_{WC}^i \varpi \quad i=1,2 \quad (3.17)$$

where:

$$S_{WC}^i = \sum_{x \in S_i} (x - \mu_i)(x - \mu_i)^T \quad (3.18)$$

Thus, by introducing the designation:

$$S_{WC} = S_{WC}^1 + S_{WC}^2 \quad (3.19)$$

we obtain the following:

$$r_1^2 + r_2^2 = \varpi^T S_{WC} \varpi \quad (3.20)$$

By combining equations (3.12), (3.16) and (3.20), we can determine the optimal vector ϖ as a solution to the problem:

$$\underset{\varpi}{Max} G(\varpi) = \frac{\varpi^T S_{BC} \varpi}{\varpi^T S_{WC} \varpi} \quad (3.21)$$

where the matrices S_{BC} and S_{WC} are represented by formulae (3.16) and (3.20), respectively. Linear discriminant analysis (LDA) is based on the above concept. As was already mentioned, however, it requires the fulfilment of quite restrictive assumptions regarding the distribution of observations and characteristics of matrices S_{BC} and S_{WC} . Good communicability of results of this technique³ makes it a popular tool for predicting bankruptcy risk.

Two very important considerations apply to both approaches and both have a significant impact on the selection of practical solutions used in RRI system design (see Chapter 10). These models turn out to be sensitive both to the period in which their estimation is made and to some characteristics of the sample itself, such as the business sector (cf. e.g. Grice and Dugan 2001).

Apart from selecting the type of model to study the risk of bankruptcy, another extremely important part of the procedure involves the choice of explanatory variables. It is obvious that this choice is to some extent dictated by the type of the model itself. There are, however, more general reasons. First of all, in the light of the concept of bankruptcy presented in Chapter 1, the search for its crucial advance symptoms should naturally focus on such financial characteristics of a given enterprise that enable us to analyse the process of 'depletion of its resources' under different assumptions regarding their possible replenishment from external sources.⁴

The justification for such an approach is straightforward and is based on the classic model proposed by Wilcox (cf. Wilcox 1970). If we assume that a firm may find itself in states $S_0, S_1, \dots, S_n, \dots$ and the transitions between these states comply with the following Markov process:

³ It is enough to provide the analytical form of the linear discriminant function (i.e. the definitions of variables and coefficients) as well as its critical values. Likewise, the model is not only easy to understand but also to use in self-assessing the risk of bankruptcy of a given firm.

⁴ In the light of remarks presented in Chapter 1, bankruptcy is not an objective state in the sense that, in the event of provision of extra capital to a firm at risk, changes in the way it is managed etc., virtually any firm can be kept alive for almost any length of time. In centrally planned economies numerous permanently unprofitable enterprises operated in this way for over half a century.

$$\begin{cases} P(S_0 | S_0) = 1 \\ P(S_i | S_{i-1}) = p \\ P(S_{i-1} | S_i) = q = 1 - p \\ P(S_i | S_j) = 0 \text{ when } |i - j| > 1 \end{cases} \quad (3.22)$$

where $P(S_i | S_j)$ denotes the probability of transition from state j to state i (as long as the entity was in state j at time $t-1$). Subsequent states of the firm in question can be interpreted as successive stages of its development, whereas state S_0 as its ultimate collapse. Note that it is an absorbing state, in other words, once the firm has found itself in it, there is no 'exit'. The probability p is a measure of the chance the firm's development, whereas q – that of its involution (i.e. return to an earlier stage of development). Using such a model it can be shown that the probability of bankruptcy of a firm in the state S_k is:

$$P(S_0(t) | S_k(t-w)) = \begin{cases} 1 & \text{when } p \leq q = 1 - p \\ (q/p)^k & \end{cases} \quad (3.23)$$

Thus, if the current value of firm equals W and assuming that each year it can increase the value by σ with probability p or lose the same value with probability q , and if $p > q$, then the probability of bankruptcy is:

$$P(S_0(t) | S_k(t-w)) = (q/p)^{W/\sigma} \quad (3.24)$$

The expression W/σ can be interpreted as the number of successive failures that 'exhaust' all the firm's assets.

In the cited work by Wilcox it is assumed that:

$$W = \lambda_1 A - \lambda_2 L \quad (3.25)$$

i.e. the company has a 'buffer' of liquidity dependent on the capacity λ_1 to liquidate assets A and postpone λ_2 its liabilities L . Let us note that the parameters λ_1 and λ_2 may depend on the characteristics of the company and possibly on the overall macroeconomic situation. In the event of a financial crisis we may assume that $\lambda_2 = 0$ (the repayment of liabilities cannot be postponed), while λ_1 may correspond to the proportion of cash in the firm's assets. On the other hand, in the case of average business economic climate or in medium-size firms, W may be equal the net value of its working assets.

If the changes in the firm's value approximate random walk, the average increase in the variable per unit of time is $(p - q)\sigma$. When observing the financial situation of the firm, change equals $A \cdot ROA \cdot \zeta$, where ROA is the return on the firm's assets, whereas ζ represents the part of the (net) profit which is neither paid out in the form of dividends nor reinvested in illiquid assets. On the basis of this information, we can calculate the q/p ratio:

$$\begin{cases} (p - q)\sigma = A \cdot ROA \cdot \zeta \\ p + q = 1 \end{cases} \Rightarrow q/p = \frac{1 - \frac{A \cdot ROA \cdot \zeta}{\sigma}}{1 + \frac{A \cdot ROA \cdot \zeta}{\sigma}} \quad (3.26)$$

It can be easily shown that if the formulae (3.24) – (3.26) hold, then in a certain area of the analysed variables we can use the following approximation:

$$P(S_0) \cong 1 - 2 \frac{A^2 \cdot ROA \cdot \zeta}{\sigma^2} (\lambda_1 - \lambda_2 \xi) \quad (3.27)$$

where ξ is a measure of financial leverage, and σ^2 an estimator of the variance of liquid funds flowing into the company.

In view of formula (3.27), the probability of bankruptcy is explained by several kinds of financial indicators: the size of the firm in question, its profitability, liquidity, leverage and ability to retain profits. It should be emphasized that the nature of relationship (3.27) constitutes the starting point for the design of explanatory variables for a large number of if not for most models of bankruptcy. In specific applications the choice depends on the need to take into account a number of other factors, including, among others: the forecast horizon, industry-specific features and availability of data. A detailed discussion of these issues exceeds the scope of this study. More information on indicators used in such analyses and their 'popularity' can be found e.g. in Hossari and Rahman (2005). It should be emphasized, though, that the procedures of selecting the explanatory variables used bankruptcy risk prediction models in RRI take these experiences into account, and the models are based on financial indices.

Our discussion of issues related to the selection of variables concludes with a remark concerning the selection of the dependent variables. It is worth remembering that the concept of bankruptcy may be defined in various ways. A review of 84 empirical studies conducted in 1968–2004 and devoted to bankruptcy modelling shows that they were dominated by the legal definition of bankruptcy (cf. (Hossari 2007)). Such an approach was also adopted in Chapter 10.

3.3. Synergy in bankruptcy proceedings and macroeconomic approaches

Formula (3.27) indicates that the likelihood of bankruptcy may be significantly influenced by macro- or mesoeconomic factors. After all, coefficients λ_1 and λ_2 reflect, among other things, a phenomenon which we might call pressure on a firm's liquidity. If the situation of the industry in which the firm operates is difficult, the creditors of that particular enterprise may insist on quick repayment of liabilities. In this case, λ_1 is small (e.g. similar to the proportion of cash and demand deposits in total assets), while λ_2 relatively large (and may include all current liabilities of the firm in question). In times of financial crisis or a deep recession λ_2 can be even greater, because it may comprise all the firm's liabilities.

Financial leverage ξ may work in a similar way (cf. e.g. Hol, Westgaard et al. 2002). In periods of increased financial instability of the economy, increased inflation etc. raising external capital may be more difficult for an extended period of time. In addition, higher interest rates on loans being repaid may significantly reduce the ROA, increase the volatility of $\tilde{\sigma}^2$, which, according to equation (3.27) will clearly lead to an increased bankruptcy risk. Thus we see that macroeconomic variables may significantly affect bankruptcy risk at the level of a single company.

It is easy to show (cf. Zhou 2001) that the links between firms may significantly increase the risk of bankruptcy in the economy. Let us assume that the random variables with the Bernoulli distribution of B_1 and B_2 describe the probability of collapse of firms 1 and 2 by time t :

$$B_i(t) = \begin{cases} 1 & \text{if bankrupt by } t \\ 0 & \text{if no} \end{cases} \quad i = 1, 2 \quad (3.28)$$

If the bankruptcies of the two companies are independent, then:

$$P(B_1 = 1 \wedge B_2 = 1) = P(B_1 = 1) \cdot P(B_2 = 1) \quad (3.29)$$

Let us, however, consider how such a probability might change if both events were not independent (which is the predominant situation, if only for reasons described in the introduction to this section). Let us define the correlation coefficient in the following way:

$$CORR(B_1, B_2) \equiv \frac{E(B_1 B_2) - E(B_1)E(B_2)}{\sqrt{VAR(B_1)VAR(B_2)}} \quad (3.30)$$

We must remember that since the variables B_1 and B_2 follow the Bernoulli distribution, then $B_1 \cdot B_2$ does well, and:

$$\begin{cases} E(B_i) = P(B_i = 1) \\ VAR(B_i) = P(B_i = 1) \cdot [1 - P(B_i = 1)] \end{cases} \quad i = 1, 2 \quad (3.31)$$

If we assume that the bankruptcies of both firms are interdependent, then from (3.30) and (3.31) it follows that:

$$\begin{aligned} \tilde{P}(B_1 = 1 \wedge B_2 = 1) &= E(B_1 B_2) = E(B_1)E(B_2) + CORR(B_1, B_2) \sqrt{VAR(B_1)VAR(B_2)} = \\ &= P(B_1 = 1)P(B_2 = 1) + CORR(B_1, B_2) \sqrt{P(B_1 = 1) \cdot [1 - P(B_1 = 1)] P(B_2 = 1) \cdot [1 - P(B_2 = 1)]} \end{aligned} \quad (3.32)$$

Hence, if we compare the probabilities resulting from the formulae (3.29) – independent events, and (3.32) – dependent events, we obtain:

$$\frac{\tilde{P}(B_1 = 1 \wedge B_2 = 1)}{P(B_1 = 1 \wedge B_2 = 1)} = 1 + CORR(B_1, B_2) \sqrt{\frac{[1 - P(B_1 = 1)] \cdot [1 - P(B_2 = 1)]}{P(B_1 = 1)P(B_2 = 1)}} = 1 + CORR(B_1, B_2) \sqrt{\frac{1}{ODDS(B_1)} \cdot \frac{1}{ODDS(B_2)}} \quad (3.33)$$

where $ODDS(B_i)$ represents the relative odds ratio of bankruptcy of firm 'i'.

Formula (3.33) leads to several important conclusions. First, due to the non-zero correlation the risk of simultaneous bankruptcies may increase severalfold in comparison with a situation without such a correlation. If, for example, the risk of bankruptcy of the first firm is 0.05 and that of the other 0.01, and the correlation equals 0.3, then formula (3.33) demonstrates that the situation leads to an almost 15-fold increase in the risk of simultaneous bankruptcies of both firms. Second, in such a context the role of EWS-type systems becomes particularly clear, especially if they permit taking pre-emptive action. It may involve both solutions to reduce such a correlation coefficient and the probabilities of bankruptcy at the level of individual firms. In the latter case, the effect of the correlation will still be strong, but the probability itself (3.32) will be small. It should be emphasized that the reduction in the correlation coefficient often requires systemic action at macro or meso levels. Third, due to the presence of the phenomenon of synergy, the analysis of the risk of bankruptcy, including one in this RRI project, must take into account not only

the microeconomic variables discussed in the previous chapter, but also the macroeconomic environment and the situation at the level of individual branches of industry.

The impact of GDP changes on the dynamics of bankruptcies in Poland is clearly visible (see Figure 3.2), but it also points to the complexity of the relationship. The chart shows a decline in the number of bankruptcies when GDP growth approached (or exceeded) 4% y/y. At the same time, slower economic growth (without a recession in Poland) below 3% led to markedly accelerated bankruptcy processes. It is thus clear that examining the relationships between the macroeconomic situation and the degree of bankruptcy risk is a difficult task and requires the application of formal tools.

Meeting the above requirement consists primarily in the selection of appropriate macroeconomic variables strongly associated with aggregated measures of bankruptcy risk. Since the design of the RRI was informed by the results of research on bankruptcy in other economies, a valuable clue was provided by the fact that macroeconomic topics have appeared in the literature for a fairly long time. Furthermore, it turned out that the most important research directions for the solutions adopted in the RRI include two main planes of such interactions. Historically speaking, the earliest studies concerned the relationships between the differently defined bankruptcy rates aggregated for the whole economy and selected macroeconomic variables. In this context it is worth mentioning the classic work by Altman, which had numerous followers⁵ (cf. Altman 1983a), devoted to the study of the relationship between the business cycle and the bankruptcy rate. We wish to emphasize that in our approach to RRI design the relationships between the bankruptcies and the economic cycle are examined with particular attention.

Analyses conducted by representatives of research trend comprised not only the cyclical position of the economy, but also the macroeconomic variables such as interest rates, unemployment, wages and exchange rates (cf. e.g. Dewaelheyns and Van Hulle 2007). They also demonstrated the importance of unanticipated changes in a number of macroeconomic variables (cf. e.g. Hunter and Isachenkova 2006).

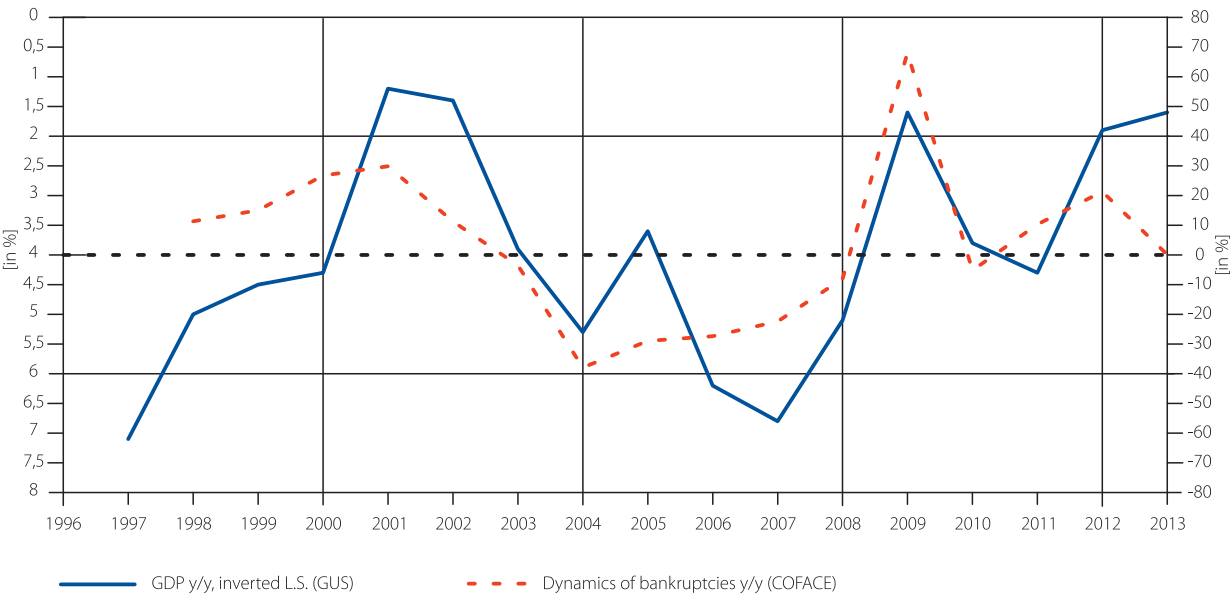


Fig. 3.2. GDP growth (y/y) and the dynamics of bankruptcy (y/y) in Poland in 1998–2013

Source: own study based on data from GUS and COFACE.

The other current of research dealing with the relationships between the intensity of bankruptcies and macroeconomic factors incorporates analyses conducted at the institutional level, including regulations governing the bankruptcy procedures themselves. When focussing on the impact of the cyclical changes, it is worth remembering that the discussion revolves around the issue of their endo- or exogenous relationships with bankruptcies. Authors of the work cited above (Suarez and Sussman 2007) mention that certain solutions in the area of bankruptcy proceedings may themselves affect the fluctuations in economic activity. The issue is analysed even more broadly by Peri and Rachedi (2013).

Most of the above approaches to modelling the impact of macroeconomic variables on bankruptcy rates are based on one of the following solutions. The simplest approach is represented by the following formula:

⁵ A more extensive review of the literature may be found in e.g. (Hol 2006).

$$BR_t = \sum_{i=1}^p \beta_i^1 X_{t-i}^1 + \dots + \sum_{i=1}^p \beta_i^k X_{t-i}^k + \varepsilon_t \quad (3.34)$$

where BR is the (variously defined, cf. section 2.3) aggregated measure of bankruptcy in the economy; whereas $X_1, \dots, X_N$ – the macroeconomic variables under consideration. In practice, equation (3.34) is often estimated as the Almon-type model, which yields good results in some economies (cf. Dewaelheyns and Van Hulle 2007).

More general approaches are based on VAR models:

$$\Upsilon_t = \tilde{B}_0 + \sum_{i=1}^p \tilde{B}_i \Upsilon_{t-i} + \tilde{\varepsilon}_t \quad (3.35)$$

where $\tilde{B}_i$ are coefficient matrices; $\tilde{\varepsilon}_t$ – the error vector; while vector Υ_t is defined as:

$$\Upsilon_t = \begin{pmatrix} BR_t \\ X_t^1 \\ \vdots \\ X_t^N \end{pmatrix} \quad (3.36)$$

Non-linear generalizations of equation (3.35) are also used (cf. e.g. (Drehmann, Patton et al. 2005):

$$\Upsilon_t = \Gamma(\Upsilon_t, \Upsilon_{t-1}, \dots, \Upsilon_{t-p}) + \tilde{\varepsilon}_t \quad (3.37)$$

Bearing in mind the perspective of RRI design, the choice of the most useful class of models from those listed here requires taking several criteria into account. First, the selection must reflect the availability and other characteristics of Polish data on bankruptcy. The quality of such information is limited as is the length of the time series (see Chapter 2). Second, an extremely important issue related to RRI design is the good communicability of results of model analyses. In general, it may be assumed that it decreases with the degree of model complexity, the use of non-standard variables, the use of 'niche' approaches etc. Third, the model should also meet other conditions supporting its credibility: be capable of replication (at least for professional economists dealing with similar issues), contain not too many assumptions about variables etc. Fourth, such a model should allow a comprehensive evaluation of possible impacts of the selected macroeconomic policy scenarios if the RRI signalled the need to take such action. Fifth, the model should be relatively simple when it comes to its re-estimation, modification of the list of variables etc. Finally, the process of feeding data into the model, estimations, calculations and analyses of results cannot be overly time-consuming. It can be said that the above conditions are best met by a model of the type (3.35). The VAR model used in the macroeconomic module meets the above conditions (see Chapter 11).

The above-listed criteria also generate some concomitant 'costs'. Among others, they fail to take into account the well-documented work on bankruptcy based on long time series or the existence of several macroeconomic bankruptcy regimes which significantly differ with respect to the mean bankruptcy rates in the economy (cf. Giesecke, Longstaff et al. 2011), the transitions between which are not continuous. Nevertheless, such a problem can be solved using alternative methodologies which include switchover mechanisms (cf. e.g. Bhattacharjee, Higson et al. 2009, Das, Freed et al. 2006). Neither does the approach in question take into account the changing systemic circumstances such as those involving changes in bankruptcy legislation. In more general terms, these formulae do not usually contain explicit qualitative variables which often play an important role in bankruptcy processes (cf. e.g. Becchetti and Sierra 2003). It should be emphasized that the RRI project comprises procedures aimed to overcome the effects of the adopted methodology and its potential limitations. One of them is the so-called Interpretation Panel whose responsibilities include the identification, assessment and expert correction of such situations.

Chapter 4

ECONOMIC AND SOCIAL CONSEQUENCES OF BANKRUPTCY

4.1. Introduction

Bankruptcy procedures constitute one of the most important selection mechanisms in the economy. As a result, they eliminate permanently inefficient enterprise whose assets could be better used in new ways, whereas certain financially inefficient but economically sound firms implement restructuring and recovery programmes allowing them to permanently regain acceptable performance. In a well-designed bankruptcy system, such changes also benefit the firm's stakeholders. As a result, in such an ideal world bankruptcy proceedings do not entail particularly serious negative consequences, the most important task of economic policy being 'not to disturb them when they are doing their job;' in consequence, the importance of early warning systems (EWS) is quite limited. However, an in-depth analysis of the operation of bankruptcy systems shows that the consequences of bankruptcy – contrary to prevalent opinions about their low costs shaped in the 1970s and 1980s – can be considerable, and spread over a wide area of economic and social life. Moreover, a detailed generic analysis of these effects shows that EWS's are capable not only of anticipating such consequences but also of rationalizing the possible costs of 'imperfections' inherent in bankruptcy systems. In particular, they may reduce the costs of type I and type II errors described here as well as shorten the time of suboptimally adjourned decisions regarding bankruptcy and its form.

In previous chapters we synthetically presented the functioning of the bankruptcy system as a selection mechanism and characterized some of its limitations, which was followed by an overview of the direct and indirect costs of bankruptcy. The literature shows that the total bankruptcy costs may range from 10 to 25% of a given firm's value. It was also noted that simple aggregation of microeconomic costs does not reflect the full macroeconomic impact of bankruptcy, including, among others, its domino effect. An additional cause of underestimation of the phenomenon is the fact that in the light of research the largest companies (including non-financial ones) are usually protected from bankruptcy. As a result, the risk monitored by the EWS may be even greater than that suggested by these estimates.

The existence of several kinds of bankruptcy costs and their substantial magnitude raises the problem of analysis of the efficiency of such procedures. This chapter reviews some performance measures and, on their basis, provides an attempt to evaluate the efficiency of the Polish system with that of other European countries. The results show that Poland ranks average in this respect. At the same time, it lags quite far behind the very best. In general, it can be said that the efficiency of a country's bankruptcy system depends on several factors, including institutional and other structural characteristics. All in all, the overall efficiency of the process changes slowly, although improvements in the system should constitute a permanent objective, such measures are not likely to lead to a rapid reduction of the EWS role as one of the tools contributing to the reduction of costs of bankruptcy procedures.

4.2. Bankruptcy as a selection mechanism

In modern economies, the termination of firms' business activity is quite a common occurrence. It is estimated that in a large group of countries 20 to 40 % of businesses fail to survive the first two years since their founding (Bartelsman, Haltiwanger et al. 2004). According to the classical views of the followers of Schumpeterian tradition, bankruptcy provides the primary selection mechanism which results in the elimination of economically weaker entities and simultaneously facilitates the release of their productive resources in favour of more efficient business use conducive to a higher efficiency of the system as a whole. Naturally, this opinion raises some important questions. First, does such a mechanism actually work in the sense that a world 'without bankruptcies' is less effective than one that allows the selection mechanism to operate? Second, is the selection mechanism itself effective in the sense that it actually eliminates weaker entities? And third, is there really no alternative solution? The most interesting issue, however, may be expressed by yet another question, which we shall address in the following sections: is it the most efficient mechanism available, and if not – what would a better one be like? All these problems are undeniably very important in the context of the EWS design, because if the natural mechanism performs well and there are no obviously better solutions, the objective of such a system would be less than obvious. A full discussion of these issues significantly exceeds the scope of this study; hence we shall synthetically address selected aspects of these problems.

As far as the issue of how 'a world without bankruptcies' might operate is concerned, now it is quite difficult to find valid current experiences that would be helpful in this respect. Since most countries have a bankruptcy law of one sort or another, in principle, we now have only two options at our disposal. First, it may be helpful to obtain information about the operation of the areas excluded from bankruptcy law. Such cases exist in a number of countries and often include even entire sectors of the economy

(e.g. strategic ones, such as energy production, mining and defence industries). Unfortunately, they constitute a thankless subject of research, since any knowledge of the actual economic situation of those entities is generally limited and not always objective. Second, one may focus on analysing historical experiences related to the operation of economies in transition from the centrally planned model to the market one. This is only seemingly an easy task. Although the centrally planned economy model has clearly historically lost ground to market-based solutions, the potential causes of the situation were so many that the selective bankruptcy mechanism under market conditions was the only one of them. In the context of this remark, very valuable knowledge can be obtained e.g. from the experience of the Chinese economy,¹ in which the first bankruptcy of a state-owned enterprise took place in 1986 with more comprehensive systemic solutions in the field of bankruptcy law were introduced in 1988. There are a handful of works examining the 'Schumpeterian effect' of bankruptcy using data from the Chinese economy in both periods. Their results can be summarised as follows (Parker 1995): in an economy without bankruptcy enterprises grow significantly faster in the initial phase of their development. Then the effects of decreasing efficiency start to appear due to the lack of selection mechanisms. In sectors of the economy where selection mechanisms are allowed to operate the reverse phenomenon can be observed, namely slower growth in the early stages of development, but greater dynamics and efficiency when firms have matured. One of the practical conclusions for the EWS from this kind of experience may be that although such solutions should not in any case involve attempts to abolish mechanisms eliminating the weaker actors or to create a model of 'a world without bankruptcies', such systems and a more active economic policy towards the areas with such risks may be desirable to include at certain stages of development of these segments.

Likewise, the question of the efficiency of bankruptcy understood as the capacity to effectively eliminate the weakest actors is quite complex. A detailed study involving non-financial companies conducted in the United States from 1979 to 1983 suggests a good efficiency of the bankruptcy process in America at that time (Kahl 2001). Other studies also show that in the case of less radical actions, without eliminating bankrupt entities but based on remedial and restructuring processes, bankruptcy law can be regarded as a fairly effective way of restoring performance (Djankov, Hart et al. 2008). On the other hand, one may not fail to recall that the term 'too big to fail' (TBTF syndrome) was first used in the USA as early as in the first half of the 1980s with respect to firms in the financial sector. The recent global financial crisis revealed even more egregious cases of TBTF in different countries worldwide. This phenomenon also included firms from the non-financial sector with a spectacular example being the bankruptcy of General Motors on June 1, 2009. At first, it could have even been considered to be event contradicting the TBTF phenomenon had it not been for the fact that merely 40 days later the company was bought out by the U.S. Treasury Department. Naturally, the phenomenon of TBTF produces not only positive consequences such as avoiding the domino effect, saving jobs, but also various types of costs and other side effects (cf. e.g. Roe 2014). This does not alter the fact that the phenomenon under discussion is always present in the economy, and in many cases the net balance of TBTF policy, despite the costs, is likely to be positive. From the EWS vantage point it is therefore important to ensure that the system is not used as a tool for reinforcing the negative effects of TBTF. On the other hand, the EWS can significantly reduce such effects. The anticipatory and warning functionality of the system allows e.g. for the implementation of a series of pre-emptive actions and defining scenarios and policies in relation to the risk of bankruptcy of large companies. In the absence of such tools all decisions in this area will have to be made on an ad-hoc basis, which certainly limits their rationality.

The third group of questions concerns potential mechanisms for the elimination of entities that fail to optimally use the means of production other than the classical mechanism of bankruptcy. Let us first note that all the modern bankruptcy systems, in principle, include such solutions associated with differently designed non-liquidation procedures. In many cases, however, creditors prefer liquidation. In this way, a natural additional research direction appears. It should be remembered that one of the main reasons for the inclusion of 'traditional' bankruptcy procedures in legal systems is the threat of an ineffectual 'creditors' race' for the assets of firms in financial distress, which would occur in the absence of those solutions. Researchers may try to develop formulae for contracts between debtors and creditors which would almost automatically facilitate the solution of the problem of claims without the above-mentioned side effects. This often happens in practice when parties 'reach an agreement' outside bankruptcy law² as to how to settle the outstanding financial obligations. In the literature, the present trend of systemic considerations employs, among others, the principles and achievements of contract theory, examining solutions which are deemed optimal from this point of view, for example works by Gennaioli and Rossi (2012). Moreover, it must be admitted that formal insolvency procedures are not 'matched' equally well with the entire population of enterprises, which applies especially to the SME sector. In the case of firms belonging to the latter group, classic bankruptcy law is often too expensive and too complicated a way

¹ Theoretically, similar insights could be gained from the experience of post-socialist European economies, including Poland. It must be remembered, though, that in these cases changes occurred much faster, included a radical reconstruction of the political model and an important role was played by the effects of integration with the developed Western countries. In such a situation, it is difficult to separately assess the impact of various factors.

² This is another reason for the fact that bankruptcy statistics are notoriously inaccurate, beyond those described in Chapter 2. Using medical terminology it may be compared to a 'silent heart attack.' Although it is not recorded in any official statistics, it meets the formal bankruptcy criteria.

of solving the problem of claims. Accordingly, in this group we can see the emergence of alternative methods of protecting the interests of creditors (cf. e.g. García-Posada and Mora-Sanguinetti 2013).

This very sketchy overview of some issues related to the operation of selection mechanisms based on bankruptcy procedures proves their indispensability. It is clear, however, that alternatives can and in some areas even must exist. Those solutions generally demonstrate a satisfactory performance. Still, the proper positioning of the role of EWS's in a world where bankruptcy law is universal and operates quite effectively, we must also consider their efficiency. This issue will be dealt with in the following sections.

4.3. Direct and indirect costs of bankruptcy – a review

Until the early 1980s, the literature on the costs of bankruptcy was dominated by an approach based only on the concept of direct costs (Bhabra and Yao 2011). Such costs usually represent the total expenditures associated with the preparation and conduct of the insolvency proceedings. They normally include such items as requisite court fees, costs of expert opinions and valuations of assets, costs of legal services and accounting or costs of protecting the property from devastation and misuse. Although various studies yield heterogeneous results regarding the magnitude of these costs, most of them show³ that they add up to only a few percent of the company's assets (cf. e.g. Altman 1984, Thornburn 2000, Weiss, 1990). This may be considered as one of the reasons for which the importance of EWS is often underestimated, in other words, if the potential losses resulting from the materialization of a risk are small, it is easy to question the desirability of developing warning systems against it. The situation changes significantly if we take into account the full costs of bankruptcy by analysing not only the microeconomic aspects of the phenomenon but also its macroeconomic effects. The following brief discussion follows up on this train of thought.

The indirect costs of bankruptcy are usually defined as follows:

$$C_{IND} = E(V | NB) - V \quad (4.1)$$

where C_{IND} represents the indirect costs of bankruptcy; $E(V | NB)$ – the assessment of the conditional expected value of the firm if unaffected by bankruptcy and (or) optimally managed, and V – the actual value of the company. It is clear that the key requirement for the practical application of formula (4.1) involves the development of a method of determining the conditional expected value of the firm in question. Approaches will differ depending, among other things, on whether we wish to evaluate the costs from the ex-ante or from the ex-post perspective. In the former case we need to analyse the disciplining impact of the model of a bankruptcy system 'i' on the willingness and motivation of the firm's stakeholders, especially managers and employees, to work more effectively for the good of the firm and control the agency problem. It is worth noting that in the case of these costs we focus on relative costs compared with the 'best' bankruptcy law.⁴ As a result, in this context formula (4.1) assumes the following form:

$$C_{IND} = \Delta V = E(V | j) - V(i) \quad (4.2)$$

where 'j' represents the optimal bankruptcy law and $V(i)$ is the value of the firm in question in the case of application of law 'i'. The aggregated ex-ante cost ($C_{EX-ANTE}$) relative to the ideal solution for the entire economy in which N firms operate is thus:

$$C_{EX-ANTE}(j, i) = \sum_{k=1}^N (E(V_k | j) - V_k(i)) \quad (4.3)$$

An estimation of ex-post costs can also be performed using different approaches, but the method proposed by Altman (cf. Altman 1984) and a number of its adaptations are considered standard. A disadvantage of this approach is that it can only be applied to firms with a sufficiently long history; including a period of financial stability.

Besides the problem of measuring indirect costs of bankruptcy, an equally important issue involves the analysis of sources of these costs including their macroeconomic effects, which is extremely important for the design of EWS. It is a comprehensive issue, but for the sake of clarity of presentation we shall confine ourselves to its synthetic discussion (see Figure 4.1) noting that its excellent and detailed description can be found e.g. in White (1996). However, at the outset, it is worth emphasizing that in this case a significant portion of these costs results from the agency problem and constitutes the consequence of specific stakeholder behaviours, which are not always optimal for the firm.

To illustrate the mechanisms of how these costs accrue, let us assume that in its current form the firm generates a revenue stream⁵ P_1^F , while line K represents the cost level. When we examine the shape of the two lines it becomes clear that we are dealing with an entity that is not only bound to enter a period of financial distress (within a certain time horizon after time T_1), but it is also economically inefficient and should be liquidated. Let us further assume that it is possible to make better use of the assets

³ A broader overview and more detailed information on the breakdown of these costs are offered by e.g. (Branch 2002).

⁴ The question how to define them still remains. The normative model of bankruptcy is discussed somewhat more broadly in Chapter 1.

⁵ Or, to be more accurate, it represents to the firm's revenue forecast.

The total costs of bankruptcy obviously include direct and indirect costs. Their full breakdown can be found e.g. in the work cited above (White 1996). It may be well worth pointing out that on the aggregated scale a crucial role is played by C_{EXANTE} costs since they relate to all firms operating in a given economy, while others affect only the group of firms⁶ in the process of bankruptcy. The literature offers different assessments of total costs of bankruptcy, but they are usually estimated at 10–25% of the firm's value (cf. e.g. Altman 1984, Andrade and Kaplan 1997). Quite often a universal measure of these costs is adopted in the form of the duration of bankruptcy proceedings (see e.g. Franks and Torous 1988).

The kinds of bankruptcy costs described above, although they may be universal and widespread, should rather be construed as microeconomic consequences. But it makes sense, especially in the context of EWS, to pay attention to the serious macroeconomic consequences that may result from the application of certain legal and institutional solutions in the area of bankruptcy. The existence of such consequences appears to be well documented, to mention only the classical work by Djankov and Hart (Djankov, Hart et al. 2008), which shows, among other things, that one of the primary catalysts of positive impact⁷ of the degree of development of the financial system on the real economy are the solutions provided by bankruptcy law. This point of view seems indeed natural if we note that credit market imperfections, certainly important for the operation of individual enterprises, may to a considerable extent arise from the provisions of bankruptcy law, the degree of investor protection etc. Consequently, if we consider the importance of bankruptcy law, it may be surprising that its macroeconomic dimension is relatively rarely mentioned in the literature and research. An additional problem in the analysis of this issue is that the measures of macroeconomic effects of specific bankruptcy policies may be skewed by the fact that, generally speaking, countries tend to protect larger companies from bankruptcies (cf. e.g. Bris, Welch et al. 2006). This may lead to the erroneous impression that the general consequences of bankruptcies are not too significant in the economy as a whole. The microeconomic picture even after certain aggregations may also be insufficient, because bankruptcies often cause various multiplier effects. A good example is the construction sector whose problems affect virtually the entire economy – the manufacturing of furniture, household appliances, steel, financial services etc.

From the perspective of EWS design, when surveying recent research results we should pay attention to two fundamental conclusions concerning the relationships between bankruptcy systems and the macro-economic sphere. First, effective operation of such systems largely depends on other elements of their regulatory environment, including the degree of investor protection (Peri and Rachedi 2013). This observation leads to an important conclusion. As was mentioned in Chapter 1, it is often argued that improving bankruptcy systems may constitute a competitive solution to the development of EWS's. Without questioning the need for such strategic actions, we must bear in mind the limitations of this approach that apply in the light of the above observations and considerations presented in Chapter 1. Improving the legal systems, although necessary, is likely to bring gradual effects in the long run. Therefore, during such a period of transition EWS's appear to constitute a solution that has no alternatives. Second, research results also suggest that EWS's may not have a viable alternative for at least one more reason. Some analysts think that if the macroeconomic effects of bankruptcies are serious, one of the ways to cushion them may be to 'soften' the provisions of bankruptcy law. The above-mentioned studies indicate, however, that the overall costs of such a 'softening' can be high and, therefore, a better solution may include aid offered to individual businesses (cf. e.g. Suarez and Sussman 2007).

In this context, it is worth paying attention to a specific kind of macroeconomic costs of bankruptcy related to the social effects of the process, which are notoriously difficult to measure. In modern economies, a very important role is played by small businesses. These entities are often separated from households only by a very 'thin border' since quite often they are simply family businesses. The bankruptcy of such an entity may therefore have similar effects to an instance of consumer bankruptcy. Furthermore, the same effect may occur even in the case of insolvent larger firms. If the local unemployment rate is high, both the rank-and-file staff and the management of bankrupt firms often become insolvent or at least illiquid consumers. The negative impacts of such a situation may be very serious and far-reaching (cf. e.g. McIntyre 1989). Likewise, we should not forget that bankruptcy is still associated with a sort of social stigma and multiple attendant negative consequences (see COM 2007).

For these reasons, the EWS designed here makes extensive use of the concept of the bankruptcy costs function. Since its practical implementation depends on obtaining relevant data, at the present stage we only apply the indicators based on the measure of potential job losses, i.e. the number of employees in a firm facing bankruptcy risk. This measure can be fairly easily adapted to other categories that assess the possible effects of bankruptcy of a given group of firms, such as added value, exports etc.

⁶ Quite often, they do not comprise all of them since the frequency of type I or type II errors does not add up to 100%.

⁷ Although it must be noted that the direction of causality of this relationship is the subject of controversy; see e.g. (Levine 2005).

4.4. The efficiency of bankruptcy procedures

The efficiency of bankruptcy procedures constitutes an important category not only from the point of view of the objectives of bankruptcy law, but is also vital in the context of EWS's tasks. If such procedures are ineffective, the general objective of the system is not likely to be achieved (Gine and Love 2006), in which case the analyses of bankruptcy risk provided by the EWS play a dual role: they are the main tool for the detection of such conditions and allow for the implementation of preventive measures. Prevention or sufficiently rapid implementation of informal procedures to solve the problem of overdue claims is a better way to solve this issue than inefficient provisions of bankruptcy law.

Despite the crucial role played by the efficiency aspect of bankruptcy law, there is no uniform concept of such efficiency or its universal measures (with the latter to a certain extent deriving from the former).

There are several approaches to the issue of defining the efficiency of bankruptcy law. First of all, its provisions may be effective for preventive (ex-ante) purposes. Provisions of bankruptcy law are considered to be effective if they affect the owners and managers⁸ of firms (as well as their other stakeholders) in a way that prevents these stakeholder groups from making excessively risky decisions (Cornelli and Felli 1997, Claessens and Klapper, 2002). It is one of the fundamental dimensions of bankruptcy law, because the lack of efficiency in this area leads to at least two kinds of costs. In economies (or their specific segments) that lack this mechanism the costs of capital are certainly higher because the lenders bear a greater risk. A very serious problem is also posed by reckless executives who suffer no consequences of their errors. The macroeconomic costs of this phenomenon can be quite high (Brogi and Santella 2004).

The adoption of certain general assumptions makes it possible to determine ex-ante efficiency conditions based on the classic model proposed by Bulow and Shoven (Bulow and Shoven 1978). Let us assume that the financial standing of a given business entity is influenced by a coalition of shareholders (E) and banks which have agreed to finance a certain project (B). This assumption can be challenged under different conditions because, among other things, it disregards the role played by bondholders (O), but it is attractive in that in the event of insolvency proceedings the decisions made by this group may be critical⁹ in terms of filing a bankruptcy petition and choosing the form of the proceedings. In order for investment I to achieve social efficiency it must fulfil the following inequality:

$$P_N \geq I_N \quad (4.4)$$

where P is the value of the firm in question (subscript N indicates that it is the value of the firm after the investment has been made). On the other hand, from the point of view of the financial coalition (the shareholders and banks) the efficiency of the project depends on the following condition:

$$\Delta(P - O_K) = \Delta(E_K + B_K) > \overbrace{I_N - D_N}^{FIN KOALICJI} \quad (4.5)$$

since the following relationship holds:

$$P = E_K + O_K + B_K \quad (4.6)$$

Subscript K in the above formulae means that the firm continues to operate. The relationship represented by (4.5) can be interpreted as a condition stating that the increase in value of the firm (as a result of investment I) less the necessary increased transfers to bondholders has to be greater than the portion of necessary capital expenditure which must be financed by this group (assuming risk neutrality). Accordingly, the condition necessary to ensure that the coalition funds only such projects that are not only beneficial from its point of view but also socially effective, can be expressed in the following way:

$$\Delta(P - O_K) + O_N = P_N \quad (4.7)$$

The other dimension of bankruptcy law is known as its ex-post efficiency, which should be understood as allowing only for the liquidation of unprofitable (nonviable) firms while simultaneously preventing the elimination of economically healthy enterprises. This kind of efficiency thus presupposes the existence of a sufficient separation of the adopted solutions in terms of their discriminative resolution. The separation aspect of bankruptcy law was discussed in more detail subsection 4.2. It should also be noted that in the literature and in practice analysts point to the need to adequately balance the two aspects of regulations. On the one hand, unduly restrictive legal provisions may lead to the elimination of otherwise economically healthy business entities which are temporarily experiencing financial distress. An opposite situation may also occur, whereby the law will be too

⁸ In the light of more recent work this effect may be weaker than previously thought, since reductions in CEO incomes proved to be overestimated (see e.g. (ECBO, EB, et al. 2012).

⁹ Bondholders generally constitute a more diverse and spatially dispersed group entitled to filing a bankruptcy petition. In consequence, reaching an agreement with this group is likely to be much more difficult and expensive for the firm's owners.

lenient towards permanently ineffective firms. Since type I and II errors tend to occur in every classification/selection system, the procedural solutions adopted should ensure an appropriate balance between them (White 1989).

Conditions similar to (4.7) can also be formulated for ex-post efficiency. In this case, the coalition of banks and owners are willing to let a given firm continue its operations (and banks are willing to provide the required funds) if:

$$E_K + B_K > B_B \quad (4.8)$$

where subscript B represents the firm's bankruptcy. Note that condition (4.8) means that in the event of bankruptcy shareholders receive nothing. Owing to the relationship expressed in (4.6) the condition can also be expressed as:

$$P > B_B + O_K \quad (4.9)$$

In turn, the condition for the social efficiency of the continued operation of the firm in question is as follows:

$$P > L \quad (4.10)$$

where L is the liquidation value of the firm's assets. Thus, the social efficiency of continued operation of the firm co-occurs with the cost-efficiency of such an option from the point of view of shareholders and creditors when:

$$L = B_B + O_K \quad \text{or} \quad O_K = O_B \quad (4.11)$$

It is easy to show (cf. e.g. White 1980) that whether or not conditions (4.7) or (4.11) are met depends to a considerable extent on the solutions adopted in the bankruptcy system, especially those applying to the rules governing the priority of claims (see Chapter 1).

One may also consider the so-called process efficiency (interim efficiency) of bankruptcy law (Mirowska 2013). It is defined as a construction that ensures effective and as harmonious as possible cooperation of stakeholders in the course of bankruptcy proceedings, especially by reducing opportunistic behaviours of managers of firms involved in such proceedings.

Finally, a very broad spectrum of concepts of efficiency of bankruptcy procedures can be described as *recovery efficiency*. In this approach, the analysis focuses on the impact of bankruptcy law on the relationships between the claims of specific stakeholder groups and the actual benefits that accrue to these groups as a result of the bankruptcy procedure.

It should be emphasized that for each group of stakeholders the term *recovery efficiency* may mean something different. Thus, creditors may focus on variously defined capital recovery rates¹⁰ adjusted for the necessary expenses incurred in the course of the procedure, its duration, the effects on reputation etc. Employees may be more interested in the proportion of overdue salaries to be paid, and in the event of restructuring, in whether or not they will keep their jobs, the scale of possible layoffs etc. (Thornburn 2000). In turn, for the current owners the term may mean a sufficiently high degree of preservation of their existing shares, the capacity of the restructured firm to regain sustainable economic performance etc. Individual efficiency measures thus defined may sometimes be in conflict, especially if we consider the interests of owners vs. those of the employees¹¹ (cf. e.g. Morgado and Garoupa 2006). Especially important are the conflicts of interests between the creditors and the owners, which, incidentally, have a considerable impact on the operation of the entire bankruptcy system (Valdimirov 2007). In its empirical layer, the phenomenon manifests itself, among other things, by various reactions of stock prices of firms involved in bankruptcy proceedings, depending on the actual design of bankruptcy law (Gutiérrez, Olalla et al. 2005).

In conclusion of this brief review of the concept of efficiency of bankruptcy law it is worth mentioning holistic approaches, in which attempts are made to develop normative solutions conducive to the maximization of social welfare (e.g. by combining the interests of different groups), cf. the so-called Objective 1 of bankruptcy procedures (Hart 2000, Hummelen 2013). Their starting point is often an analysis of the main objectives of bankruptcy law, including, in particular, appropriate solutions to the problem of coordinating redress if the firm in question has numerous creditors. A thorough analysis of the behaviour of these entities may constitute a source of useful tips for streamlining the process.

¹⁰ Sometimes such criteria are formulated not in terms of relationships but in terms of maximization of the absolute amounts obtained by creditors as a result of the proceedings. There are several reasons for adopting such an approach, but the practical ones focus on the fact that efficiency measures based on relationships are difficult to construct owing to the problems in selecting the denominator for the fraction. Usually, the denominator includes items such as receivables and the firm's assets. It is very difficult to accurately assess their value if the firm in question is in financial distress, which is the case especially during bankruptcy proceedings, since it is subject to substantial changes throughout.

¹¹ Some studies suggest the existence of a negative correlation between the efficiency of bankruptcy procedures and the extent of labour market protection.

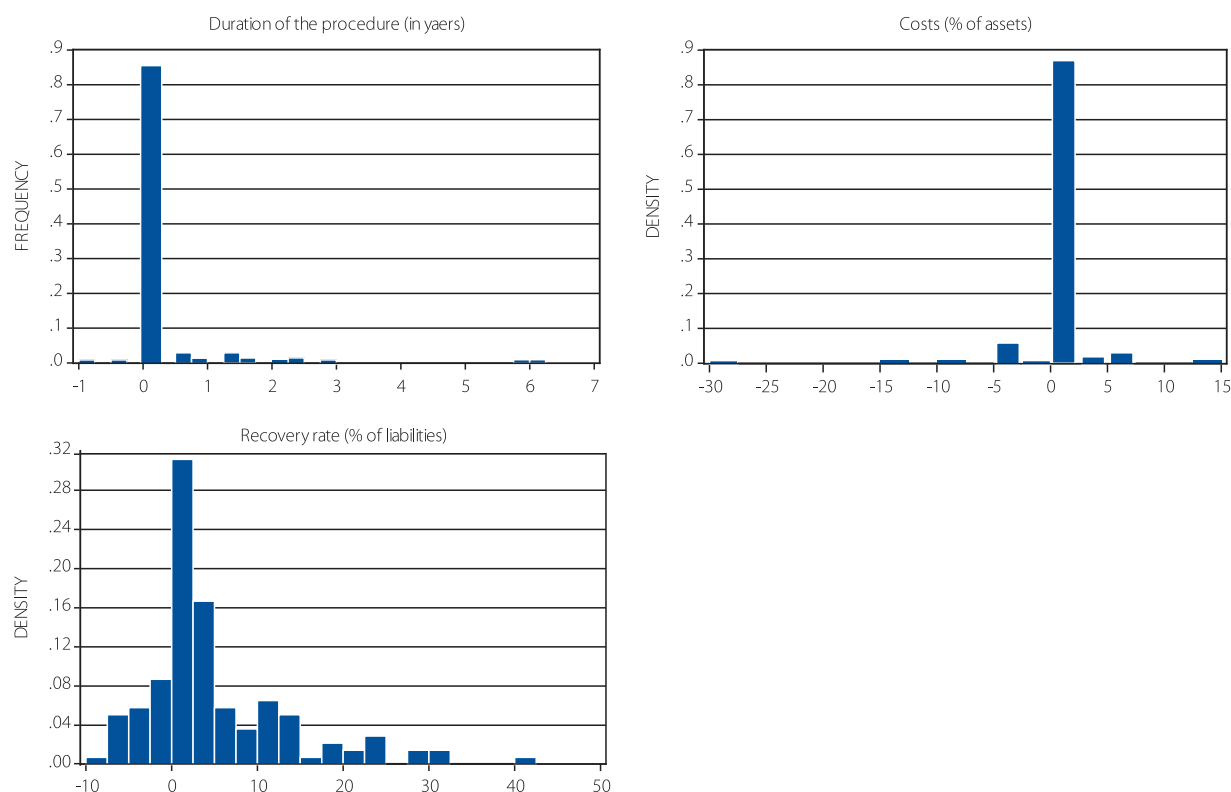


Fig. 4.2. Distributions of changes in the duration of bankruptcy procedures (in years), their costs (% of firm’s assets) and recovery rate (% of liabilities) in 2004–2013 in 138 countries worldwide

Source: own study based on: (Doing Business 2013).

Summing up this topic, we should also mention that the issue of the efficiency of bankruptcy law has not only a theoretical dimension but primarily constitutes a matter of enormous economic importance. This is supported by the intensity and depth of the changes in bankruptcy law after World War 2, especially in the 1990s introduced by over 90 countries (Gine and Love 2006). The effects of these modifications, however, were markedly different (cf. e.g. Franks and Loranth 2005). One of the underlying causes of the problems, which were already mentioned above, is the dilemma related to the choice between restrictive regulations and the desire to avoid their ‘accidental’ victims resulting in pressure on the implementation of ‘softer’ solutions. One area of particularly strong contradictions may involve the balance between liquidation and restructuring provisions. This particularly emphasizes the importance of EWS-type solutions: since the development of an optimal bankruptcy system entails overcoming certain difficulties, moreover, some of them appear to be immanent in nature, such early warning procedures offer more time for rational decision-making regarding how to proceed with firms facing bankruptcy risk. If we look at efficiency parameters such as the duration of bankruptcy procedures, their costs and recovery rates (see Figure 4.2) surveyed by the World Bank in 2004–2013 in nearly 140 countries (Doing Business 2013), what is striking is that the first two of these variables have practically remained unchanged (in both cases the median values are zero, and the average is close to zero). Only the recovery rate has improved in some countries (mean value = 5.0, median = 2.0).

Despite such an important role played by the issue of the efficiency of bankruptcy procedures and the inclusive character of this category, the design of efficiency measures is difficult in practice and, to a considerable extent, arbitrary. This is partly due to a certain vagueness of the concept of bankruptcy law and partly to the difficulty in assigning to it specific economic impacts that should affect the business entities involved. As a result, a significant portion of those measures is based on the analysis of qualitative features of bankruptcy systems and on attempts to assign to discrete variables thus obtained specific economic significance on the basis of various kinds of quantitative modelling. The term *economic significance* also requires clarification, although it usually refers to certain cost categories of bankruptcy, which were discussed in the previous section.

We shall start our brief overview of measures by recalling the idea proposed by Guiterezz (Guiterezz, Olalla et al. 2002) whose elements were already present in earlier works (cf. e.g. Rafael La Porta, Lopez-de- Silanes et al. 1998). The approach employed the so-called ex-ante efficiency index constructed in the following way: all the characteristics of a bankruptcy system, which, in the authors’ opinion, contributed to the improvement of ex-ante efficiency were assigned 1 point, while others were scored at 0. Five groups of system features were evaluated, including: the group of entities entitled to filing a bankruptcy petition, whether or not the taking of such action was mandatory, the scope of the absolute priority rule (APR), the group of entities entitled

to making decisions as to the firm's liquidation or restructuring. The system was also characterized by another measure, the so-called reorganization index, the aim of which was to provide a synthetic reflection of features which could help to improve the survival of firms in financial distress. Its design principle was similar and the index itself was obviously an attempt to approximate ex-post efficiency. As a result, both indicators adopt values from 0 to 5 and are stimulants.

Doing Business reports prepared by the World Bank offer practically useful efficiency measures which are based on the classic methodology developed by Djankov and Hart (Djankov, Hart et al. 2008). In particular, they employ such variables as bankruptcy duration and costs as well as a measure of efficiency based on the concept of terminal value:

$$E = \frac{V_{GC} \cdot CONT + V_{LIK}(1 - CONT) - C_{BANKR}}{\frac{(1+r)^T}{P}} \quad (4.12)$$

where: VGC represents the terminal value of a firm if, as a result of the bankruptcy process, its financial health is restored and it continues to do business (variable CONT assumes the value of 1); V_{LIK} – the liquidation value of the company (CONT=0), C_{BANKR} – the costs of the bankruptcy procedure; T – the duration of the procedure, P – the value of the company before it is declared bankrupt. It should be noted that in this approach costs represented by C_{BANKR} include only the direct costs.

Other efficiency measures are based on the analysis of the results of individual stages of bankruptcy proceedings. For example, Mirowska (Mirowska 2013) examines the relationships among the assets recovered (the ratio of funds recovered during the proceedings to total assets in the opening balance) and the degree to which creditors' claims were satisfied (the ratio of funds received by the creditors to the amounts recovered). They allow for a decomposition of the total process efficiency ratio (the ratio of the recovered funds to total assets), which is their product.

4.5. The efficiency of the bankruptcy process in the Polish economy

the considerations presented in the previous section demonstrate that the efficiency of the bankruptcy process can be assessed using different measures. Since such an assessment may depend on a number of factors, a good practice would involve taking into account both partial measures and an attempt to design an aggregated measure based on them. Here we seek to analyse the efficiency of the bankruptcy process in Poland using data from Doing Business 2014 (World Bank 2014). Three indicators are used in the report: the duration of the bankruptcy procedures, their cost and the recovery rate. Unfortunately, owing to changes in the methodology of the study, results are not fully comparable throughout the entire study period (2004–2013), i.e. since its beginning.

As was mentioned before, the results will be presented in two ways: as an aggregated measure and as a set of partial measures. The aggregated measure makes use of the principal components technique. The global bankruptcy index thus created (the first component) explains about 75% of the variance in the entire sample. Because of the way the index was constructed, it is a destimulant, i.e. the higher its value, the lower the efficiency of the bankruptcy process. The distribution of this measure throughout Europe is shown in Fig. 4.3. Clearly, Poland occupies a position 'in the middle' – behind most developed Western countries. On the other hand, Poland ranks clearly higher than most post-socialist countries led by the Czech Republic, Latvia and Lithuania.

It is worth comparing the results obtained here with the original classification¹² included in the report. In the case of the leaders – 20 countries with the highest efficiency level of the process in question – the classifications are quite similar. More noticeable differences appear as we go down the ranking list and are probably due to the fact that in our model, the shorter total duration of the procedures is scored higher, whereas the methodology applied by the World Bank appears to attach more weight to the recovery rate. In the original World Bank publication of 2013, Poland ranked 37th, second only to the Czech Republic among the former socialist countries.

This ranking should, however, be supplemented by information on the partial indicators since it does not show the actual 'distance' between analysed countries, only their succession in the classification. Hence, if we take into account the partial indicators, we can see that the efficiency of the Polish bankruptcy system is much lower than that of the leading countries. In the case of the leaders (Japan, Norway), the average procedure takes six to nine months. In Poland it lasts three years, and its cost (in percentage terms) is several times higher. As far as the recovery rate is concerned, in the top ten countries it is no less than 87%, whereas in Poland it is only 55%.

¹² Its main drawback is the lack of data on the composite index on which the ranking is based.

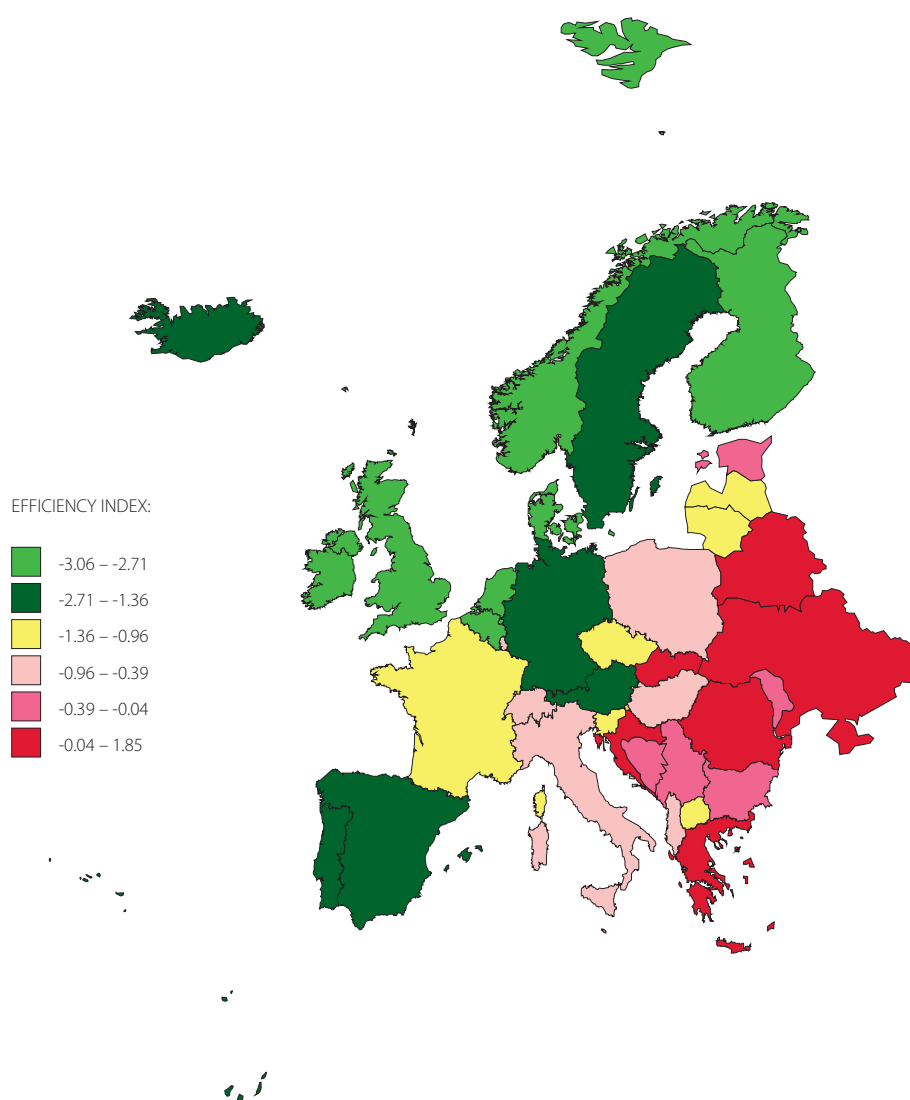


Fig. 4.3. The distribution of the bankruptcy proceedings aggregate efficiency index in selected European countries in 2013

Source: own study based on: (Doing Business 2013).

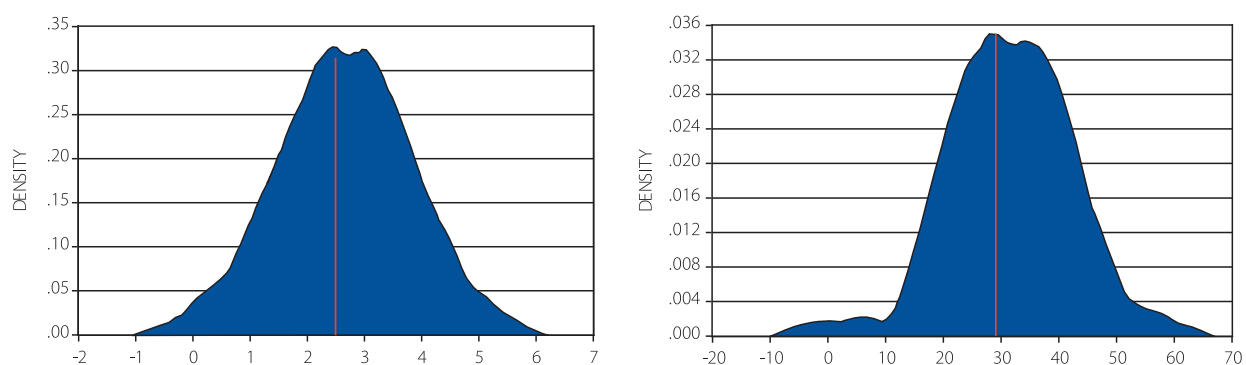


Fig. 4.4. Time density distribution functions¹³ in 2012 (in months): bankruptcies declared by the lower court (left graph) and the duration of bankruptcy proceedings (right graph)

Source: Author's own analysis based on Information (2013).

¹³ The negative results arise only from the applied estimator and their weight in the distribution is marginal. However, there were districts in which the duration of the procedure amounted to zero due to the fact that none were actually conducted there. One 'extreme' district was excluded from the analysis of duration since the procedure in question lasted 220 months. This was due to the fact that it was the only one conducted there and therefore was considered to be an outlier.

Based on the Doing Business survey, the efficiency of the Polish bankruptcy system can be classified as average, yet we lag far behind the countries with the best solutions. It should also be noted that the index in question is an aggregated one and hence refers to the country as a whole. Disaggregated data about the characteristics of bankruptcy proceedings conducted by district courts (GU and GUp registers) indicate significant differences in the duration of proceedings in individual districts (see Figure 4.4). In 2012, the time required to declare bankruptcy was approximately 2.6 months with the standard deviation of about 1.1 months, whereas bankruptcy proceedings took on average about 29 months with the standard deviation of 11 months. It should also be noted that in 2012 the duration of bankruptcy proceedings was longer by nearly two months when compared to 2011.

Part II

Bankruptcy vs. social policy

Chapter 5

AN OVERVIEW OF THE SECOND CHANCE POLICY

5.1. Introduction

The European Union (EU) has firmly placed small and medium-sized enterprises (SME's) at the centre of the Lisbon Strategy for growth and jobs implemented since 2000, and especially since 2005 through the application of the partnership approach.¹ To confirm the importance of SME's in EU policies and fulfil the vision of the heads of state and government of EU Member States in 2000, and thus make the EU a world-class environment for small and medium-sized enterprises, the European Commission (EC) on June 25, 2008 issued a **Communication Think Small First. A 'Small Business Act' for Europe** (COM 2008 (394) (henceforth referred to as SBA), which is crucial for actions under the new opportunity policy.

SBA is the main strategic document at the EU level, which sets out the framework for SME policy. It comprises a coherent strategy for small and medium-sized enterprises, included in the proposals for specific actions implemented at both Community and national level.

The second priority area of the Small Business Act refers explicitly to the second chance policy and aims to 'ensure that honest entrepreneurs who have faced bankruptcy quickly get a second chance.'

The issues related to the second chance were also raised in the Communication from the Commission to the Council of the European Parliament, the European Economic and Social Committee and the Committee of the Regions of October 18, 2007: Overcoming the stigma of failure in business – for a second chance policy. Implementing the Lisbon Partnership for growth and employment (COM (2007) 584), and the Communication of 23 February 2011, Review of the 'Small Business Act' for Europe (COM (2011) 78).

EU policy as well as the recommendations of the European Commission to the Member States in relation to the issue of entrepreneurship development are based on the assumption that it is necessary to continuously improve the business environment, in order to simplify the setting up of such activities and to reduce barriers to business development. Simultaneously, the priority is the creation and implementation of a second chance policy.

One of the objectives of this policy is to encourage those who have suffered a business failure. First, the experience gained by such people often allows them to resume business activities on a larger scale than previously. Second (but related to the first), the activation of entities after a business failure, prepares the ground for maintaining or increasing employment, which is particularly important for the economies of those Member States that have been affected most by the consequences of the crisis.²

Even though there are quite a few positive aspects of resuming business activities by entities which have previously failed, this is not a common occurrence. This is due, among others, to the risk inherent in doing business at any stage as well as the general public 'stigmatization' of people who have experienced a business failure, which discourages them from taking up further challenges.

The Second chance policy cannot be limited to actions to facilitate the resumption of economic activity, but should provide a comprehensive support system for entrepreneurs in difficulties. It should be supplemented by tools that help to prevent business failures. This is especially important for small and medium-sized enterprises, which are affected by the consequences of economic crises to a much larger extent than the large enterprises sector.

Problems related to the bankruptcy of enterprises and resumption of economic activity after sustaining a business failure have been given special attention by the European Commission. As part of the second chance policy, the European Commission invites the Member States to:

Promote a positive attitude in the society to the resumption of business activities by e.g. public information campaigns,

Strive to ensure that all legal procedures related to business closure in the event of a bankruptcy unrelated to non-compliance with the law last no longer than a year,

Ensure that business people re-starting economic activity are treated on an equal footing with the new firms, which also includes access to assistance programmes (ECC 2008).

¹ In June 2010, the European Council adopted a new strategy for smart, sustainable and inclusive growth – Europe 2020, which replaced the Lisbon Strategy

² An expert review commissioned by the Ministry of Economy concerning the prevention of bankruptcy of enterprises and a second chance policy, Warszawa 2012

As is clear from the monitoring of the implementation of SBA principles developed for the annual SBA Fact Sheet³ for individual Member States, in all countries, the lowest scores among the ten SBA principles is given to the area of a second chance policy.

Emphasizing the essence and importance of ensuring that viable firms in financial difficulty have an opportunity to restructure at an early stage, the EC has issued recommendations on a novel approach to a business failure and insolvency (ECR 2014). The recommendations are aimed at preventing insolvency, thus ensuring maximization of the total value for creditors, employees, owners and the entire economy. The aim of the recommendations is also to enable honest entrepreneurs who have been declared bankrupt to take advantage of their second chance in the EU (ECR 2014, art. 1).

The international financial crisis occasioned a downturn in the Polish economy, and, as a result, destabilised a number of domestic companies. Considering the phenomenon in question and its attendant problems, on July 22, 2014, the Council of Ministers adopted a resolution concerning the *New Opportunity Policy* submitted by the Minister of the Economy. The document provides a development programme⁴ and aims to create a comprehensive system in support of SME's in a difficult financial situation and entrepreneurs who intend to resume business activity.

The policy is intended to increase the survival rate of enterprises and to facilitate the resumption of economic activity by people who have faced a business failure. Ensuring optimal functioning and development capacity of enterprises constitutes an essential element of economic development strategies and programmes constituting an effective way to overcome or at least mitigate the effects of economic crises.

5.2. Passivity or commitment?

In recent years, increasing risk and uncertainty in the economy as a whole comprised the main negative factors affecting the operation of businesses. Enterprises are increasingly subject to unexpected events series of events as well as negative economic phenomena, which are difficult to anticipate.

The frequency of occurrence of uncertainty and instability in the modern economy is increasing due to the technological advances and changes taking place all over the world. In Poland, civilizational and technological transformation overlaps with the increasing internationalization and globalization of the economy. Under such circumstances, firms face a variety of barriers which are hard to overcome, such as difficulties with the shaping of long-term development strategies, the absence of which exposes the firm to management errors, which, in turn, may lead to bankruptcies (Mączyńska 2009).

The ongoing globalization processes, the development of capital markets, multinational corporations and a complex network of relationships make not only the economy, but also the risks subject to globalization (Mączyńska 2005). In a knowledge-based economy, factors related to knowledge and information management play an increasingly important role. At the same time, knowledge and information management as well as their flow faces a number of obstacles, which may result in measurable business losses.

Given such uncertainty, economic policy requires long-term planning, flexibility and adaptation to the rapidly changing economic conditions. Thus, actions taken by central governments should be aimed at overcoming the above-mentioned factors. The poor culture of strategic approach also adversely affects economic policies and conditions in which enterprises operate. For those reasons, comprehensive research on the issues of uncertainty and risk may explain the mechanisms of survival and bankruptcy of enterprises as well as contribute to a rationalization of economic policy.

Numerous entrepreneurs in the course of day-to-day business activity experience financial difficulties and liquidity problems. It should be noted, however, that financial distress does not necessarily mean unprofitability or lack of prospects for business growth. New and small businesses are often financially unstable. Their problems may result from a number of reasons, such as recession, loss of a key supplier or customer, unpaid obligations, poor management, lack of control over liquidity, lack of expertise in such critical areas as accounting and marketing, high growth rate as well as from personal reasons, such as illness.

It makes much more sense to restructure a firm and maintain the existing jobs in the event of its temporary financial distress or even insolvency, for the sake of the firm itself, its employees and the economy rather than to instantly liquidate it. Therefore, critical importance is attached to effective protection procedures which help enterprises facing insolvency to maintain current liquidity, continue their operations and, subsequently, to restore profitability and to repay debts to their creditors.

³ The document prepared annually by a group of experts for Research on Entrepreneurship and SME Sector (Policy-relevant Research on Entrepreneurship and SME's), acting under the guidance of the European Commission. A separate publication of the SBA Fact Sheet For is prepared for each of the Member States. Monitoring provides the basis for peer review and exchange of good practices between Member States in the area of competition policy.

⁴ Pursuant to Article 15 of the Principles of Development Policy Act of December 6, 2006 (Journal of Laws 2009, No. 84, item. 712, as amended).

Successful management of an enterprise consists not only in the perception of and adequate response to external factors that influence its development, such as its specific environment, demographic, social and cultural factors, but also depends on internal factors, such as governance, staffing policy and the relationships with the firm's business partners.

Practice shows that a confronting difficulty in a timely manner increases the likelihood of saving the firm – the earlier a problem is diagnosed and acted upon, the better restructuring results can be achieved.

A key issue is to accurately identify the main crises-generating factors and an early warning against threats to business activity and impending insolvency, which may cause an entrepreneur to go bankrupt. These are the necessary conditions for making sound business decisions (Mączyńska 2009).

Entrepreneurs should be able to respond to the identified threats in an inconspicuous way, since the disclosure of problems may not only reduce the prestige or adversely affect the image of the firm, but above all, it may trigger a chain of events accelerating the negative trends within it, such as the loss of some business partners as a result of the disclosure of information related to its poor financial situation. The above constitute some of the most important reasons why entrepreneurs conceal their problems and take ineffective attempts to repair their firm by themselves.

State action targeting viable enterprises in difficulty should focus on minimizing the negative effects of a crisis situation within the firm and encourage a more proactive approach in responding to change and emerging challenges. This does not mean, however, that the state should prevent bankruptcy at all costs, since it constitutes a natural component of the economy based on market principles. The role of the state is to create legal and institutional framework allowing the firms to implement remedial measures. Only in the absence of evidence that might warrant restructuring should they be able to go bankrupt as efficiently as possible.

Ensuring optimal capacity for enterprises to operate and develop as well as promoting a more proactive approach to preventive measures constitute indispensable elements of strategies and economic development programmes as well as an effective way to overcome or at least mitigate a business failure. Greater commitment to rapid intervention to rectify previously identified problems allows for the stabilization of an enterprise in difficulty and minimises the negative effects of change.

5.3. The role of preventive action

In 2003, the European Commission emphasized the importance of early warning systems,⁵ whose implementation is meant to detect emergencies and financial difficulties before firms at risk actually become insolvent. With the right combination of economic and financial indicators characterizing an economic entity its failure can be predicted with a good degree of probability. Likewise, there are tools with which the willingness of entrepreneurs to expose the firm to crisis-generating factors increasing the risk of bankruptcy can be determined. Unfortunately, this kind of risk management is not very popular, especially among micro-entrepreneurs, hence rarely used in practice. Supporting the development and use of early warning systems offers one of the ways of improving the survival rates of enterprises and maintain economic activity without the need to resort to reducing creditor protection.

In order to implement an effective system for diagnosing the financial health of the SME sector, it is necessary to take into account the difficulties in terms of their access to accounting and financial information.⁶

Due to the fact that entrepreneurs who experience difficulties in managing their firm often cannot afford expensive legal consultancy, they should be given access to the fullest possible range of such services. To that end, a good solution is to use the support opportunities currently offered on the market by business environment networks, particularly in the context of information and consultancy services.

The category of preventive instruments, which constitute part of the preventive measures in the area of the second chance policy, includes the option to grant *de minimis* aid⁷ and aid covered by block exemptions.⁸ The legal system makes it possible to provide such assistance regardless of whether the aid comes solely from the national budget or whether it was provided for in aid programmes to the public under individual operational programmes and regardless of which agency provides such aid.

It is reasonable, however, to note that in order to ensure effectiveness it is necessary to assume that any *de minimis* aid for entrepreneurs in the early stages of difficulties as well as those meeting the conditions stipulated for enterprises in difficulty

⁵ The best project on *Restructuring, Bankruptcy and a Fresh Start*, 2003.

⁶ Expert report commissioned by the Ministry of Economy *Instrument badania kondycji przedsiębiorstwa* (An Instrument to diagnose firms' economic condition), Allerhand Institute, Kraków 2010.

⁷ Commission Regulation (EU) No 1407/2013 of December 18, 2013 on the application of Art. 107 and 108 of the Treaty on the Functioning of the European Union to *de minimis* aid (OJ. EU L 352 of 24.12.2013).

⁸ Commission Regulation (EC) No 800/2008 of 6 August 2008 declaring certain categories of aid compatible with the common market in application of Art. 87 and 88 of the Treaty (General Block Exemption).

as provided by EU regulations on rescuing and restructuring⁹, aid should be used to solve their problems and can be granted only to some of those entities.

De minimis aid is limited to the amount of 200,000 euro within 3 calendar years, which restricts the number of potential entrepreneurs who could restructure their firms on the basis of this principle. It should be added, however, that the application of these solutions will primarily minimize the obligation to draw up relevant documentation with respect to obtaining the consent of the European Commission to grant state aid.

Another advantage of this solution is the fact that no special support measures dedicated to entrepreneurs who encounter difficulties, are needed. The solution makes it possible to draw on the existing instruments, so that they can be used for a new purpose, namely solving the problems faced by entrepreneurs.¹⁰ This means that such measures could be implemented without the need for legislative action to develop new regulations (support programmes) governing aid to firms in difficulty.

Nonetheless it must be emphasized that the restructuring of a firm in difficulty, which is not eligible for aid under the de minimis rule, will still require an individual notification procedure,¹¹ which significantly slows down the restructuring process and increases the risk of its failure. It should be noted, however, that in principle the legislation governing state aid admits of the preparation and notification of an assistance programme,¹² which may constitute a systemic solution for businesses that either cannot be granted assistance under the general block exemption or the aid exceeds the amount set forth in the de minimis rule.

Providing small and medium-sized enterprises with an opportunity to receive assistance without a long waiting period for the Commission's decision may be crucial in ensuring that they regain profitability more quickly as well as minimizes the risk of bankruptcy.

It should be emphasized that the development of a restructuring assistance programme whose effect is purely procedural and not substantive, does not establish an additional legal basis for granting state aid and is not related to its amount. Moreover, such an assistance programme has the following benefits:

1. It shortens the aid-granting procedure, which increases the likelihood of success of the restructuring process and, consequently, reduces the number of bankrupt entrepreneurs,
2. It reduces the costs related to obtaining the President of the UOKiK's (Office of Competition and Consumer Protection, OCCP) opinion and costs of proceedings involving the European Commission, which will allow for a significant shortening of the procedures in the area of granting restructuring aid, as they will only involve the national aid-granting agency.

Entrepreneurs' inadequate knowledge and awareness of possible threats and ways in which they can respond to such threats¹³ constitutes an argument in favour of the institution of expert consultancy under the de minimis rule, which would ensure the identification of possible solutions and implementation of appropriate action in enterprises in order to avoid further problems.

It can therefore be stated that at the stage of crisis prevention in an enterprise it is extremely important to create conditions that will allow the entrepreneurs to improve their knowledge and skills in business management, including crisis management. It should be remembered that consultancy provided to firms which still are in a good financial condition may be more effective than such activities designed for firms experiencing difficulties (Iłszanska 2011). Consequently, training and consultancy activities within the framework of bankruptcy prevention should focus primarily on raising the entrepreneurs' awareness of the risks and failures inherent in business activity, the ability to recognize the signs of a forthcoming crisis as well as the existing forms of aid and restructuring when their firms face financial distress. Such services should also be largely based on the transmission of practical skills with the participation of people who have had similar experiences.

5.4. Judicial and non-judicial proceedings

Entrepreneurs in financial difficulty who have limited resources are often unable to afford a long restructuring process involving external consultants, because it generates significant additional costs. Affordable and simple restructuring procedures are therefore necessary. Non-judicial procedures are often cheaper and faster and thus particularly attractive for start-ups and small businesses.

Amicable settlements of disputes and reorganization implemented without involving the judiciary occur outside statutory regulations. Their objective is to restructure the firm which currently finds itself in financial distress. They often involve unofficial settlements, because they are not directly regulated by the law. According to Dutch researchers, such procedures often comprise

⁹ Communication from the Commission – Guidelines on State aid for rescuing and restructuring non-financial undertakings in difficulty (OJ C 249, 31.07.2014).

¹⁰ Expert report commissioned by the Ministry of Economy concerning the prevention of bankruptcy of enterprises, and a second chance policy, Warszawa 2012, p. 62.

¹¹ Council Regulation (EC) No 659/1999 of 22 March 1999 laying down detailed rules for the application. 93 of the EC Treaty.

¹² *Ibidem*.

¹³ Expert report commissioned by the Ministry of Economy concerning the prevention of bankruptcy of firms, and a second chance policy, Warszawa 2012, p. 56–58.

two processes: 1. the restructuring of economic activity, when an attempt is made to restore a firm's viability, and 2. financial restructuring, where repayments are deferred, the nominal debt is reduced and new capital is brought in (Adriaanse 2005).¹⁴

Moreover, according to the EC report *Business Dynamics: Start-ups, Business Transfers and Bankruptcy*, with respect to non-judicial proceedings, particular attention was paid to the fact that the purpose of such proceedings for the creditors should be to achieve a joint agreement on the liabilities. The agreements are concluded out of court, making it faster and cheaper, but it does not mean that they entail no costs. The report indicated that in only five Member States (Poland is not one of them) the tax authorities participate in such proceedings. Furthermore, it was noted that the average length of such proceedings in Poland is 7.7 months, which is considered average. The system of non-judicial proceedings in Poland was similarly rated based of the outcome coefficient.¹⁵

In order to achieve the most satisfactory agreement, the state should allow entrepreneurs facing insolvency to negotiate agreements with their creditors without involving the judiciary, e.g. through arbitration. Entrepreneurs should enjoy an easy access to information on alternative modes of dispute resolution, in particular, especially on negotiation and mediation. Based on international experience, non-judicial settlements often follow certain established standards or codes of conduct. An important role in promoting codes of conduct may be played by public authorities such as the central bank or the Ministry of Finance, as exemplified by the so-called London approach promoted by the Bank of England since 1980.¹⁶ The state may also support such solutions by establishing a general legal framework and favourable tax systems to encourage such settlements.¹⁷

State action to reduce the risk of premature bankruptcy targets entrepreneurs whose economic situation is so serious that it requires them to take active remedial measures. At this stage, the key issue for the survival of the firm is to provide conditions conducive to its effective restructuring, which will restore its ability to compete on the market and thereby contribute to increasing the nationwide business survival rate. At the same time, we must not forget that in the early stages of problems affecting a given firm, all kinds of non-judicial settlement of disputes can be used, which may lead to repairing the firm's condition in parallel with the restructuring of its debt.

Currently, in Poland the popularity of non-judicial ways of reaching agreements between entrepreneurs and creditors, such as mediation¹⁸ or arbitration,¹⁹ is negligible. Although judicial mediation was included in the Code of Civil Procedure in 2005 and about 4 thousand mediators are active on the market, only a fraction of economic matters is settled in this way. Nonetheless, there is no verifiable data on the scale of non-judicial mediation. Meanwhile, a proper application of those instruments would help to reduce the costs and duration of judicial procedures involving economic issues.

At present, under Polish law, the restructuring of firms is governed by Part Four of the Bankruptcy and Restructuring Act of February 28, 2003.²⁰ Still, both the statistics and the daily practice indicate a negligible use of the institution of its provisions by Polish entrepreneurs.

The main objective of the restructuring process is to improve the condition of the firm, which should restore its capacity to compete on the market. This means that entrepreneurs should treat the procedure as an instrument to be used when the firm is not yet eligible to start insolvency proceedings. It is therefore necessary to promote a way of thinking about the restructuring procedure as a tool to respond to emergent issues, even non-financial ones, but those that may in the future have a negative financial impact.

Difficulties in determining when a firm's situation actually requires the implementation of remedial measures cause that entrepreneurs tend to take such action too late, moreover, they file bankruptcy petitions, which is even more unfavourable.

Currently, due to the dynamic changes in the market and errors made directly by entrepreneurs, numerous firms find themselves in financial distress which manifests itself as insolvency.

In Poland, the concept of insolvency based on which an entrepreneur may be eligible for restructuring proceedings or bankruptcy proceedings is governed by Article 11 of the Bankruptcy and Restructuring Act of February 28, 2003.²¹ According to its provisions, an entrepreneur is deemed insolvent if his firm does not cover the financial obligations which have become due. This provision applies to:

- The firm's monetary obligations,
- All the liabilities regardless of their extent, causes and as well as whether or not they are related to the economic activity. In regard of the shareholders of unlimited partnerships, in which partners are responsible for their firm's liabilities with all its

¹⁴ The legal options for the capital solution remain a moot point.

¹⁵ Final report of the (Business Dynamics 2011).

¹⁶ *Entrepreneurship policy indicators for bankruptcy legislation in OECD member and non-member economies*. Final Report, Working Party for Small and Medium-sized Enterprises and Entrepreneurship, OECD CFE / SME (2006)3.

¹⁷ Commission Recommendation of March 12, 2014 on a new approach to failures in business and insolvency (C (2014) 1500).

¹⁸ Code of Civil Procedure of November 17, 1964 (Journal of Laws 2014.101 uniform text), Articles 183¹–183¹⁵.

¹⁹ Code of Civil Procedure of November 17, 1964 (Journal of Laws 2014.101 uniform text), Part Five – The Court of Arbitration.

²⁰ Bankruptcy and Restructuring Act of February 28, 2003 (Journal of Laws No. 60, item. 535, as amended).

²¹ Bankruptcy and Restructuring Act of February 28, 2003 (Journal of Laws No. 60, item. 535, as amended).

assets, it is immaterial whether these entities fail to perform the obligations on behalf of their firm or fail to perform their other obligations,

- The liabilities due as set by the public law and the civil law.²²

Entrepreneurs facing bankruptcy risk may declare in court that they have planned and initiated remedial proceedings. The entrepreneur is considered to be at risk of insolvency if, despite the payment of due liabilities, it is obvious that his firm will soon become insolvent according to a reasonable assessment of its economic situation.²³

Both the statistics and the daily practice indicate that Polish entrepreneurs make a negligible use of the provision of the Act. This fact contrasts sharply with the difficulties that they have had to face in recent years, related to the economic situation (which resulted, among other things, in an increase in the number of bankruptcies) and with the popularity of varied remedial solutions available in other countries. Leaving aside the reasons for this state of affairs on the part of the entrepreneurs themselves, it means that the regulations governing Polish remedial procedures and the restructuring infrastructure are not functioning properly and require a critical analysis and subsequent modification (Analiza możliwości 2010).

The remedial or corrective procedure is implemented by the entrepreneur assisted by the designated court supervisor. The procedure should involve simple rules of conduct, which entails short proceedings, since a recognised risk or threat may rapidly develop into palpable difficulties. Moreover, the debtor is entitled to protection from creditors, who are not interested in prolonging the proceedings and thereby delaying the satisfaction of their claims. Quick proceedings are possible if court actions are limited to a few necessary steps crucial for the lawfulness of the final ruling. Currently, they include:

- The capacity to prohibit the entrepreneur from implementing remedial measures as a result of occurrence of the conditions specified in the regulations,
- The capacity to appoint a court supervisor, whose presence guarantees that all the measures undertaken will lead to a negotiated agreement in a professional manner and in compliance with legal and economic knowledge,
- Approval or refusal to approve the agreement,
- Revocation of the agreement.

The remedial procedure is actually implemented in the debtor's interest, or, to be more specific, in the interest of the potential debtor, since the entrepreneur who plans to embark on such an undertaking is still paying his obligations (which may soon cease to be possible). The procedure is also in the interests of creditors or rather suppliers of an entrepreneur threatened with insolvency. It is important, therefore, that the rules clearly present the position of the legislator, stating that remedial action to protect the entrepreneur for a specified period of time against too hasty debt collection efforts on the part of potential creditors is meant to enable the firm to improve its condition, perhaps saving it from bankruptcy. Preventing such firms from bankruptcy subsequently rescues and protects current turnover of other suppliers.

As a result of the initiation of remedial measures, the enforcement of obligations owed by the entrepreneur and the accrual of interest on the debt is suspended (deduction of debts is permissible). No security and enforcement proceedings against the entrepreneur can therefore be initiated, and those already underway are subject to suspension by law except those involving claims not covered by the agreement.²⁴ In the event that a creditor's files the bankruptcy petition, the court will postpone hearing the case until the completion of the remedial procedure or will combine it with the agreement approval procedure.²⁵

It is worth noting that the inclusion of remedial legislation in the same legal act as the rules governing bankruptcy procedures has a very negative impact on the popularity of restructuring measures as a means of rescuing enterprises from difficulties, since remedial procedure tend to be strongly associated with bankruptcy (insolvency). Legally sanctioned separation of remedial legislation from bankruptcy provisions will serve to improve the way it is perceived and applied in practice (Il szansa 2011).

5.5. Systemic significance of early warning mechanisms

Preventive and pre-emptive measures on the part of the state in the area of early warning systems should be readily available for entrepreneurs, complete with transparent and clear rules for their employment. At the same time, entrepreneurs must be aware of what phenomena constitute warning signals that should prompt them to take action under such a system, and possess the skills to employ those solutions.

In many cases where preventive measures have not been instituted or have failed to produce the expected results, it is necessary to implement a procedure under which the entrepreneur's debt is restructured, including further remedial action taken to eliminate

²² Expert report commissioned by the Ministry of Economy concerning the prevention of bankruptcy of enterprises, and a second chance policy, Warszawa 2012.

²³ Bankruptcy and Restructuring Act of February 28, 2003 (Journal of Laws No. 60, item 535, as amended), Articles 492 &ff.

²⁴ Bankruptcy and Restructuring Act of February 28, 2003 (Journal of Laws No. 60, item 535, as amended), Article 498.

²⁵ *Ibidem*, Article 499.

the causes of similar difficulties in the future. A significant role in this regard could potentially be played by non-judicial proceedings due to their simplicity, pace and informal character. Notwithstanding the foregoing, in practice, they should be organized so that entrepreneurs in difficulties could actually see them as an opportunity to effectively restructure their firms and eliminate the problems that affect them.²⁶

The role of the state should be limited to helping entrepreneurs to identify threats and prevent the occurrence of crisis situations in their firms, but should not involve counteracting bankruptcy at all costs. It is in the interest of the state that firms should be strong and flexibly react to any changes on the market. Ensuring optimal operation and development capacity of enterprises constitutes an essential element of economic development strategies and programmes and an effective way to overcome or at least mitigate the effects of economic crises.

An important role in overcoming the difficulties inherent in economic activity is played by preventive measures, both in the area of identification/anticipation of crisis situations in enterprises and averting premature bankruptcies. Therefore, state actions should focus on providing entrepreneurs with the possibility of implementing preventive measures with the following objectives:

- To promote ongoing monitoring of the economic and financial situation of firms,
- To promote early warning systems detecting the susceptibility of firms to crises and financial difficulties before they become insolvent,
- To provide a fully featured system of consultancy and training for entrepreneurs, enabling them to cope effectively with the threat of financial difficulty, which could result in bankruptcy.

An example of such a solution is the pilot project carried out by the Polish Agency for Enterprise Development (PARP) directed to entrepreneurs who experience economic problems, but their firms do not yet meet the criteria of an enterprise in difficulty. The project called the Rapid Response Instrument (RRI, Polish acronym ISR) involves a system of preventive measures intended to stabilize the condition of firms in distress and mitigate the negative effects of economic change by undertaking rapid intervention thanks to an early identification of problems. Thus, entrepreneurs may obtain comprehensive assistance in the development and implementation of development plans, which will provide the basis for corrective or development action.

A very important component of a comprehensive early warning system consists of preventive instruments, such as on-line tools to enable entrepreneurs to monitor their financial situation. The identification of economic entities in the early stages of difficulty will allow entrepreneurs to become eligible for any state aid within the limits set by the rules of admissibility laid down at EU level for different kinds of public assistance. These solutions primarily reduce the need to prepare relevant documentation and do not require prior consent of the Commission to give aid. As far as prevention instruments are concerned, it is possible to grant de minimis aid and public assistance covered by the block exemption regardless of whether such support derives solely from the national budget or whether it is provided for by public assistance programmes under operational programmes and regardless of the body that gives such aid.

It should be noted that de minimis aid is limited to the amount of 200,000 euro within 3 calendar years, which limits the number of potential entrepreneurs who could restructure their firms on the basis of this principle. Consequently, restructuring firms in difficulty not eligible for aid under the de minimis rule will require the completion of an individual notification procedure, which significantly slows down the restructuring process and increases the risk of its failure.

Identification of the problems of entrepreneurs who find themselves in a difficult economic situation and of measures to overcome them should constitute one of the priorities of the second chance policy pursued by the state. For example, it would be possible to create a refundable aid programme, which would allow SME's to implement the necessary restructuring measures (e.g. change their production profile or restructure employment) and ensure appropriate conditions for the process.

Consequently, the design of national legislation should make it easier to conduct a comprehensive restructuring of enterprises (including structural and financial restructuring). New normative acts should institute an aid programme that includes rescuing firms from difficulties, restructuring, temporary support for restructuring and the restructuring of certain public and legal dues. The development of an assistance programme will offer entrepreneurs clear and transparent eligibility rules for public assistance, and hence it will also speed up the procedure, reduce administrative burdens as well as improve the efficiency of restructuring measures.

The idea of a second chance involves not only the provision of effective support to entrepreneurs in difficulty, but also making use of their potential and experience in case their firm ceases its activity. Thanks to the dissemination and promotion of the possibility to resume business activity it is possible to achieve a positive impact on societal attitudes towards entrepreneurship. Hence, awareness-raising activities should be undertaken aimed at overcoming the 'bad reputation' of the phenomenon of bankruptcy and at the prevention of stigmatisation of entrepreneurs who have experienced a business failure. This issue is important since it involves a sensitive matter such as the consciousness not only of entrepreneurs, but also society as a whole.

²⁶ Expert report commissioned by the Ministry of Economy concerning the prevention of bankruptcy of enterprises, and a second chance policy, Warszawa 2012.

A very important feature of activities in the area of countering the stigmatisation of entrepreneurs who have experienced a business failure is first of all the creation of opportunities for the resumption of business activity using their previous experience.

Needs analyses show that people who have been forced out of business require different services than active entrepreneurs or people starting new businesses. Therefore, in order to allow people who have experienced a business failure to resume economic activity, a dedicated support system for former entrepreneurs (a new start) should be established.²⁷

Interventions undertaken as part of the 'new start' programme should target exclusively honest entrepreneurs whose firms have been liquidated, who would like to remain active and apply for aid in order to accomplish their business plans taking into account their past experience. Moreover, targeting support to such businesses will have a positive impact on the societal perception of the concept of a new start. Such actions are likely to eliminate the negative connotations of bankruptcy and will constitute an important step in countering the stigmatisation of entrepreneurs who have experienced a business failure.

In view of the above considerations, the current economic downturn and the resulting problems affecting many Polish firms, the Ministry of Economy prepared the document New Chance Policy. The document aims to build a comprehensive support system for entrepreneurs (SME's) who find themselves in financial difficulty and those who intend to resume economic activity. The policy is designed to increase the survival rate of enterprises and to facilitate the resumption of economic activity by people who have suffered a business failure.

Thus, the New Chance Policy provides for activities with the following objectives:

1. To reduce the risk of business setbacks,
2. To minimize the impact of negative connotations related to bankruptcy via liquidation through the dissemination and development of restructuring procedures,
3. To streamline bankruptcy procedures, especially in terms of shortening the procedure and reducing its costs,
4. To provide conditions to ensure that every honest entrepreneur who has experienced a business failure is offered a chance to start a new business.

The New Chance Policy involves not only the provision of effective support to entrepreneurs in difficulty, but also aims to make use of their potential and experience in case their firms have to terminate their activity. Firms founded by people who resume business activity record higher turnover and employment growth, as well as exhibit greater prudence in decision-making compared with firms run by start-up entrepreneurs or by those who have never suffered a defeat. At the same time, the promotion and support of the resumption of business activity makes it possible to achieve a positive impact on societal attitudes to entrepreneurs.

The New Chance Policy advocates the dissemination of remedial measures aimed at enterprises, which would involve, first of all, restructuring followed by negotiated settlements. Liquidation would be undertaken only in the absence of economic reasons for restructuring. One of the primary aims of the proceedings should be to continue sustainable operation of economic entities, which offers and opportunity, among others, to maintain existing jobs. Such a model requires appropriate changes in bankruptcy legislation.

Changes in the legislation should also include relevant insolvency proceedings with a view to making it less formal and simpler, which may translate into its lower costs as well as shorten its duration.

Conclusions from the analysis of the practical application of the existing regulations in the field of bankruptcy and restructuring law and the recommendations of the European Commission have been taken into account in the proposals of new regulations prepared by the Ministry of Justice, which is currently working on drafting new legislation (the Restructuring Act) and on amendments to in the Bankruptcy and Restructuring Act of February 28, 2003.

The adoption of a completely new law – the Restructuring Act – will ensure institutional autonomy of the restructuring proceedings from the bankruptcy proceedings, as the latter may unduly stigmatize entrepreneurs.

According to the draft document,²⁸ the primary change will involve the way of dealing with insolvent businesses, including the aim of the proceedings. Bankruptcy and liquidation of the debtor's assets will be treated as a last resort measure. The main aim of the changes is to ensure to entrepreneurs in a difficult financial situation conditions conducive to successful restructuring, allowing them to resume normal activity within several to a dozen months.

Consequently, the inventory of restructuring proceedings will be expanded, which will be more flexible and better-adapted to the actual needs of debtors. The new Restructuring Act will introduce four brand new restructuring institutions, based in part on the best international practices adapted to the Polish economy. Entrepreneurs experiencing financial problems should be given

²⁷ Expert report commissioned by the Ministry of Economy concerning the prevention of bankruptcy of enterprises, and a second chance policy, Warszawa 2012.

²⁸ The Restructuring Bill adopted by the Council of Ministers on February 11, 2014.

unobstructed access to flexible procedures, which, on the one hand will offer them an opportunity for effective restructuring, while on the other ensuring creditor protection.²⁹

The development of new types of restructuring proceedings has the following primary aims:

- a) To simplify the procedures as much as possible,
- b) To enable entrepreneurs to individually and independently choose the most convenient restructuring path,
- c) To reduce the time required to conclude a successful agreement with creditors,
- d) To enable actual restructuring of the overall activities of the firm under court protection.

All restructuring procedures should be directed both to insolvent entrepreneurs and those threatened with insolvency in line with the view that the liquidation of a firm is only permissible in the absence of economic reasons for restructuring.

Moreover, in accordance with the provisions of the draft bill, a debtor's insolvency will be defined as inability to meet his financial obligations for over 3 months, which means that such inability should meet the condition of permanence (the liquidity premise). The opinion as to the loss of ability to meet financial obligations should result from the evaluation of the financial condition of the debtor's business. An additional criterion of insolvency is met if the total amount of liabilities exceeds the total value of the debtor's saleable assets (the liability premise).

The Bankruptcy and Restructuring Act emphasizes the primacy of interests of creditors over the interests of the insolvent debtor. In the new Act, this provision should apply only at the liquidation stage. To enable the entrepreneur to carry out an effective restructuring programme, during negotiated settlements and reorganization the interests of creditors and the debtor should be protected to a similar extent. The lack of balance between those two kinds of protection makes it virtually impossible for entrepreneurs to pursue business activity that would result in overcoming the threat of insolvency and ensure their firms' survival.

It should be emphasized that financial difficulties affecting a firm, which may lead to its liquidation, do not necessarily mean defeat. New attempts to conduct economic activity should be based on past experience, which will have a substantial influence on the change of societal attitudes towards entrepreneurs. Accordingly, the New Chance Policy provides for an extensive information campaign aimed at changing the public perception of the phenomenon of bankruptcy.

²⁹ *Ibidem.*

Chapter 6

THE LEGAL FRAMEWORK FOR STATE AID

6.1. Introduction

State aid constitutes a powerful intervention instrument thanks to which desired economic phenomena can be strengthened or the phenomena perceived as negative can be counteracted. In particular, such aid may assist in the design of effective policies against bankruptcies.

In its Communication to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'The modernization of EU state aid policy'¹ the European Commission notes that the European development strategy laid down in the document 'Europe 2020' sets three objectives for the European economy, which should achieve smart, sustainable and inclusive growth. The Commission points out that the best instrument for achieving these goals is the single market. Its efficient operation requires a more modern state aid control, so that the spending of the Member States in the area is aimed at the implementation of policies for economic growth while limiting the distortion of competition.

The Commission stresses that the modernization of the system of state aid control is aimed to: i) stimulate sustainable, smart and inclusive growth in the competitive internal market, ii) focus the Commission's attention on ex-ante control activities involving cases with the greatest impact on the internal market while strengthening cooperation between Member States in the enforcement of state aid rules, iii) optimize the rules and shorten the decision-making process.

The first of the stated objectives requires that *state aid control shall facilitate the processing of aid that is well designed, targeted at identified market failures and objectives of common interest and cause the least disturbance ('appropriate assistance'). This shall ensure that public support stimulates innovation, the development of green technology and human capital, without causing damage to the environment, and ultimately shall stimulate economic growth, employment and competitiveness in the EU. Such assistance shall best contribute to economic growth if it is targeted at a specific market failure, and thus shall complement, not replace, spending from private sources. State aid shall contribute effectively to the achievement of the desired objectives of public policy only if it provides an incentive effect, i.e. when the beneficiary of the aid is induced to take actions which they would not have taken without such aid. The biggest impact of state aid on economic growth shall occur only when it is constructed in a way that constrains distortions of competition, and the internal market remains open and competitive.*

According to the Commission, *state aid control, if the quality and efficiency of public support is duly emphasized, can also help Member States improve budgetary discipline and improve the quality of public finances – and ultimately ensure a better use of the taxpayers' money. It is particularly important to be able to perform intelligent fiscal consolidation; reconciling the role that targeted public spending is expected to play in generating economic growth with the need to control the budget situation.*

Modernization of the system of state aid control shall be achieved by:

- Establishing uniform rules applicable to the assessment of compatibility of all the aid with the common market (including, in particular, the definition and evaluation of actual market failure, the incentive effect and the negative effects of public intervention),
- The revision and harmonization of guidelines on state aid, so that they are consistent with these common principles. The Commission draws attention to the fact that the revision of the rules is to be used primarily for strengthening the internal market and increasing the efficiency of expenditure, as well as a more accurate identification of market failures, in relation to which the aid is to be addressed and a more detailed examination of the incentive effect. The Commission announced in this Communication that the assessment of state aid should be carried out taking into account the fact that all its negative and positive effects,
- The prioritization of control of aid and further focus on the assessment by the Commission of such aid only that has a significant impact on trade on the internal market. Hence, the modernization of the control system is associated with a change in regulations on block exemptions and de minimis aid,
- Simplification and modernization of procedures under which the Commission shall study aid granted by the Member States.

Driven by the demands delineated in the above Communication, the Commission proposed amendments to Council Regulation (EC) No 659/1999 of March 22, 1999 laying down detailed rules for the application of Article 108 of the Treaty on the Functioning of the European Union (Official Journal of the European Union (OJ) L 83, 27.3.1999, p. 1, as amended). These changes were

¹ Brussels, 8.5.2012 COM (2012) 209 final.

adopted Council Regulation (EU) No 734/2013 of July 22, 2013 amending Regulation (EC) No 659/1999 laying down detailed rules for the application of Article 93 of the EC Treaty (OJ L 204, 31.7.2013, p. 15). In addition, the Council issued Regulation (EU) No 733/2013 of July 22, 2013 amending Regulation (EC) No 994/98 on the application of Articles 92 and 93 of the Treaty establishing the European Community to certain categories of horizontal state aid (OJ L 204, 31.7.2013, p. 11).

The Commission also adopted:

- Regulation (EU) No. 1407/2013 of December 18, 2013 on the application of Articles 107 and 108 of the Treaty on the Functioning of the European Union to de minimis aid (OJ L 352, 24.12.2013, p. 1),
- Guidelines on national regional aid for 2014–2020 (OJ C 209, 23.7.2013, p. 1),
- Union Guidelines on state aid to promote risk finance investment (OJ C 19, 22.1.2014, p. 4),
- EU Guidelines for the application of state aid rules in relation to rapid deployment of broadband networks (OJ C 25, 26.1.2013, p. 1),
- Guidelines on state aid to airports and airlines (OJ C 99, 4.4.2014, p. 3),
- Guidelines on state aid for environmental protection and energy-related targets in 2014–2020.²

In addition, the Commission is currently consulting with Member States drafts of the following legislation:

- Regulation declaring certain categories of aid compatible with the common market in application of Articles 107 and 108 of the Treaty,
- Communication from the Commission – Criteria for the compatibility analysis of the internal market state aid to promote the execution of important projects of common European interest,
- The Framework for state aid for research, development and innovation,
- Guidelines on state aid for rescuing and restructuring of non-financial enterprises in a difficult situation,
- Commission Notice on the concept of state aid as provided by Article 107, paragraph 1 of TFEU.

6.2. The concept of state aid

Pursuant to Article 107 paragraph 1 of TFEU: *Save as otherwise provided in the Treaties, any aid granted by a Member State or through State resources in any form whatsoever which distorts or threatens to distort competition by favouring certain undertakings or the production of certain goods shall, in so far as it affects trade between Member States, be incompatible with the internal market.* That provision establishes a general prohibition to grant aid by Member States. At the same time, the provisions of the Treaty admit of exceptions from the prohibition and thus constitute the basis for the admissibility of state aid. Over the years, the Commission (and to some extent the Council) adopted a number of instruments that specifically indicate what types (and categories) of aid may be granted by Member States within the exceptions to the prohibition.

Pursuant to Article 107 paragraph 1 of TFEU, the EU courts have developed a definition of state aid. It is assumed that aid constitutes an advantage conferred: i) either by the state or its resources that ii) gives the recipient a selective economic advantage, iii) distorts or threatens to distort competition and iv) affects the terms of trade between Member States. For any state action to be considered state aid, all the above conditions must occur jointly. Although the above definition of state aid was developed decades ago, its individual elements (conditions) are still subject to detailed analyses by the Commission and the EU courts. Thus, the interpretation of Article 107 paragraph of TFEU is subject to constant evolution.

First, granting aid entails state activity. Assistance may therefore be provided by central regional and local governments.³ Additionally, the provisions of Article 107 paragraph 1 of TFEU indicates that aid may be provided from state resources. This distinction serves merely to highlight that *intervention through State resources' was intended to cover, in addition to advantages granted directly by the State, those granted through a public or private body⁴ appointed or established by that State to administer the aid.⁵ The concept of 'state resources' refers to all funds by which public authorities might actually support undertakings, irrespective of whether or not those means were permanent assets of the public sector. Therefore, even if the sums corresponding to the measure in question were not permanently held by the Treasury, the fact that they constantly remained under public control, and therefore available*

² Adopted by the Commission on April 9, 2014 (not yet published).

³ ECJ judgment of 14 October 1987 on C-248/84 Germany v Commission and CFI judgment of 6 March 2002 in Joined Cases T-127/99, T-129/99 and T-148/99 Territorio Histórico de Álava and Others. v Commission (Demes).

⁴ EGC Judgment of 21 May 2010 in Joined Cases T-425/04, T-444/04, T-450/04, T-456/04, the French Republic, France Telecom SA, Bouygues SA, Bouygues Telecom SA, AFORS Telecom v Commission.

⁵ ECJ Judgment of 30 May 2013 on C-677/11 Doux Elevage SNC Cooperative agricole UKL – ARREE against the Ministère de l'Agriculture, de l'Alimentation, de la Pêche, de la Ruralité et de l'Aménagement du territoire, Comité interprofessionnel de la française dinde (CIDEF).

to the competent national authorities.⁶ At the same time, in cases where assistance is not provided by the administrative authorities of the state, it is necessary that assistance could be imputed to the state.⁷

Second, state aid must entail a selective economic advantage. This means that it must be primarily provided in connection with the economic activity of the beneficiary, which involves offering goods or services on the market.⁸ It is irrelevant whether such activity is conducted for profit.⁹ With reference to entities established in order to conduct economic activity, EU competition law uses the term *undertaking*. The term includes every entity that offers goods or services on the market regardless of its legal status or how it finances its activities. The concept of enterprise has a functional character. It means that *even if the majority of the activities of a given entity involve projects of other than economic nature and, therefore, it is not, as a whole, an undertaking, such entity may nevertheless qualify as a one due its certain functions if they are economic in nature*.¹⁰ The status of an undertaking does not depend on how the entity in question allocates its profits (consequently, a non-profit organization may also qualify as an undertaking).¹¹

The Commission notes that economic activity does not occur in connection with the exercise of public authority understood as a *task which is part of the essential functions of the state, or if it is associated with these functions by its nature, its aims and principles to which it is subject*.¹²

In order for state aid to occur, an undertaking must receive an advantage from the state. The advantage is defined as a benefit which is not available under market conditions. Conferring advantages is, in practice, the subject of detailed analyses by the EU Commission and the EU courts owing to the fact that Member States undertake a number of activities in the economic sphere and often argue that their conduct should be considered identical to actions that can be expected on the market on the part of investors, creditors or purchasers of goods or services (Kaznowski 2013, p. 816). It should be emphasized that the key factor is the actual impact of the advantage on the undertaking, not the objectives of state intervention.¹³

The absence of an advantage, or the ability to demonstrate that the state acts in the same way as a market entity, is synonymous with the absence of state aid despite its action.

The said advantage must be selective. The provision of Article 107 paragraph 1 of TFEU provides for aid favouring certain undertakings or the production of certain goods. Selective instruments are contrasted with general instruments. The distinction in this regard, however, is very complicated and in practice the Commission rarely admits that a measure introduced by a Member State has a general character (Kurcz 2009, p. 9&ff).

Selectivity can be either territorial (geographical selectivity), sectoral, be related to the size of an undertaking (e.g. aid targeted at small and medium-sized enterprises) (object-based selectivity) or derive from the discretionary power of an authority, which does not mean, however, that the instruments implemented on the basis of objective criteria (based on the existence of objective circumstances) are general by definition (Van den Castele, Hocine 2008, p. 247&ff).

Conversely, general measures are those which are available to all undertakings operating in a given Member State on the same basis, provided, however, that they are not actually subject to limitations (including e.g. sectoral ones, which, as was indicated above, may lead to selectivity).¹⁴ Determining whether a given instrument is selective requires the establishment of a reference system, ascertaining whether the studied instrument constitutes a deviation from the reference system, and whether the deviation is justified by the nature of the system. If the instrument in question is found to constitute such a deviation but its application is found to be justified by its nature, it is not be regarded as selective, and therefore does not constitute an instrument of state aid.¹⁵

⁶ ECJ judgment of 16 May 2002 in Case C-482/99 French Republic v Commission. Cf. also the explanation given by the Commission in the Draft Commission Notice on the notion of state aid pursuant to of Article 107 paragraph 1 of TFEU: *Regulation which leads to a redistribution of funds from one private entity to another without any further involvement of the state, does not involve the transfer of state resources, where there is a direct transfer of funds from one private entity to another, without the participation of public or private entity designated by the state for the purpose of managing such transfer. For example, an obligation imposed by a Member State in private electricity suppliers to purchase energy produced from renewable energy sources at fixed minimum prices does not involve direct or indirect transfer of State resources to undertakings which produce that kind of electricity. In this case, the companies (i.e. private electricity suppliers) are not appointed by the state to manage the aid program, but they are only bound by the obligation to purchase a certain type of energy using its own financial resources.*

⁷ Judgment of the ECJ of 15 July 2004 in Case C-345/02 Pearle BV, Hans Prijs Optiek Franchise BV, Rinck Opticiens BV v Hoofdbedrijfschap Ambachten and the ECJ judgment of 16 May 2002 in Case C-482/99 French Republic v Commission.

⁸ ECJ judgment of 23 April 1991 on C-41/90 Klaus Höfner and Fritz Elser v Macrotron GmbH, the ECJ judgment of 22 January 2002 on C-218/00 Cisl di Battistello Venanzio & C. Sas v Istituzione nazionale per l'assicurazione contro gli infortuni sul lavoro (INAIL), the judgment of the ECJ of 12 September 2000 in Joined Cases C-180/98 to C-184/98 Pavel Pavlov et al. v Stichting Pensioenfonds Medische Specialisten, and the judgment of the ECJ of 26 March 2009 on C-113/07 P Selex Sistemi Integrati v Commission.

⁹ Judgment of the ECJ of 21 September 1999 on C-67/96 Albany International BV v Stichting Fonds Bedrijfspensioen Textielindustrie, ECJ, judgment of 1 July 2008 on C-49/07 MOTOE.

¹⁰ European The Commission's Decision in Case N 470/08 – Poland – Aid for revitalization of degraded areas in Poland.

¹¹ Judgment of the ECJ of 11 July 2006 in Case C-205/03 P Federación Española de Empresas de Tecnología Sanitaria (FENIN) v Commission.

¹² Draft Commission Notice on the notion of state aid pursuant to Article 107 paragraph 1 of TFEU.

¹³ ECJ Judgment of 17 July 2008 on C-206/06 Essent Netwerk Noord.

¹⁴ ECJ judgment of 8 November 2001 in Case C-143/99 Adria-Wien Pipeline GmbH and Wietersdorfer & Peggauer Zementwerke GmbH v Finanzlandesdirektion für Kärnten.

¹⁵ Draft Commission Notice on the notion of state aid pursuant to Article 107 paragraph 1 of TFEU.

Selective advantage conferred by the State must distort or threaten to distort competition and affect trade. In the Commission's decision-making practice, the distortion of competition and the impact on trade are very often considered together. This is due to the fact that the vast majority of cases they are actually very closely interlinked, moreover, if an advantage distorts competition, it also implies that it has an impact on trade. This does not mean, however, that there are no cases in which the Commission finds that a distorting action taken by a given state is limited to the Member State granting the aid and therefore has no impact on trade as provided by the TFEU. In such cases, where despite the finding that aid distorts or may distort competition, it is decided that it has no impact on the terms of trade between Member States, state aid as provided by Article 107 paragraph 1 of TFEU does not occur.¹⁶

State aid distorts competition when it leads (or may lead) to favouring an undertaking (beneficiary) at the expense of its competitors. What it means in practice is that if a state grants a selective economic advantage to an undertaking operating in a liberalized sector, the condition of distortion or threat of distortion of competition is met.

Actual or potential advantages accorded to a beneficiary undertaking over its competitors may be related to different spheres of its activities depending on the purpose of the aid. Therefore, it may result from the fact that the beneficiary (unlike its competitors) does not have to incur all expenses related to investment, modernization and restructuring processes, development or expansion or even (although it is possible only to a limited extent) its current operation.¹⁷ In principle, the size of the advantage is immaterial.¹⁸

With regard to the distortion of trade it should be noted that: *When aid granted by a Member State strengthens the position of an undertaking compared with other undertakings competing in intra-Community trade, it is considered that the aid has an impact on this trade.*¹⁹ It is necessary to emphasize that the distortion of trade may also apply to undertakings which: i) are not involved in cross-border exchange, ii) conduct only local activity, iii) only export to countries outside the EU.²⁰

As was already mentioned, the Commission accepts, however, that in certain circumstances no effect of aid on trading conditions is present. This occurs in particular if it can be demonstrated that the economic activity in question is only relevant to the territory (region) of a single state (the services or goods offered attract no interest in other countries), or if it is shown that the aid does not lead to market closure. For example, the Commission found no impact of state aid on trading conditions in relation to theatrical productions,²¹ the activities of hospitals,²² museums,²³ cultural infrastructure²⁴ or conference centres.²⁵

6.3. Principles of state aid in the EU

As was mentioned above, state aid is in principle inadmissible. However, the treaties provide for exceptions to such prohibition, which along with associated conditions of their use, constitute the rules of admissibility of state aid. Such rules, developed in the decision-making practice of the Commission, are contained primarily in the guidelines, communications and framework principles. They refer to categories of state aid, the admissibility of which ensues from the provisions of the Treaty. It should be mentioned that the Commission has not issued relevant documentation governing the admissibility of aid with respect to all its kinds of aid authorized under the treaty provisions (i.e. excluded from the ban). In such cases, Member States shall apply the rules arising from the Commission's decision-making practice.

The table below contains a list of Treaty provisions on the admissibility of state aid and the relevant Commission documents further specifying its conditions.

Treaty provision	Guidelines/communications/frameworks
Article 107 paragraph 2 a) TFEU: aid having a social character, granted to individual consumers	– Guidelines on state aid to airports and airlines (OJ C 99, 4.4.2014, p. 3).
Article 107 paragraph 2 b) TFEU: aid to make good the damage caused by natural disasters or exceptional occurrences	–

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¹⁶ Cf. the Commission's decisions in the following cases: SA.34466 (2012/N) – Cyprus – State support to the Centre for Visual Arts and Research, SA.34576 (2012/N) – Portugal – North East of long-term care unit of Jean Piaget and SA.34891 (2012/N) – Poland – state aid to the Association of Municipalities of the Przemyśl Fortified Area.

¹⁷ The reason is that aid to cover operating costs is generally inadmissible. To a very limited extent it is permitted only where justified by the nature of a business and its attendant factors. See e.g. records in the Guidelines on state aid to airports and airlines (not yet published).

¹⁸ Judgment of 24 July 2003 in Case C-280/00 Altmark Trans GmbH, Regierungspräsidium Magdeburg v Nahverkehrsgesellschaft Altmark GmbH.

¹⁹ Judgment of 17 September 1980 in Case 730 /79 Philip Morris Holland BV v Commission of the European Communities.

²⁰ The Commission discusses the issue in detail in the Draft Commission Notice on the notion of state aid pursuant to of Article 107 paragraph 1 of TFEU, p. 52&ff.

²¹ The Commission's Decision in Case N 257/2007– Spain – Grants for theatrical productions in the Basque country.

²² The Commission's decision SA.34576 Portugal – North-eastern long-term care unit of Jean Piaget.

²³ The Commission's Decision in Case N 630/2003 – Italy – Sardinia Local Museums.

²⁴ The Commission's decision SA.34891 (2012/N) – Poland – state aid to the Association of Municipalities of the Przemyśl fortified area.

²⁵ The Commission's Decision in Case N 486/2002 Sweden – congress hall in Visby.

Treaty provision	Guidelines/communications/frameworks
Article 107 paragraph 2 c) TFEU: aid granted to the economy of certain areas of the Federal Republic of Germany affected by the division of Germany	–
Article 107 paragraph 3 a) TFEU: aid to promote the economic development of areas with economic or social problems	– Guidelines on national regional aid for 2014-2020 – EU Guidelines for the application of state aid rules in relation to rapid deployment of broadband networks (OJ C 25, 26.1.2013, p. 1) – The Framework on state aid for shipbuilding (OJ C 364, 14.12.2011, p. 9)
Article 107 paragraph 3 b) TFEU: aid to promote the execution of an important project of common European interest or to remedy a serious disturbance in the economy of a Member State	– Communication from the Commission – Criteria for the compatibility analysis of the internal market state aid to promote the execution of an important project of common European interest (draft) – Community framework for state aid for research, development and innovation (OJ C 323, 30.12.2006, p. 1)¹ – Communication from the Commission on the application, from 1 August 2013, of state aid rules to support measures in favour of banks in the context of the financial crisis ('Banking Communication'), (OJ C 216, 30.7.2013, p. 1)
Article 107 paragraph 3 c) TFEU: aid to facilitate the development of certain economic activities or of certain economic areas	– Guidelines on national regional aid for 2014-2020 – Community framework for state aid for research, development and innovation – Communication from the Commission – Criteria for the compatibility analysis of state aid to workers in disadvantaged and disabled workers subject to individual notification (OJ C 188, 11.8.2009, p. 6) – Communication from the Commission – Criteria for the compatibility analysis of state aid for training subject to individual notification (OJ C 188, 11.8.2009, p. 1) – Guidelines on environmental and energy State aid for 2014–2020² – Guidelines on certain state aid measures in the context of the greenhouse gas emission allowance trading scheme post-2012 (OJ C 158, 5.6.2012, p. 4) – EU Guidelines on state aid to promote risk finance investment (OJ C 19, 22.1.2014, p. 4) – Community guidelines on state aid for rescuing and restructuring firms in difficulty (OJ C 244, 1.10.2004, p. 2, as amended)³ – EU Guidelines for the application of state aid rules in relation to rapid deployment of broadband networks (OJ C 25, 26.1.2013, p. 1) – The Framework on state aid for shipbuilding (OJ C 364, 14.12.2011, p. 9) – Guidelines on state aid to airports and airlines (OJ C 99, 4.4.2014, p. 3) – Community guidelines on state aid to maritime transport (OJ C 13, 17.1.2004, p. 3) – Communication from the Commission providing guidance on state aid complementary to Community funding for the launching of the motorways of the sea (OJ C 317, 12.12.2008, p. 10) – Communication from the Commission providing guidance on state aid to ship management companies (OJ C 132, 11.6.2009, p. 6)
Article 107 paragraph 3 d) TFEU: aid to promote culture and heritage conservation	– Commission Communication on state aid to films and other audio-visual works (OJ C 332, 15.11.2013, p. 1) – Commission Communication on the application of state aid rules to public service broadcasting (OJ C 257, 27.10.2009, p. 1)
Article 107 paragraph 3 e) TFEU: other categories of aid	– Council Decision of 10 December 2010 on state aid to facilitate the closure of uncompetitive coal mines (OJ L 336, 21.12.2010, p. 24)
Article 93 TFEU	– Council Regulation (EC) No 1370/2007 of the European Parliament and of the Council of 23 October 2007 on public passenger transport services by rail and by road and repealing Council Regulations (EEC) Nos 1191/69 and 1107/70 (OJ L 315, 31.12.2007, p. 1) – Community guidelines on state aid for railway undertakings (OJ C 184, 22.7.2008, p. 13)
Article 106 paragraph 2 TFEU	– Commission Communication on the application of EU rules on state aid in relation to compensation for services of general economic interest (OJ C 8, 11.1.2012, p. 4) – Commission Decision of 20 December 2011 on the application of Article 106 paragraph 2 of the Treaty on the Functioning of the European Union to state aid in the form of public service compensation granted to certain undertakings entrusted with the operation of services of general economic interest (OJ L 7, 11.1.2012, p. 3) – The framework of the European Union state aid in the form of public service compensation (2011) (OJ C 8, 11.1.2012, p. 15) – EU Guidelines for the application of state aid rules in relation to rapid deployment of broadband networks (OJ C 25, 26.1.2013, p. 1) – Commission Communication on the application of state aid rules to public service broadcasting (OJ C 257, 27.10.2009, p. 1) – Commission Notice on the application of competition rules to the postal sector and on the assessment of certain State measures relating to postal services (OJ C 39, 6.2.1998, p. 2) – Guidelines on state aid to airports and airlines (OJ C 99, 4.4.2014, p. 3) – Community guidelines on state aid to maritime transport (OJ C 13, 17.1.2004, p. 3)

¹ The document is valid until 30 June 2014 and will be replaced by a new framework.

² Adopted by the Commission on 9 April 2014 (not yet published).

³ The document will be replaced by new guidelines.

The rules governing the admissibility of state aid also include the rules laid down for specific aid instruments contained particularly in the following documents:

- Commission Notice on the application of Articles 87 and 88 of the EC Treaty to state aid in the form of guarantees (OJ C 155, 20.6.2008, p. 10),
- Commission Communication on state aid elements in sales of land and buildings by public authorities (OJ of the EC C 209, 10.1997, p. 3),
- Communication from the Commission to the Member States on the application of Articles 107 and 108 of the Treaty on the Functioning of the European Union to short-term export-credit insurance (OJ C 392, 19.12.2012, p. 1),
- Commission Notice on the application of state aid rules to measures relating to direct business taxation (OJ of the EC C 384, 10.12.1998, p. 3),
- Commission Communication on the revision of the method for setting the reference and discount rates (OJ C 14, 19.1.2008, p. 6).

Apart from those acts and documents devoted to the admissibility of state aid rules, EU law also regulates the procedural issues related to the granting of state aid by Member States. As a matter of principle, state aid (within the framework defined by exceptions to the ban) requires the consent of the Commission.

Article 108 paragraph 3 TFEU provides that the Member States shall not implement proposed aid until the Commission gives its approval. In consequence, the EU aid law contains the following legal acts governing the procedure through which Member States shall notify the Commission of their aid plans:²⁶

- Council Regulation (EC) No 659/1999 of 22 March 1999 laying down detailed rules for the application of Article 108 of the Treaty on the Functioning of the European Union (OJ of the EC L 83, 27.3.1999, p.1, as amended),
- Commission Regulation (EC) No 794/2004 of 21 April 2004 implementing Council Regulation (EC) No 659/1999 laying down detailed rules for the application. 93 of the EC Treaty (OJ L 140, 30.4.2004, p.1, as amended).

Not every kind of aid, however, requires notification as provided by article 108 paragraph 3 TFEU. Acting on the basis of Article 94 of the Treaty establishing the European Community (now Article 109 TFEU), the Council adopted Regulation No 994/98 of 7 May 1998 on the application of Articles 92 and 93 of the Treaty establishing the European Community to certain categories of horizontal state aid (OJ of the EC L 142, 14.5.1998, p.1, as amended). It authorizes the Commission to adopt regulations specifying the categories of aid that are compatible with the common market and not subject to the notification requirements of Article 108 paragraph 3 TFEU (block exemption), and also by means of appropriate regulations, to stipulate that certain categories of aid do not meet all the criteria under Article 107 paragraph 1 TFEU (evidence of state aid) and, therefore, are exempt from the notification requirement of Article 108 paragraph 3 TFEU, provided that the aid granted to the same undertaking over a given period does not exceed a certain fixed amount (*de minimis*). On the basis of this mandate, the Commission adopted the existing Regulation No 800/2008 of 6 August 2008 declaring certain categories of aid compatible with the common market pursuant to Articles 87 and 88 of the Treaty (General Block Exemption Regulation), (OJ L 214, 9.8.2008, p. 3, as amended)²⁷ Commission Regulation No. 1407/2013 of 18 December 2013 on the application of Articles 107 and 108 of the Treaty on the Functioning of the European Union to *de minimis* aid (OJ L 352, 24.12.2013, p. 1), as well as Regulation No 360/2012 of 25 April 2012 on the application of Articles 107 and 108 of the Treaty on the Functioning of the European Union to *de minimis* aid granted to undertakings providing services of general economic interest (OJ L 114, 26.4.2012, p. 8).

6.4. Domestic regulations

In Poland, the issues at hand are regulated by the Procedural Issues Pertaining to State Aid Act of 30 April 2004, including the rules of conduct in matters concerning state aid, the notification procedure, the rules of cooperation between the President of the UOKiK²⁸ (Office for Competition and Consumer Protection, OCCP) and the institutions developing aid programmes, aid donors, entities applying for aid and beneficiaries of such aid as well as the principle of representation of Republic of Poland before the European Court of Justice (ECJ) and the European Court of First Instance (ECFI), aid refund and monitoring the rules and procedures.

It should be emphasized that the Act in question does not lay down the rules of aid admissibility since they are defined in EU legislation. The Act sets out the procedures necessary for the proper implementation of the provisions of EU law, especially in the context

²⁶ In addition, the following documents have been adopted: the Commission Notice on a simplified procedure for treatment of certain types of state aid (OJ. EU C 136, 16.6.2009, p. 3) and the Code of Best Practice for the conduct of state aid control procedures (OJ C 136, 16.6.2009, p. 13).

²⁷ The regulation will expire on 30 June 2014 and will be replaced by a new one concerning state aid covered by the block exemption.

²⁸ The Act also defines the powers of the minister responsible for agriculture in matters concerning state aid. The issue of state aid in agriculture remains beyond the scope of this chapter.

of the requirement to inform the Commission of plans to grant aid in accordance with Article 108 paragraph 3 TFEU (notification requirement). The notification requirement applies to aid schemes²⁹ or individual aid (i.e. remaining outside aid programmes).³⁰

In the notification procedure, the President of the UOKiK issues opinions regarding the planned state aid, i.e. with regard to planned aid schemes as well as individual aid projects. In the opinions, the President takes a stand regarding the question of whether the project actually constitutes state aid, and whether the aid is compatible with the internal market. In the case of an aid scheme, such notification requires the consent of the Council of Ministers. The pre-notification procedure thus designed is aimed at the development of an appropriate notification form to ensure that it complies as fully as possible with the rules applied by the Commission in its assessment of admissibility of state aid.

The draft aid scheme or individual aid project is then be forwarded by the President of the UOKiK to the Permanent Representation of the Republic of Poland to the EU in Brussels, which officially submits it to the Commission. Notification occurs in electronic form (by means of the State Aid Notification Interactive, SANI).

The President of the UOKiK is the competent authority in the area of proceedings before the Commission. Accordingly, the relevant stakeholders, including public authorities, as well as applicants for aid, submit to the President of the UOKiK information necessary to draw up explanations, comments or define the joint position on issues related to questions asked by the Commission in the course of proceedings. Using the ICT network, the President publicizes information concerning the decisions made by the Commission Decisions related to the aid instruments subject to notification.

The President of the UOKiK is also responsible for representing the Republic of Poland in all aid-related proceedings before the Court of Justice of the European Union and the General Court of the European Union.

The President of the UOKiK monitors all state aid granted in Poland. For that reason, donors are required to submit to the President all information on assistance provided. The President draws up an annual report concerning the aid granted in Poland and presents it to the Council of Ministers.

The Procedural Issues Pertaining to State aid Act also sets the framework rules related to the scope of information submitted by applicants for state aid or for de minimis aid.

Second, Poland's domestic legal provisions related to state aid include those that provide direct legal basis for granting aid. Such regulations may be contained in the already mentioned aid programmes. In accordance with Article 2 item 7 of the Procedural Issues Pertaining to State Aid Act, an aid scheme is a normative act that meets the conditions set out in Article 1 d) of the Council Regulation (EC) No 659/1999 of 22 March 1999 laying down detailed rules for the application of Article 108 of the Treaty on the Functioning of the European Union (OJ L 83, 27.3.1999, p.1, as amended), and therefore, in particular, a normative act on the basis of which funds may be disbursed to individual undertakings defined in the Act in a general and abstract manner without further implementation measures being required. This means that an aid programme is a normative act on the basis of which state aid may be granted aid, and which specifies:

- i. The beneficiaries of such aid e.g. small and medium-sized enterprises,
- ii. A body (entity) providing the aid, e.g. the Polish Agency for Enterprise Development,
- iii. The purpose of the aid (what the aid is granted for), e.g. investment, training, consultancy services etc.,
- iv. The form in which the aid is granted, e.g. a grant, a preferential loan, a loan guarantee,
- v. The amount of aid, most often defined with respect to the so-called eligible costs, e.g. 50% of the eligible costs, such as the cost of purchasing consultancy services,
- vi. The principles governing the accumulation of aid received from various sources,
- vii. The aid application procedure.

An aid programme may be based on the provisions of several regulations (e.g. an act or several acts with their attendant enactment and implementation provisions). In the Polish system of state aid, such schemes involve primarily the aid granted under operational programmes, which specify support areas under the Structural Funds. Currently, Article 21 item 1 of the Development Policy Principles Act of 6 December 2006 (Journal of Laws No. 227, item 1658, as amended) provides that *to the extent to which the funding of projects under programmes constitutes aid that meets the conditions set out in Article 87 paragraph 1 of the Treaty establishing the European Community [now Article 107 paragraph 1 of TFEU] or de minimis aid, such funding shall be governed by specific conditions and procedures for granting aid*. In addition, paragraph 3 of the Article provides that *the competent minister or the minister responsible*

²⁹ Pursuant to Article 2 item 7 of the Procedural Issues Pertaining to Public Aid Act, an aid programme is normative act on the basis of which funds may be disbursed to individual undertakings defined in the Act in a general and abstract manner without further implementation measures being required as well as any act on the basis of which an indefinite amount of aid that is not linked to any specific project may be granted to one or more undertakings for and/or for an indefinite period of time.

³⁰ Individual aid as provided by Article 2 of Regulation No 800/2008 of 6 August 2008 declaring certain categories of aid compatible with the common market in application of Articles 87 and 88 of the Treaty (General Block Exemption) (OJ L 214, 9.8.2008, p. 3, as amended) constitutes ad hoc aid (aid granted outside aid schemes) and notifiable aid.

for regional development in terms of operational programmes under which the voivodship [regional] government serves as the managing authority or intermediate body, shall determine, by way of statutory instruments, the specific purpose, conditions and procedures for granting aid referred to in paragraph 1, especially bearing in mind the need to ensure compatibility of the aid with the conditions of admissibility, where separate regulations do not specify the detailed conditions and procedures for granting the aid. Accordingly, such secondary legislation constitutes aid programmes as provided by the Procedural Issues Pertaining to State Aid Act pursuant to EU law.

Other than this, state aid derived exclusively from the domestic budget is also granted on the basis of aid programmes (see e.g. the Special Economic Zones Act of 20 October 1994) (Journal of Laws 2007, No. 42, item. 274, 2008, No. 118, item 746, 2009, No.18, item 97).

As was indicated above, the provisions governing state aid in Poland will soon be subject to modification due to the extensive changes in EU law setting out the conditions for the admissibility of such aid.

EU regulations and domestic legal provisions under which aid is granted may serve as a state policy tool aimed at preventing bankruptcies. The system contains no documents or legislation that would expressly indicate the admissibility of aid for preventing bankruptcy (see the tabulated overview in section 6.3). EU law provides, however, in particular for the admissibility of the following kinds of aid: de minimis aid for rescuing and restructuring, training and consultancy services. Such aid may be in line with the adopted policy focused exclusively (or among other things) on respond to problems of firms which find themselves in broadly defined difficulties or are undertakings in difficulty as provided by the current Community guidelines on state aid for rescuing and restructuring of firms in difficulty (OJ C 244, 1.10.2004, p. 2, as amended).³¹

Abbreviations

TFEU – Treaty on the Functioning of the European Union

The Commission – the European Commission

ECJ – European Court of Justice

SPI – the Court of First Instance

EGC – The Court of the European Union

ECJ – The Court of Justice of the European Union

³¹ The guidelines provide that a firm is considered to be in difficulty where it is unable, whether through its own resources or with the funds it is able to obtain from its owner/shareholders or creditors, to stem losses which, without outside intervention by the public authorities, will almost certainly condemn it to going out of business in the short or medium term (point 9 of the Guidelines).

In particular, a firm is considered to be in difficulty if at least one of the following circumstances occurs (point 10 of the Guidelines):

- a) in the case of a limited liability company where more than half of its registered capital has disappeared and more than one quarter of that capital has been lost over the preceding 12 months, or
- b) in the case of a company where at least some members have unlimited liability for the debts of the company, where more than half of its capital as shown in the company accounts has disappeared and more than one quarter of that capital has been lost over the preceding twelve months, or
- c) whatever the type of company concerned where it fulfils the criteria under its domestic law for being the subject of collective insolvency proceeding.

Even when none of the circumstances set out in point 10 are present, a firm may still be considered to be in difficulties, in particular where the usual signs of a firm being in difficulty are present, such as increasing losses, diminishing turnover, growing stock inventories, excess capacity, declining cash flow, mounting debt, rising interest charges and falling or nil net asset value (point 11 of the Guidelines).

Chapter 7

THE FORMS AND INSTRUMENTS OF STATE AID

7.1. Introduction

According to the preferences expressed by the Commission in its Communication to the European Parliament, the Council of Europe, the European Economic and Social Committee and the Committee of the Regions 'The modernization of EU state aid policy',¹ one of the objectives of the reform of the rules governing public assistance is to focus the Commission's ex-ante scrutiny on cases with the biggest impact on the internal market as well as to streamline the rules and provide for faster decisions.

The Commission thereby intends that the scope of its control be even more limited than before and that an increasing scope of state aid should not require such ex-ante scrutiny and, therefore, notification by the Member States. Accordingly, the Commission extends the inventory of state aid targets that will be exempted from the notification requirement referred to in Article 108 paragraph 3 TFEU.

Due to the need for continued focus by the Commission on the most important issues for the single market, the importance of de minimis aid and aid covered by the block exemption increases. It is assumed that in the near future this kind of support shall be the most frequently provided by the Member States.

7.2. De minimis aid and block exemption regulations

As was mentioned above (cf. Section 6.3 above), it should be noted that, acting under the authority of the Council, the Commission has adopted:

- i) De minimis regulations,
- ii) Regulation No 360/2012 of 25 April 2012 on the application of Articles 107 and 108 of the Treaty on the Functioning of the European Union to de minimis aid granted to undertakings providing services of general economic interest (OJ L 114, 26.4.2012, p. 8.), as well as
- iii) Regulation No 800/2008 of 6 August 2008 declaring certain categories of aid compatible with the common market in application of Articles 87 and 88 of the Treaty (General Block Exemption), (OJ L 214, 9.8.2008, p. 3, as amended).²

De minimis aid is defined as aid which does not fulfil all the criteria under Article 107 paragraph 1 TFEU (aid awarding conditions) and therefore is exempt from the notification requirement of Article 108 Paragraph 3 TFEU, due to the fact that aid granted to the same undertaking over a given period does not exceed a certain fixed amount.³

Pursuant to Article 3 item 1 of the De minimis Regulation, it was decided that aid funds do not meet all the criteria set out in Article 107 paragraph 1 TFEU and are therefore exempted from the notification requirement provided that they are granted in accordance with the Regulation.

First, the total amount of de minimis aid granted to any one undertaking shall not exceed EUR 200,000 (EUR 100 000 for an undertaking in the field of road freight of goods and may not be used for the acquisition of vehicles for the road freight of goods) over any period of three fiscal years.⁴ The ceilings of the de minimis rule shall apply regardless of the form (e.g. grant, loan guarantee) and the objective pursued (such as investment activities, operations, etc.) and regardless of whether the aid granted by the Member state is financed entirely or partly by resources of Union origin. The ceilings applicable to the de minimis rule shall be expressed in terms of gross cash grant. Where aid is awarded in a form other than a grant, the aid amount shall be its gross grant equivalent.⁵

¹ Brussels, 8.5.2012 COM (2012) 209 final.

² The regulation will expire on 30 June 30 2014 and will be replaced by a new one on state aid covered by block exemption.

³ Cf. Regulation No. 994/98 of 7 May 1998 on the application of Articles 107 and 108 of the Treaty on the Functioning of the European Union to certain categories of horizontal state aid.

⁴ If an undertaking performs road freight transport for hire or reward and other activities to which the ceiling of EUR 200 000 applies, the ceiling of EUR 200 000 shall apply to the undertaking, provided that the Member States ensure by appropriate means such as separation of activities or distinction of costs that the benefit to the road freight transport activity does not exceed EUR 100 000 and that no de minimis aid is used for the acquisition of road freight transport vehicles.

⁵ Pursuant to §2 item 1) of the Regulation of the Council of Ministers of 11 August 2004 on the detailed rules for calculating the aid granted in various forms (Journal of Laws No. 194, item. 1983, as amended), the gross grant equivalent shall be the gross amount of aid received by the aid recipient or the applicant entity if received aid in the form of a grant without regard to income tax expressed accurate to two decimal points.

Pursuant to Article 6 of the De minimis Regulation, the Member States are obliged to institute a mechanism to ensure that specified ceilings for de minimis aid shall be observed in each case. Thus, the appropriate authority in the Member state shall inform the beneficiary in writing of the estimated amount of aid (expressed as gross grant equivalent) and of its de minimis character, making express reference to the de minimis Regulation. Prior to granting the aid, the competent authority shall also obtain a statement from the undertaking concerned, in written or electronic form, about any other de minimis aid received to which this Regulation or other de minimis regulations apply during the previous two fiscal years and the current fiscal year. In implementing this obligation, pursuant to Article 5 paragraph 3 of the Procedural Issues Pertaining to state Aid Act, bodies awarding de minimis aid issue to the beneficiary an official statement declaring that the aid obtained meets the de minimis conditions. According to Article 37 of the Act, an entity applying for de minimis aid is obliged to submit to the aid granting body certificates confirming the award of de minimis aid, a statement of the amount of de minimis aid, or a statement of non-receipt of such aid.

Second, de minimis aid must be transparent in nature. Article 4 item 1 of the De minimis Regulation provides that it *shall apply only to aid in respect of which it is possible to calculate precisely the gross grant equivalent of the aid ex ante without need to undertake a risk assessment ('transparent aid')*.

For obvious reasons, transparent aid is awarded in the form of grants.

De minimis aid to be provided in the form of loans is considered transparent aid if it meets the following criteria:

- i. The beneficiary is not subject to collective insolvency proceedings or does not meet the appropriate domestic law criteria regarding collective insolvency proceedings at the behest of its creditors. Beneficiaries who are large companies must be in a situation comparable to at least B- credit rating, and
- ii. The loan does not exceed EUR 1 000 000 (or EUR 500 000 for undertakings performing road freight transport), has a duration not exceeding five years and is secured by collateral covering at least 50% of the loan. If a loan only accounts for less than this amount and/or is granted for a period of less than five years, the gross grant equivalent of that loan shall be calculated as a proportion of the applicable ceiling (200 000 EUR of 100 000 EUR), or
- iii. Gross grant equivalent has been calculated on the basis of the reference rate applicable at the time of the grant.⁶

Aid in the form of capital injection is considered transparent de minimis aid, if the total amount of the public injection does not exceed the de minimis ceiling.

Aid comprised in risk finance measures shall not be considered as transparent de minimis aid, unless the measure concerned provides capital not exceeding the de minimis ceiling to each target undertaking.

Aid comprised in guarantees shall be treated as transparent de minimis aid if:

- i. The beneficiary is not subject to collective insolvency proceedings or does not meet the appropriate domestic law criteria regarding collective insolvency proceedings at the behest of its creditors. Beneficiaries who are large companies must be in a situation comparable to at least B- credit rating, and
- ii. The guaranteed part of the underlying loan does not exceed EUR 1 500 000 (or EUR 750 000 for undertakings performing road freight transport) and the duration of the guarantee does not exceed five years. If the guaranteed part of the underlying loan only accounts for less than this amount and/or the guarantee is for a period of less than five years, the gross grant equivalent of that guarantee shall be calculated as a proportion of the applicable ceiling (EUR 200 000 or EUR 100 000), or
- iii. The gross grant equivalent has been calculated on the basis of safe-harbour premiums laid down in the Commission Notice on the application of Articles 87 and 88 of the EC Treaty to state aid in the form of guarantees (OJ C 155, 20.6.2008, p. 10), or
- iv. Before being implemented, the methodology to calculate the gross grant equivalent of the guarantee has been accepted following notification of this methodology to the Commission under a regulation adopted by the Commission in the state aid area, and the approved methodology explicitly addresses the type of guarantee and the type of underlying transaction at stake in the context of the application of this Regulation.

Aid comprised in other instruments shall be considered as transparent de minimis aid on condition that the instrument provides for a cap ensuring that the applicable ceiling is not exceeded.

Third, we need to analyse the cumulation rules contained in Article 5 of the De minimis Regulation. Their purpose is primarily to ensure that the total de minimis aid granted to one company does not exceed the relevant ceilings (EUR 200 000 and EUR 100 000, respectively). De minimis aid pursuant to the Regulation may thus be cumulated with the Commission Regulation (EU) No 360/2012 of 25 April 2012 on the application of Art. 107 and 108 of the Treaty on the Functioning of the European Union to de minimis aid granted to undertakings providing services of general economic interest (OJ L 114, 26.4.2012, p. 8). This means that in a period of three years (calculated as the previous two fiscal years and the current fiscal year) an undertaking may receive de

⁶ In such a case, the rules arising from the Commission's Communication on the revision of the method for setting the reference and discount rates (OJ C 14, 19.1.2008, p. 6) shall apply, which states that the reference rate corresponding to the base rate and the applicable margin can be established for each individual case.

de minimis aid from a number of sources, provided that the cumulated de minimis aid within that time the (expressed in terms of the gross grant equivalent) does not exceed EUR 200 000 or 100 000, respectively.

Cumulative rules also apply to de minimis aid combined with state aid. Therefore, de minimis aid cannot be cumulated with state aid in respect of the same eligible costs, or with the state aid for the same measure of risk financing, if such cumulation would result in an aid intensity exceeding that fixed in the specific circumstances of each case by a block exemption regulation or decision adopted by the Commission. De minimis aid, which has not been granted in relation to specific eligible costs, or which cannot be attributed to such costs, can be combined with other state aid granted in accordance with the Regulation on Block Exemption or in accordance with the decision made by the Commission.

Accordingly, any applicant for de minimis aid must provide information not only on de minimis aid obtained so far, but also any public aid if de minimis aid is to be granted to cover the same eligible costs which have already covered by the previous aid, or if is to complement the aid fixed in the Regulation on block exemption or the Commission's decision.

Assistance under the current de minimis Regulation may be granted in principle, regardless of the financial situation of the beneficiary (c.f. however, the provisions relating to aid in the form of loans and guarantees). Thus, the recipient of de minimis aid can also be a company in difficulty as provided by the Community guidelines on state aid for rescuing and restructuring firms in difficulty (OJ C 244, 1.10.2004, p. 2, as amended), for which until now only rescue and restructuring aid has generally been available. Such a change is not without significance for the EU bankruptcy prevention policy.

As already mentioned, the Commission was authorized by the Council to adopt regulations specifying the categories of aid which are compatible with the common market and not subject to the notification requirements of Article 108 paragraph 3 TFEU (block exemption). Therefore, the Commission adopted the existing Regulation No 800/2008 of 6 August 2008 declaring certain categories of aid compatible with the common market in application of Articles 87 and 88 of the Treaty (General Block Exemption), (OJ L 214, 9.8.2008, p. 3, as amended).⁷ The regulation will be replaced by a new regulation related to block exemptions.

The draft of the new Block Exemption Regulation,⁸ the Commission provides for the admissibility of and exemption from the notification requirement for the following uses:

- 1) Regional aid (investment and operating activity⁹ for the development of urban areas),
- 2) Small and medium-sized enterprises (SME's) (investment aid, participation in trade fairs, costs of project-related cooperation under European territorial cooperation),
- 3) Access of SME's to finance (risk financing, start-ups, alternative trading platforms specializing in SME's, costs of due diligence),
- 4) Research, development, innovation (research and development projects, investment in the research infrastructure for innovation clusters, to support SME innovation, process and organizational innovation, research and development in the fishery and aquaculture sector),
- 5) Training,
- 6) Disadvantaged workers and workers with disabilities (wage subsidies, recruitment of workers in a particularly difficult situation, wage subsidies for workers with disabilities, to offset the additional costs of employing disabled workers),
- 7) Environmental protection (investment aid enabling undertakings to go beyond Union standards for environmental protection or increase the level of environmental protection in the absence of Union standards, early adaptation to future standards of EU investment in measures to promote energy savings for efficiency projects energy investments in cogeneration systems, promotion of energy from renewable sources, promotion of electricity from renewable energy sources in installations operating on a small scale in the form of reductions in environmental taxes on Under Directive 2003/96/EC, investment in the remediation of contaminated sites, investment in energy-efficient heating and cooling systems, environmental studies),
- 8) To make good the damage caused by certain natural disasters (aid schemes to remedy some of the damage caused by natural disasters),
- 9) Social aid for transport for residents of remote regions,
- 10) Broadband infrastructures,
- 11) Culture and heritage conservation (aid schemes for audio-visual works),
- 12) Sport and multifunctional recreational infrastructure.

Clearly, the range of aid targets exempted from the notification requirement as provided by Article 108 paragraph 3 TFEU is therefore much broader than even the applicable provisions of the Block Exemption Regulation (Regulation 800/2008). First, it results from the greater experience of the Commission, which has enabled the establishment of criteria for admissibility and exclusion of the notification requirement in relation to the new allocation of aid. Second, it is dictated by the provisions (described

⁷ The regulation will expire on 30 June 2014, and will be replaced by a new regulation on state aid covered by the block exemption.

⁸ Draft Commission Regulation (EU) of 18 December 2013 declaring certain categories of aid compatible with the common market in application of Articles 107 and 108 of the Treaty.

⁹ Regional operating aid is, however, permissible to a limited extent, i.e. only in the most remote or sparsely populated areas (cf. art. 15 of the Draft).

in the previous part) of the reform in the area of regulations governing state aid,¹⁰ which aim to promote: (i) sustainable, smart and inclusive growth in the competitive domestic market, while contributing to the progress of the activities of the Member States to make more efficient use public finance, (ii) the focus in the Commission's ex-ante control measures on the issues that have the greatest impact on the internal market, while strengthening cooperation between the Member States in the enforcement of state aid rules, and (iii) optimizing the rules and allow faster and more robust decisions based on clear economic reasons, a common approach and clear responsibilities. New rules for granting aid covered by the block exemption meet the specific priorities of the Commission.

At the same time, especially in the part related to SME's, the new rules allow for a broader scope of state intervention, which may affect the prevention of business failure and does not require prior approval of the Commission.

It should be noted, however, that the rules of block exemption will not apply (as is the case today) to firms in difficulty as defined in relevant Community guidelines on state aid for rescuing and restructuring firms in difficulty (OJ C 244, 1.10.2004, p. 2, as amended).

7.3. Regional, horizontal and sectoral aid

The admissibility of regional aid, beyond the already mentioned Block Exemption Regulation, is determined by regional guidelines.¹¹ In the Introduction to the Guidelines, the Commission points out that, *pursuant to Article 107 paragraph 3 points a) and c) of the Treaty on the Functioning of the European Union (TFEU), the Commission may declare aid to promote the economic development of certain disadvantaged EU regions compatible with the common market. This kind of aid is known as regional aid.* The guidelines therefore indicate the conditions of admissibility of public aid aimed at regional development.¹² Such aid is compatible with the internal market pursuant to Article 107 paragraph 3 points a) and c) of the TFEU. Prior to the awarding of such aid, the Member States should obtain the Commission's decision confirming the compatibility of the aid with the internal market.

According to the guidelines, regional aid may be granted as aid for new investment and, to a limited extent, as operating aid, if the investment aid alone is not enough to stimulate economic development in a given region.

The guidelines are generally applicable to all areas of economic activity with the exception of iron and steel, synthetic fibres, fisheries and aquaculture, agriculture and transport as well as the airports and the energy sector.¹³ No regional aid is admissible for investments of large undertakings in areas classified as regions specified in Article 107 paragraph 3 point c) TFEU, unless such investment ushers in new economic activities in the area or diversifies the existing activity to include new products or innovative processes. Regional aid to firms in difficulty is also inadmissible.

The Regional Guidelines (as all the new documents laying down the rules of admissibility of public aid), the Commission sets out the general criteria for aid eligibility, which result from the adopted general rules for the modernization of the policy on state aid. Thus, i) the aid must contribute to the achievement of a well-defined objective of common interest, ii) there must be a need for state intervention, iii) the measure applied must be appropriate iv) the aid must include an incentive effect, v) the aid must be limited to the minimum (needed to induce additional investment or activity in the area), vi) undue negative effects of the aid should be limited, vii) transparency of aid must be ensured. In this context, of particular importance are the provisions related to the proportionality of the aid:

- In the case where aid provides an incentive to make the investment, the amount should not exceed the minimum necessary to make the project profitable enough,
- If the aid is an incentive to carry out the project in the region (since it compensates for the limitations and net costs arising from such a location), the amount should of aid not exceed the difference between the net present value of the investment in the target region and the net present value of such investment in another location.

Moreover, the Commission has set out the maximum aid intensities in relation to eligible costs, which are primarily used as the maximum allowable ceilings of aid calculated using the above principles¹⁴ as well as in calculating aid for SME's.

The formula of the new guidelines, which contributes to the objectives of the reform of state aid (see Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'The modernization of EU policy in the field of state aid') clearly indicates that the rules related to the granting of state aid

¹⁰ Cf. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, 'The modernization of EU policy in the field of state aid' Brussels, 8.5.2012 COM (2012) 209 final.

¹¹ In order to avoid all doubt, it should be emphasized that the conditions for granting regional aid are governed by regional guidelines. The Block Exemption Regulation lists the conditions for granting regional aid whose application eliminates the notification requirement.

¹² Thus, the purpose of such aid is different from the special categories of aid to certain sectors, or aid which refers to specific purposes, such as training, research and development, environmental protection, etc.

¹³ In this respect, the aid admissibility rules contained in other documents, apply.

¹⁴ With the provision that for large investment projects the amount of aid shall be calculated based on the so-called the adjusted aid amount.

are increasingly used to influence the economic policies of the Member States, to set their priorities and to verify the legitimacy of public spending.

There is no single document of the Commission which regulates awarding horizontal aid. For each of the objectives of horizontal aid, the Commission issued separate documents specifying the conditions for the admissibility of such aid. Currently the following are in force:

- Union Guidelines on state aid to promote risk finance investment (OJ C 19, 22.1.2014, p. 4),
- Community framework for state aid for research, development and innovation (OJ C 323, 30.12.2006, p. 1)¹⁵ (subject to revision, to be replaced by a new document),
- Communication from the Commission – Criteria for the compatibility analysis of state aid to disadvantaged and disabled workers subject to individual notification (OJ C 188, 11.8.2009, p. 6),
- Communication from the Commission – Criteria for the compatibility analysis of state aid for training subject to individual notification (OJ C 188, 11.8.2009, p. 1),
- Guidelines on state aid for environmental protection and energy 2014–2020,¹⁶
- Community guidelines on state aid for rescuing and restructuring firms in difficulty (OJ C 244, 1.10.2004, p. 2, as amended.)¹⁷ (the document is currently being revised).

Awarding state aid referred to in the above documents requires the consent of the Commission; therefore, the Member States are obliged to notify it of their intentions to grant such assistance.

The general principles governing the admissibility of each category of horizontal aid are (or will be, in the case of documents subject to change) based on uniform assumptions underlying the reform of EU policy in the field of state aid.

In the context of the present study, attention needs to be drawn to the rules related to rescuing and restructuring aid. As was mentioned previously, the current guidelines in this regard are subject to change. The Commission is consulting a draft version of the new guidelines with the Member States. In its proposal, the Commission emphasizes that *Rescue and restructuring aid are among the most distortive types of State aid. It is well established that successful sectors of the economy witness productivity growth not because all the undertakings present in the market gain in productivity, but rather because the more efficient and technologically advanced undertakings grow at the expense of those that are less efficient or that have obsolete products. Exit of less efficient undertakings allows their more efficient competitors to grow and returns assets to the market, where they can be applied to more productive uses. By interfering with this process, rescue and restructuring aid may significantly slow economic growth in the sectors concerned.* (Point 6 of the Draft Guidelines).

Where parts of a failing undertaking remain essentially viable, the undertaking may be able to carry out a restructuring that leads to its exit from certain structurally loss-making activities and allows the remaining activities to be reorganised on a basis that gives a reasonable prospect of long-term viability. Such restructuring should usually be possible without State aid, through agreements with creditors or by means of insolvency or reorganisation proceedings. Modern insolvency law should help sound companies to survive, help safeguard jobs and enable suppliers to keep their customers, and allow owners to retain value in viable companies. Insolvency proceedings may also return a viable undertaking to the market by way of acquisition by third parties, whether of the undertaking as a going concern or its various production assets. It follows that undertakings should only be eligible for State aid when they have exhausted all market options and where such aid is necessary in order to achieve a well-defined objective of common interest that could not be achieved without the aid. Undertakings should be allowed to receive aid under these guidelines only once within ten years (the 'one time, last time' principle). (Points 7 and 8 of the Draft Guidelines).

Under the Draft Guidelines, an undertaking is considered to be in difficulty when, without intervention by the state, it will almost certainly be condemned to going out of business in the short or medium term. In particular, it means that at least one of the following circumstances occurs: i) in the case of a limited liability company, where more than half of its subscribed share capital has been lost as a result of losses incurred, ii) in the case of a company where at least some shareholders have unlimited liability for the debts of the company, where more than half of its capital as shown in the financial statements has been lost as a result of losses incurred, iii) where the undertaking is subject to collective insolvency proceedings or fulfils the criteria under its domestic law for being placed in collective insolvency proceedings at the request of its creditors, iv) where the undertaking is rated the equivalent of CCC+ ('payment capacity is dependent upon sustained favourable conditions') or below by at least one registered credit rating agency, v) where: (1) the undertaking's book debt to equity ratio is greater than [7.5] [and]/[or] (2) the undertaking's [EBIT]/[EBITDA] interest coverage ratio has been below [1.0] for the past [two] years.¹⁸

¹⁵ The document is valid until 30 June 2014, and will be replaced by a new framework.

¹⁶ Adopted by the Commission on 9 April 2014 (not yet published).

¹⁷ The document will be replaced by the new guidelines.

¹⁸ These provisions shall be specified in the adopted document.

Where none of the circumstances applies, the Commission (and only the Commission) may exceptionally consider that an undertaking is in difficulty if there is evidence that without an intervention by the state, the undertaking will almost certainly be condemned to going out of business in the short or medium term.

Assistance referred to in the Draft Guidelines may not be granted to new businesses, i.e. during the first three years after the start of their activity.

The Draft Guidelines deal with three types of aid: rescue aid, restructuring aid and temporary restructuring support. Rescue aid is temporary in nature and is intended to enable an undertaking to survive for the time necessary to develop a restructuring plan or a liquidation plan. The aim of the restructuring aid is to restore the undertaking's ability to compete in the market on the basis of a restructuring plan, which should determine the causes of the difficulties, appropriate methods of their solutions, time, and budget restructuring, with the provision that state aid in the budget should be limited to the minimum necessary. *Temporary restructuring support is liquidity assistance designed to support the restructuring of an undertaking by providing the conditions needed for the beneficiary to design and implement appropriate action to restore its long-term viability. Temporary restructuring support may only be granted to SMEs* (point 30 of the Draft Guidelines).

As a rule, the rescue and restructuring aid cannot be given in each individual case without the consent of the Commission. Therefore, the Member States prior to awarding such aid are required to make the notification, but this rule does not apply to SMEs, for which the Member States may develop aid programmes.¹⁹ Approval of an aid programme on the part of the Commission in principle excludes the obligation to submit individual notifications for each case.

The Commission shall assess the admissibility of aid (its compatibility with the internal market) taking into account the following criteria:

- 1) Contribution to a well-defined objective of common interest. In relation to SMEs, the Commission expects to be shown that the disappearance of an undertaking would result in social hardship or market failure. In addition, the Commission expects that the restructuring plans will comprehensively address all the issues which are the source of problems²⁰ (in particular, the aid will not be solely focused on financial aid to offset losses), and ways to eliminate them through the necessary restructuring of every sphere of business. Restructuring plans must specify reliably expected effects of corrective actions,
- 2) The need to provide assistance. It is necessary to demonstrate that without such aid the objectives of common interest will not be achieved,
- 3) Relevance. Rescue aid must fulfil the following conditions: aid may be provided in strictly defined forms (loan guarantees or loans) as set out in the draft remuneration, and for a specified period of time (cf. point 57 of the Draft Guidelines). In the case of restructuring aid, the Member States are free to choose its form as long as the instrument chosen is appropriate to the issue that it is intended to address. In regard to the temporary restructuring support for SMEs, it may be limited to loans or loan guarantees for which level of remuneration should reflect the underlying creditworthiness of the beneficiary, and be provided for a limited time,
- 4) The incentive effect. It is necessary to demonstrate that in the absence of the aid, the beneficiary would have been restructured, sold or wound up in a way that would not have achieved the objective of common interest,
- 5) Proportionality. Rescue aid must be limited to the minimum necessary to keep the beneficiary in business for six months. The amount of rescue aid shall be determined by the formula set out in Annex 1 to the Draft Guidelines. The amount of restructuring aid should also be kept to a minimum, which shall be determined by the burden sharing formula²¹ or method of determining the extent to which the beneficiary should bear the restructuring costs. Temporary restructuring support must be restricted to the amount needed to keep the beneficiary in business for [12] [18] months.²² In determining that amount regard will be had to the outcome of the formula set out in Annex 1.
- 6) Avoidance of undue negative effects on competition and trade between the Member States. In this respect the Draft Guidelines provide that rescue, restructuring and temporary restructuring support should be granted in principle only in respect of a single restructuring action ('one time, last time' principle). Secondly, the Draft provides for the application of measures to limit distortions of competition: structural measures in the form of a sale of assets or reduction of production

¹⁹ A definition of what constitutes an aid programme can be found in Part VI.

²⁰ In the case of SMEs, the assessment of the circumstances remains at the discretion of the Member States. In other cases such assessment shall always be conducted by the Commission.

²¹ Currently, the Guidelines provide for two options for burden sharing: i) the amount of contribution to the restructuring shall be at least equal to the amount of aid, and the contribution made by the existing shareholders and creditors shall be justified in the light of any losses which they may have suffered in the event of insolvency. Under exceptional circumstances and in cases of particular hardship, the Commission may authorize a contribution which is lower than the amount of the aid, ii) the amount of contribution to the restructuring shall be at least 50% of the restructuring cost. In exceptional circumstances and in cases of particular hardship, the Commission may authorize a contribution that is less than 50% of the restructuring cost. Detailed terms and conditions associated with each of these options are set out in section 3.5.2 of the Guidelines.

²² As previously indicated, this condition shall be ultimately determined in the adopted guidelines.

capacity or market presence and behavioural measures, which aim to ensure that the aid is directed solely to finance long-term viability, as well as market opening measures.

Avoiding excessive negative effects of state aid also occurs through the application of the principle that where unlawful aid has previously been granted to an undertaking in difficulty in respect of which the Commission has adopted a negative decision with a recovery order, and where no such recovery has taken place, the assessment of any rescue aid, restructuring aid or temporary restructuring support to be granted to the same undertaking shall take into account, first, the cumulative effect of the old aid and of the new aid and, second, the fact that the old aid has not been repaid.

- 7) Transparency. The Member States must publish on a designated website information on notified aid programmes, including the granting authority, the form and amount per beneficiary and the principal economic sector.

In addition, with regard to SME programmes submitted to the Commission, the Member States should specify the maximum amount of aid that can be awarded to any undertaking as part of the activities of rescue aid, restructuring aid or temporary restructuring support. The maximum total amount of aid granted to any one undertaking may not be more than EUR 5 million, including any aid obtained from other sources or under other schemes.

Conditions for awarding rescue aid, restructuring and temporary restructuring support to SME's as well as the conditions for granting de minimis aid (including firms in difficulty) should allow the Member States to create more flexible than previously instruments to prevent bankruptcy in order to enable them to respond effectively to problems of undertakings whose continued operation is particularly important for socio-economic development.

The policies against bankrupt companies should therefore take into account the rules related to rescue aid, restructuring and temporary restructuring support for SME's, in particular the principle that the Commission may approve aid programmes that target SME's, but in relation to other undertakings it must make individual assessments of aid for each beneficiary.

It should also be noted that EU law lays down specific rules for awarding aid to sectors in which the prevailing business conditions justify a particular approach to the provision of aid. In this regard, the following documents have been adopted:

- Guidelines on state aid to airports and airlines (OJ C 99, 4.4.2014, p. 3),
- EU Guidelines on the application of state aid rules in relation to rapid deployment of broadband networks (OJ C 25, 26.1.2013, p. 1),
- Framework on state aid to shipbuilding (OJ C 364, 14.12.2011, p. 9),
- Communication from the Commission on the application, from 1 August 2013, of state aid rules in relation to support measures in favour of banks in the context of financial crisis ('Banking Communication'), (OJ C 216, 30.7.2013, p. 1),
- Guidelines on certain state aid measures in the context of the greenhouse gas emission allowance trading scheme post-2012 (OJ C 158, 5.6.2012, p. 4),
- Community guidelines on state aid to maritime transport (OJ C 13, 17.1.2004, p. 3),
- Communication from the Commission providing guidance on state aid complementary to Community funding for the launching of the motorways of the sea (OJ C 317, 12.12.2008, p. 10),
- Communication from the Commission providing guidance on state aid to ship management companies (OJ C 132, 11.6.2009, p. 6),
- Council Decision of 10 December 2010 on state aid to facilitate the closure of uncompetitive coal mines (OJ L 336, 21.12.2010, p. 24),
- Commission Notice on the application of competition rules to the postal sector and on the assessment of certain state measures relating to postal services (OJ C 39, 6.2.1998, p. 2),
- Community guidelines on state aid for railway undertakings (OJ C 184, 22.7.2008, p. 13),
- Council Regulation (EC) No 1370/2007 of the European Parliament and of the Council of 23 October 2007 on public passenger transport services by rail and road passenger transport services and repealing Council Regulation (EEC) No 1191/69 and (EEC) No 1107/70 (OJ L 315, 31.12.2007, p. 1).

In the context of policies aimed at preventing business failure of particular importance is the Communication on the application, from 1 August 2013, of state aid rules in relation to support measures in favour of banks in the context of financial crisis.

7.4. Structure and scale of state aid in Poland

Pursuant to Article 31 of the Procedural Issues Pertaining to Public Aid Act, the President of the UOKiK (Office for Competition and Consumer Protection, OCCP) monitors state aid granted in Poland²³ and prepares an annual report on the results of the process. The latest report pertains to 2012, while a separate report contains information on aid granted in 2012 under the de minimis rule.

²³ Monitoring state aid in agriculture falls under the responsibility of the Minister of Agriculture and Rural Development.

The total value of aid granted in Poland in 2012 amounted to 20 379.1²⁴ million PLN, which represented 1.28% of GDP.

In 2008–2012, the largest aid was granted in 2010 (24 087.3 million PLN, which represented 1.70% of GDP).

In 2012, rescue aid amounted to 401.2 million PLN, and restructuring aid totalled 17.7 million PLN, while de minimis aid was 4 329 PLN 5 million (0.27 % of GDP).

As far as policies against bankruptcy are concerned, it should be noted that currently in Poland there are no rescue or restructuring aid programmes targeted at SME's. It means that there is no systemic solution that would permit the state to intervene and help the above group of undertakings in difficulty.²⁵ It should be remembered, however, that the availability of rescue and restructuring aid constitutes an essential instrument for the prevention of bankruptcies.

Abbreviations

TFEU – Treaty on the Functioning of the European Union

The Commission – the European Commission

ECJ – The European Court of Justice

SPI – The Court of First Instance

EGC – The Court of the European Union

ECJ – The Court of Justice of the European Union

De minimis Regulation – No. 1407/2013 of 18 December 2013 on the application of Articles 107 and 108 of the Treaty on the Functioning of the European Union to de minimis aid (OJ. EU L 352, 24.12.2013, p.1)

Regional Guidelines – Guidelines on national regional aid for 2014–2020 (OJ. EU C 209, 23.7.2013, p.1)

Design Guidelines – Guidelines on state aid for rescuing and restructuring non-financial undertakings in difficulty²⁶

SME – small and medium-sized enterprises

²⁴ This amount does not include aid in the form of remuneration for Gdańsk Transport Company SA and for Autostrada Wielkopolska II SA. In its decisions on the compatibility of aid with the internal market, the Commission did not indicate the extent of remuneration that constituted state aid.

²⁵ It is possible that the lack of a rescue or restructuring aid programme for SME's reflects the policy of focusing exclusively on large firms that can actually affect the socio-economic development.

²⁶ http://ec.europa.eu/competition/consultations/2013_state_aid_rescue_restructuring/draft_guidelines_pl.pdf.

Part III

Models of the Rapid Response Instrument

Chapter 8

THE DESIGN PRINCIPLES OF EARLY WARNING AND RAPID RESPONSE SYSTEMS IN THE NON-FINANCIAL SECTOR

8.1. Introduction

Early warning, rapid alert, early response or rapid response systems are just some of the names given to mechanisms that serve to anticipate and prevent risks developed at the level of strategic management in a given country or their components within inter- and transnational systems. These names refer to diverse analytical and decision-making structures as well as formal organization which share common goals. Warning systems focus on prediction, whereas response systems concentrate on avoiding dangers and risks. An early identification and elimination of the causes of threats before they develop into full-scale crises or disasters is a doctrine on which various institutions of public governance are built. This way of thinking also incorporates the developments in science and technology enabling us to perform observations more effectively and limit the risks of uncertainty, instability and unpredictability occurring in the areas of the economy, society, policy and the environment.

Early warning and response systems usually include:

- Mechanisms to analyse the risk of occurrence of disruptions in national economies or in their sectors which justify the employment of specific preventive measures and assistance activities by the government and its agencies (early/rapid alert systems),
- Anticipatory research on the economic and financial condition of firms in order to diagnose the symptoms of their worsening standing, including the threat of bankruptcy, using discriminatory prediction models of such bankruptcy (early/rapid alert systems),
- Comprehensive systems providing proactive support to firms in financial distress, employees of such enterprises, usually taking into account assistance in the form of preparation and implementation of restructuring plans (early/rapid response systems),
- Warning systems against currency crises implemented by banks and financial institutions (early/ rapid alert systems),
- Hazard warning systems in international goods and services markets concerning e.g. dangerous food products, animal feed etc. (early/rapid alert systems),
- Early warning systems against natural disasters and catastrophic events including: air quality, fires in natural areas, nuclear and chemical accidents, geological hazards (earthquakes, tsunamis, volcanic eruptions, sinkholes, landslides), hydro-meteorological hazards (desertification, droughts, floods, impact of climate change, extreme weather conditions, storms, tropical cyclones), epidemics (early/rapid alert systems),
- Early warning/response systems to risks related to the political situation, security, the operation of educational systems, health care, communications, transportation and a number of others.

In this chapter we shall focus on early warning and rapid response systems used to anticipate and prevent threats to the economy.

8.2. An outline of the morphology of early warning systems

Contemporary economies are served by a number of early warning systems (EWS's) with differing characteristics and objectives (cf. e.g. Walas-Trębacz 2012). Nevertheless, they have some features in common, which shall be discussed below.

An outline of the structure of such a system is shown in Figure 8.1. It should be emphasized that this is a far-reaching simplification since they tend to be, in fact, quite complex structures. In particular, in our diagram most connections between the elements have been assumed to run one-way, whereas in reality they often are two-way ones. Moreover, in real EWS's certain direct relationships exist even among the majority of their component parts. It must also be remembered that the operation of such systems – especially in the social space – often requires multiple iterations of the procedures described here. In our discussion we do not differentiate¹ between EWS and RRS systems since, although we have simplified the subject matter somewhat, they can be assumed to differ mainly with respect to the scale of the reaction. After all, the operation of an EWS results in certain 'reactions,' occasionally involving only the transfer of information from the system to its stakeholders. Obviously in the case of RRS's the scope of such activities, their impacts and further procedures may be much more complex compared with the EWS's.

¹ Such differences, however, have been discussed in more detail in other sections.

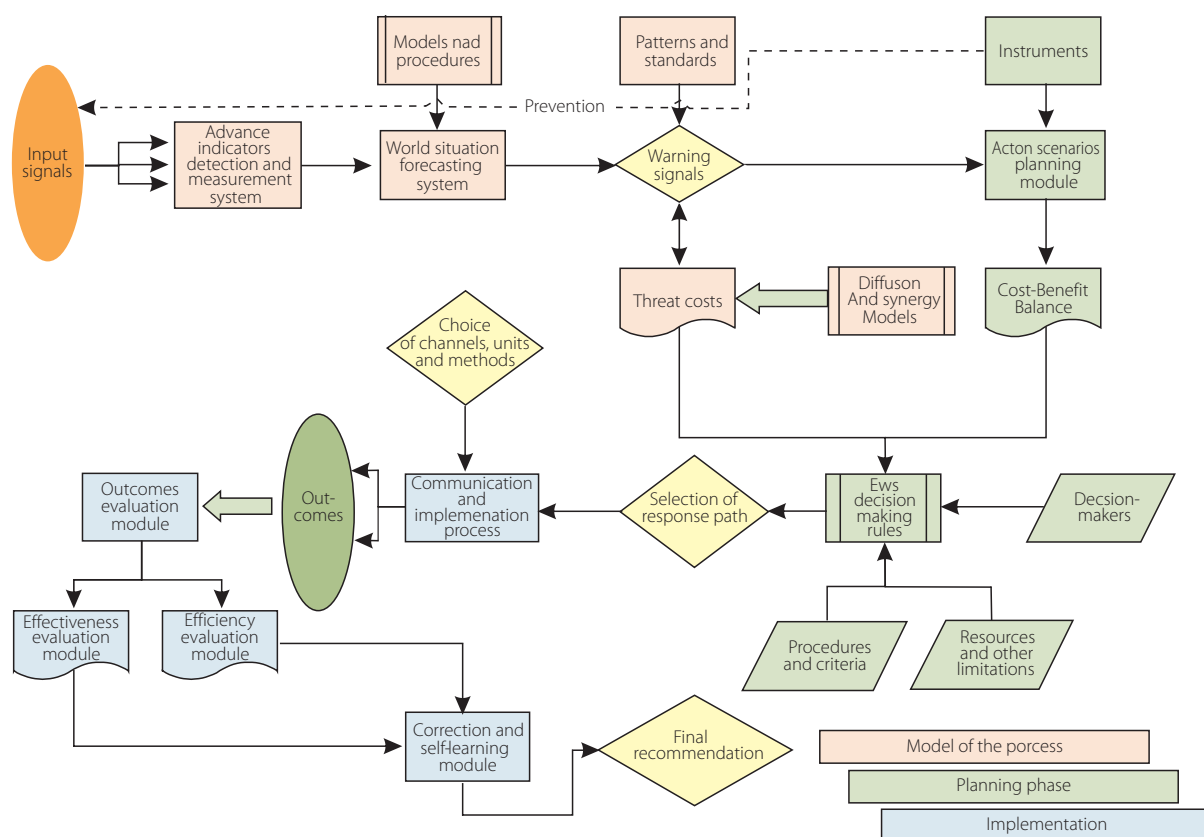


Fig. 8.1. A structural outline of an early warning/rapid response system (EWS/RRS)

Source: own study.

The first element of an EWS is a component that serves to detect and measure advance signals. It should be noted that the existence of such signals constitutes the necessary condition for the design of such a system. International experience shows that those signals include both macro- and microeconomic variables. Their list can be found e.g. in Report 2011 (Report 2011) and most of them are also analysed in the RRS. They must be strong enough to be measured and occur early enough to ensure that by activating the prognostic–decision-making procedures shown in the diagram above we can be reasonably certain that our actions stop or blunt the unfavourable course of events that would take place if the system was not used. In the context of this remark, particular attention should be paid to subsection 1.4 and Chapters 3, 10, 11, which characterize the forecast horizons and actions ensuring that the condition is met. Likewise, we can better realize the significance of problems inherent in the measurement of the phenomenon of bankruptcy and its attendant circumstances, including the prevalent economic conditions, to the design of EWS described in Chapter 3.

The next stage of EWS operation involves prognostic procedures, which, on the basis of the identified advance signals permit the identification of threats ahead of time. At this stage, a variety of tools may also be used such as formal statistical and econometric models, expert reviews, opinion surveys etc.

It should be emphasized, however, that the forecast of a future situation in no way constitutes a sufficient condition for triggering further actions on the part of the EWS or RRS in question. Such a decision can only be made if the presence of at least one of the circumstances is detected, i.e. the forecast diverges from a certain standard or model and/or a high social cost associated with the occurrence of such a situation.

Both above-mentioned criteria may be either complementary or substitutable. For example, we are often unable to calculate the costs (the magnitude of a threat) associated with certain future situations and remedial action is instituted only because we believe that they are unusual. Let us also note that the decision may be based both on models (i.e. normative elements) and on departures from conditions considered as typical. The latter element of an EWS is based on statistical regularities, and thus has strong empirical foundations.

As was shown in Chapter 4 in the case of our EWS, bankruptcy costs in Poland can be substantial. The system as such, in comparison with standards, is not very efficient. At the same time, the costs may arise in various areas of the economy and affect numerous elements of social structures.

In the discussion of the process of generating warning signals we must also mention another issue. In the process of cost examination, a very important role may be played by analyses of diffusion and synergies of threats. Naturally, one may imagine that such procedures belong to the module that forecasts a certain state of the world. In practice, this tends to be quite difficult. Usually, we can make best predictions about individual components of the system at an earlier stage. To that end, aggregation procedures are needed, which do not just 'add up' the individual threats. EWS have to deal with the problems of interdependence of threats. How seriously they may affect the state of the entire system in the event of bankruptcy was demonstrated in subsection 3.4.

The rules outlined above have also been subject to attempts at formalization, but they originally concerned natural disasters rather than disruptions in the operation of economic systems. A good illustration of such rules was offered e.g. by Grasso (2005), whose idea is reproduced below.

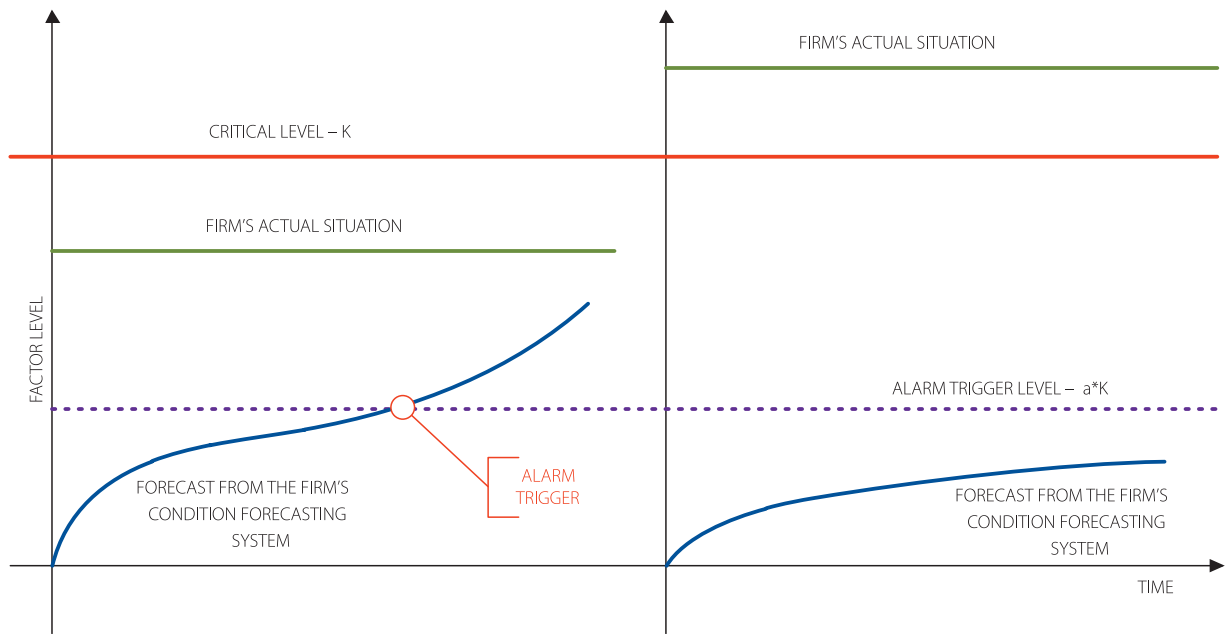


Fig. 8.2. Types of errors in early warning systems

Source: compilation based on: (Grasso 2005).

First of all, we must note that in the case of EWS's two types of erroneous decisions may be taken. Obviously, different rules may apply to alarm triggers and their deactivation, but it can be assumed that they are similar to the mechanism shown in Figure 8.2. Such steps are, in fact, taken if the projected state of the object exceeds a certain level of threat. First, a decision to initiate the programme to counter the threat may be taken in a situation in which it does not materialize. If the measure of threat is the condition of an object which is worse than a certain critical level K , the situation is illustrated in the left panel in Figure 8.2. The probability of occurrence of such an event – known as a false alarm – is represented by P_{FALSE} and is determined by formula (8.1).

$$\begin{cases} P_{FALSE} = \Pr[F < K | \tilde{F} \geq \alpha \cdot K] \\ P_{MISSED} = \Pr[F \geq K | \tilde{F} < \alpha \cdot K] \end{cases} \quad (8.1)$$

The opposite situation, presented in the right panel, may occur if the system does not signal the need for action when the state of the object turns out to be worse than the critical level K . This is the case of a hazard overlooked by the system whose probability is P_{MISSED} . One of the factors affecting the likelihood of occurrence such errors is the choice of the hazard level that triggers alarm activation.² The choice reflects an obvious dilemma – if the trigger level is low, the probability of P_{MISSED} is small. However, at the same time it increases the likelihood of generating false alarms. The issue of appropriate selection procedures for the activation of such a system is discussed in more detail in Chapter 12 devoted to the triggering mechanisms. Here we should only mention that it is particularly difficult in the case of EWS since such systems operate in a social environment in which a high incidence of false alarms would completely undermine confidence in such systems and thus the rationale for its existence. Moreover, in economics it is not always clear how to define the measured variable K and how to determine its critical level, especially in a situation of limited access to sufficiently long observation sequences to easily establish their distribution and to identify the areas of risk on their basis (cf. e.g. Bussiere and Fratzscher 2002).

² Here we have assumed that it is proportional to the magnitude of the critical state K , but other options are possible.

Each of the above-mentioned errors entails certain costs, but EWS's generate them even when they properly respond to threats. In the latter case, they are associated with the maintenance of the system in its standby mode. The matrix of these costs is shown below:

$$\begin{array}{cc}
 & F < K & F > K \\
 AKYW & C_{FA} & C_{GA} \\
 PASYW & C_{GM} & C_{MA}
 \end{array} \quad (8.2)$$

The rows in the matrix correspond to situation in which a decision was made within the system to take action (AKYW) or not to respond to the threat (PASYW). In turn, the first column ($F < K$) reflects a situation in which the magnitude of the threat does not justify the risks of taking action within a given EWS, whereas the second one deals with a situation that requires a response ($F > K$). The expected total costs of action in both cases are described by formulae (8.3) and (8.4):

$$E(C | AKYW) = C_{FA}P_{FALSE} + C_{GA}(1 - P_{FALSE}) = C_{FA}P_{FALSE} + (C_{BANK} - C_{OPOR})(1 - P_{FALSE}) \quad (8.3)$$

$$E(C | PASYW) = C_{GM}(1 - P_{MA}) + C_{MA}P_{MA} \cong C_{MA}P_{MA} \quad (8.4)$$

where C_{BANK} denotes costs associated with the bankruptcy of the entity in question (or a sector of industry or specific segments of the economy), C_{OPOR} – the benefits of avoiding risks, and P_{MA} – the probability of missing an actual threat by the system. The approximation which entails the relationship presented in (8.4) is the result of our assumption that the costs associated with system inactivity when it should not trigger any actions constitute standby costs and are insignificant.

On the basis of formulae (8.3) and (8.4) we can define the main condition for action within an EWS/ RRS based on the cost avoidance approach (cf. e.g. Klafft and Meissen 2011):

$$E(C | PASYW) > E(C | AKYW) \quad (8.5)$$

Owing to relationships (8.3) and (8.4), the inequality can be rewritten as:

$$C_{BANK} \cdot P_{MA} > (C_{OPOR} + C_{FA} - C_{BANK})P_{FALSE} + (C_{BANK} - C_{OPOR}) \quad (8.6)$$

From formula (8.6) it follows that one of its important elements is the quality of a given EWS expressed by both P_{MA} and P_{FALSE} , the costs of taking action in the event of a false alarm C_{FA} , as well as the benefits that the system affords in terms of avoiding threats – C_{OPOR} . Assuming that the above EWS/RRS parameters are appropriate, it directly follows from (8.6) that if bankruptcy is socially expensive, it is worth avoiding in a broad range of contexts (determined by the other components of the inequality). Incidentally, it shows the importance of the reflections on the proper design of decision-making rules for EWS/RRS systems contained in Part I of this book, especially Chapters 1, 2 and 4.

The stages in EWS operation described above result in the provision of information on the areas and magnitudes of threats. Let us then assume that after relevant analyses and tests have been completed, it was found that condition (8.5) holds, but at least³:

$$C_{OPOR} > C_{BANK} \quad (8.7)$$

Now, the EWS/RRS's initiate procedures known as the planning stage. The first element of the process constitutes an attempt to map out the instruments at the system's disposal over the area under threat. Let us make here a trivial, but important note that EWS/RRS's without instruments of action virtually turn into mock systems since they can do nothing to avoid or reduce the effects of a threat. The other important issue is that EWS instruments can either correct and compensate (i.e. by minimizing the effects of already present negative consequences) or prevent threats before they materialize (an action represented by the dashed line in Figure 8.2).

A technical solution of this problem is not easy, but in EWS/RRS's one of the 'canonical' approaches may include the so-called MIMC class models (see e.g. Rose and Spiegel 2009) in which the observed symptoms/costs of threat y_{ij} are modelled as a hidden function of the unobservable variable of the harmfulness of crisis ξ_i in a given area (sector, country etc.)⁴, where harmfulness itself is measured as a function of the observable causes and instruments 'w' affecting crisis $x_{i,w}$:

$$\begin{cases} y_{i,j} = \beta_j \xi_i + \varepsilon_i \\ \xi_i = \lambda_w x_{i,w} + \theta_i \end{cases} \quad (8.8)$$

³ In fact, verifying condition (8.5) requires analyses of the successive stages presented in Figure 19: the costs in matrix (8.2) depend, among other things, on the choice of instruments. Therefore Figure 8.2 is, in practice, as was already mentioned, a procedure that requires multiple iterations.

Hence, if we can assign specific instruments of action to identified threats, we can move on to the next stage: calculating the costs-benefits balance associated with their use. The costs of conducting specific activities within any EWS are in fact always present, even if it is only meant to convey warnings.

Such a cost-benefit balance of using specific tools should be compared with the costs to be incurred in the event of failure to pursue an active policy to prevent threats (see matrix 8.2). Obviously this does not involve a simple comparison of two numbers, but a complex procedure, which we have called the EWS decision-making rules. Whereas the previously described stages of EWS operation can be implemented by experts or even automatically, at this stage the need to involve stakeholders in the decision-making process is becoming clear. In calculating the final balance of the advisability of responding to threats they must be guided not only by a map of their goals and interests or consensus procedures in this respect, but also by the material resources and other constraints available in a given EWS. Let us emphasize that at this stage our system will often require the activation of links operating in the opposite direction. This may occur e.g. when the instruments selected at an earlier stage prove to be too costly or unacceptable by all stakeholders.

If the above process of analysing the costs and opportunities associated with the specific mode of conduct leads to positive results – to finding a path for EWS instruments – we may move on to the strategy implementation phase. It is a complex task, which, in the case of EWS, requires further specification of a number of components. It is vital to select communication strategies, target groups of activities, detailed courses of action etc.

This is an extremely subtle and important component of EWS from the vantage point of their effectiveness. Poorly targeted assistance only generates costs – both direct losses related to ineffective outlays and indirect ones. A system which does not warn in due time those who are actually in danger loses its credibility. In any EWS it is the confidence in the quality of its solutions that constitutes a prerequisite for its effective implementation. Hence the extensive discussion of the issues of communication and perception of this instrument as applicable to RRS's in Chapter 13.

The final components of an EWS are the performance evaluation modules complete with procedures for their correction and self-learning. Such an evaluation occurs along two dimensions – efficiency and effectiveness. In designing an EWS one needs to determine the reciprocal relationship between these two elements. In the case of bankruptcy it is particularly important, because, as we have shown in Chapter 1, a given bankruptcy system itself may be designed to achieve different objectives and in different ways. Very often the effectiveness of a given EWS requires efficiency as its prerequisite. An inefficient intervention system is characterized by low social credibility, which, in turn, may reduce its efficiency. Second, a very important element of all EWS's is the inclusion of self-correcting and self-learning procedures. These characteristics are highly desirable, especially in the prognostic section. Despite the dynamic development of methods of forecasting social and economic phenomena, the quality of predictions is still an area in which the learning processes, including those based on previous forecasting experience, significantly contributes to improving their quality.

8.3. Classification of early response systems

An early response system is defined as an institutionalized, public administration-based preventive mechanism aimed at providing support to enterprises in distress or employees of such enterprises triggered in response to perturbations in the economic cycle. Such a system comprises all activities undertaken from the moment an emergency situation is recognised (alert triggered by an early warning system), the specification of the scope of the intervention needed, the decision to start such an intervention, the intervention itself until the evaluation of its outcomes. The essence of an early intervention consists not only in a rapid implementation of pre-emptive activities but also – no less important – in achieving their objectives with maximum efficiency within a short span of time.

Early response systems originated in the 1970s and 1980s in the United States, where instruments offering comprehensive support to the employees of restructured enterprises especially in the heavy and automotive industries, came to be used more and more widely. The purpose of those solutions was to assist workers facing redundancy, companies and their closest business environment. The system comprised rapid response units equipped with pre-emptive action capacity. At the federal level, these mechanisms were sanctioned by the Worker Adjustment and Retraining Notification Act of 1989. Since then, numerous countries have built similar systems. The worldwide financial crisis, which started in 2007, made such systems even more popular and led to the intensification of further development of rapid response systems. With time, these systems have become the standard of good governance in economic policy.

Identification, analysis, but especially categorization and classification of early warning systems in the economy is beset by a number of limitations. Two of them appear to be the most important. First, such systems noticeably differ among one another

not only due to the fact that sometimes they perform other related functions beyond rapid response. Second, some of the early warning systems have names that do not directly correspond with their functions, which makes them difficult to recognize.

It should be emphasized that no universally accepted convention categorizing early response systems has been developed so far. The accomplishment of such a plan exceeds the scope of this book, we wish, however, to suggest a handful of criteria useful in developing a typology of early warning/rapid response systems (Table 8.1).

Table 8.1. The criteria for differentiating early warning systems in the economy

Criterion	RRS characteristics
1. Place occupied in the administrative system	– government, centralized – government, de–concentrated – decentralized – mixed
2. Compliance with the restructuring trends	– include basic restructuring trends – disregard restructuring trends
3. Notification about planned redundancies	– legal acts (usually labour market regulations) – judicial decision – collective bargaining – governed by customs – mixed
4. Jobs	– preservation of existing jobs – finding new jobs – creation of new jobs – mixed
5. Role of trade unions	– major – insignificant
6. Scale and scope of instruments used	– numerous and varied – few and uniform
7. Flexibility and innovation	– high – low

Source: own research.

Now let us analyse the position of these solutions within the administrative system. Early response systems are managed by central government administration or in a decentralized manner. Where the responsibility for rapid response rests with the government, such systems are directly subordinated to central authorities or their local representatives (a de-concentrated system). An alternative solution involves the development of early response systems at the level of decentralized administration. There are also mixed solutions in which the responsibilities rest both with the central government and decentralized administration. An example of a mixed system attached to central government structures and to de-concentrated administration is the British Rapid Response Service. In contrast, early response systems operating in the United States are essentially decentralized, managed at the level of state administration.

Today’s rapid response systems are expected to form part of the mainstream restructuring processes in enterprises. Currently used early response systems should therefore be consistent with the ongoing nature of such processes and operate on the assumption that they are carried out in multi-level arrangements and with the participation of numerous actors (European Restructuring 2010, p. 11).

Corporate restructuring is increasingly becoming a perpetual process. This involves the need to implement mechanisms for programming and overseeing changes in enterprises. These changes should, however, be programmed in a rational manner. Especially in large enterprises there exist certain individual cells that do not tolerate well excessive change since the quality of their performance requires stability over time. In some enterprises such cells include central management or production facilities, while in others they may comprise research centres or customer service. Early response systems should therefore take into account the limited utility of immediate remedial measures as long as they are targeted at segments of enterprises which prefer a short- or medium-term stability and inertia.

The effects of economic perturbations are observed primarily in individual enterprises or parts of large companies affected by the consequences of crises affecting local or supralocal markets. In contrast, due to the progressive intensification of cooperation among enterprises and the ties between the components of large companies and corporations, it is necessary for early response systems to be aware of the multi-level (local, regional, national and transnational) context of remedial actions which start at the local level. For example, possible interventions involving a manufacturing firm which belongs to a transnational corporation necessitate negotiations with its headquarters on the part of the institution that manages a given early intervention system.

Finally, restructuring processes have become an arena where, in addition to enterprises requiring support, there are a number of territorially-rooted actors. One may even go as far as to say that it is not an enterprise in distress but the territory within the range of impact of such an enterprise which has become the most important target of early interventions. Gone is the vision of corporate restructuring conducted at the affected enterprise's own expense as is the perception of corrective actions in enterprises only in economic terms. The reasons for this are fairly obvious. Problems of enterprises cause a range of social, economic, financial and environmental perturbations for the residents of a given territory, for the chain of local sub-contractors and affect local development at large. That is why rapid alert systems should allow local social and economic actors to be involved in the design and implementation of interventions.

Notification about the planned redundancies constitutes an important part of our considerations. Employers' obligations to notify public authorities of their intention to alter the employment structure differ by country.

Such obligations are laid down not only by relevant legislation that regulates the labour market, but also result from judicial decisions, collective bargaining and local customs. In practice, each early response system employs all the above mentioned ways to varying degrees and with varying intensity. Essentially, legal provisions dominate in continental European countries. The formula of collective bargaining has been extensively used in Sweden, in Germany and in the United States, while in Japan such issues are for the most part resolved by custom (Hurley, Mandl 2011, p. 16).

As a rule, notifications about planned layoffs are submitted to public authorities, trade unions and employees in advance of the deadlines stipulated by law or dictated by custom. In most cases the notification period is at least 30 days.

Most early response systems operating in continental European countries feature a strong orientation towards the preservation of existing jobs (e.g. Germany, France, and Austria). In these countries redundancies are considered justified only if all other methods of protecting jobs have proved to be ineffective.

Concerted efforts to preserve jobs are also evident in Japan, where extensive instrumentation to that end is used in the restructuring process. This logic derives from the belief that employment stability (or even lifelong employment) is the supreme value, which is rooted in Japanese culture and constitutes a natural duty of entrepreneurs.

The focus of the early response system in the United States is quite different. Despite the presence of legislation that is quite favourable to employees in terms of restructuring, corporate reorganisation is a much more frequent phenomenon than in Europe. Employers more readily use employment restructuring as a means of optimizing employment. In turn, public authorities more often implement measures aimed at creating new jobs rather than at the protection of existing ones (Evans-Klock, Kelly P, Richards, Vargha 1998).

The position of trade unions in early response systems varies considerably. In some of them (e.g. in Germany or France), the trade unions play an important role in determining the conditions of employment restructuring and the redundancy criteria ('socially fair' as provided by the German Protection against Redundancies Act). They are also extensively involved in the programming of pre-emptive actions involving training schemes aimed at the acquisition of new skills by employees who may need them in case they are made redundant.

In the United States, the position of trade unions in restructuring processes is less prominent. This does not mean, however, that employees are deprived of legal protection in the area of employment. On the one hand, such protection is provided by, among others, the collective bargaining formula. On the other hand, analysts note the increasing popularity of agreements made between employers and trade unions concerning 'pre-emptive' training aimed at developing the competencies and flexibility of employees in order to protect them from losing their jobs in the course of restructuring (a practice common in the automotive industry) (Evans-Klock Kelly P, Richards, Vargha 1998).

We shall now turn to the question of the scale and scope of application of the instruments used. From the perspective of early intervention, instruments to support restructuring can be divided by stage of their application:

- Pre-emption and prevention (before layoffs),
- Implementation of remedial activities in enterprises (after layoffs).

A survey conducted in 2011 by the European Foundation for the Improvement of Living and Working Conditions shows⁴ that the most frequently used pre-emptive and preventive instruments to support restructuring include: counselling (30% of the total), training (27%), other support for the SME sector (26%), information concerning the situation on the labour market (20%), access to funding (17%), supporting the growth of companies (17%), support for innovation (14%), internationalization activities (9%), territorial coordination (7%), and support for start-ups (5%). Less frequently used instruments include: attracting investment, pro-employment incentives, greater remuneration flexibility, needs analyses in the field of lifelong learning, financial support of employment in enterprises and increasing wage and working time flexibility (Hurley, Mandl 2011, p. 12).

⁴ The survey was conducted in 27 EU countries and in Norway.

Conversely, the most popular instruments in support of restructuring used at the stage of implementation of remedial measures include respectively: training (38% of the total), counselling (36%), benefits for employees (27%), job matching (23%), increasing working time flexibility (20%), support for start-ups (10 %), access to funding (11%) and pro-employment incentives (8 %). Other instruments play a smaller role in this respect.

In 2011, the following European countries had the most numerous and diverse support instruments: Belgium (35 instruments), France (25), Finland (24) Denmark (21) and Austria (19). Few instruments were available at the time in Romania (5 instruments), Slovakia (5) and Lithuania (6). Poland, with a 11 instruments identified in the survey, belonged to the group of countries using fewer support instruments (Hurley, Mandl 2011, p. 12).

The best contemporary early warning systems are characterized by flexibility and innovation. Flexibility means the ability to make changes in how the interventions already underway are being implemented, whereas innovation reflects their openness to non-routine, non-standard modes of action. Flexibility and innovation relate both to the instruments used in the restructuring process and to the procedures for their implementation.

Examples of innovation include employee pooling, communication plans and pro-employment employee innovation. Employee pooling comprises agreements among enterprises under which they jointly employ their staff and jointly cover the employment costs. Such pools are created mainly when companies need small quantities of specific, specialist labour and the demand for specific jobs in individual enterprises is cyclical. Employee pooling is popular, among others, in France, Germany, the Netherlands and Belgium.

Communication plans include detailed communication programmes to notify about planned redundancies, whose implementation reduces the social impact of such actions. Communication plans are already used in many countries, but Spanish and British solutions are considered to be particularly interesting.

Pro-employment employee innovation, in turn, comprises incentives meant to encourage employees to seek and report ways to prevent loss of jobs or to create new ones in their enterprises. Such mechanisms are used, among others, in Denmark and Germany (Hurley, Mandl 2011, pp. 202, 232, 278).

Early warning systems are subject to ongoing development, adaption to changing expectations and economic change. Characteristically, such systems evolve towards increasing the role of enterprises in the early response process. These trends partly explain the influence of ethical action models derived from the mainstream of corporate social responsibility. Enterprises not only assume a passive role by submitting to streamlining employment as recommended by public services, but also become the originators and leaders of early intervention, e.g. in the process of building local partnerships for employment or, in the case of corporations, by initiating transnational agreements.⁵

8.4. Rapid response systems vs. early warning systems

the operation of early warning systems entails the capacity to intervene once certain conditions have been met. In the vast majority of early warning systems, signals that trigger interventions come directly from companies concerning impending difficulties. This is usually done through the mandatory filling and submission of forms specifying planned redundancies. Thus, early warning interventions in such cases are implemented in companies which have both indicated their difficulties, and at the same time meet the criteria for support (e.g. minimum number of planned layoffs). This kind of relationship between early warning and early response systems is illustrated in the first quadrant of Table 8.2 (Decentralized EWS and RRS).

Table 8.2. Types of model relationships between early warning and rapid response systems

		Early Response System	
		decentralized	centralized
Early Warning System	decentralized	• Source of signals about threats – enterprises • Intervention targets – enterprise and employees	• Source of signals about threats – enterprises • Intervention targets – economy, sectors of economy
	centralized	• Source of signals about threats – economy, sectors of economy (macro- or microeconomic data) • Intervention targets – enterprise and employees	• Source of signals about threats – economy, sectors of economy (macro- or microeconomic data) • Intervention targets – economy, sectors of economy

⁵ Such initiatives were implemented e.g. by Vauxhall in England, European plants owned by Ford and Schneider Electric headquartered in France.

The Rapid Response Instrument developed in Poland involves the integration of a centralized early warning system (macro- and microeconomic data) with the intervention of an early response system undertaken in a decentralized manner, i.e. one that targets specific companies. The strength of such an approach lies in the availability of aggregated knowledge about a given situation in the economy and its sectors, on the basis of which a decision is made to start an intervention and determine its objectives (the so-called starting mechanism). A weaker spot in such an approach is, however, the inertia of the early response system. Firms in distress do not receive support until at least several dozen days have passed.

According to the matrix, two other kinds of model relationships between early warning and early response systems can be distinguished. In the first one, information about the threats come directly from enterprises (decentralized EWS's), while interventions are directed towards the economy as a whole or its sectors (centralized RRS's). In the second one, information about the threats come from data on the economy and its sectors (centralized EWS's), and interventions are also directed towards the economy or its sectors (centralized RRS's). It means, however, that the response occurs at the level of economic policy whose effects are naturally delayed in time and less appropriate than individual aid. For that reason, the objectives of the previous two kinds of response should involve making rapid changes in economic conditions rather than rapid interventions on the labour market and in enterprises in distress.

8.5. Conditions for an effective implementation of early warning systems

The results of analysis of international experience enable us to identify the general conditions affecting the effectiveness of RRS. These conditions, to some extent, are universal and, as such, appear in various early warning systems.

First, an RRS must be holistic, which means that it is capable of performing three mutually complementary functions:

- a) Programming – the design of public aid packages for restructuring actions to mitigate/eliminate the risk of bankruptcy and loss of jobs,
- b) Implementation – implementation of the aid packages aimed at supporting the restructuring measures to mitigate/eliminate the risk of bankruptcy and loss of jobs,
- c) Evaluation – of the effects of public aid in support of the restructuring measures designed to reduce/eliminate the risk of bankruptcy and loss of jobs.⁶

Second, an RRS must be dynamic in nature. In this context, the term means both the capacity to quickly take pre-emptive action based on the information coming from an early warning system and flexibility of such action (it should be founded on a wide range of different instruments to facilitate rapid response appropriate to the situation). The dynamic nature of an RRS is its ability to learn and adapt in response to broader economic and social changes in the environment in which the system operates.

Third, an RRS must be transparent. In particular, it is important to provide a specific and clear division of powers and responsibilities of its participants and assign appropriate roles to them (strategic, concerted action, coordination, implementation, monitoring). It is also important to provide clear rules and mechanisms of communication within the RRS and between it and its environment.

Fourth, an RRS should be hybrid in nature. On the one hand, it should be characterized by a fairly high degree of centralization (in the sphere of strategic decisions on the scope and form of support provided to certain sectors of the economy and monitoring the overall health of the economy). On the other hand, it should be decentralized and based on local knowledge (in the field of recognition of specific needs and targeting appropriate implementation activities).

Fifth, an RRS must be based on the logic of network interoperability. In such a system, it is essential to ensure interaction among central government and its agencies, regional and local structures of territorial government, businesses, employers' organizations, trade unions and organizations offering appropriate training and consultancy services. Each of those entities has the resources (power, knowledge, financial resources, information, processing potential etc.) without the integration of which it is impossible to achieve the objectives for which an RRS was established.

Sixth, an RRS must be capable of systemic learning and evolution. This implies the need for regular evaluations of the outcomes of the measures implemented under the system and for the subsequent modification of its mechanisms based on the results of such evaluations. In this case, it is advisable pursue the approach known as evidence-based policy.

Seventh, an RRS must be credible. Its credibility is verified by the promptness of its interventions, their relevance to the needs of entrepreneurs and their employees in addition to low transaction costs of using its services.

⁶ A function complementary to the three listed here is the monitoring function. It is attributed to an early warning system and its purpose is to study the economic and financial situation of enterprises in order to assess their condition and identify phenomena that may point to its significant deterioration (early warning) as well as monitoring the state of the economy as a whole.

Chapter 9

RAPID RESPONSE SYSTEMS – INTERNATIONAL EXPERIENCE

9.1 Introduction

This chapter outlines the objectives and structures of rapid response systems (RRS) operating in the United Kingdom and in the United States. These systems constitute crucial elements in the portfolio of state interventions aimed at reducing the negative consequences of the economic cycle. Their anticipatory nature helps to avoid the high economic and social costs, which inevitably arise if interventions are initiated after the fact. An RRS is an exponent of mature, anticipatory impacts on the changing economic conditions and their consequences, in particular for the labour market. They provide a form of aid to enterprises and their employees affected by economic downturns and global financial crises. The aid is meant mainly to support the restructuring process.

This chapter begins with a discussion of the British experience of RRS and then presents an overview of similar solutions used in the United States. The analysis covers the objectives of such systems, their components and mechanisms. In conclusion, a synthetic assessment of the utility of these RRS is provided.

RRS descriptions in this chapter are, to a certain degree, fragmentary. This is due to two main reasons. First, the RRS's only to some extent assume the form of a system in the classical sense of the term. Often they comprise sets of solutions which facilitate immediate reaction to economic processes and, as such, they are implemented without an overall plan for state intervention in the economic sphere. Second, the literature lacks studies which would address the matter at hand in a holistic manner.

Another issue dealt with in this chapter concerns the question of evaluating the effectiveness of RRS with a special focus on the identification of the key factors that influence the utility of these systems. These include reliability, speed, sensitivity, specificity, transparency and communication.

Conclusions and recommendations for Poland based on the foregoing review make up the final part of this chapter.

9.2. The Rapid response service in the United Kingdom

The early warning system operating in the United Kingdom, called Rapid Response Service (RRS), deserves special attention among the European solutions of its kind. It is offered and managed by Jobcentre Plus, an executive agency of the Department for Work and Pensions specializing in labour market services.

Jobcentre Plus is a network of agencies operating throughout the country that offers comprehensive support services ranging from job search to the disbursement of benefits. Its business profile reflects its mission 'work for those who can, security for those who cannot'. The key objective of Jobcentre Plus is to prepare the recipients of its services to compete for existing jobs and to prevent long-term unemployment. The agency's activities focus on improving job search strategies and on increasing employability especially of those whose labour market situation is difficult for various reasons. The agency is also committed to promoting co-operation among public sector, market-based and non-government entities in order to improve its performance in terms of achieving its objectives.

The Rapid Response Service was launched by Jobcentre Plus in April 2002.¹ It was one of the activities undertaken as part of Welfare-to-Work labour market reforms implemented by Tony Blair's Cabinet. Apart from the establishment of the RRS, the reform included decentralization of employment services, introduction of the minimum wage and linking welfare benefits with an active job search. As part of the policy, active job search instruments were integrated with welfare support tools (Evans, Millar 2006, p. 62–63).

The RRS is designed to help entrepreneurs planning collective redundancies, and through them, their employees affected, who are the main recipients of support. The most important goal and priority of the service is to quickly step into action in order to help the largest number of employees to find a new job before they lose their current one. The scope of assistance offered to redundant workers by the RRS is quite broad. In addition to basic forms of support, the RRS offers services which are rarely available to people who look for jobs in the traditional way. This testifies to the actual primacy of policies to prevent the loss of jobs over the other pro-employment solutions.

¹ Certain elements of the service were offered before 2002 under the name of the Rapid Response Fund (RRF).

In order to fully understand the operation of the RRS mechanism, we shall now review the stages that precede the actual initiation of the service. The path involves the following steps:

- Notification of planned redundancies by a firm,
- Consultations on the scale and principles of planned redundancies,
- Contact of Jobcentre Plus consultants with the employer to determine the scope of the RRS to be implemented,
- The RRS steps into action.

The obligation to report anticipated redundancies in a firm rests with the employer. Such notification is made using the advance notification of redundancies (HR1 form). The requirement applies to planned redundancies involving 20 or more employees at one establishment within a period of 3 months. The completed forms are submitted to the Department for Business, Information and Skills. Then the data concerning planned redundancies are sent to an institution called Insolvency Service² and then to Regional Development Agencies³ and local Jobcentre Plus branches. (Jefferys, Clark 2009, p. 19).

According to the provisions of the Trade Union and Labour Relations Act, the notification of planned redundancies is followed by consultations with the affected employees.⁴ They are held in order to explore the possibilities of preventing layoffs, and if this is not possible, to minimize their effects.

The employer who intends to proceed with collective redundancies is obliged to consult the plan with representatives of employees affected by his action. If the employees belong to a trade union, the employer is also obliged to consult the planned redundancies with the relevant unions. If no trade unions⁵ are active in the firm in question, such consultations are carried out directly with the representatives of the affected workers.

Consultations must take place before the formal notification of employees of dismissals. When the planned staff reduction affects 20 to 99 people, the consultation should begin at least 30 days before issuing the first dismissal notice. In the case of 100 or more redundancies, consultations shall begin at least 45 days before issuing the first dismissal notice.

For consultation purposes, employers are obliged to provide information on the reasons of the planned reduction in employment, the number and characteristics of employees expected to be dismissed, the method for selecting employees for dismissal, the dismissal procedure and the amount of severance pay if it is governed by other than statutory regulations. The main purpose of such consultations is to determine ways to avoid redundancies, reduce their scale or mitigate their effects. The regulations stipulate that the consultations should be genuine and conducted with a view to reaching an agreement between the employer and the representatives of employees.

During the consultations, a number of solutions are being considered that can prevent the forced redundancies. They include finding employees who are willing to voluntarily become redundant or accept a shorter working time, early retirement, dismissal of self-employed staff or temporary employees, restriction or abandonment of overtime, withholding hiring new staff, filling vacancies with staff already employed by the firm, reduction in the working time, temporary reduction of salaries, temporary leaves and suggestion of employment in a different position.

In the event of bankruptcy of an entrepreneur, a specialized government agency enters the scene. It takes over part of the company's financial obligations to its employees. For example, the Service disburses allowances to temporarily unemployed people (e.g. on maternity leaves), money equivalents for unused vacation, compensation for unfair dismissal and statutory severance pursuant to court decisions (Jefferys, Clark 2009, p. 12–14).

If the results of consultations with employees to be made redundant or trade unions have verified that dismissals are inevitable, regional centres of Jobcentre Plus intervene. The centres employ RRS managers whose duties involve accepting, giving opinions and processing aid applications and the coordination of actions undertaken by the administration and its partners. The basic condition for receiving aid by a firm under the RRS involves its planned downsizing that may cause or worsen the situation on the local labour market. Managers of local Jobcentre Plus centres are authorized to assess the scale of such risk and enjoy a considerable autonomy in this respect.

The provision of RRS services begins even before actual dismissals take place. RRS managers liaise with the employer and agree on the type and scope of assistance. If the offer is accepted, aid specialists visit the firm in order to detail the scope of the service offered (Jefferys, Clark 2009, p. 23). If, however, dismissals have already started, eligible persons receive assistance under the RRS for a period up to 13 weeks from the time of dismissal (Robinson 2009, p. 5).

² A government executive agency which specializes in investigating the issues of bankruptcy and financial distress in the economy. It deals with, among others, improving bankruptcy laws, limiting barriers to its use and the promotion of effective bankruptcy procedures. The British Insolvency Service has 35 branches throughout the country.

³ Government agencies responsible for supporting economic development and investment, enterprise development and economic competitiveness, promote employment and improve professional competence at regional level.

⁴ The consultations are conducted under Part IV of the Trade Union and Labour Relations Act of 1992.

⁵ In 2009, it applied to ca. 73 % of firms.

State support under the RRS scheme is extended to all employees at risk of losing their jobs and includes, in particular:

- Those under threat of redundancy, but still employed,
- Those under notice of redundancy, but still employed,
- Those who lose their jobs in companies which are in the supply chain of a larger company making redundancies,
- Those who lose their job in a locality designated as having RRS status by the Jobcentre Plus District Manager or Customer Services Director. (Provider Guidance, 2010).

The Rapid Response Service has been designed as a flexible tool. In practice, it means that the inventory of services provided by it is unlimited. As a rule, RRS support the process of managing redundancies in firms and help employees about to lose their job primarily through a wide range of professional counselling. The process includes providing information on available forms of support, welfare benefits and pensions, self-employment counselling, assistance in the preparation of CVs, cover letters, job interviews and job search.

The fundamental element of the package offered by the RRS to employees is a high-quality personalized analysis of skills and competencies (Skills Transfer Analysis). It helps to determine to what extent the existing employee qualifications meet the needs of local labour markets and to identify the skills to be acquired, which are likely to improve the competitiveness of people losing their jobs. If the results of the analysis indicate the existence of skills gaps, the RRS framework offers access to training and education programmes (Job Focused Training). Measures enacted under such programmes may involve retraining, but only if there is excess demand over supply of skilled employees on a given market. The vocational training offered allows those interested, among others, to obtain skills certificates which are not subject to confirmation by other official documents.

Eligible people may also be granted financial support in the form of travel expenses (to work) and to overcome other barriers to obtaining gainful employment, such as the purchase of specialist tools or clothing. Funds for these purposes come from a separate operational fund (the Action Fund). If, however, the existing forms of support prove to be insufficient, in accordance with the principle of openness and flexibility of RRS, special solutions may be applied which are offered or designed with the participation of the Specific Programme Support Centre.

On the premises of firms planning a significant reduction in employment an ad hoc consultancy and job centre can be established, which in the case of shift work, may be active up to 24 hours a day (Provider Guidance 2010, p. 9–13, Robinson 2009, p. 3).

Since its launch, the budget of the Rapid Response Service has steadily grown. The highest growth rate was noted in 2007–2010. In the 2007–2008 fiscal year, its budget totalled 3 million pounds to double only a year later and in the 2009–2010 fiscal year it amounted to 12 million pounds (Jefferys, Clark 2009, p. 24).

The overall conclusion is that after more than 10 years of its operation UK's Rapid Response Service constitutes a useful tool that has lived up to the hopes of its creators. The most immediate and tangible results of the existence of the RRS is its real impact on reducing the number of jobs lost and prevention of the dangerous and costly labour market phenomenon of long-term unemployment.

The Rapid Response Service has also become an important source of strategic change for the economy as a whole. More and more stakeholders in economic policy believe in the desirability of anticipatory approaches and tools, aimed at preventing and reducing the negative consequences of economic turmoil. The Rapid Response Service is also subject to constant evolution and development. For several years, a considerable emphasis has been placed on building the right atmosphere and the formation of a mature relationship between employers and employees of enterprises undergoing restructuring. New elements of RRS's procedures already contain a number of mechanisms reflecting innovative developments in governance and management psychology. They consist, for example, in encouraging employers to pay attention not only to economic but also to emotional aspects of job cuts, taking notice of the moods and feelings of the affected workers, giving them support in finding new employment, demonstrating concern for their present and future, ensuring proper communication with the public, trade unions and other external stakeholders as well as preventing emotional isolation of the affected workers. RRS's procedures attempt to support the employees of restructured enterprises. This involves the dissemination of information about new opportunities involving employment change, consideration for the interests and general well-being of employees and the local community, stimulating participation in managing the restructuring process, which basically aims to allay the fears and reduce uncertainty of staff (How to manage 2013, p. 29–31). The system's flexible procedures, but above all, its evolution dynamics consistent with the rhythm of social and economic change, makes the British rapid response system all the more remarkable for those who wish to develop similar systems at home.

9.3. The early response system in the United States

The history of efforts to build an early response system (ERS) in the US economy dates back to the 1950s. The efforts intensified in the 1970s and the 1980s due to the restructuring of heavy and automotive industries, which led to a marked increase in the number of redundancies. In order to prevent increased unemployment, instruments aimed at both protecting jobs and reallocation of resources and labour were used.

An important step in the development of an RRS in the United States was the Trade Act of 1974. It imposed, among others, on companies planning to relocate their activities outside the United States an obligation to deliver prior notification of such an intention. This information was to be communicated to the employees concerned and the Secretaries of Labour and Commerce. Implementation of the Act's provisions was accompanied by much controversy and concern, of which the key ones involved the introduction of inefficient and bureaucratic mechanisms in the US labour market (Levine 2007).

Another important stage in the development of RRS's solutions came with the passage of the Worker Adjustment and Retraining Notification Act of 1989.⁶ It imposed on employers with over a hundred people, among other things, the obligation to inform about planned redundancies (involving more than fifty people) or about a planned closure of a firm the following entities: the employees, the state rapid response unit and the local government. It was decided that such information should be provided at least sixty days before the planned action. This Act constitutes the core of the rapid response system by mandating early notification of problems and the planned solutions, which offered specialized public institutions an opportunity to take pre-emptive action.

The principles of interaction between businesses and public authorities, as provided by the Worker Adjustment and Retraining Notification Act, have been further elaborated in the documents adopted by the state authorities. As a rule, they clarify and often introduce stricter notification criteria related to the provision of information concerning planned redundancies.

In the Employer's Guide prepared by the Department of Labour, the solutions contained in the Worker Adjustment and Retraining Notification Act was summarized as follows: 'In our dynamic economy, many companies are streamlining their operations to maintain a competitive position in the marketplace. Although such actions can help your company become more efficient, this may result in the elimination of existing jobs and facilities. In 1988, Congress passed the Worker Adjustment and Retraining Notification (WARN) Act to provide workers with sufficient time to prepare for the transition between the jobs they currently hold and new jobs. This transition may involve the provision of information about where new jobs may be found, or it may involve providing workers with other employment or retraining opportunities before they lose their jobs.'⁷

The next step in the process of building the RRS was the Economic Dislocation and Worker Adjustment Assistance Act adopted in 1988. It imposed on state authorities the obligation to establish specially designated units to aid employees changing their place of work, within which rapid response units were to be organized (Salzman, 2009).

Experience with the operation of the RRS in the 1980s and the 1990s showed its fragmentation, low coordination potential and redundancy of adopted measures. Those critical insights led to the adoption of the Workforce Investment Act in 1998. Its key feature constituted the establishment of rapid response units (RRU) by state administrations. Their range of activities includes:

- Conducting on-site visits (immediately after receiving information about planned redundancies) in order to assess the scale of redundancies, the possibility of avoiding them, alternatives, potential needs in terms of retraining, job opportunities on the local labour market and available resources,
- Informing redundant employees about the range of services that they can use, including unemployment insurance, employment centres and integrated assistance offered by Trade Adjustment Assistance/NAFTA – Transitional Assistance programme, providing financial support to employers affected by importer competition,
- Setting up local committees to implement strategies aimed at assisting the employees of firms in difficulty,
- Supporting local administration in solving current problems and helping create comprehensive strategies for solving problems related to the layoffs (including the application for a special federal grant called the National Emergency Grant).

In addition, the RRU – as part of state administration – can perform additional tasks, including:

1. Together with other public entities, employers' organizations and trade associations they may develop labour market intervention strategies in the context of rising unemployment risks, create programmes to discourage the use of redundancies, develop instruments to exchange information concerning the plans of liquidation of enterprises or tools available to help workers at risk of redundancy.
2. Together with the competent state authorities, they may collect and analyse information related to the disturbing phenomena that occur on the labour market, with a particular emphasis on layoffs and plant closure, as well as aggregate information

⁶ Its adoption, as was the case with the Trade Act, was accompanied by concerns about the US labour market losing its flexibility, poorer economic growth and a reduced job creation capacity (Addison, Blackburn in 1994).

⁷ The Worker Adjustment and Retraining Notification (WARN) Act, Employer's Guide to Advance Notice of Closings and Layoffs, United States of Department of Labor, July 2003.

in order to create the basis for effective management of the rapid response programme, as well as develop control and evaluation tools for such programmes.

3. Engage in educational activities to improve the quality of assistance to workers affected by redundancies.
4. Participate in the preparation and implementation of strategies for:
 - The prevention of collective redundancies (including the funding of studies of the possibilities of restructuring affected firms or their acquisition by other operators, including the its employees),
 - Retraining,
 - The provision of loans to workers with a view to improving their qualifications.

The Workforce Investment Act specifies the sequences of actions within the early response system. They consist of:

- I. The diagnosis: an analysis based on the data on planned redundancies provided by firms, the second information channel makes use of the results of labour market research (and the economy as a whole) in the following respects:
 - Analysis and evaluation of the impact of disturbances caused by the financial and economic turbulence on the labour market. The aim of the analysis is to identify the vulnerable sectors of the economy and to ensure the access of state and local administration to the necessary information in order to take action to reduce the threat of company failure,
 - Evaluation of regional and national economy in order to identify opportunities to offset job losses in other industries and/or in other areas,
 - Devising employee competence profiles in order to assess their chances of finding another job in the region,
 - Opportunities to provide education and training services in the regions for people at risk of losing their jobs.
- II. Impact assessment of the effects of a given company's failure on the labour market using an econometric model. The model is based on input-output analysis and, once certain assumptions have been adopted, allows for an assessment of the impact on a given region's economy of the elimination of a certain number of jobs in specific firms. The impact is measured in terms of lost jobs and declining revenues. This enables the administration to perform a cost-benefit analysis of individual policy options. The model is supplemented with information from the employers affected by the financial and economic disruption (e.g. wage levels, lists of suppliers).
- III. Analysis and evaluation of the regional economy in order to identify employment opportunities in other sectors of the economy, it being understood that such action will strengthen the regional economy and protect it against new disruptions. The likelihood of finding an alternative that meets all of these criteria is low, but the extent to which they are fulfilled determines the possible options. The first stage involves the search for companies in the same or a related industry to the one in which the failing firm operates, which narrows down the scope of the necessary adaptation action. If, however, the difficulties affect the entire sector of industry, efforts should be redirected to other, more promising sectors. In order to minimize retraining costs, industries which employ workers with similar skills are sought (an analysis of key professional groups in the liquidated company is followed by application of the industry–occupation matrix). An inputs–results model may help in the search for industries complementary to the regional structure of the economy.
- IV. Profiling employees with respect to their profession. In order to provide effective assistance to workers at risk of redundancy, the analysis includes the following data: employment history, education, skills and qualifications, individual preferences, readiness to change their place of residence etc. Understanding the structure of employment of those at risk of redundancy according to the SOC (Standard Occupational Classification) system allows for the identification of industries capable of hiring laid-off workers with minimal retraining. Statistical data collected allows for an assessment where in the state or neighbouring states selected industries are represented, and subsequently, based on the NAICS (North American Industry Classification System) statistical register specific employers, potentially interested in employing workers can be chosen using the available databases such as infoUSA.
- V. Profiling employee qualifications in terms of employers' expectations. The simplest method is to identify the skills required to perform a specific job based on the SOC-O*NET model that contains 6 major domains of information (employee profile, expectation of employees including skills and education, professional experience, specific job position and its attributes, characteristics of the position from the point of view of the parameters of the labour market and the social and cultural context of the job). Similarities in terms of the above-mentioned attributes help in the identification of professions that require the least outlay on training. Likewise, employees themselves may individually use the job evaluation tests in order to develop a list of related occupations for which they could be retrained.
- VI. Diagnosis of training opportunities at post-secondary level. Preliminary testing can be performed using the IPEDS (Integrated Post-Secondary Education Data System) database maintained by the Department of Education's National Centre for Education Statistics, to which all post-secondary schools submit mandatory reports. The identification of opportunities in a given area may include the currently available programmes and their training opportunities as well as the prospects for the implementation of new programmes tailored to the needs of workers and employers. Where employees may have trouble finding a job corresponding to their experience and skills, the key measures include vocational training and the use of rapid response instruments.

The advantage of the Workforce Investment Act is that it lays down the rules for the implementation of human resource development programmes focused on workers. All investment in human capital should meet the following requirements:

1. Training, educational and employment services should lead to the creation of quality jobs that guarantee the maintenance of stable families and local community development.
2. The services should be administered by public institutions that provide fair and equal access to all employees.
3. They should be used to reduce the existing income gap in the economy, while creating conditions conducive to the implementation of career paths through access to better paid and more skilled professional jobs.
4. Educational services in the field of vocational retraining and reintegration offered to adult workers should guarantee long-term improvement in career opportunities and earnings.
5. Support provided to young people should be based on guidance from adults. In addition, it is necessary to create conditions conducive to the acquisition of academic knowledge and professional experience by young people that foster their development, and not constitute a tool to delay their entry in the job market.
6. Services should be delivered in an environment where the workers in need occupy a central place, and their rights, dignity and privacy are fully respected.
7. Users of the service should be informed of the employee rights in the workplace and other instruments of legal protection such as the Fair Labour Standards Act, the Occupational Health & Safety Act, the National Labour Relations Act and the Civil Rights Act.
8. Providers of the services should respect and uphold the principle of participation of all stakeholders – employees, employers, educational institutions and training local organizations both in the course of preparation of programmes and in the delivery of services.

In order to ensure effective implementation of the solutions contained in the Workforce Investment Act, the Department of Labour established working groups, including the National Rapid Response Group. Its role is to provide support as well as to coordinate the components of the rapid response system in the US economy (Salzman 2009).

In summary, the legislation governing the operation of US companies provides a set of tools which aim to provide systemic support to employees facing the risk of redundancy. The legislation has allowed for the establishment of a comprehensive RRS. Its effectiveness is ensured by advanced research tools and procedures for data transmission, legitimacy provided by the legal system, efficient coordination mechanisms and the capacity to utilize experience accumulated thanks to its previous actions. This system has a strong institutional legitimacy in the form of Rapid Response Units, whose activity allows for multi-faceted impacts as well as pre-emptive and effective response to emerging issues.

9.4. Conclusions and recommendations for Poland

The results of research and analyses can be combined to provide six key recommendations, which, in our opinion, should be taken into consideration when developing a RRI in Poland. They include the following:

1. The RRI should be based on the assumption that it is only authorized to counter negative changes in the economy caused by periodic fluctuations and economic downturns. Such a system should not be used to respond to structural changes in the economy.
2. Actions and measures contained in a RRI are subject to a number of well-defined conditions. While avoiding excessive intervention of state aid in market economy mechanisms, they should also contain safeguards against abuse by individual firms.
3. The planned RRI include three components:
 - (I) Programming,
 - (II) Implementation,
 - (III) Evaluation.
 - (I) The aims of the programming component should be to formulate recommendations for public policies, to prepare policy plans for the purposes of the decision-making process and to design support instruments.
 - (II) The implementation component should serve to execute public interventions relevant to the diagnosis of risks and to carry out actions in support of restructuring firms in difficulty. The potential range of tools available to public authorities in this regard is quite broad. The implementation tools most relevant to the current economic situation include:
 - Community framework for state aid measures to support access to finance,
 - The 'Second chance' policy tools,
 - Instruments to assist the restructuring of firms in difficulty.

- (III) The evaluation component should involve a scrutiny of implemented policies. It is assumed that all the individual tools of the Rapid Response Instrument shall be evaluated. The rationale for conducting such evaluations is dictated by the need for ongoing improvement of interventions and their adaptation to the actual circumstances. Another task subsumed under this component involves the periodic evaluation of the functioning of the RRI in its two essential dimensions: substantive and procedural-organizational.
4. The RRI architecture should be multi-layered and should consist of different entities with various functions and resources that are complementary to one another. The five levels of institutional architecture should include:
- (I) The Prime Minister and the Council of Ministers,
 - (II) Appropriate ministers, particularly of economy, finance and regional development,
 - (III) Institutions which report to the Minister of Economy (e.g. the Agency for the Restructuring of Industry), especially the Polish Agency for Enterprise Development and the future Economic Change Monitoring Centre established within its structures,
 - (IV) Regional (voivodship) governments with their associated regional development agencies and local labour market institutions,
 - (V) Employers' organizations, trade unions and trade representations.

The institutional actors listed above should have the following roles in the system:

- a) The Prime Minister and the Council of Ministers: setting the strategy,
 - b) Appropriate ministers, particularly of economy, finance and regional development: coordination,
 - c) Institutions that report to the Minister of Economy (especially the Polish Agency for Enterprise Development): analyses, projections and coordination,
 - d) Local and regional governments, development agencies, labour market institutions: consultancy and implementation,
 - e) Employers' organizations, trade unions and trade representations, including the banking sector: information and consultancy.
5. The primary operator of the Rapid Response Instrument is a unit operating unit within the Polish Agency for Enterprise Development (it has appropriate resources in terms of staff and experience). We propose to call it the Economic Change Monitoring Centre.
6. In order to ensure the effectiveness of the system, it should be holistic, dynamic, transparent, hybrid, network-based, capable of learning and evolution, and reliable (the cited characteristics have been described in more detail above).

Chapter 10

BANKRUPTCY RISK ASSESSMENT – A MICROECONOMIC PERSPECTIVE

10.1. Introduction: purposes and features of early warning systems and rapid response systems

From the microeconomic perspective, for research purposes, a crisis is seen as a culmination of adverse events, as a turning point between development stages, which distorts or threatens normal operation of an enterprise. Businesses vary in terms of exposure and vulnerability to such a threat and the parameters may be subject to modelling. As numerous studies demonstrate, Polish firms are quite vulnerable in this respect, which may increase the 'contagion effect' in times of crisis.

A crisis is not an aberration – either for firms or the economy as a whole – and can be subject to risk management. The latter can be effective if it constitutes part of an integrated solution. A crisis may have negative impacts, possibly leading to bankruptcy, as well as positive ones – a threat to a firm's existence may be turned into an opportunity for its development through restructuring.

Determinants of crisis include numerous factors that differ in terms of type and source of origin. A characteristic feature of a crisis is its complexity and the fact that it is caused by a co-occurrence of several factors in a sequence of events based on identifiable cause-effect relationships as well as a clear escalation path. External factors associated with the stages of the life-cycle of sectors of industry and their economic condition are particularly dangerous. Even intensive individual remedial actions undertaken by a firm in difficulty do not guarantee its survival.

Symptoms of a crisis in a firm appear as a result of diverse internal and external causes and usually do not occur in isolation. Such symptoms tend to include failures in its general condition and management. The problem is that crisis has a rather 'nebulous' character – it can be felt rather than described, moreover, its symptoms are difficult to quantify. For the purposes of the present study, such symptoms have been defined for the area of the financial condition of the firm with reference to the economic aspect of its behaviour.¹

In order to counter crises effectively, we must possess the capacity to anticipate and prevent. The former condition was a prerequisite for the development of the concept of an Early Warning System (EWS). It is an integrated tool for measuring risk focused on the identification of changes in the exposure to financial risk that may entail bankruptcy or through the identification and quantification of symptoms as structured financial signals.

As a tool, the EWS is integrated into the first of the four RRS functions – the monitoring component, whose aim is to scrutinize the financial situation of undertakings in order to evaluate their condition and identify phenomena that may indicate its significant deterioration (early warning function).

The degree of risk subject to measurement expresses the category of bankruptcy in economic terms, in other words, as the financial risk of failure of a firm's operation and bankruptcy (bankruptcy in its broad sense, also called financial distress). The evaluation also addresses the phenomenon of bankruptcy in legal terms (in its strict sense, also called insolvency proceedings), i.e. court-supervised bankruptcy proceedings.

The measures of bankruptcy in its economic sense and in its legal sense, respectively, cannot be related without making a distinction between their substantive content. This does not mean, however, that there is no correlation between them. This relationship is the subject of research, moreover, it allows for comparative analyses of firms using a measure of financial distress expressed in units corresponding to the percentage of court insolvency proceedings.

The primary task of the EWS RRI is to evaluate the risk of financial distress using original methodologies that involve empirical induction and discriminant analysis (multivariate logit models). Conclusions are reinforced by the multi-criteria evaluation of the potential and financial results of a firm in question supported by data from court insolvency proceedings.

In order to evaluate the degree of financial distress the EWS RRI prediction models apply classic and 'Firth' logistic regression. This is due to the weakness of the previous prediction models (shortcomings in their design and applicability limitations), especially

¹ Further discussion of the impacts of crisis on firms, its characteristics, determining factors and symptoms can be found, among others, in: (Mitroff 2001, p. 5), (Hamel, Prahalad 1994, p. 134), (Smart 1978, no 9 p. 46–48), (Mączyńska 2011, p. 14), (Gierszewska, Romanowska 1995, p. 44), (Wieczeryńska 2009, p. 35), (Altman 1983b, p. 40, 180), (Argenti 1976, p. 123, 132–135), (Wawrzyniak 1999, p. 112–118), (Zavgren 1983, nr 2, p. 1–33).

in the context of learning from very small data sets. Conducting population surveys of the institutional sector of non-financial undertakings numbering close to 50 thousand entities thus necessitated the development of new research tools.²

The measure obtained using the tools listed above – the degree of financial risk (PR and MW) – reflects the likelihood of bankruptcy of analysed firms within one year. It facilitates a quantitative description of the dynamic rate of change in the area of bankruptcy and a comparison of the degree of risk among the undertakings of different sizes (total, small, medium-sized, large) and generic groups of firms (total, manufacturing, trade and services). The models previously constructed and described in the literature do not possess such properties, moreover, the newly-developed discriminant models may be considered unique in Poland thanks to the application of innovative methods and certain detailed techniques.

Due to the specific function of the RRI monitoring component in microeconomic terms (ongoing analysis and diagnosis of the situation of firms), studies in the area of monitoring condition of firms using the EWS RRI have several overlapping aims:

- To define the symptoms of financial distress in a firm,
- To develop methods and tools for the quantification of emergencies described by specific symptoms of threats,
- To evaluate the degree of financial distress using multivariate discriminant models,
- To evaluate the course, intensity and structure of bankruptcy of firms in legal terms,
- To conduct a multivariate analysis of trends in the value and structure of the measures of potential and financial performance of firms.

The type, method and approach employed in the EWS RRI are characterized by the following features:

- Its task is to reveal the deteriorating situation of firms, in particular the detection and measurement of warning signals indicating the threat of financial distress,
- It serves to assess the degree of risk represented by the likelihood of bankruptcy within one year and scaled in units corresponding to the percentage of court insolvency proceedings,
- It is not a predictor of bankruptcy, the warning signals identified should be interpreted as a component of the warning forecast.

The premises on which the EWS RRI was founded, its objectives and features as well as the methods and tools that make up the path of study of financial distress as applied to non-financial undertakings determine the scope and manner of possible deduction procedures and assessments formulated on their basis, taking into account the principles of periodization.

10.2. Characteristics of microeconomic data sources

The operation of the EWS RRI, the extent and frequency of observations, analytical itemisation and classification criteria are determined by the platform that feeds information and numerical data into the system. Its core resource is constituted by the database created and processed by the Central Statistical Office (GUS) in Warsaw. This resource is unique in terms of describing the research methodology, the scope and quality of the results obtained. It contains information and numerical data on individual firms present in the national statistical system. The resources are processed to achieve the objectives of EWS RRI observing the principles of statistical confidentiality.

The group of economic entities included in the analysis consists of non-financial firms with 10 or more employees, which have submitted the mandatory statistical report (referred to as F-01/-01, F-02 and SP forms). As at the end of the second half of 2013, there were 51 269 such firms. The share of manufacturing, trade and services enterprises in the overall population of non-financial firms employing more than 10 people was at least 93.4% in terms of the basic economic categories (number of employees 95.3%, total assets 93.4%, sales revenue 96.5%, net profit 99.8%, equity 93.8%, added value 96.6%, capital outlays 94.5%). Additionally, their share in added value of the whole institutional sector of enterprises in Poland (broadly speaking, in terms of their contribution to GDP) was 91.7% (total) and 88.5% (manufacturing, trade, services). The balance was the share of economic entities with up to 9 employees, whose 4% random sample was included in the national statistical survey. These parameters indicate that the conclusions based on the surveyed population should be treated as highly reliable and, as such, they justify the generalizations made with reference to the entire institutional sector of firms in Poland.

The facts and figures that characterize individual firms within the data set processed by the GUS in Warsaw include three basic groups:

- General information and identification (statistical unit number, type of economic activity according to NACE, ownership form, organizational and legal form, location (region), activity status),
- Numerical data reflecting the financial situation of the firm (set of 29 relative measures),

² The concept of evaluating the degree of financial distress, including the paths and research methods along with their updates, are discussed in detail in: Kaczmarek, Kolegowicz, Krzemiński, Fijorek (May 2011), Kaczmarek, Kolegowicz, Krzemiński, Fijorek (June 2011), Kaczmarek, Kolegowicz, Krzemiński, Fijorek (December 2013).

- Numerical data describing the dynamics of change in key financial figures (set of 10 measures assessing time series with a variable base).

The analysis, evaluation and conclusions related to the financial standing as well as financial distress of firms are carried out in the multidimensional space of non-financial enterprises described by the following criteria:

- Firm size, i.e.:
 - small (10–49 employees),
 - medium-sized (50–249 employees),
 - large (250 employees or more),
- Type of activity:
 - manufacturing (NACE divisions 5–39),
 - trade (NACE divisions 45–47),
 - services (NACE divisions 41–43, 49–68, 77–82, 94–96),
- NACE sections (i.e. the selected branches of the national economy):
 - industry (NACE sections: B, C, D, sections 5–35),
 - construction (NACE section range: F, sections 41–43),
 - wholesale and retail trade (NACE sections range H, sections 45–47),
 - transportation and storage (PKD scope of Section H, sections 49–53),
 - information and communication (NACE section range: J, sections 58–63),
- NACE divisions (32 manufacturing ones, 3 trade and 27 services, ranges as in the types of activity),
- Regions (16 voivodships).

Another layer of information and numerical data is provided by the economic and financial parameters describing the condition of individual NACE divisions (economic background in the form of sectoral analyses), NACE sections and kinds of activity taking into account the criterion of firm size and its location (voivodship). These are processed, analysed and evaluated using databases provided by the Info Gospodarka SSiDP Pont Info Ltd. system in Warsaw, whose primary data sources are the GUS databases in Warsaw.

The third layer of information supply is based on the Court and Economic Monitor of the Ministry of Justice and Coface Bankruptcy Reports. The data collected, processed and analysed characterize the bankruptcy processes in terms of initiated insolvency proceedings under the Bankruptcy and Restructuring Act of 28 February 2013 (Journal of Laws 20013, No. 60, item 535).

The periodization of research within the EWS RRI and presentation of its results is determined by the cyclical nature of national statistical surveys conducted by GUS. The results of surveys of financial distress in the form of reports are compiled on a quarterly basis starting from the fourth quarter of 2010 until the third quarter of 2013. The results for medium-sized and large enterprises are updated quarterly, whereas small enterprises and enterprises total update the data semi-annually.

For the purpose of comparison and detection of trends, the analysis involves – apart from the current period – a retrospective approach starting in the first quarter of 2007. As regards the forecasting of time series of variables (factors) for the risk prediction models, a short-term annual forecast period was adopted with quarterly and semi-annual updates, respectively (for individual classes of firms).

Table 10.1. NACE divisions that provide the information and basis for research conducted as part of the EWS RRI

NACE division	Description
05	Mining of coal and lignite
08	Other mining and quarrying
09	Mining support service activities
10	Manufacture of food products
11	Manufacture of beverages
12	Manufacture of tobacco products
13	Manufacture of textiles
14	Manufacture of wearing apparel
15	Manufacture of leather and related products
16	Manufacture of wood and of products of wood and cork, except furniture, manufacture of straw and plaiting materials
17	Manufacture of paper and paper products
18	Printing and reproduction of recorded media
19	Manufacture of coke and refined petroleum products

→

NACE division	Description
20	Manufacture of chemicals and chemical products
21	Manufacture of pharmaceutical, medicinal chemical and botanical products
22	Manufacture of rubber and plastics products
23	Manufacture of other non-metallic mineral products
24	Manufacture of basic metals
25	Manufacture of fabricated metal products, except machinery and equipment
26	Manufacture of computer, electronic and optical products
27	Manufacture of electrical equipment
28	Manufacture of machinery and equipment n.e.c.
29	Manufacture of motor vehicles, trailers and semi-trailers except motorcycles
30	Manufacture of other transport equipment
31	Manufacture of furniture
32	Other manufacturing
33	Repair, maintenance and installation of machinery and equipment
35	Electricity, gas, steam, hot water and conditioning supply
36	Water collection, purification and supply
37	Sewerage and wastewater treatment
38	Waste collection, treatment and disposal activities, materials recovery
39	Remediation activities and other waste management services
41	Construction of buildings
42	Civil engineering
43	Specialized construction activities
45	Wholesale and retail trade and repair of motor vehicles and motorcycles
46	Wholesale trade, except of motor vehicles and motorcycles
47	Retail trade, except of motor vehicles and motorcycles
49	Land transport and transport via pipelines
50	Water transport
51	Air transport
52	Warehousing and support activities for transportation
55	Accommodation
56	Food and beverages service activities
58	Publishing activities
59	Motion picture, video and television programme production, sound recording and music publishing activities
60	Programming and broadcasting activities
61	Telecommunications
62	Computer programming, consultancy and related activities
63	Information service activities
64	Financial service activities, except insurance and pension funding
66	Activities auxiliary to financial service and insurance activities
68	Real estate activities
77	Rental and leasing activities
78	Employment activities
79	Travel agency, tour operator, reservation service and related activities
80	Security and investigation activities
81	Services to buildings and landscape activities
82	Office administrative, office support and other business support activities
94	Activities of membership organizations
95	Repair of computers and personal and household goods
96	Other personal service activities

Source: own study.

10.3. A system for evaluating the financial condition of firms

Using multifaceted, cross-sectional information and figures characterizing the population of non-financial enterprises as well as the new models and specific measures, the main structure of the EWS RRI was developed, complete with relevant research paths. The conceptually coherent structure – with its appropriate instruments, structural elements, objectives of scrutiny and an organizing factor in the form of a defined measure of the degree of financial distress – meets the requirements of an integrated (systemic) solution.

The EWS RRI structure comprises six planes of scrutiny and evaluation of non-financial undertakings in terms of their financial condition and the degree of risk:

- An analysis of changes in groups enterprises, their potential and financial performance,
- An analysis of instituted insolvency proceedings supervised by courts,
- A multifaceted analysis of changes in the financial condition of firms,
- An analysis of the degree of financial distress,
- An analysis of risk factors faced by individual NACE divisions (the so-called 'TOP 10' of highest risk),
- Developing forecasts of factors driving change and the degree of financial distress.

Each of the above-listed EWS RRI planes of scrutiny constitutes a separate path of inquiry which measures, assesses, classifies and predicts the degree of financial distress. Each plane has well-defined, measured and analysed key exponents (comprising its path of inquiry) as well as its characteristic evaluation process.

In terms of changes affecting the population of enterprises (demographics), their potential and financial performance, the following are subject to evaluation:

- The number of firms,
- The number of employees,
- Sales revenue,
- Investment outlays,
- Total assets,
- Short-term liabilities,
- Receivables and claims,
- Net financial result.

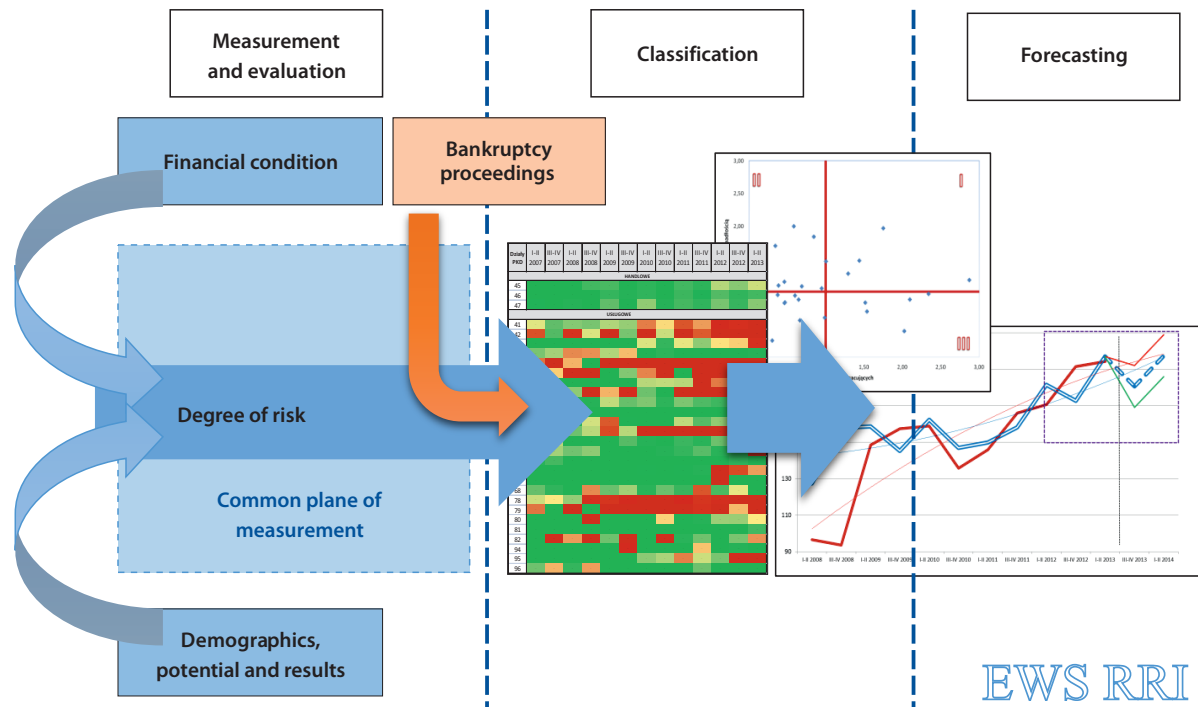


Fig. 10.1. Architecture, stages and processes comprising the EWS RRI

Source: own study.

In the area of evaluation of the bankruptcy phenomenon in legal terms (i.e. bankruptcy in its strict sense – insolvency proceedings), the analysis and evaluation of ongoing proceedings supervised by courts involved:

- The number and percentage of proceedings,
- The types of insolvency proceedings,
- Regional analyses by region (regional bankruptcy barometer – RBU),
- Analysis of sectors of industry by type of activity (industry bankruptcy barometer – BBU).

The multifaceted analysis of changes in the financial condition of firms is carried out using the following key measures:

- The overall condition of the firm,
- Financial liquidity,
- Total debt,
- Ability to service debt,
- Performance measures:
 - The inventory cycle,
 - The accounts receivable collection cycle,
 - The short-term liabilities cycle,
 - The cash cycle,
- Asset productivity,
- Operating return on sales,
- Return on assets.

The central plane and, at the same time, the key evaluation process involves establishing the degree of financial distress of an enterprise in question (bankruptcy in its broad sense – financial distress) using the estimated predictive models (classes PR and MW). It is carried out in a multidimensional space of non-financial firms designated by the following criteria:

- Firm size,
- Type of activity,
- NACE sections, i.e. the selected branches of the national economy,
- NACE divisions, i.e. manufacturing (32), trade (3) and services (27),
- Regions (16 voivodships).

Thanks to the determination of risk bankruptcy parameters for individual firms it was possible (starting with the 11th edition of the study) to broaden the capacity and scope of the analysis of financial distress. Hence, the analyses carried out at the general level of aggregation, types of activity and NACE sections, include the following:

- The time series of the mean value and standard deviation of the degree of bankruptcy risk,
- The time series of the mean value, the ninth decile and the proportion of the maximum to the mean value,
- The value of deciles for two periods under comparison,
- The change in interdecile ranges for two periods under comparison,
- The cumulative distribution function for two periods under comparison,
- The time series of positive deviations of deciles from the mean and interdecile range between the ninth and the first decile,
- The time series of the mean value, the upper and lower limit and the ninth decile,
- The time series of the decile distribution.

The analysis of the heat map (representing the degree of risk) and the synthetic evaluation measure (MSO) provide the criteria for outlining areas of increased risk – NACE divisions at particular risk (called the 'TOP 10'). The process involves a multi-criteria analysis of risk factors with respect to:

- The number of firms,
- The number of employees,
- The degree of risk and the factors that influence it:
 - Asset productivity,
 - Operating return on assets,
 - Operating return on sales,
 - Return on equity,
 - Current liquidity,
 - Self-financing,
 - Short-term debt,
- Financial performance (the cash cycle and its components: inventory conversion, receivables and short-term liabilities cycles).

The application of forecasting time series variables (factors) in risk prediction models made it possible to further extend their timeframe beyond the immediate predictive horizon. As a result, assumptions concerning the future levels of financial distress can

be made and the time horizon can be extended to include another year. The process employs the classification and evaluation criteria applicable to sets of non-financial firms:

- Their size,
- Type of activity,
- NACE sections represented (i.e. selected sectors of the national economy).

Thanks to the conceptual consistency and reliability of instruments, the structural elements, the objectives of scrutiny and the organizing factor, the EWS RRI constitutes an integrated solution that performs a key function and provides a monitoring component of the RRI supported by the macroeconomic approach, i.e. studying the economic cycle.

The core component of the EWS RRI involves the evaluation of financial distress, which is additionally reinforced by five analytical planes. As a result of the inquiry, they combine to generate a stream of information which describes the financial risk, scaled (MW class models) by the percentage of court bankruptcy proceedings, in other words, bankruptcy in its broad sense (financial distress) is adjusted for bankruptcy in its strict sense (insolvency proceedings).

10.4. Estimation of bankruptcy risk models

The condition of a firm is usually described synthetically by means of various financial indicators. The models of bankruptcy risk employed in the system under discussion comprise a set of 24 indicators from the following areas: productivity, liquidity, funds, returns, debt and performance.³ Apart from the basic versions for the explanatory variables, their nonlinear functions and interactions between pairs of variables are also included in the analysis.⁴

Table 10.2. Financial indicators used for the construction of predictive models

Area of analysis	Financial indices
Liquidity	Current liquidity index, quick liquidity ratio, cash ratio
Funds	Overall financial situation, self-financing, coverage of fixed capital assets, ability to service debt, coverage of liabilities by financial surplus, period of debt repayment, creditworthiness/ debt capacity
Profitability	Return on sales, operational profit margin, return on assets, return on operating assets, return on equity
Debt	Total debt, short-term debt, long-term debt
Productivity / efficiency / performance	Asset productivity, inventory conversion, receivables, payables, cash cycles, net working capital cycle

Source: own study.

In order to compile the training data set⁵ for the first stage of the study (editions 1–10) under the EWS RRI (2011 – 1st half of 2013), the fullest possible data on a group of firms at risk (cases) was prepared. Then, using the case-control method, they were matched with enterprises deemed not to be at risk (controls).⁶ It was assumed that the criterion of risk was tantamount to the declaration of bankruptcy, i.e. the initiation of bankruptcy proceedings. The figures needed for the training set were obtained from public databases on firms. As a result, the original data set included 15 thousand firms not at risk and about 2 thousand at-risk ones. Following the elimination of incomplete data and taking into account the matching criteria, the final training set consisted of 426 firms at risk and 1936 firms not at risk.

The development of models for prediction was preceded by an analysis of one-dimensional distributions of explanatory variables conducted separately for firms in difficulty and in a good condition, respectively. The distributions were analysed with respect to their numerical descriptive characteristics (mean, deciles, measure of dispersion) and the corresponding diagrams (histograms,

³ The indicators constitute a set of explanatory variables which, in the case of a firm in difficulty, describe its financial condition one year before the legal declaration of bankruptcy (the initiation of court bankruptcy proceedings).

⁴ For a further discussion of the course, methods and techniques for estimating such models, see: Kaczmarek, Kolegowicz, Krzemiński, Fijorek (May 2011), Kaczmarek, Kolegowicz, Krzemiński, Fijorek (June 2011).

⁵ In the preparation of training data sets, standard practice involves collating numerical data on firms at risk, and then matching them with firms which are not at risk. Small data sets typically involve matching based on expert knowledge and a careful analysis of each individual observation. Such an approach, however, is shows limited effectiveness in analyses involving larger data sets.

⁶ This method consists in the determination of several key characteristics of statistical units and matching each one with a certain highlighted feature with a unit without such a feature, but most similar in terms of the variables used for matching (pairing). It was assumed that each firm in difficulty should be matched with firms in a good condition similar in terms of the value of their assets and net sales, and the pairing was done at NACE level with respect to legal and organizational forms. Additionally, financial data on these firms came from the same financial year. Frequently 1 to 1 matchings were applied, but from a theoretical point of view, it is reasonable to use even 1 to 5 matchings. In the study under discussion, it was possible to assign to each firm in difficulty 4 or 5 similar firms deemed not at risk. See also: (Hosmer, Lemeshow 1989, p. 145–162).

box-and-whisker plots, density functions determined by nuclear-type estimators). Moreover, univariate analyses determined the predictive capacity of simple decision-making rules based on the values of individual explanatory variables. The predictive ability of simple rules and the models described below were measured using the parameters of *sensitivity* (proportion of firms at risk considered to be at risk) and *specificity* (percentage of firms not at risk deemed not to be at risk). An equally important component of the initial data analysis involved the evaluation of the correlation of all potential explanatory variables (financial indicators). The procedure helped us to define a group of variables with a similar information load about the risk of bankruptcy.

Despite the fact that the set of firms was quite large (nearly 2 500 entities), the concept of modelling taking into account the type of economic activity (manufacturing, trade, services) required a special effort to ensure that the data were used with maximum efficiency, reasoning was affected by the least systematic error and the uncertainty of parameter estimates was reliably measured. Numerous studies have shown that in small samples, the estimations of logistic regression model⁷ parameters obtained using the classical method of maximum likelihood are characterised by a significant bias. Bearing this in mind, for the purposes of the study we decided to use Firth’s logistic regression model, which could be regarded as a relatively minor modification of the classical logistic regression model. The estimations of parameters in this model are almost unbiased, while the confidence intervals are characterized by superior probabilistic properties. The research required an in-depth study of the logistic regression model and the development of specialized software.⁸ In order to determine the optimal set of variables forming a logistic regression model, we used the best subset method (models of up to eight explanatory variables were considered). The adequacy of model-data fit was assessed using the Akaike Information Criterion (AIC).

In keeping with the methodology described above, three models of bankruptcy threat were estimated, one for each of the types of firms (i.e. manufacturing, trade and services). The effectiveness of those models was evaluated with respect to their sensitivity, specificity and AUC.⁹ The resulting models are characterized by a high predictive capacity.

Table 10.3. Measures of efficiency of PR class models representing the degree of bankruptcy risk

Model	Entities at risk	Entities not at risk	Sensitivity	Specificity	AUC
Manufacturing firms	207	916	82.1 %	81.3 %	0.890
Trade firms	65	318	84.6 %	84.5 %	0.918
Service firms	154	702	86.3 %	80.0 %	0,886

Source: own study.

The PR-class models, represented by formulae used for determining the degree of bankruptcy risk for manufacturing, trade and service firms, respectively, are as follows:

⁷ Logistic regression is a common tool for analysing binary data and is usually used to assess the impact of independent variables on the probability of occurrence of a particular event. The classical logistic regression model assumes that the dependent variable $y_i \in \{0,1\}$ ($i = 1, \dots, n$) is subject to Bernoulli distribution with the probability of a success $F(x_i'\theta)$, where F is the cumulative distribution function of the

logistic distribution $F(x_i'\theta) = \frac{1}{1 + \exp[-x_i'\theta]}$, where x_i is a p-dimensional vector of explanatory variables, and $\theta \in \mathbb{R}^p$ is a p-dimensional vector

of structural parameters containing an absolute term. In order to estimate the parameters of the model the likelihood function and its natural logarithm are determined, then the partial derivatives of the logarithm of the likelihood function of the model parameters $U(\theta)$ are calculated. The solution of the equation $U(\theta) = 0$ is equivalent to finding the vector of parameter estimates θ_{nw} that maximize the likelihood function. The θ_{nw} vector is obtained using iteration. In the case of Firth’s logistic regression model, the function $U(\theta)$ is replaced by its modified version:

$U^*(\theta) = \sum_{i=1}^n \left[y_i - F(x_i'\theta) + h_i \left(\frac{1}{2} - F(x_i'\theta) \right) \right] x_i$, where h_i are the diagonal elements of matrix $H = W^{-\frac{1}{2}} X(X'WX)^{-1} X'W^{\frac{1}{2}}$, X is a data matrix and W is a $n \times n$ diagonal matrix, where the i -th diagonal element equals $F(x_i'\theta)(1 - F(x_i'\theta))$. The modification of the system of equations $U^*(\theta)$ is

identical with the modification of the likelihood function $L^*(\theta) = L(\theta) |I_\theta|^{1/2}$, where I_θ is the information matrix, while the function $L^*(\theta)$ is called the penalized likelihood function. It can be shown that Firth’s logistic regression model, despite the fact that it was derived on the basis of classical statistical inferencing, has its Bayesian counterpart. It is equivalent to the classical model of logistic regression with Jeffreys non-informative prior distribution imposed on the parameters. See also: (Long 1997, p. 56–68), (Fijorek 2011, no 2).

⁸ A broader discussion of the problems of the parameter estimates, as well as in-depth analysis of the logistic regression model and its instrumentation development, can be found, inter alia, in: (Firth 1993, no 80, p. 27–38), (Heinze 2006, no 25, p. 4216–4226), (Fijorek 2011, no 27, p. 3439–3440), (Fijorek, Sokółowski 2012, no 47), (Fijorek 2012).

⁹ 9 AUC (Area Under the Curve) is the most commonly used measure of the quality of the classifier associated with the ROC curve, defining the area under the curve, and taking values in the range (0,1): $AUC = \int_0^1 y(x) dx$, where $y(x)$ is a function describing the ROC curve (Receiver Operating Characteristic). ROC is a two-dimensional graph that shows the and 1–specificity calculated for different values of the cut-off point.

Manufacturing firms $PR_p =$

$$= \frac{1}{1 + \exp \left[- \left(-0,51 - 0,44 \cdot \frac{(W_1 - 1,64)}{0,85} - 0,80 \cdot \frac{(W_3 - 0,41)}{0,32} + 0,65 \cdot \frac{(W_6 - 0,45)}{0,29} - 0,70 \cdot \frac{(W_{19} - 2,12)}{13,51} \right) \right]} \quad (10.1)$$

where:

W_1 – asset productivity index,

W_3 – self-financing index,

W_6 – short-term debt index,

W_{19} – return on operating assets (%).

Trade firms $PR_H =$

$$= \frac{1}{1 + \exp \left[- \left(-0,80 - 0,20 \cdot \frac{(W_1 - 1,79)}{0,85} - 1,57 \cdot \frac{(W_3 - 0,33)}{0,30} - 0,69 \cdot \frac{(W_8 - 1,58)}{0,98} - 0,84 \cdot \frac{(W_{17} - 0,00)}{12,20} \right) \right]} \quad (10.2)$$

where:

W_1 – asset productivity index,

W_3 – self-financing index,

W_8 – current liquidity index,

W_{17} – operating return on sales (%).

Service firms $PR_U =$

$$= \frac{1}{1 + \exp \left[- \left(-0,82 - 0,46 \cdot \frac{(W_1 - 2,26)}{1,39} - 1,15 \cdot \frac{(W_3 - 0,39)}{0,29} + 0,69 \cdot \frac{(W_6 - 0,48)}{0,27} - 0,38 \cdot \frac{(W_{17} - 1,93)}{9,26} - 0,35 \cdot \frac{(W_{20} - 7,86)}{51,10} \right) \right]} \quad (10.3)$$

where:

W_1 – asset productivity index,

W_3 – self-financing index,

W_6 – short-term debt index,

W_{17} – operating return on sales (%),

W_{20} – return on equity (%).

The measures calculated using the models presented above indicate the degree of financial distress (understood in its broad economic sense) established under the current conditions. It is an estimate of the probability of bankruptcy threat arising within one year of the currently analysed period.

Based on the analysis of historical data regarding bankruptcy risk at the highest level of aggregation, three levels of such risk have been identified: 0–20 % – low (acceptable) risk, above 20–40 % – warning level, above 40 % – high risk level. The cut-off points were determined arbitrarily on the basis of the volume and distribution of the degree of bankruptcy risk based on turning points and peak values (a retrospective analysis of the 1st half of 2008 – 2nd half of 2009). The degree of risk at the general level (aggregation of results from specific models corresponding to individual types of activity) is determined using the weighting of results obtained at lower levels.

The second stage of the study (from the 2nd half of 2013, edition 11–12) resulted in the estimation of new models of financial distress (MW class). Their distinguishing feature is the fact that they were developed on the basis of the complete database of non-financial enterprises subject to a large-scale nationwide statistical survey conducted by GUS in 2007–2012. The training data set comprised 42 479 active firms (non-bankrupt, mean value in the period studied) observed for six years on a semi-annual basis (small enterprises) and on a quarterly basis (medium-sized and large enterprises) and 4 975 firms identified as bankrupt (same frequency of observations) classified into three activity groups (production, trade and services). Comparative analyses included the total of 641 370 entity-observations (firms observed at specified intervals), including 353 282 entity-observations which comprised the training data set of predictive models.

Table 10.4. Measures of efficiency of MW class models representing the degree of bankruptcy risk

Model	Active entities ¹	Entities at risk ²	Entity-observations for the training set ³	AUC
Manufacturing firms	13 047	1 377	130 204	0,914
Trade firms	13 197	906	120 673	0,796
Service firms	11 823	1 306	102 405	0.893

Notes: ¹ the mean annual number of enterprises in 2007–2012, ² the number of enterprises in 2007–2012, ³ the number of entity-observations conducted with a given frequency (semi-annual and quarterly) in 2007–2012.

Source: own study.

The previously developed system for building predictive models remains unchanged. The new models are highly efficient – the AUC was 0.914 for manufacturing firms, 0.796 for trade ones and 0.893 for service firms¹⁰ – which means that they are good or very good. Moreover, their predictive quality is higher than that of other models thanks to the large scale and number of analytical levels as well as the size of the training set (nearly 50 000 enterprises as compared with a few dozen usually used to feed comparable models).

The MW-class models, represented by formulae used for determining the degree of bankruptcy risk for manufacturing, trade and service firms, respectively, are as follows:

Manufacturing firms $MW_p =$

$$= \frac{1}{1 + \exp\left[-\left(-5,85 + (-1,231 \cdot R_1 - 0,492 \cdot R_3 - 1,947 \cdot R_6 + 0,62 \cdot R_9 + 0,004 \cdot R_{13})\right)\right]} \cdot 10000 \quad (10.4)$$

where:

R_1 – operating return on assets,

R_3 – debt service coverage ratio,

R_6 – operating return on sales,

R_9 – total debt ratio,

R_{13} – short-term liabilities conversion cycle.

Trade firms $MW_H =$

$$= \frac{1}{1 + \exp\left[-\left(-6,22 + (-0,053 \cdot R_4 - 1,804 \cdot R_6 - 1,17 \cdot R_7 + 0,594 \cdot R_{10} - 0,427 \cdot R_{16})\right)\right]} \cdot 10000 \quad (10.5)$$

where:

R_4 – current (liquidity) ratio,

R_6 – total debt ratio,

R_7 – return on sales,

R_{10} – short-term debt,

R_{16} – return on equity.

Service firms $MW_u =$

$$= \frac{1}{1 + \exp\left[-\left(6,24 + (-0,342 \cdot R_3 + 0,544 \cdot R_9 + 0,004 \cdot R_{13} - 1,44 \cdot R_{14} - 1,088 \cdot R_{15})\right)\right]} \cdot 10000 \quad (10.6)$$

where:

R_3 – debt service coverage ratio,

R_9 – total debt ratio,

R_{13} – short-term liabilities conversion cycle.

R_{14} – return on sales,

R_{15} – return on assets.

¹⁰ A further discussion of the course, methods and techniques for estimating these models can be found in source: Kaczmarek, Kolegiewicz, Krzemiński, Fijorek (December 2013).

The application of the estimated logistic regression models yields the probability of bankruptcy of a given firm (degree of risk) within one year assessed on the basis of the conditions prevalent in the inquiry period and its current economic and financial condition. The aggregation of individual probabilities constitutes the basis for determining the proportion of corporate bankruptcies scaled by the number of initiated court bankruptcy proceedings. The degree of risk of bankruptcy is expressed per 10 000 firms (a quotient scale).

Three brackets of bankruptcy risk at the highest level of aggregation have been identified: 0–160 – low (acceptable) risk, above 160–200 – warning level, above 200 – high risk level. The cut-off points were determined arbitrarily on the basis of the volume and distribution of the degree of bankruptcy risk based on turning points and peak values (a retrospective analysis of the 1st half of 2007 – 2nd half of 2012). The degree of risk at the general level (aggregation of results from specific models corresponding to individual types of activity) is determined using the weighting of results obtained at lower levels.

Features which make these models unique in terms of significantly higher-quality predictions of change in financial distress levels and bankruptcy risk than models applied so far include: estimation on a large sample of firms, multiple parameters used to assess the firms’ condition and to identify phenomena indicating a possible financial distress (early warning) coupled with the application of innovative methods and techniques.

10.5. The rationale and methods for determining the validity period of the measured risk

The application of models predicting the degree of risk of financial distress constitutes an effective tool used in the assessment of threats faced by firms which may occur in the event of deteriorating business conditions in which they operate. The problem of poor predictive capacity, inaccuracy and outdatedness of models available in the literature was resolved thanks to estimating new, unique and highly efficient PR and MW models. Another limitation, which consisted in significant delays in the supply of relevant survey data in Poland (up to a year), was overcome by the provision of information and numerical data from national statistics (GUS) on a quarterly and/or semi-annual basis.

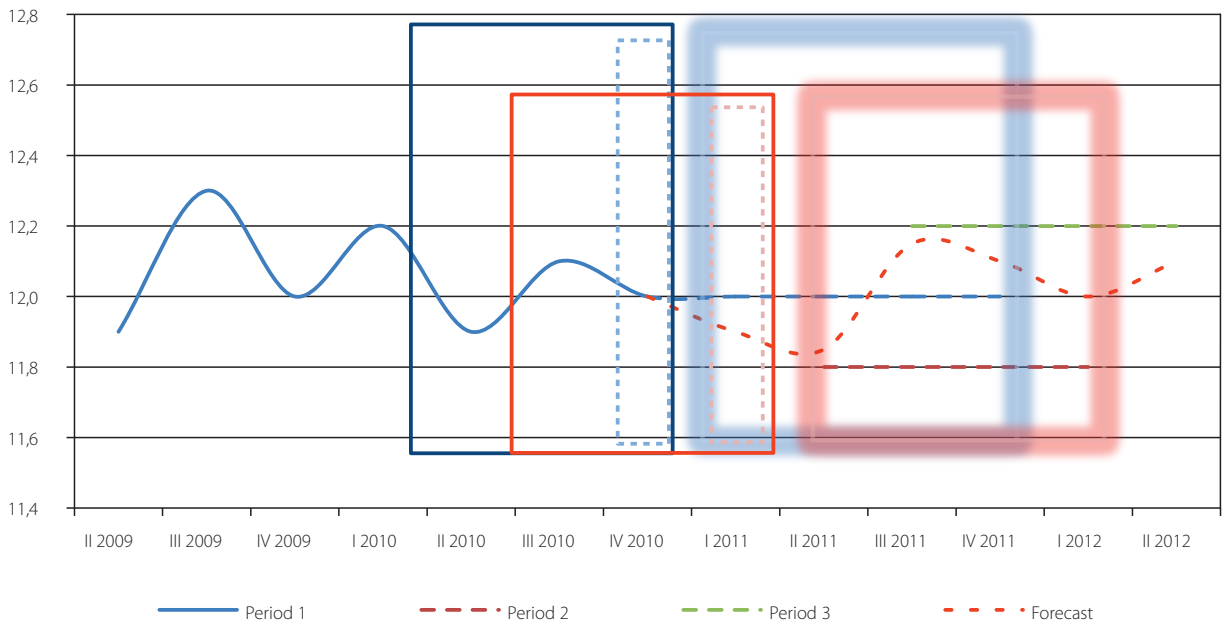


Fig. 10.2. Predicting the degree of risk on an annual basis using the moving average model

Source: Kaczmarek, Kolegowicz, Krzemiński, Fijorek (May 2011), Kaczmarek, Kolegowicz, Krzemiński, Fijorek (June 2011).

The solution developed – Early Warning System – Rapid Response Instrument – allows for the recognition of adverse changes in the degree of risk within a much shorter timeframe. Thanks to the fact that surveys are conducted on a quarterly and/or semi-annual basis, the degree of risk estimated in advance remains valid for a single survey period, since a subsequent survey provides new information about the measures in question and refers to the next period.

The estimated models themselves are tools (methods) of a prospective analysis of financial distress (one year ahead). However, the use of time series forecasting methods allowed us to extend the validity of the forecasts. In forecasting the change in the degree of risk instead of using the measure of risk itself (PR or MW values) we have decided to apply the variables (factors defined as financial indicators) reflecting the financial condition of firms. The predicted values of these variables are fed into prediction models, which yield the likely future levels of financial distress and allow us to extend the time horizon onto the next period (one year).

The variables determining the degree of risk are predicted using one-dimensional time series models. For this purpose, the following models have been used: SARIMA (Seasonal Autoregressive Integrated Moving Average) and Hyndman's exponential smoothing¹¹ (ETS). The main reason for the use of one-dimensional models instead of multidimensional ones is the relative shortness of the time series studied. The decision was also justified by the results of empirical studies showing that multivariate models applied to short time series typically generate forecasts subject to greater errors than those generated by one-dimensional models.

At present, ETS-class models are not yet popular; hence it makes sense to provide a brief introduction. Classic exponential smoothing belongs to a group of forecasting methods. A 'forecasting method' should be understood as a set of procedures used to obtain point forecasts of a studied phenomenon in a future period of time. In contrast, the SARIMA-class model is a full statistical model with a defined stochastic process generating numerical data; consequently, the probability distribution of a forecast for the subsequent period of time can be estimated. As a result, the statistical model apart from point forecasts is capable of delivering interval forecasts with a probabilistic interpretation. The classic exponential smoothing methods did not have this dimension, which changed thanks to the work of Hyndman and his associates. In order to specify the exponential smoothing model, three elements need to be determined. The first one is the component responsible for the trend. The component consists of the 'level factor' and the 'growth factor'. Both factors may be combined in several ways to define a process that either has no trend or has an additive trend, a damped additive trend, a multiplicative trend or a damped multiplicative trend. The second component is the component of seasonal fluctuations which may occur in additive and/or multiplicative versions, or it may not exist. The third element is the random fluctuations component that may occur in its additive or multiplicative version. Thus, specific components of the ETS model define 30 different models, from which the optimal model can be selected by using e.g. information criteria.

In the analyses of levels of risk, each time series of financial indicators studied was matched with the best SARIMA and ETS models in terms of the AIC criterion. The predicted values were calculated as the arithmetic average of the forecasts yielded by SARIMA and ECJ models. The solution adopted is justified by the results of empirical research, which show that averaging models usually leads to smaller forecast errors.

As part of the quantitative analysis of uncertainty associated with the projections of financial distress, a tool called *scenario analysis* was used: in addition to the neutral scenario, pessimistic and optimistic scenarios were also constructed. For this purpose, the lower and upper limits of 80% of the confidence interval of the predicted degree of risk were used based on the analysis of historical deviations of the degree of risk adjusted for the percentage of initiated court bankruptcy proceedings.

10.6. A synthetic assessment measure in the identification of risk areas

An important aspect of studying the degree of financial distress under the EWS RRI is the sectoral analysis by NACE divisions. The analysis includes 62 individual types of production, trade and services enterprises. Structurally, it is carried out in two stages – type of economic activity and the synthetic evaluation measure (MSO) – using two classification criteria: enterprise size (total enterprises, small, medium-sized, large) and the type of activity (manufacturing, trade, services).

As a result, changes are described and risk levels are assessed using a heat map. Moreover, areas of particular risk are indicated using the synthetic evaluation measure (MSO). The process leads to the development of a ranking list of NACE divisions characterized by the highest risk adjusted for the share of individual NACE divisions in the total number of employees, the so-called 'TOP 10.'

¹¹ An in-depth discussion of issues concerning prediction using ETS class models can be found e.g. in: (Hyndman 2008).

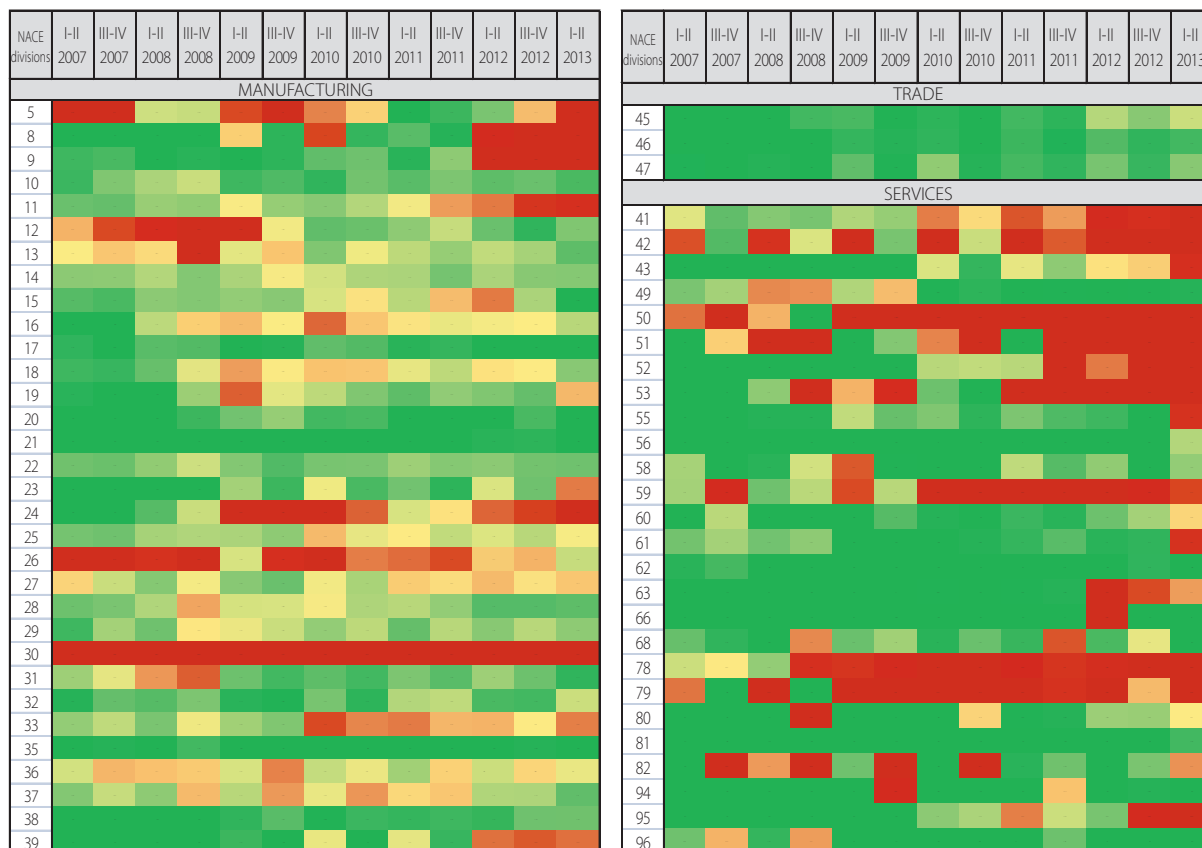


Fig. 10.3. Heat map – differences in bankruptcy risk levels by NACE division

Source: own study based on: Kaczmarek, Kolegowiec, Krzemiński, Fijorek (December 2013).

The synthetic evaluation measure (MSO), which constitutes the basis for the ranking list, employs two categories: the relationship of the risk level and the number of employees in a specific NACE division to average values in individual types of economic activity. The next steps in the analysis and MSO calculation are as follows:

1. Determining the deviation of the degree of risk (MW) for each NACE division relative to that of the corresponding type of economic activity.

$$oMW D_{it} = \frac{MW D_{it}}{MW RD_{jt}} \quad (10.7)$$

where:

oMW – deviation of the degree of bankruptcy risk for a given NACE division,

MW D – degree of risk for a given NACE division,

MW RD – degree of risk by type of economic activity,

i – NACE division ($i = 1, \dots, n$),

j – type of economic activity ($j = \text{manufacturing, trade, services}$),

t – period analysed.

2. Determining the deviation of the number of employees for each NACE division relative to the average value for the type of economic activity.

$$oLP D_{it} = \frac{LP D_{it}}{sLP RD_{jt}} \quad (10.8)$$

where:

oLP D – deviation of the number of employees for a given NACE division,

LP D_{it} – number of employees in a given NACE division,

sLP RD – average number of employees by type of economic activity,

i – NACE division ($i = 1, \dots, n$),

j – type of economic activity ($j = \text{manufacturing, trade, services}$),

t – period analysed.

3. Assigning normative standards to individual NACE divisions.

Based on the results of oMW D and oLP D for NACE divisions, normative standards (1, 2, 3 or 4) are assigned to individual NACE divisions, including the assessment of the deviation of the degree of bankruptcy risk for a given NACE division (oMW D) and the deviation of the number of employees in a given NACE division from the average for a given type of activity (oLP D).

Table 10.5. Normative standards designated by the degree of bankruptcy risk and the number of employees applicable to individual NACE divisions

Criterion 1	Standard	Criterion 2
Deviation of the degree of risk for a given NACE division (oMW D) > 1	I	Deviation of the number of employees for a given NACE division (OLP D) > 1
Deviation of the degree of risk for a given NACE division (oMW D) > 1	II	Deviation of the number of employees for a given NACE division (OLP D) ≤ 1
Deviation of the degree of risk for a given NACE division (oMW D) ≤ 1	III	Deviation of the number of employees for a given NACE division (OLP D) > 1
Deviation of the degree of risk for a given NACE division (oMW D) ≤ 1	IV	Deviation of the number of employees for a given NACE division (OLP D) ≤ 1

Source: own study based on: Kaczmarek, Kolegowicz, Krzemiński, Fijorek (December 2013).

The features of respective standards (i.e. the NACE divisions assigned to each group) are interpreted in the following way:

- **Standard I** – a NACE division characterized by an above-average risk and an above-average number of employees – a high-risk area,
- **Standard II** – a NACE division characterized by an above-average risk and a below-average number of employees – an average-risk area,
- **Standard III** – a NACE division characterized by a below-average risk and an above-average number of employees – a low-average-risk area,
- **Standard IV** – a NACE division characterized by a below average risk and a below-average number of employees – a low-risk area.

4. Calculation of the synthetic evaluation measure MSO D_i

The synthetic evaluation measure (MSO) is used to assign the above-listed normative standards to individual NACE divisions. The measure is based on the evaluation of two categories: the relationships between the bankruptcy risk and the number of employees in a given NACE division relative to the mean values for respective types of activity. The calculation of MSO value involves measuring the distance of a given NACE division (whose coordinates are oMW D_i and oLP D_i, respectively) from the point of origin of the coordinate system.

$$MSO D_i = \sqrt[2]{oMW D_i^2 + oLP D_i^2} \tag{10.9}$$

where:

MSO D_i – synthetic evaluation measure of a NACE division (object),

5. Compilation of a ranking list of NACE divisions

The synthetic evaluation measure (MSO) enables us to draw up a list of NACE divisions organized according to two criteria: the standards discussed above (in ascending order) and MSO values within a given standard (in descending order).

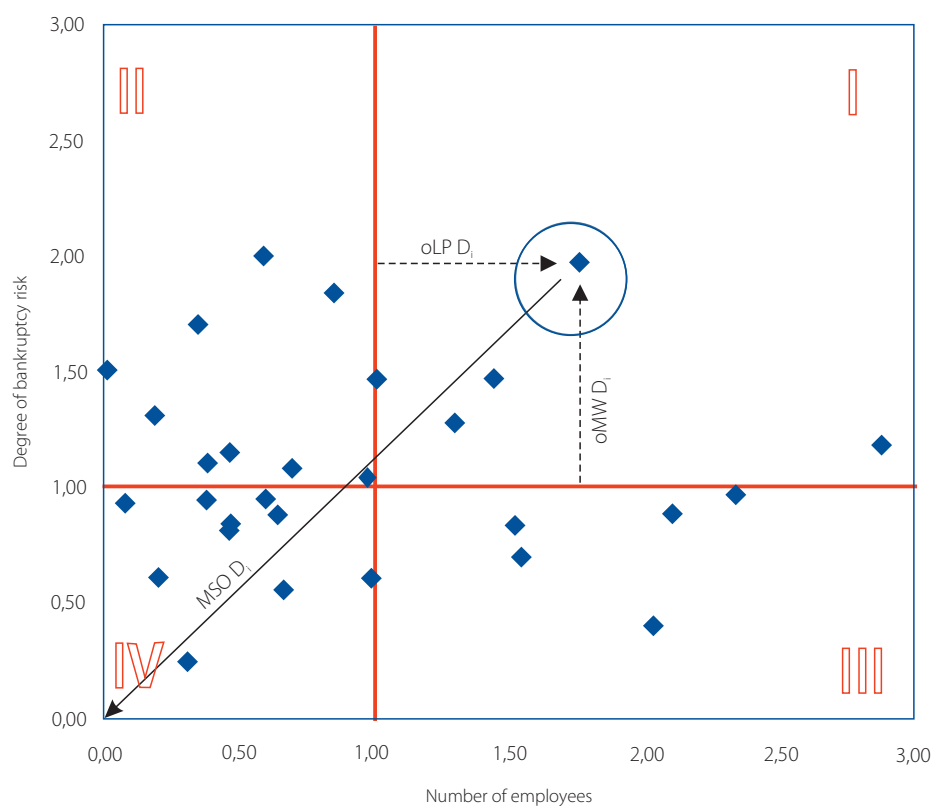


Fig. 10.4. Determining the value of the synthetic evaluation measure (MSO) for individual NACE divisions in accordance with the pre-defined normative standards

Source: own study based on: Kaczmarek, Kolegowicz, Krzemiński, Fijorek (December 2013).

Table 10.6. A sample ranking of NACE divisions according to the degree of risk, the synthetic evaluation measure (MSO) and normative standards

NACE division	MW	STANDARD		MSO		
	1st half of 2013	1st half of 2012	1st half of 2013	1st half of 2012	1st half of 2013	Change
25	198	I	I	3.08	3.10	+
5	332	III	I	2.04	2.63	+
23	248	I	I	1.86	2.06	+
27	215	I	I	1.85	1.82	-
...						
8	935	II	II	1.80	5.55	+
9	606	II	II	1.88	3.60	+
30	337	II	II	3.13	2.08	-
24	310	II	II	1.80	2.02	+
...						
10	131	III	III	4.50	4.52	+
29	163	III	III	2.44	2.53	+
22	148	III	III	2.25	2.27	+
28	140	III	III	1.80	1.73	-
...						
20	101	IV	IV	1.14	1.16	+
13	139	II	IV	1.21	0.95	-
12	157	IV	IV	0.90	0.93	+
15	100	II	IV	1.54	0.63	-
...						

Source: own study based on: Kaczmarek, Kolegowicz, Krzemiński, Fijorek (December 2013).

Chapter 11

MACROECONOMIC MODELLING OF BANKRUPTCY RISK

11.1. Introduction

The main aim of this section is to discuss in detail the methodological approach adopted by the Macroeconomic Team of the project titled 'Rapid Response Instruments'. Theoretical and empirical analyses focus on three issues: first, the methods of drawing inferences about business cycles with a particular emphasis on the specifics of the Polish economy; second, the principles of constructing projections of basic macroeconomic indicators which constitute the basis for the description of prospects for economic growth in Poland; and third, the methodology of scenario analyses of the impact of potential impulses affecting the Polish economy and its cyclical changes, with regard to the condition of the corporate sector.

Part 1 of the study is devoted to the formal-statistical approach to modelling business cycles. The proposed approach is based on econometric analysis of selected macroeconomic indicators, which belong to the so-called cyclic indicators. These indicators shall provide the basis for the formulation of stylized facts about the variations in business activity in Poland. The analysis will aim, among other things, to identify the dominant business cycle length in Poland, to estimate the amplitudes of identified fluctuations and to provide the possible interpretations of thus estimated phases.

Within the macroeconomic block, the primary objective shall be achieved through the use of proprietary solutions in the field of mathematical statistics. The business cycle will be analysed based on the results obtained in the domain of the almost periodically correlated time series. New tools for the statistical analysis of business cycles will draw both on the long-established spectral theory for the class of stationary time series and the theory of harmonized almost periodically correlated time series. The key outcomes of theoretical work in the field of mathematical statistics are related to the parameters and their estimators, which characterize both the discrete spectrum and the continuous almost periodically correlated time series.

In our analyses we shall assume that the fluctuations in business activity can be modelled using a non-parametric approach with concurrent discrete and continuous characteristics of the spectrum. In most studies on the business cycle it is assumed that cyclical fluctuations constitute, in fact, a time series with its expected value equal to zero, which means that the discrete spectrum for this time series is identical and equal to zero. The approach developed and applied to the matter at hand is original and innovative in comparison with the standard methods for analysing the cyclical nature of the economy based on the spectral theory and filtration methods applied to observable discrete-time processes.

In Chapter 2 we propose to use the Bayesian approach to the problem of short-term forecasting of macroeconomic indicators and the cyclical position of the economy. Due to the short forecast horizon, we focus on the modelling of one-dimensional time series. An important distinguishing feature of this approach in comparison with the methods widely used in practice is that we formulate our forecasts in probabilistic terms, which, in addition to the future indicators designating point estimates, includes the uncertainty of forecasts. The resulting forecasts in the form of predictive probability intervals will be based on the Bayesian approach to the estimation of model parameters and forecasting.

Chapter 2 introduces the idea of Bayesian inference and discusses the specifications of models used in forecasting macroeconomic indicators. The added value consists in proposing a novel method of forecasting the cyclical position of the economy based on the Bayesian model with respect to the problem of parameter estimation of almost periodically correlated processes (which are discussed in Part 1). The approach commonly used in practice is based on filters that enable the estimation of the cycle, yet it precludes any cyclical forecasts beyond the period considered. Our team has developed an approach that allows for short-term probabilistic forecasts of the cyclical component, which will facilitate an analysis of the condition of the Polish economy, which includes forecasts about the business cycle.

Chapter 3 is devoted to the issue of modelling vector-based time series with a special emphasis on the cointegration approach that makes use of vector autoregression models (VAR) and vector error correction (VECM). These methods focus on a formal statistical approach to testing long-term relationships among the observable variables, forecasts and scenario analyses. One of the subsections presents both the classical approach and the Bayesian one to the estimation of model parameters and forecasts.

Multi-dimensional modelling, discussed in Part 3, is applied with a view to assessing the effects of abrupt changes in macroeconomic variables. Such abrupt changes are referred to as impulses, and the assessment of their occurrence is described in terms of hypothetical macroeconomic scenarios (as is done in the literature on quantitative methods) reflecting the estimation of the impulse response functions both in classical and Bayesian terms. In empirical analyses, this function will

constitute the primary tool to assess the sensitivity of the condition of the corporate sector to hypothetical impulses occurring in the economy.

As in the case of forecasts, quantitative assessments of the effects of certain impulses are presented in probabilistic terms. Accordingly, the analyses include a formal assessment of statistical uncertainty as to the value of the impulse response function, which allows us to evaluate the impact of statistical uncertainty on our conclusions.

All parts of the study are illustrated by empirical examples of the proposed econometric and statistical methods.

11.2. Modelling fluctuations in business activity using cyclostationary processes

In this section we shall introduce our original proposals for the analysis of fluctuations in business activity. The approach discussed here does not provide tools for forecasting fluctuations which can be identified with fluctuations in business activity, but focuses only on the detailed characteristics of cyclical changes affecting the basic macroeconomic indicators.

Intensive research on the empirical identification of business cycles, which over the years has yielded a wide range of methods and tools to analyse the process in question, has not led to the development of a dominant method that would be acceptable to most scholars. In the literature, most popular approaches to the extraction of fluctuations identified with the fluctuations of business activity employ filtration methods, including those developed by Hodrick and Prescott (Hodrick and Prescott 1997), Baxter and King (Baxter and King 1999), Christiano and Fitzgerald (Christiano and Fitzgerald 2003), and Butterworth (Gómez 2001). The proposed solutions, especially in regard of their automatic application, have attracted serious criticism, since their inappropriate use may lead to the identification of spurious business cycles (cf. e.g. Nelson and Kang 1981, Kaiser and Moravall 1999, Gómez 2001, Shenk-Hoppé 2001).

In particular, the methods developed and tested in highly-developed economies may not supply data that would allow researchers to formulate clear conclusions applicable e.g. to economies in transition. One of the reasons may involve the characteristics of cyclical fluctuations affecting the economies in transition in comparison with the characteristics of fluctuations in highly-developed economies. The features of cyclical fluctuations in transition economies have been described by Barczyk et al. (2006), emphasizing their separation and substantial differences from the progression of the business cycle in developed economies. In the latter, fluctuations in business activity (around the downturn/upturn path) have been, in fact, 'flattened,' hence the dominant view about the need to model them using stationary processes with expected value zero. This feature does not have to accompany the cyclical fluctuations in transition economies (due to the likelihood of greater intensity and amplitude of fluctuations). Hence the motivation to adopt the more general assumptions typical of the APC model, which, in a particular case, can be reduced to the assumption that the process is stationary. In the proposed approach, the problem of choice between stationarity and APC assumptions shall be resolved using appropriate statistical tests.

The analysis of fluctuations in business activity may also be made more difficult due to the lack of sufficiently extensive statistical material justifying strong conclusions about the nature of the business cycle. The issue of uncertainty regarding the inferences on the cyclical nature of the Polish economy having its source in the very short time series was highlighted in a study by Adamowicz et al. (2008), where alternative methods of filtration were applied together with an analysis of identified fluctuations both in the domains of time and frequency. The problem with identifying the length of business cycles in Poland complete with an analysis of the degree of synchronization with the Eurozone countries was investigated, among others, by Skrzypczyński (2006), Skrzypczyński (2008), Adamowicz et al. (2008), Skrzypczyński (2010), Konopczak (2009), Gradzewicz et al. (2010).

This chapter offers a method for analysing fluctuations in the business cycle which has a solid theoretical grounding. The small-sample properties of statistical methods, on which the algorithm is based, were tested by Lenart (2010). Of special interest are the tools for the estimation of parameters which can be identified with the length of business cycles, specifically their amplitude and phase. The methodology is based on the fundamental properties of a subclass of non-stationary stochastic processes, i.e. almost periodically correlated processes. The key results of the proposed algorithm procedure are estimators of the parameters identified with fluctuations in business activity. This allows us to determine the necessary parameters using the Hodrick-Prescott filter.

The proposed methodological approach is based on an econometric analysis of macroeconomic time series. Modelling comprises historical data, which makes it very difficult to formally take into account (possible) significant changes in the nature of the business cycle of the Polish economy that result, among other things, from the convergence process.

The methodological approach presented in the following sections is based on more in-depth studies on the subject by Lenart (2010) and Lenart and Pipień (2011). Some of the definitions in this section are quoted directly from Lenart (2010), where all the attributions can be found. However, we devote more attention to the available interpretations in the context of research on fluctuations in business activity informed by the comments and conclusions to be found in Lenart (2010) and Lenart and Pipień (2011).

11.3. Almost periodically correlated stochastic processes – basic features

This section starts with the definition of the class of periodically and almost periodically correlated time series. Next, we discuss the definitions and properties of almost periodic functions, which are closely related to the definition and properties of almost periodically correlated time series.¹ The final part of the section contains the definition of the amplitude and phase of fluctuations with respect to the representation of the expected value function of the process under consideration as a Fourier series.

The concepts of periodic and almost periodic functions are primary with respect to the definitions of time series periodically and almost periodically correlated in a broader sense. For the first time the class of periodically correlated time series was defined by Gladyshev (1961). Often, periodically correlated and almost periodically correlated time series, respectively, are called cyclostationary series or almost cyclostationary time series, respectively (cf. Gardner et al. 2006). Let us consider the time series $\{X_t : t \in \mathbb{Z}\}$ with the expected value function:

$$\mu(t) = E(X_t) < \infty$$

and the following autocovariance function:

$$B(t, \tau) = \text{cov}(X_t, X_{t+\tau}) < \infty$$

where $\tau \in \mathbb{Z}$. Let us now derive the definition of periodically correlated time series.

Definition 1.1 (Gladyshev 1961). *The time series $\{X_t : t \in \mathbb{Z}\}$ is said to be periodically correlated in a broader sense (abbreviated PC) with a period equal to T , if for any $\tau \in \mathbb{Z}$ functions $\mu(t)$ and $B(t, \tau)$ are periodic functions of an integer variable with period T .*

In order to define the class of almost periodically correlated time series in a broader sense, we should first quote a definition of almost periodic functions taken from the monograph by Corduneanu (1989).

Definition 1.2 (Corduneanu 1989, p. 45) *The function of the integer variable $f : \mathbb{Z} \rightarrow \mathbb{R}$ is said to be almost periodic if for any $\varepsilon > 0$ there exists an integer N_ε such that in each set containing N_ε elements of consecutive integers there is an integer p for which the following holds true:*

$$\sup_{t \in \mathbb{Z}} |f(t+p) - f(t)| < \varepsilon$$

To introduce the concept of almost periodic functions, let us consider the function $h : \mathbb{Z} \rightarrow \mathbb{R}$ such as

$$h(t) = \sin(\sqrt{2}t) \quad (11.1)$$

This function is not a periodic function of the integer variable t , which can be easily justified using indirect proof. Conversely, function h is almost periodic.

Any periodic function with period T is also an almost periodic function. The family of almost periodic functions is closed under addition and multiplication (cf. Corduneanu 1989, p. 46). The basic property of the almost periodic function $f : \mathbb{Z} \rightarrow \mathbb{R}$ is the fact that the limit

$$\lim_{n \rightarrow \infty} \frac{1}{n} \sum_{t=t_0+1}^{t_0+n} f(t) \quad (11.2)$$

exists and does not depend on the value of the integer parameter t_0 (cf. Corduneanu 1989, Theorem 1.28, p. 48). The limit is called the average value of the almost periodic function. As shown by Lenart (2010) and Lenart and Pipień (2011), this property is fundamental to the estimation of the parameters identified with the frequencies responsible for fluctuations in the business cycle.

The definition of the class of almost periodically correlated time series is a natural generalization of the definition of the class of periodically correlated time series.

Definition 1.3 *The time series $\{X_t : t \in \mathbb{Z}\}$ is said to be almost periodically correlated in a broader sense (abbreviated APC), if for any $\tau \in \mathbb{Z}$ functions $\mu(t)$ and $B(t, \tau)$ are almost periodic functions of the integer variable t .*

Each stationary time series is also periodically correlated, and each periodically correlated time series is almost periodically correlated.

In order to intuitively explain the difference between the periodic and almost periodic functions, let us consider a simple example of a periodic function $f(t)$ with period $T = 12$. Using elementary properties of periodic functions, function f can be represented as

¹ Cf. also (Besicovitch 1932) and (Corduneanu 1989).

$$f(t) = \sum_{k=0}^{T-1} b_k e^{it\omega_k} \quad (11.3)$$

where b_k are complex numbers and frequencies ω_k equal $\omega_k = 2k\pi/T$, for $k = 0, 1, \dots, T-1$. As can be seen, the characteristic property of a periodic function is that in its representation (11.3), frequencies ω_k depend on period T (are strictly determined). Assuming, however, that function $f(t)$ is an almost periodic function represented as

$$f(t) = \sum_{k=0}^K b_k e^{it\omega_k} \quad (11.4)$$

we only assume that ω_k are numbers from the interval $[0, 2\pi)$ and K is an arbitrary natural number.

Subsequently, the expected value and autocovariance functions, respectively, can be presented as a Fourier series:

$$\mu(t): \sum_{\psi \in \Psi} m(\psi) e^{i\psi t} \quad (11.5)$$

$$B(t, \tau): \sum_{\lambda \in \Lambda_\tau} a(\lambda, \tau) e^{i\lambda t} \quad (11.6)$$

where coefficients $m(\psi)$ and $a(\lambda, \tau)$ equal

$$m(\psi) = \lim_{n \rightarrow \infty} \frac{1}{n} \sum_{t=1}^n \mu(t) e^{-i\psi t} \quad (11.7)$$

$$a(\lambda, \tau) = \lim_{n \rightarrow \infty} \frac{1}{n} \sum_{j=1}^n B(j, \tau) e^{-i\lambda j}$$

Thus, sets:

$$\Psi = \{\psi \in [0, 2\pi) : m(\psi) \neq 0\}$$

and

$$\Lambda_\tau = \{\lambda \in [0, 2\pi) : a(\lambda, \tau) \neq 0\}$$

are countable (cf. Corduneanu 1989). If a given time series is periodically correlated, then its representations (11.5) and (11.6) become equal, whereas sets Ψ and Λ are contained in the set

$$\{2k\pi/T : k = 0, 1, \dots, T-1\}$$

where T represents the length of the period.

The classical analysis of the fluctuations in business activity begins with the assumption that the isolated fluctuations identified with fluctuations in business activity are stationary. This assumption, however, is not verified in most cases, except when unit root tests are used. The condition of stationarity of these fluctuations is equivalent to the special case of an almost periodically correlated process in which the following equalities apply: $\Psi = \{0\}$ and $\Lambda = \{0\}$. These equalities need not be justified, given the numerous cases of modelling macroeconomic time series which contain a component identified with fluctuations in business activity using models with the non-stationary, periodic structure of the autocovariance function (cf. e.g. Franses and Paap 2004). Therefore, the proposed approach to the study of fluctuations in business activity constitutes a generalization, in which it is possible to test the widely adopted assumption of stationarity.

In the approach proposed by the Macroeconomic Team, the modelling of cyclical fluctuations is accomplished on the basis of more general assumptions (note that the class of APC time series contains the class of stationary time series). It is assumed that the basic properties of cyclical fluctuations, such as fluctuations in length, amplitude, asymmetry and phase, can be modelled using the parameters of a non-trivial spectrum of a discrete APC time series. Using the basic Fourier representation of the expected value of the APC time series, certain frequencies in this representation shall be identified as those responsible for the fluctuations caused by the business cycle, while others shall be interpreted as seasonal variations. The fact that the function of the expected

value of the APC is almost periodic may contribute to a better description of the characteristics of fluctuations of business activity (in terms of fitting the empirical data to the model).

The assumption of almost periodicity of the expected value function is also very convenient from the point of view of the economy. The discussion on the causes of economic fluctuations may include the impact of endogenous and exogenous variables, the effects of business cycle transmission between different economies, the investment multiplier effect as well as the effects of interactions and overlaps among these reasons. If each of those multiple reasons generates cyclical (wavelike) changes, the assumption of almost periodicity of the expected value function intuitively seems not to impose restrictions on the concepts and theories of the business cycle.

11.4. Estimation of Apc processes using subsampling methods

Parameters which are thought to directly correspond with the fluctuations in business activity belong to set Ψ . In this section, we shall focus on the issues related to the estimation of selected elements of this set. In mathematical statistics, Lenart (2010) formulated and proved theorems related to the identification and estimation of the parameters of set Ψ . The method for identifying these parameters is based on the well-known subsampling method (in the literature on mathematical statistics, cf. Politis et al. 1999).

What follows below is a summary of the subsampling method based on Lenart (2010), which, in turn, is based on the results contained in the monograph by Politis et al. (1999).

Let $\{X_1, X_2, \dots, X_n\}$ be an n -element sample of an actual time series $\{X_t : t \in \mathbb{Z}\}$ whose total distribution is P . $\hat{\theta}_n(X_1, X_2, \dots, X_n) = \hat{\theta}_n$ denotes the estimator of the unknown real parameter $\theta = \theta(P)$. The subsampling version of estimator $\hat{\theta}_n$ is denoted by $\hat{\theta}_{n,b,t}$ and calculated as the value of the estimator $\hat{\theta}_n$ based on subsample $\{X_t, X_{t+1}, \dots, X_{t+b-1}\}$, where $1 \leq t \leq n-b+1$ can be interpreted as the starting point for the subsample, and $b = b(n)$ as its length. One of the basic assumptions of the subsampling procedure is that $b/n \rightarrow 0$ and $b \rightarrow \infty$. Let $\{v_n\}_{n \in \mathbb{N}}$ be a sequence of real numbers. If we are interested in obtaining an approximation using the subsampling distribution method

$$v_n(\hat{\theta}_n - \theta) \quad (11.8)$$

then the cumulative distribution function of this distribution for any point $x \in \mathbb{R}$ can be approximated using the subsampling estimator below

$$L_{n,b}(x) = \frac{1}{n-b+1} \sum_{t=1}^{n-b+1} \mathbb{I}\{v_n(\hat{\theta}_{n,b,t} - \hat{\theta}_n) \leq x\} \quad (11.9)$$

Another basic assumption of the subsampling method is that the asymptotic distribution of the size of (11.8) exists. To explain the compatibility of the subsampling method, let $J(P)$ denote the limiting distribution of $v_n(\hat{\theta}_n - \theta)$, and $J(x)$ the value of the distribution function $J(P)$ at point x . Let $c(1-\alpha)$ and $c_{n,b}(1-\alpha)$, respectively, be the $1-\alpha$ -th order quantiles from the distribution of $J(P)$ and the subsampling distribution, that is

$$c(1-\alpha) = \inf\{x : J(x) \geq 1-\alpha\}$$

$$c_{n,b}(1-\alpha) = \inf\{x : L_{n,b}(x) \geq 1-\alpha\}$$

With respect to the above it can be said that a subsampling procedure is consistent if:

(i) $L_{n,b}(x) \xrightarrow{P} J(x)$ for each continuity point of the distribution function $J(\cdot)$,

(ii) $\sup_{x \in \mathbb{R}} |L_{n,b}(x) - J(x)| \xrightarrow{P} 0$,

in case the distribution function $J(\cdot)$ is continuous along the real axis,

(iii) for any point of continuity $c(1-\alpha)$ of the distribution function $J(\cdot)$ the following relationship holds

$$P(v_n(\hat{\theta}_n - \theta) \leq c_{n,b}(1-\alpha)) \rightarrow 1-\alpha$$

where $\alpha \in (0,1)$.

Sufficient conditions for the compliance of the subsampling method for non-stationary time series were formulated as Assumptions 4.2.1 and 4.2.2 in a monograph by Politis et al. (1999, pp. 102–103). Let us note that the structure of estimator (11.9) does not require

the knowledge of the asymptotic distribution of (8), which is very convenient if such a distribution is not exactly known or is very complicated.

The practical application of the subsampling method, however, is not entirely devoid of problems. One of the limitations is undoubtedly introduced by condition $b/n \rightarrow 0$ without which, according to the monograph by Politis et al. (1999), the proof of procedural compliance appears to be impossible, since the subsampling method may be sensitive to changes in parameter b . Lenart et al. (2008), studying the properties of the test based on a subsampled distribution for PC time series, reached the same conclusion. The optimum value of parameter b is not known, except for a few special cases.

The study by Lenart (2010) proved the compliance of the subsampling procedure in the class of non-stationary time series for the Fourier coefficient estimator $m(\psi)$ for any $\psi \in [0, 2\pi)$, which, in turn, leads to the construction of a statistical test² based on which the frequencies of set Ψ are identified. The methodology will be described in the next section.

11.5. The four-step business cycle extraction procedure

In this section we shall discuss a four-step business cycle extraction procedure described in detail by Lenart (2010) and Lenart and Pipień (2011).

Let $\{P_t : t \in Z\}$ be the observed time series. For the sake of clarity, let us focus on time series observed at monthly intervals.³ We assume that $\{P_t : t \in Z\}$ is a time series with a finite unconditional expected value for any point in time $t \in Z$. The equation representing this model is based on the assumption that the expected value function $\mu(t) = E(P_t)$ is the sum of function $f(t, \beta)$ of argument $t \in Z$, parameter $\beta \in \mathbb{R}^s$, and the almost periodic function

$$g(t) = \sum_{\psi \in \Psi_p} m_p(\psi) e^{i\psi t} \quad (11.10)$$

of argument $t \in Z$, where $\Psi_p \subset [0, 2\pi)$. The equation for the model, therefore, has the following form:

$$\mu_p(t) = f(t, \beta) + g(t) = f(t, \beta) + \sum_{\psi \in \Psi_p} m_p(\psi) e^{i\psi t} \quad (11.11)$$

For set Ψ_p we shall use the natural representation in the form of

$$\Psi_p = \Psi_{p,1} \cup \Psi_{p,2} \cup \Psi_{p,3} \quad (11.12)$$

where set $\Psi_{p,1}$ is a set containing frequencies identified with those responsible for business fluctuations, set $\Psi_{p,2}$ is a set of frequencies responsible for seasonal variations, whereas set $\Psi_{p,3}$ represents all other frequencies. Set $\Psi_{p,1}$ includes such frequencies that correspond to cycles whose length ranges from half a year to infinity,⁴ which means that

$$\Psi_{p,1} \cap (0; 0.35) = \Psi_{p,1}$$

Set $\Psi_{p,1}$ includes, therefore, the frequencies of interest. Set $\Psi_{p,2}$ identified with the intersection of set Ψ_p with the frequencies set $\{2k\pi / T : k = 1, 2, \dots, T-1\}$, where T is the number of periods in the year in the data under consideration. Conversely, set $\Psi_{p,2}$ contains other frequencies, such as those responsible for the interaction between seasonal variations and cyclical fluctuations identified with the fluctuations caused by changes in the business cycle.⁵

In our considerations we shall assume that function $f(t, \beta)$ is a polynomial of at most the second degree, that is $f(t, \beta) = \beta_0 + \beta_1 t + \dots + \beta_p t^p$, where $p \leq 2$. The value of parameter p will be assumed to equal 1 or 2, depending on the macro-economic indicator after the observation of the graphics representation of the first or the second differences of the time series under consideration. Let us note that function $f(t, \beta)$ may not contain an intercept, because such a term constitutes a natural expression of a trigonometric series $g(t)$.⁶ Let us consider a sample time series that meets the assumptions formulated in model equation (11.11).

Example 3.1 Let the time series $\{P_t : t \in Z\}$ be of the form

$$P_t = P_{t-1} + \varepsilon_t$$

² The test is asymptotically consistent.

³ The time series can also be observed on a quarterly basis or at other intervals.

⁴ Not all the frequencies that belong to this set can be identified with fluctuations in business activity.

⁵ An example of a time series satisfying model equation (11) can be found in: (Lenart 2010).

⁶ A sufficient condition for it to hold is that $\Psi_p \cap \{0\} \neq \emptyset$.

where $E(P_0) = b$ and $\{\varepsilon_t : t \in Z\}$ are APC time series whose expected value function (unconditional) $\mu_\varepsilon(\cdot)$ that satisfies the following equation

$$\mu_\varepsilon(t) = a + g(t) - g(t-1)$$

where $g : Z \rightarrow \mathbb{R}$ is an almost periodic function of the form:

$$g(t) = \sum_{\psi \in \Psi} m(\psi) e^{i\psi t}$$

$a \in \mathbb{R}$ and $\text{card}(\Psi) < \infty$. Note that for any $t \geq 1$ we obtain

$$P_t = P_0 + \varepsilon_1 + \varepsilon_2 + \dots + \varepsilon_t$$

Hence

$$E(P_t) = b + \sum_{j=1}^t E(\varepsilon_j) = b + at - g(0) + g(t) = f(t, \beta) + g(t)$$

Where $f(t, \beta) = \beta_0 + \beta_1 t$, $\beta_0 = b - g(0)$, $\beta_1 = a$, which means that the time series under consideration $\{P_t : t \in Z\}$ satisfies equation (11.11). Note that if we assume $g(t) \equiv 0$, then $\mu_\varepsilon(t) = a$, which proves that time series $\{P_t : t \in Z\}$ satisfies equation (1) with $E(P_0) = b$ being an additional condition.

Below we present an overview of a procedure for the identification and estimation of model parameters (presented in the form of a four-stage algorithm) developed by Lenart (2010). In most cases, before the application of the algorithm, the realization of a given time series will be logarithmised to the base e .⁷

Step 1. Reducing seasonal variations

Given the fact that most monthly macroeconomic indicators reflect seasonal variations, the following observation appears to be obvious

$$\Psi_P \cap \{2k\pi / 12 : k = 1, 2, \dots, 11\} \neq \emptyset$$

which means that set Ψ_P contains certain frequencies responsible for seasonal variations. The identification of model parameters corresponding with cyclical fluctuations is not, however, the key objective of the study of business activity. In order to eliminate seasonal variations and, at the same time, strengthen the business cycle fluctuations, we shall apply a filter from the family of the centred moving averages to the indicator in question. One option is the above-mentioned 2x12MA-type operator (cf. Makridakis et al. 1998, Brockwell and Davis 2002). Using the operator 2x12MA we obtain a time series $\{Y_t : t \in Z\}$ for which

$$Y_t = L_{2 \times 12}(B)P_t$$

where

$$L_{2 \times 12}(B) = (B^{-6} + 2B^{-5} + \dots + 2B^{-1} + 2 + 2B + \dots + 2B^5 + B^6) / 24$$

and $B^k P_t = P_{t-k}$ for any integer values of time t and shift k . Let us note that for the time series $\{Y_t : t \in Z\}$ there exists an unconditional expected value. Applying Theorem B.1, we obtain an unconditional expected value function of the time series $\{Y_t : t \in Z\}$ in the form of

$$\mu_Y(t) = E(Y_t) = \underbrace{\tilde{\beta}_0 + \tilde{\beta}_1 t + \dots + \tilde{\beta}_p t^p}_{\tilde{f}(t, \tilde{\beta})} + \sum_{\psi \in \Psi_Y} m_Y(\psi) e^{i\psi t} \quad (11.13)$$

where

$$\Psi_Y \cap \{2k\pi / 12 : k = 1, 2, \dots, 11\} = \emptyset$$

and

$$\Psi_Y = \Psi_P \setminus \{2k\pi / 12 : k = 1, 2, \dots, 11\}$$

⁷ After logarithmisation, the identified cycle (using Step 4) will enable us to interpret these fluctuations as a cycle of deviations. Another purpose of the operation is to equalize the possible amplitude of seasonal variations, which will facilitate their weakening in Step 1 of the algorithm.

This means that the time series $\{Y_t : t \in \mathbb{Z}\}$ contains the same frequencies in set Ψ_Y as a time series $\{P_t : t \in \mathbb{Z}\}$ in set Ψ_P , after deducting the frequencies responsible for seasonal variations. Additionally, for coefficients $m_P(\psi)$ and $m_Y(\psi)$ the following relationship obtains:

$$m_Y(\psi) = L_{2 \times 12}(e^{-i\psi})m_P(\psi) \quad (11.14)$$

For coefficients $\tilde{\beta}_k$ and β_k we obtain $\tilde{\beta}_k = \beta_k$, for $k = p$ and $k = p-1$, which means that for $p = 0$ and $p = 1$ coefficients of polynomials remain unchanged. If $p = 2$, what changes is only the intercept of the polynomial.

Step 1 shall be executed for all macroeconomic indicators under consideration in the analysis of the business cycle regardless of the justification for the presence of seasonal variations. This is due to the properties of filter 2x12MA, after whose application the random fluctuations are reduced, which facilitates subsequent stages of the analysis.

Step 2. Trend elimination

The next step proposed in the algorithm for identifying the frequency of set Ψ_P represented by (11.11) involves the use of an operator that eliminates a possible trend from the time series $\{P_t : t \in \mathbb{Z}\}$. Let us recall that we are only considering a case where function $f(t, \beta)$ is a polynomial of the p -th degree, where $p \leq 2$. Accordingly, we shall consider two cases.

Case 1. Let $p = 1$. Using the operator $L_1(B) = (1-B)$ for the time series of moving averages we obtain a time series $\{X_t : t \in \mathbb{Z}\}$ in the form

$$X_t = L_1(B)Y_t = Y_t - Y_{t-1} = (P_{t+6} - P_{t-6} + P_{t+5} - P_{t-7}) / 24$$

The expected value for the time series $\{X_t : t \in \mathbb{Z}\}$ exists and is an almost periodic function represented by the formula

$$\mu_X(t) = \beta_1 + \sum_{\psi \in \Psi_X} m_X(\psi) e^{i\psi t} \quad (11.15)$$

where

$$\Psi_X = \Psi_P \setminus \{2k\pi / 12 : k = 0, 1, 2, \dots, 11\}$$

which follows from Theorem B.1. Additionally,

$$m_X(\psi) = L_1(e^{-i\psi})m_Y(\psi) = L_1(e^{-i\psi})L_{2 \times 12}(e^{-i\psi})m_P(\psi) \quad (11.16)$$

and

$$\Psi_X \cap (0; 0.35) = \Psi_{P,1} \quad (11.17)$$

It should be noted that the expected value of the time series is an almost periodic function, for which condition 1.5.1 is satisfied. The resultant series thus obtained $\{X_t : t \in \mathbb{Z}\}$ can be identified with the dynamics of change in the time series $\{P_t : t \in \mathbb{Z}\}$.

Case 2. For $p=2$ we use the operator $L_2(B) = (1-B)^2$. In this way we obtain the following series

$$X_t = (1-B)(P_{t+6} - P_{t-6} + P_{t+5} - P_{t-7}) / 24$$

$$\mu_X(t) = \tilde{\beta}_2 + \sum_{\psi \in \Psi_X} m_X(\psi) e^{i\psi t} \quad (11.18)$$

where

$$m_X(\psi) = L_2(e^{-i\psi})m_Y(\psi) = L_2(e^{-i\psi})L_{2 \times 12}(e^{-i\psi})m_P(\psi) \quad (11.19)$$

$$\Psi_X = \Psi_P \setminus \{2k\pi / 12 : k = 0, 1, 2, \dots, 11\}$$

Similarly, if $p = 1$, we obtain

$$\Psi_X \cap (0; 0.35) = \Psi_{P,1} \quad (11.20)$$

At this point it is worth explaining why, before the determination of the first and second differences, we do not perform the ADF (Augmented Dickey-Fuller) unit root tests known in the literature. The reason is the absence of justification for the use of ADF tests,

where we assume that the expected value of the time series under consideration depends on the values of a nontrivial almost periodic function. The operation of differentiation, which is executed in Step 2, is perceived in terms of a filter that eliminates the possible component of a linear trend or a stochastic trend. Unwarranted use of the differentiation filter does not cause the loss of any information (from a formal point of view) whose frequencies are identified with changes in the business cycle (cf. formulae (11.17), (11.20)).

Step 3. Identification and estimation of frequencies

The identification and estimation of frequencies in set Ψ_p for the time series $\{P_t : t \in \mathbb{Z}\}$ thus comes down to their identification on the basis of the realization of the time series $\{X_t : t \in \mathbb{Z}\}$.⁸ For the purpose of further reasoning we shall formulate an additional assumption regarding the time series $\{X_t : t \in \mathbb{Z}\}$. This assumption allows for the identification of frequencies in set Ψ_p of the time series $\{Y_t : t \in \mathbb{Z}\}$ based on the realization of the time series $\{X_t : t \in \mathbb{Z}\}$. We shall, therefore, assume that the time series $\{X_t : t \in \mathbb{Z}\}$ is an APC time series, which means that it is also characterized by a nearly periodic autocovariance function. This assumption is necessary to identify the frequencies of set Ψ_p using the subsampling method. The assumption should not be treated as too restrictive, because this series was produced using the differentiation operator and the moving averages operator for original data. In addition, in a number of previously cited articles and monographs on the analysis of macroeconomic indicators (cf. e.g. Parzen and Pagano 1979, Osborn and Smith 1989, Franses and Boswijk 1996, Franses 1996, Franses and Ooms 1997, Franses and Dijk 2005) adopt a slightly stronger assumption concerning the periodic structure of the autocovariance function.

In order to identify the parameters subject to inference in set $\Psi_{p,1}$ we use the test statistic $\tilde{\Pi}_n(\{\psi\}) = \sqrt{n} |\hat{r}_n(\psi)|$ and the corresponding critical values $\tilde{g}_{n,b}(0.99\%)$ for the series $\{X_t : t \in \mathbb{Z}\}$. We should remember that the test statistic $\tilde{\Pi}_n(\{\psi\})$ can be identified with the value of the test statistic $\Pi_n(\{\psi\}) = \sqrt{n} |\hat{m}_n(\psi)|$ based on a sample $\{X_1 - \bar{X}_n, X_2 - \bar{X}_n, \dots, X_n - \bar{X}_n\}$, where $\bar{X}_n$ is the mean of the sample $\{X_1, X_2, \dots, X_n\}$. The critical value is calculated as

$$\tilde{g}_{n,b}^{(\psi)}(1-\alpha) = \inf\{x : \tilde{G}_{n,b}^{(\psi)}(x) \geq 1-\alpha\}$$

where

$$\tilde{G}_{n,b}^{(\psi)}(x) = \frac{1}{n-b+1} \sum_{t=1}^{n-b+1} \mathbf{1}\{\sqrt{b}(|\hat{r}_n^{t-1,b}(\psi)| - |\hat{r}_n(\psi)|) \leq x\}$$

and

$$\hat{r}_n^{t-1,b}(\psi) = \frac{1}{b} \sum_{j=t}^{t+b-1} (X_j - \bar{X}_n) e^{-i\psi j}$$

In our analyses we assume that $b = 2.5\sqrt{n}$. The values of the test statistic together with its critical values are determined for the frequency ψ from a discrete set⁹ contained in the interval $(0; 0.35)$. If the value of the test statistic exceeds the critical value on a certain interval $I \subset (0; 0.35)$, we assume that the interval includes a frequency from set $\Psi_{p,1}$. The next step involves the estimation of the unknown frequency.

Step 4. Extracting the cycle using the Hodrick-Prescott filter

This step involves the selection of the filtering parameter using the Hodrick-Prescott method (HP filter) in order to correctly extract the fluctuations of interest. The HP filter shall be understood as a filter (extracting cyclical fluctuations) in the form of $L(B) = \sum_{k=-\infty}^{\infty} a_k B^k = 1 - 1/(1 + \lambda(1-B)^2(1-B^{-1})^2)$, where filter $1 - L(B)$ is a filter that extracts the long-term growth or decline path (trend).

In empirical applications of the filtration method proposed by Hodrick and Prescott, it is particularly important to properly select the smoothing parameter λ . Changing the parameter affects the smoothness of the isolated trend line. The larger its value, the smoother the trend line, and thereby the extracted fluctuations (i.e. the difference between the data and the values along the trend line) include cycles of greater length. An algorithm for the selection of the smoothing parameter λ depending

⁸ The literature on the analysis of business activity fluctuations also offers examples of the use of Fourier series as a method for the approximation of the trend function. Milas et al. (2006) (Chapter 9, pp. 221–246) considered a model with a time-varying intercept, which was approximated using Fourier series. This approach, however, is somewhat different from those where Fourier analysis is used to identify and estimate the parameters which may affect the plot of economic fluctuations. The trend function is not subject to estimation, as was the case with the results discussed by Milas et al. (2006).

⁹ This set shall be selected to ensure that its cardinality is several times larger than the sample size.

on the length of the cycles of interest was presented by Maravall and del Rio (2001). In their work (p. 17, formula 5.3) the value of parameter λ constitutes the following function of frequency ω_0 .

$$\lambda = [4(1 - \cos(\omega_0))^2]^{-1} \quad (11.21)$$

Frequency ω_0 can be interpreted as the lower limit of the frequencies of interest. Determining the ω_0 , which so far in the literature has been done arbitrarily, also determined the morphological features of the obtained cycle estimators. On the strength of the construction, the value of parameter λ can be interpreted as the value for which, after the application of the HP filter, the corresponding variations in frequencies above the value of ω_0 will be amplified, whereas the corresponding frequencies below the value of ω_0 will be diminished. Such an interpretation is possible by demonstrating that the HP filter can be obtained as a special case of the Butterworth filter (cf. Gómez 1999, Gómez 2001).

The approach proposed in this study consists in the determination of the smoothing parameter λ using the values of statistically significant frequencies identified in Step 3 of the algorithm. Therefore, we select the smoothing parameter so as to reduce the fluctuations which do not result from changes in the business cycle while strengthening those fluctuations which have been identified with such changes. The selection of parameter λ thus becomes a statistical procedure with asymptotic properties, and is no longer a purely arbitrary decision, which has been the case so far.

In order to explain the above mechanism let us consider an example in which fluctuations have been isolated using the HP filter for different values of parameter λ .

Example 3.2. Let us consider the time series $\{P_t : t \in Z\}$ of the form

$$P_t = \cos(0.262t) / 2 + 4\cos(0.15t) + 10\cos(0.06t) + 5\sin(2\pi t / 12) + \eta_t \quad (11.22)$$

where $\eta_t = \eta_{t-1} + \varepsilon_t$, $\eta_0 = 0$ and $\{\varepsilon_t : t \in Z\}$ is Gaussian white noise with a mean which equals 0.6 and variance which equals one.

For monthly data, the frequency of 0.262 corresponds to a 2-year cycle, the frequency of 0.15 to a 3.5-year cycle, and the frequency of 0.06 for a 8.7-year cycle. Based on (11.12), it can be rewritten as $\{0.262, 0.15, 0.06\} \subset \Psi_{p,1}$ and $2\pi t / 12 \in \Psi_{p,2}$. The cardinality of the realization $n = 160$ was determined using model (11.22) and the centred moving average filter 2x12MA with a view to weakening the seasonal variations. Fluctuations were isolated using the HP filter for different smoothing parameters. The results obtained are shown in Figure 11.1.

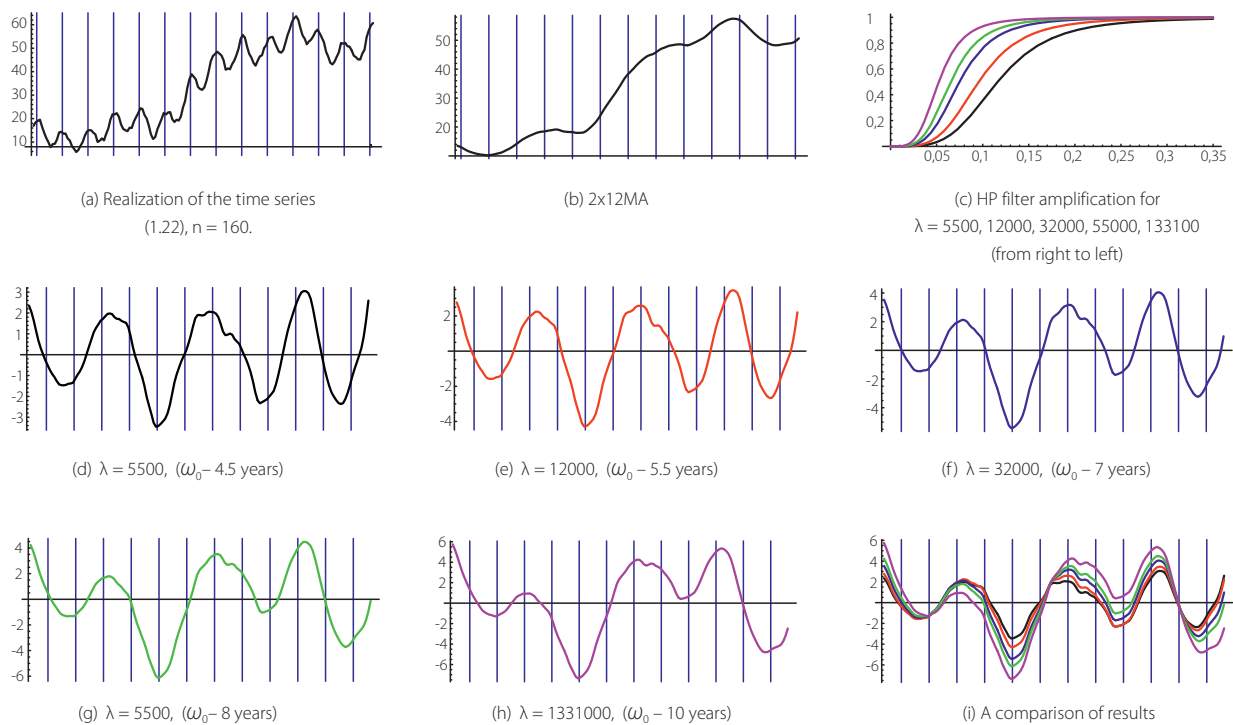


Fig. 11.1. Effects of the HP filter for different values of the smoothing parameter λ on the realization of a time series of the form (11.22) after the application of the centred moving average

Source: own study.

Note that for the values of parameter $\lambda = 5500, 12000, 32000$ (which, according to formula (11.21), correspond to 4.5-, 5.5-, and 7-year cycles) the extracted cyclical fluctuations are characterized by an average length of 3–4 years (cf. Figure 11.1 (d)–(f)). When analysing fluctuations extracted using $\lambda = 55000, 13310$ (which, according to formula (1.21), correspond to 8- and 10-year cycles), we can see a clear impact of frequency 0.06 (in equation (11.22) it corresponds to a 8.7-year cycle) on the plot of the fluctuations obtained. For the smoothing parameters thus selected, fluctuations of the corresponding length of 8.7 years are not effectively separated due to the proximity of the frequency 0.06 to a frequency corresponding with the smoothing parameter λ and due to the large amplitude of those fluctuations (cf. model equation (22)). Therefore, the HP filter has reduced these variations to a lesser extent for $\lambda = 55000, 13310$ (which resulted in an artificial cycle whose length was approximately 6–8 years) than for parameters $\lambda = 5500, 12000, 32000$. Figure 11.2 (c) shows linear filter amplification $|\mathcal{L}(e^{-i\psi})|$ significant for the interpretation of the amplitude of the extracted fluctuations.

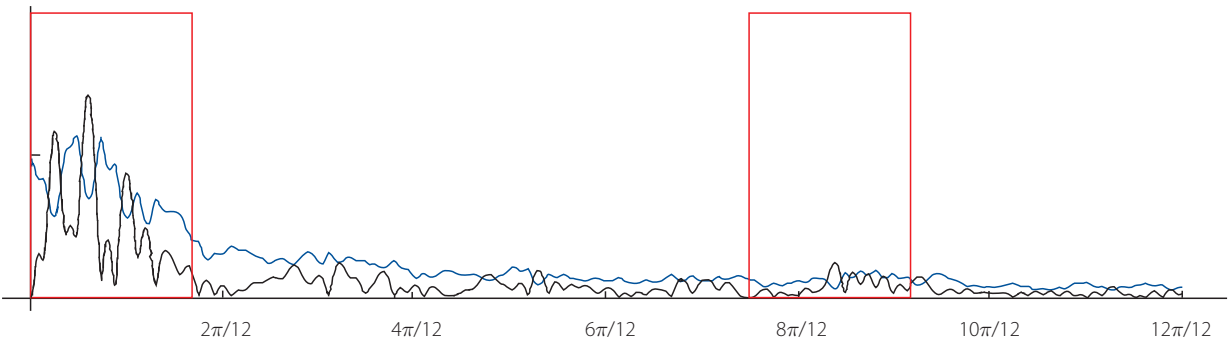


Fig. 11.2. Identification of significant values of statistic $\tilde{\Pi}_n(\{\psi\}) = \sqrt{n} |\hat{r}_n(\psi)|$ for the realization of process $\{X_t : t \in \mathbb{Z}\}$. – The values of the test statistic $\tilde{\Pi}_n(\{\psi\}) = \sqrt{n} |\hat{r}_n(\psi)|$ for ψ from the discrete set $\{(k-1)\pi / 720 : k = 1, 2, \dots, 720\}$; – the values of $\hat{g}_{n,b}^{(\psi)}(99\%)$ for ψ from the discrete set $\{(k-1)\pi / 720 : k = 1, 2, \dots, 720\}$

Source: (Lenart 2010).

Analysing the identified frequencies from set $\Psi_{p,1}$, parameter λ is selected so that the frequency determined by formula (21) finds itself between the frequencies identified with the fluctuations in the business cycle and the frequencies identified with the long-term growth trend. The reason is that absence of information on significant frequencies that belong to set $\Psi_{p,1}$ may in fact lead to erroneous conclusions. Setting an arbitrary smoothing parameter may significantly distort the picture of cyclical fluctuations (in terms of conclusions reached) identified with changes in business activity.

Fig. 11.2 illustrates how Stage 3 of the proposed algorithm works. It contains the values of the test statistic $\tilde{\Pi}_n(\{\psi\}) = \sqrt{n} |\hat{r}_n(\psi)|$ and the values of $\hat{g}_{n,b}^{(\psi)}(99\%)$ for ψ from the discrete set $\{(k-1)\pi / 720 : k = 1, 2, \dots, 720\}$ for the first process differences of the centred moving average as applied to the production index in Poland.¹⁰

Areas in which the identified values of the static test exceeded the subsampling quantile are shown in Figure 11.2. as red rectangles. These areas are also shown in the figure below. The vertical lines in Figure 11.3 (a) represent the sampled estimator values of the unknown frequencies from set $\Psi_{1,p}$. These values are summarized in the table below.

Table 11.1. Estimated frequency values with their corresponding cycle lengths (in years) for the industrial production index in Poland

Estimated frequency value	$\hat{\psi}_{n,1} = 0.062$	$\hat{\psi}_{n,2} = 0.153$	$\hat{\psi}_{n,3} = 0.258$
Corresponding cycle length (in years)	8.5	3.4	2

Source: own study.

On the basis of the obtained estimates of the unknown frequencies from set $\Psi_{1,p}$ the parameter of the Hodrick-Prescott filter is selected. The selection is thus based on results justified from a formal point of view. This allows us to avoid choosing the parameter in an arbitrary manner. The figure below shows fluctuations in the industrial production index in Poland¹¹ extracted in this way. The following Hodrick-Prescott filter parameters have been adopted: $\lambda = 5500, \lambda = 12000, \lambda = 32000, \lambda = 55000$, which corresponds to the weakening of fluctuations which exceed (respectively): 4.5 years, 5.5 years, 7 years and 8 years. The selection of such a set of parameters was due to the absence of identified variations in the 4–8-year interval.

¹⁰ A single base index (2005 = 100%) from January 1995 to December 2009.
¹¹ A single base index (2005 = 100%) from January 1995 to December 2009, after the application of the centred moving average 2x12MA.

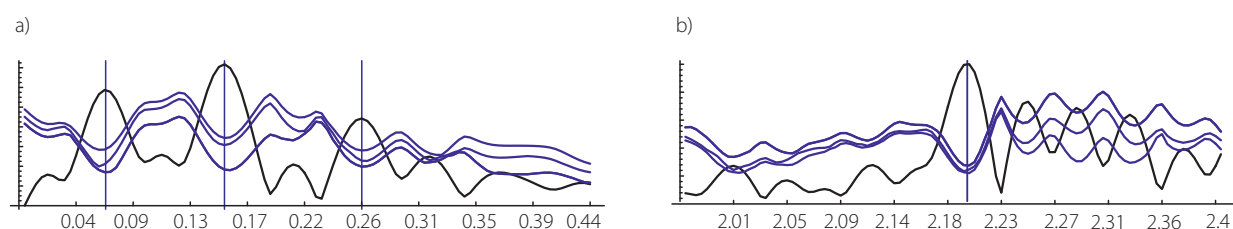


Fig. 11.3. Identification of essential values of the test statistic

Identification of significant values of test statistic $\sqrt{n}|\hat{r}_n(\psi)|$ for the realization of a discrete process $\{X_t : t \in Z\}$: (a) the values of the test statistic $\tilde{\Pi}_n(\{\psi\}) = \sqrt{n}|\hat{r}_n(\psi)|$ (black line) and the value of $\tilde{g}_{n,b}^{(\psi)}(\alpha)$ (blue line) for $\alpha \in \{92\%, 95\%, 99\% \}$ and y from the discrete set $\{(k-1)\pi/720 : k=1,2,\dots,100\}$; (b) the values of test statistic $\tilde{\Pi}_n(\{\psi\}) = \sqrt{n}|\hat{r}_n(\psi)|$ (black line) and the values of $\tilde{g}_{n,b}^{(\psi)}(\alpha)$ for $\alpha \in \{92\%, 95\%, 99\% \}$ and ψ from the discrete set $\{(k-1)\pi/720 : k=450,451,\dots,550\}$.

Source: (Lenart 2010).

A more detailed discussion of the methods of estimation of the amplitude and phase of fluctuations identified with fluctuations in business activity (and their graphical representation and interpretation) can be found in Lenart (2010).

A detailed description of fluctuations in business activity Polish appears to be only a preliminary step in modelling business cycles. Naturally, the next step should involve forecasting the phases of the business cycle based on appropriately constructed econometric models. This issue, however, is quite complex due to the characteristics of cyclical fluctuations. The innovative design methodology of forecasting cycles using the Bayesian approach is the subject of the next section.

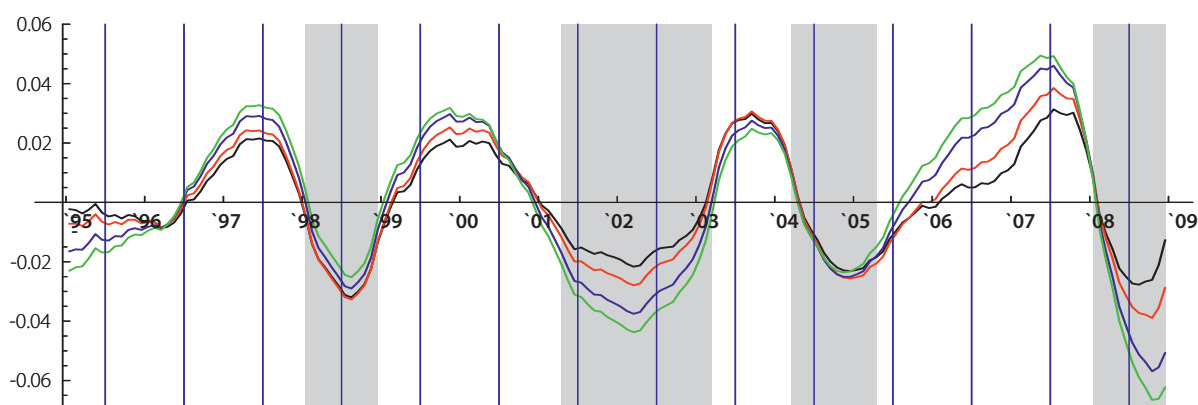


Fig. 11.4. The process isolated from the moving average of the logarithm of industrial production using the Hodrick-Prescott filter for: $\lambda = 5500$ (black line), 12000 (red line), 32000 (blue line), 55000 (green line)

Source: own study.

11.6. The Bayesian forecasts of macroeconomic indicators using one-dimensional models

The proposed methodology for obtaining short-term projections of key microeconomic indicators involves the application of Bayesian inference to the basic parametric models of a given time series. This is dictated by two fundamental reasons. First, it permits a fully formal comparison of competing models and combining knowledge. Problems related to the choice of a model do not require arbitrary decisions involving one specification and rejecting other, competing models. The final projections result from formal inferences using all the models considered together, with uncertainty related to the choice of a specification being automatically reflected in the forecasts. Second, Bayesian inference provides a useful, formally-grounded and non-arbitrary description of uncertainty regarding the projected valued in the form of a predictive distribution. In contrast to certain other procedures involving the study of ex-post error distribution, it is not necessary to invoke arbitrary methods adopted on an ad-hoc basis. In the Bayesian model, predictive distribution is defined in an unambiguous manner. When examining error distributions ex-post, even given a fixed form of the sampling model, one may consider various types of errors, moreover, the results obtained can be highly sensitive to the length of the series of expired forecasts under consideration.

The primary forecasting tool comprises one-dimensional models for individual time series. This assumption stems from the finding that the main goal of inference is the examination of the future values of indicators which characterize the state of the economy. An analysis of the future relationships among them poses a more advanced problem. In such an approach it may be justified to limit ourselves to one-dimensional models. Due to the fact that the primary objective of inference is prediction, we have excluded exogenous variables from the analysis, since it would require the specification of an additional model, which inevitably leads to undue complexity.

For the purposes of the present analysis, it is assumed that variable y_t is subject to modelling, which represents increments (or logarithmic rates of change) of macroeconomic indicator x_t under consideration. It is further assumed that T observations are available (realizations of random variables) representing the values of y_t in successive equidistant time intervals (periods). The values of y_t in subsequent H periods are treated as unavailable and are subject to statistical inference (prediction).

For the sake of clarity we have adopted a generic notation, in which $p(\cdot)$ represents the density functions of an absolutely continuous probability distribution, for which the identification of distributions of different variables follows from the context and the designation adopted for the arguments of function $p(\cdot)$. Likewise, in the case of different sampling models, the vector of all parameters shall be designated as θ without a subscript identifying the model. To simplify the notation, we have also decided that the sequence of random variables $\{y_t\}$ (a stochastic process with discrete time) can be represented by a single typical element y_t .

Each of the competing sampling models corresponds to a family of T -dimensional distributions of a random vector $\mathbf{y}$ which groups the available observations parameterized using the finite-dimensional parameter vector $\theta \in \Theta$. It is assumed that the adopted form of a sampling model also determines the form of the conditional distribution of vector $\mathbf{y}^f$ that groups H unavailable observations, which constitute the subject of statistical inference (with a fixed past of the observable process and set parameter values).

The Bayesian model represents the combined distribution of parameters θ , available observations $\mathbf{y}$, and unavailable observations $\mathbf{y}^f$, which corresponds to the probability density function $p(\mathbf{y}^f, \mathbf{y}, \theta)$. It should be added that the elements of vector θ may involve unavailable observations which do not constitute the subject of inference (e.g. those representing the unknown initial conditions of a dynamic process) as well as hidden variables.

The following decomposition is being considered for the purpose of the specification based on the Bayesian model:

$$p(\mathbf{y}^f, \mathbf{y}, \theta) = p(\mathbf{y}^f | \mathbf{y}, \theta) p(\mathbf{y} | \theta) p(\theta)$$

where: $p(\mathbf{y}^f | \mathbf{y}, \theta)$ represents the sampling-theoretical predictive distribution, $p(\mathbf{y} | \theta)$ corresponds with the sampling model, and $p(\theta)$ represents the so-called prior distribution. The first two elements are used in the non-Bayesian inference and can be specified by determining the form of the observation equation. $p(\theta)$ (the prior distribution) reflects the assumption of randomness of parameters adopted in Bayesian inference and on the strength of the construction it constitutes is the marginal distribution of unknown parameters (relative to observations). Uncertainty about the possible parameter values (before accessing data) is here represented formally in a probabilistic manner. The specification of a particular form of $p(\theta)$ in research practice usually refers to the idea (formal or only approximate) that reflects the absence of initial knowledge about the parameters of the model. This clause requires, of course, a definition of the space in which the parameters and observations assume their values.

Statistical inference is possible according to the following decomposition of the combined distribution of observations and parameters:

$$p(\mathbf{y}^f, \mathbf{y}, \theta) = p(\mathbf{y}^f | \mathbf{y}, \theta) p(\theta | \mathbf{y}) p(\mathbf{y})$$

This reflects the basic idea of Bayesian inference, which is conditioning with respect to observable parameters ($\mathbf{y}$). The $p(\theta | \mathbf{y})$ distribution is called the posterior distribution. It represents the knowledge concerning the parameters of the model after access to relevant data. Within Bayesian inference, initial knowledge about parameters represented by the prior distribution is influenced by observations and undergoes modification to the form of the posterior distribution. Differences between the prior and posterior distributions reflect the impact of observable data $\mathbf{y}$ on the knowledge of unknown parameters θ .

If the likelihood function, which is analytically identical with $p(\mathbf{y} | \theta)$ is denoted by $L_{\mathbf{y}}(\theta)$, the core of the posterior distribution can be rewritten as

$$p(\theta | \mathbf{y}) \propto L_{\mathbf{y}}(\theta) p(\theta)$$

If the goal of inference is only to reach a prediction, the predictive distribution of the following form is considered:

$$p(\mathbf{y}^f | \mathbf{y}) = \int_{\Theta} p(\mathbf{y}^f | \mathbf{y}, \theta) p(\theta | \mathbf{y}) d\theta$$

In the above formula, the total distribution of the unknown parameters (i.e. unavailable observations and parameters) conditioned by the known values (i.e. the available observations) were integrated. This corresponds to the idea of Bayesian inference which involves marginalization with respect to unknown parameters which remain outside the researcher's interest. In this case it means that all the uncertainty associated with the inference concerning unknown parameters has been formally included in the forecast. The predictive distribution may also be interpreted in the following way: the distribution of unavailable observations is obtained as a mix of theory-sampled predictive distributions (conditional with respect to $\boldsymbol{\theta}$) and mixed according to the posterior distribution of parameters $\boldsymbol{\theta}$. In this approach, the predictive distribution $p(\mathbf{y}^f | \mathbf{y})$ represents both uncertainty associated with the stochastic mechanism generating the observations and uncertainty related to drawing inferences about the unknown parameters of the model.

In the basic model employed in this study, the observation equation defining the sampling model has the following structure:

$$y_t = g(t; \boldsymbol{\gamma}) + \varepsilon_t, \quad t = 1, 2, \dots, T$$

$$\varepsilon_t = \sum_{j=1}^J \eta_j \varepsilon_{t-j} + \sum_{k=1}^K \psi_k \zeta_{t-k} + \zeta_t$$

$$\zeta_t | \boldsymbol{\theta} : i.i.N(0, \tau^{-1})$$

It means that it was assumed that the rates of change (increments) under consideration are described by function $g(t; \boldsymbol{\gamma})$, which reflects the average level of change x_t , including its possible regular (e.g. seasonal) fluctuations, and the deviation process ε_t . The latter is defined by the conditional distributions (in terms of conditioning with respect to the predetermined parameters and the past of the process). Their structure corresponds to the stationary and causal Gaussian autoregressive moving averages model $ARMA(J, K)$ (with reversible part MA) and strict white noise ζ_t with precision τ (cf. Brockwell and Davis 1986, Gelfand et al. 1995). The distribution of vectors $\mathbf{y}$ and $\boldsymbol{\varepsilon}$ is obviously determined in $\mathbf{R}^T$. The deviation process ε_t , strictly speaking, does not have to be a stationary process. This is due to the assumption adopted above concerning the time domain limited from below.

In such a case, it is necessary to specify the assumptions concerning the initial conditions of the observable process and white noise (we shall denote them, respectively, by $\mathbf{y}^{(0)}$ and $\boldsymbol{\varepsilon}^{(0)}$). Here we have assumed that the initial conditions are unknown, and therefore must be represented by hidden variables. We have also assumed that they are stochastically independent of the future of the white noise ζ_t , but the distributions resulting from analysing the stationary process $ARMA$ in the domain of integers (for the observation index) are assumed not to apply. From the viewpoint of Bayesian inference, the initial conditions may thus be treated in a similar way to the other parameters in the model.

The adoption of distributions of initial conditions which do not reflect the full homogeneity in time of process ε_t allows for a certain weakening of assumptions about the structural stability of the data generation mechanism under consideration. For example, the impact of increased variability of x_t in the period of time preceding the one under review can be visualized in an initial sequence of modelled observations as the (decreasing) impact of initial conditions.

The model adopted for process ε_t implies at least its asymptotic stationarity (in the sense that with increasing t , the distribution of ε_t converges with the stationary distribution of the $ARMA$ process with zero as the unconditional expected value). Due to the assumption concerning the Gaussian distribution of random components ζ_t , in the case under consideration (for the $ARMA$ process with time in the domain of integers) strict stationarity is equivalent to covariance stationarity.

Stationarity of process y_t itself depends on the form of the function $g(t; \boldsymbol{\gamma})$ which defines the essential component of the sampled expected value y_t . The expected value y_t also depends on the expected value of ε_t , which can be non-zero due to the influence of the initial conditions. As mentioned above, as t increases, the expected value of ε_t tends to zero, so that the sampled expected value of the observed process is dominated by the form of $g(t; \boldsymbol{\gamma})$. We are talking about the unconditional sampled expected value of y_t in the sense that given a fixed and known t , and fixed parameters of the model, is conditioning with prior realizations of the process is not considered (i.e. realizations up to the moment including the index $t - 1$). Thus understood unconditional expected sampled value y_t with increasing t converges with $g(t; \boldsymbol{\gamma})$.

If function $g(t; \boldsymbol{\gamma})$ is not constant with respect to t , it is possible that the sampled model for the observed process will not exhibit even asymptotic stationarity. However, this will only be associated with the possible fluctuations in the above-mentioned expected value; unconditional variance in such a model cannot grow indefinitely. In this sense, the non-stationarity generated in the sampled distribution of y_t is different in nature from the non-stationarity caused by single elements in an $ARMA$ -type process associated with the concept of integration $I(1)$. If y_t is defined as increments of x_t , the model considered, in fact, allows for a certain generalization of property $I(1)$ with respect to the implied process describing the evolution of the basic macroeconomic indicator x_t .

In accordance with the assumptions set out above, the vector of all the parameters of the model has the form $\theta' = (\gamma', \eta', \psi', \tau, y^{(0)', \epsilon^{(0)'})$. The initial conditions have been previously defined as hidden variables, but from a formal point of view in Bayesian analysis they are treated in the same way as parameters. We assume a fixed form of $g(t; \gamma)$ as well as values J and K . Due to the different possibilities of specification of $g(t; \gamma)$ and the selection of values J and K it is necessary to perform a formal comparison of models.

In the first stage of the analysis, we assume that function $g(t; \gamma)$ for successive t adopts a repetitive sequence S of fixed values ($s = 1, 2, \dots, S$). For $S = 1$ we are dealing with a constant function with respect to t . For $S = 12$, function $g(t; \gamma)$ – if we take into account monthly data – assumes the same value γ_s each time in the same calendar month. Since the increments of macroeconomic indicators are subject to modelling, there is no need to deal with $g(t; \gamma)$ in the form of polynomial trends. In summary, vector γ comprises S unknown parameters. It is assumed, therefore, that $\gamma \in \mathbf{R}^S$.

Vectors η and ψ represent parameters of part of $ARMA(J, K)$. Due to the conditions of causality and reversibility, the vectors belong to sets of a fairly complex shape in the general case. These conditions imply $\eta \in \mathbf{H}_J$ and $\psi \in \Psi_K$, as well as $\mathbf{H}_i \subset \mathbf{R}^i$ and $\mathbf{H}_i = \Psi_i$. Between vectors η and ψ the relation of free variation holds (i.e. $(\eta', \psi') \in \mathbf{H}_J \times \Psi_K$).

The initial conditions are met by $y^{(0)}$ and $\epsilon^{(0)}$ which assume values in $\mathbf{R}^J$ and $\mathbf{R}^K$. It is understood that both $y^{(0)}$ and $\epsilon^{(0)}$ are random vectors formed by variables with identical independent Student's t -distributions with the number of degrees of freedom greater than 2. Obviously, the distribution parameters of typical elements $y^{(0)}$ and $\epsilon^{(0)}$ are different. The assumption of identity and independence of these distributions is dictated by the desire to simplify the structure of the model.

The proposed structure of the prior distributions in this model is as follows (the initial conditions below will be treated in the same way as other parameters):

$$p(\theta) = p(\gamma)p(\eta)p(\psi)p(\tau)p(y^{(0)})p(\epsilon^{(0)})$$

All these distributions are proper distributions with the groups of parameters exhibiting prior independence. For parameters γ , a prior multivariate normal distribution was assumed. Parameters η and ψ are assumed to have uniform distributions on $\mathbf{H}_J$ and Ψ_K (it can be shown that these are proper distributions). The precision parameter τ is assumed to have prior gamma distribution, while the initial conditions $y^{(0)}$ and $\epsilon^{(0)}$ can be treated as parameters for which prior identical, independent Student's t -distributions are assumed.

The adoption of such a prior structure has significant advantages. First, it helps to ensure the coherence of the prior structure, which is important because of the need to compare models. Uniform distributions for η and ψ , the multidimensional normal distribution for γ and distributions with independence for $y^{(0)}$ and $\epsilon^{(0)}$ allow us, in principle, to meet the coherence postulate in comparisons of models with different values J, K and S . Second, since all the prior distributions are proper distributions, the models can be compared using the Newton-Raftery estimator (cf. Raftery et al. 2007 and the cited references). Unfortunately, it cannot be demonstrated that such a prior distribution structure satisfies the formal conditions of non-informativeness (derived e.g. from the Jeffreys' rule). In the case of $ARMA$ structural parameters, the solution applied here (the uniform distribution) is probably less arbitrary than the normal distribution truncated by the restrictions of causality or reversibility often adopted in multidimensional applications. The adoption of the Gaussian distribution where the shape of sets $\mathbf{H}_J$ and Ψ_K is quite complicated does not allow for an easy control of the adopted assumptions. Certain areas of the parameter space can thus be a priori strongly preferred or strongly dispreferred in a purely random manner.

It can be shown that if the assumptions of the Bayesian model described here are adopted, the analysis of the posterior distribution can be carried out using MCMC methods (cf. Tierney 1994, Robert and Casella 2004). Unfortunately, due to the reversibility and causality restrictions (and the adopted prior structure) it is not possible to find a complete conditional posterior distribution of parameters η and ψ of a standard form to enable easy randomization. Therefore we propose to use a hybrid algorithm in the form of the Gibbs sampler together with the Metropolis algorithm for vector $(\eta', \psi', y^{(0)', \epsilon^{(0)'})$. The complicated appearance of sets $\mathbf{H}_J$ and Ψ_K suggests a re-parameterisation invoking the mutually unambiguous mapping $\mathbf{H}_i \rightarrow \mathbf{R}^i$ (cf. Gelfand et al. 1995 and the cited references). Such a re-parametrization for estimation purposes allows for the replacement of parameters η and ψ by their counterparts $\tilde{\eta}$ and $\tilde{\psi}$, which allows for the assumption that the domain of vector $(\tilde{\eta}', \tilde{\psi}', y^{(0)', \epsilon^{(0)'})$ is $\mathbf{R}^{2J+2K}$

and the use of the Gibbs sampler with the Metropolis algorithm in its random walk version. Such a re-parameterisation may be necessary for the study of models characterized by a large number of delays in the structure. Sampling from the distribution in the Metropolis algorithm while rejecting the values that do not meet the restrictions of causality or reversibility may be extremely inefficient in such a case.

The step of the Gibbs algorithm associated with parameter τ can be implemented in many ways. The scalar dimension of the parameter facilitates sampling. For parameters γ the full conditional distribution is a multivariate normal distribution, which makes the latest step in the Gibbs cycle easy to implement.

The use of a hybrid Gibbs sampler allows us to obtain a (dependent) sample of the distribution $p(\boldsymbol{\theta}|\mathbf{y})$. Generally, MCMC procedures generate a correlated sample from the posterior distribution. The simulation tool is a Markov chain type of an innumerable number of states whose stationary distribution is $p(\boldsymbol{\theta}|\mathbf{y})$. In connection with the asymptotic character (with respect to the number of iterations of the algorithm) of convergence and the potentially strong correlation of the sampler, it is necessary to generate numerous pseudo-random samples and monitor (at least with a degree of approximation) convergence of the chain used.

Due to the standard form of $p(\mathbf{y}^f|\mathbf{y},\boldsymbol{\theta})$ obtaining a sample from the predictive distribution $p(\mathbf{y}^f|\mathbf{y})$ is relatively easy. For parameters $\boldsymbol{\theta}$ randomly drawn from the posterior distribution of vector realisations and denoted by $\boldsymbol{\theta}^{(j)}$, a sample from $p(\mathbf{y}^f|\mathbf{y},\boldsymbol{\theta}=\boldsymbol{\theta}^{(j)})$ is obtained by direct sampling using conventional procedures.

Having sampled the predictive distribution $p(\mathbf{y}^f|\mathbf{y})$, we can estimate the posterior probabilities of events referring by definition to the future values of the indicator in question. The diagnosis of the state of the economy may therefore depend on the values of posterior probabilities obtained for the specific configuration of the future value of the variable under consideration. It is also possible to represent uncertainty of the future values of the modelled process, i.e. y_{T+h} or x_{T+h} (for $h = 1, 2, \dots, H$) using, for example, a fan chart.

11.7. Bayesian forecasts of the business cycle using a model with cyclical fluctuations

The model proposed in the previous section was built on the assumption that the structure of function $g(t;\boldsymbol{\gamma})$ reflects seasonality that occurs in the increments of a given macroeconomic indicator in question. It is possible to extrapolate this concept by invoking an analogy with the idea of APC processes discussed previously. This allows us to redefine the observation equation of the model under consideration to the following form:

$$y_t = d(t;\boldsymbol{\delta},\boldsymbol{\varphi}) + \varepsilon_t, \quad t = 1, 2, \dots, T$$

$$d(t;\boldsymbol{\delta},\boldsymbol{\varphi}) = g(t;\boldsymbol{\gamma}) + \sum_{f=1}^F \alpha_f \sin(t\varphi_f) + \sum_{f=1}^F \beta_f \cos(t\varphi_f)$$

where it is assumed that $\boldsymbol{\varphi}' = (\varphi_1, \dots, \varphi_F)'$ and $\boldsymbol{\varphi} \in \Phi \subset \langle 0, \pi \rangle^F$, while the value of F is finite (fairly small in practice). For function $g(t;\boldsymbol{\gamma})$ a specification discussed in the previous section was adopted, namely that its value is represented by parameters $\boldsymbol{\gamma}_S$ which belong to the a repetitive sequence containing S elements. It is also assumed that $\boldsymbol{\alpha} = (\alpha_1, \dots, \alpha_F)'$, $\boldsymbol{\beta} = (\beta_1, \dots, \beta_F)'$. Vector $\boldsymbol{\delta}$ groups parameters with respect to which function $d(t;\cdot)$ is linear: $\boldsymbol{\delta}' = (\boldsymbol{\alpha}', \boldsymbol{\beta}', \boldsymbol{\gamma}')$. It is further assumed that $\boldsymbol{\delta} \in \mathbf{R}^{2F+S}$. The model developed in this way allows us to represent more complex cyclic structures in the unconditional sampled expected value y_t . If we assume that $S = 1$ and $y_t = \Delta x_t$, the difference $d(t;\boldsymbol{\delta},\boldsymbol{\varphi}) - g(t;\boldsymbol{\gamma})$ may represent cyclical deviations from the linear trend in the unconditional sampled expected value x_t (for the sake of simplicity, we have disregarded the effect of initial conditions which diminishes in time, and also adopted some weak technical assumptions to ensure the existence of the expected values under consideration).

Bayesian inference in such a model needs to be supplemented with the structure of the prior distributions as described in the previous section. In this paper, we propose to adopt for the vector parameters $\boldsymbol{\delta}$ of a multi-dimensional normal distribution, while for vector $\boldsymbol{\varphi}$ – the uniform distribution on Φ (which, due to the assumptions adopted above, is its proper distribution). A separate issue is related to determining the acceptable range of values for parameters $\boldsymbol{\varphi}$. Admitting values too close to zero may allow the existence of components of the cyclic dynamics whose period is shorter than the length of the vector of available observations. It appears reasonable to limit the domain of parameters φ_f from below, e.g. by $k2\pi/T$, for $k \in \{1, 2, 3\}$. Additionally, it is possible to express the prior knowledge of the planned structure of the modelled dynamic process by further limiting the domain of φ_f to certain sub-intervals of $\langle 0, \pi \rangle$. Preservation of methodological consistency of Bayesian inference, however, requires that the domain in which the prior distribution of the vector assumes a positive density should be determined before accessing data.

Moreover, certain considerations of a methodological nature may justify imposing a priori restrictions on the total space occupied by parameters $\boldsymbol{\delta}$ and $\boldsymbol{\varphi}$. This may be dictated by the desire to ensure identifiability. The definition of function $d(t;\boldsymbol{\delta},\boldsymbol{\varphi})$ adopted above allows for $F > 1$ the existence of multiple observationally equivalent (in the sense of the sampled model) combinations of parameter values. From the viewpoint of accuracy of Bayesian methodology used for constructing predictions, the requirement is not essential. Ensuring identifiability may, however, be dictated by the desire for a clear representation of a posteriori knowledge about the parameters of the model. The lack of identifiability may, in fact, lead to a posterior distribution of a very complicated shape. In such a case the description of a posteriori information applicable to elements of vector $\boldsymbol{\theta}$ using traditional characteristics (such as central moments) may be far from satisfactory.

Sampling from the posterior distribution in such a case may also invoke the hybrid Gibbs algorithm. The sampling process described in the previous section requires some modifications. The first one consists in the replacement of vector γ with the entire vector δ (in this case, the structure of the full a posteriori conditional distribution is analogous). The second difference is more basic in that the estimation of vector φ requires an additional step in the Gibbs cycle. The full conditional posterior distribution for vector φ is non-standard, hence sampling from it requires a step invoking the Metropolis algorithm in its independence chain or random walk versions. In the latter case it may be convenient to re-parameterise vector φ which would allow for searching the domain in the form of $\mathbf{R}^F$.

In principle it is also possible to use a version of the Metropolis algorithm for all parameters of the model together. It seems, however, that when considering larger values of J, K, S and F , such a solution may be of limited utility. The size of the combined space of the parameters in the case under consideration is $S + 3F + 2J + 2K + 1$. In the case of monthly data, is difficult to exclude values close to 12. A similar argument may refer to S , which may be replaced to a certain extent by allowing $F > 1$.

The use of MCMC algorithms to sample from the posterior distribution of the model discussed in this section, however, requires special attention. The combined posterior distribution may have a complex multimodal structure. In turn, algorithms such as the Gibbs sampler may encounter difficulties in the exploration of highly multimodal distributions. Obtaining a practically useful Markov chain may therefore require fairly detailed research in each case.

It is assumed that the structure analogous to that described by the above observation equation is defined by the H -dimensional, sample-theoretical distribution using the predictive $p(\mathbf{y}^f | \mathbf{y}, \boldsymbol{\theta})$. Sampling from the Bayesian predictive distribution is done by direct sampling using a sample from the posterior distribution. This allows us to obtain a predictive distribution of y_t or x_t ($t = T + 1, \dots, T + H$) and its characterization using the techniques discussed in the previous section.

Adopting the specification of $g(t; \boldsymbol{\gamma})$ described above, one may consider the posterior distribution of a $T + H$ -dimensional function vector of the parameters of the model designated as $\mathbf{c}(\delta, \varphi)$ with a typical element of the form:

$$c_t(\delta, \varphi) = d(t; \delta, \varphi) - \frac{1}{S} \sum_{s=1}^S \gamma_s$$

The posterior distribution of this parameter may represent the knowledge of the cyclic component indicated by the analysed model of y_t distribution (including its predictive distribution). It is a matter of debate to what extent predictions for such a function of parameters can be identified with the projection of components representing the business cycle. Forms $\mathbf{c}(\delta, \varphi)$ and $d(t; \delta, \varphi)$ may require the modification depending on the empirical and theoretical properties of the time series under consideration. It appears, however, that the analysis of the posterior distribution of function $\mathbf{c}(\delta, \varphi)$ (or functions of a similar structure) can provide important information related to the potential future value of the cyclical nature of the time series studied. Knowledge of $\mathbf{c}(\delta, \varphi)$ (especially in the prediction period) can be represented by point characteristics (expected value, quantiles) or using a fan chart made up by marginal posterior distributions. It is also possible to analyse the decomposition of future values into components $d(t; \delta, \varphi)$ and ε_t , and analyse the relationships that hold among them.

Bayesian inference allows for a formally grounded examination of a posteriori uncertainty that affects inferences concerning the cyclical component. Naturally, it is also possible to study posterior probabilities of specific events defined with reference to either the future value of variable x_t under consideration or to an otherwise defined cyclical component. The identification of the cyclical component in each case and its suggested decomposition into seasonal variation components and business cycle fluctuations must be made individually, taking into account the nature of the series under consideration in the context of economic knowledge.

We shall illustrate the methodology presented here using an analysis of the annual dynamics of industrial production (using monthly statistical data from GUS). The analysis of the macroeconomic time series updated on a monthly basis enables us to minimize the delays associated with data publication. This is especially important for the monitoring of the current economic situation in terms of the possibilities and advisability of intervening.

Figure 11.5 shows the year-on-year percentage change in industrial production from January 1997 to March 2011 (number of observations $T = 171$).

Let us consider a model where $F = 3, J = 12, K = 0, S = 1$, which corresponds with the adoption of three harmonic components in function $d(t; \delta, \varphi)$, twelve delays in the autoregressive part of the model, the exclusion of the moving averages process and the adoption of $g(t; \boldsymbol{\gamma})$ representing a single intercept fixed in time. Due to the desire to extract long-term fluctuations we assume that the parameter domain φ_f is limited to the interval $\langle 0; 0.52 \rangle$. This corresponds to the exclusion of fluctuations with a period of less than one year.

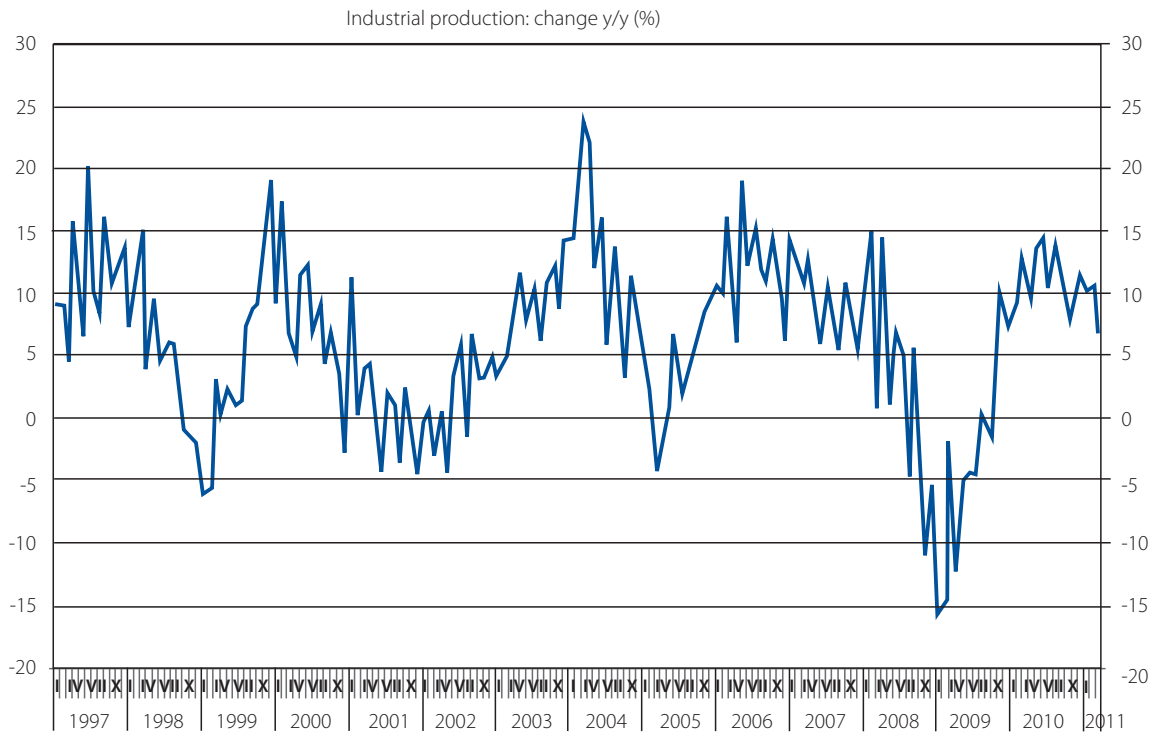


Fig. 11.5. Year-on-year change in industrial production (%) from January 1997 to March 2011

Source: own study.

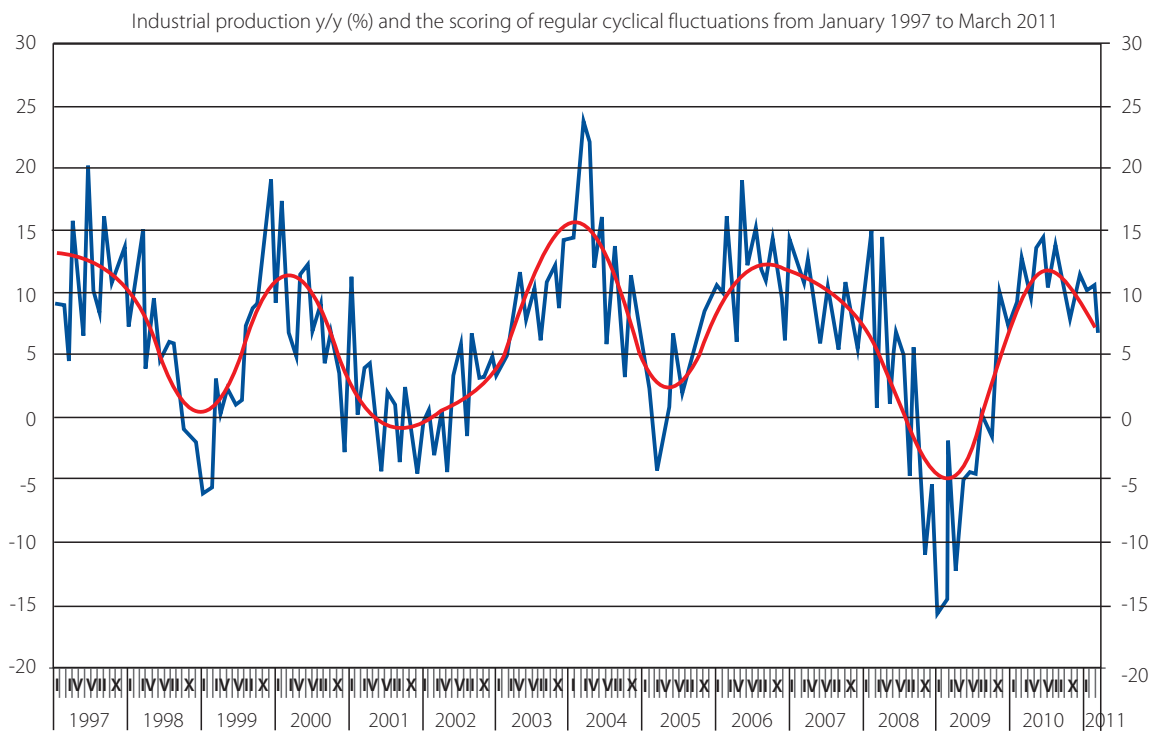


Fig. 11.6. Year-on-year change in industrial production (%) and the regular cyclical component (point assessments) from January 1997 to March 2011

Source: own study.

In the model above, the function of parameters $d(t; \delta, \varphi)$ represents the regular cyclical component. It differs from $c_t(\delta, \varphi)$ only with respect to a shift by a constant value, which represents the average change in industrial production. The figure shows the plot of the posterior expected value of function $d(t; \delta, \varphi)$ for $t = 1, \dots, 171$, which corresponds to the period studied. In Figure 11.6 the data values observed have also been shown.

An informal analysis of Figure 11.6 appears to indicate that the year-on-year changes in output exhibit cyclical regular cyclical fluctuations. The plot of ratings of the cyclical component shows a substantial overlap with the data plot.

The model shown here allows us to obtain both the posterior distribution for future values of the regular cyclical component represented here by the values of $d(t;\delta,\varphi)$ and the predictive distribution of the explanatory variable, i.e. the percentage of year-on-year change in industrial production. Based on the model, the predictive distribution of the rate of change in industrial production was obtained for April 2011 (forecast horizon $H = 1$). The industrial production growth rate in April 2011 published by GUS (compared with April 2010) is 6.6%. It is located between the quantile of the 0.55th order of the predictive distribution (which equals 6.38%) and the quantile of the 0.6th order (which equals 6.85%). The expected value of the predictive distribution is 5.93% with a standard deviation of 3.7 percentage points.

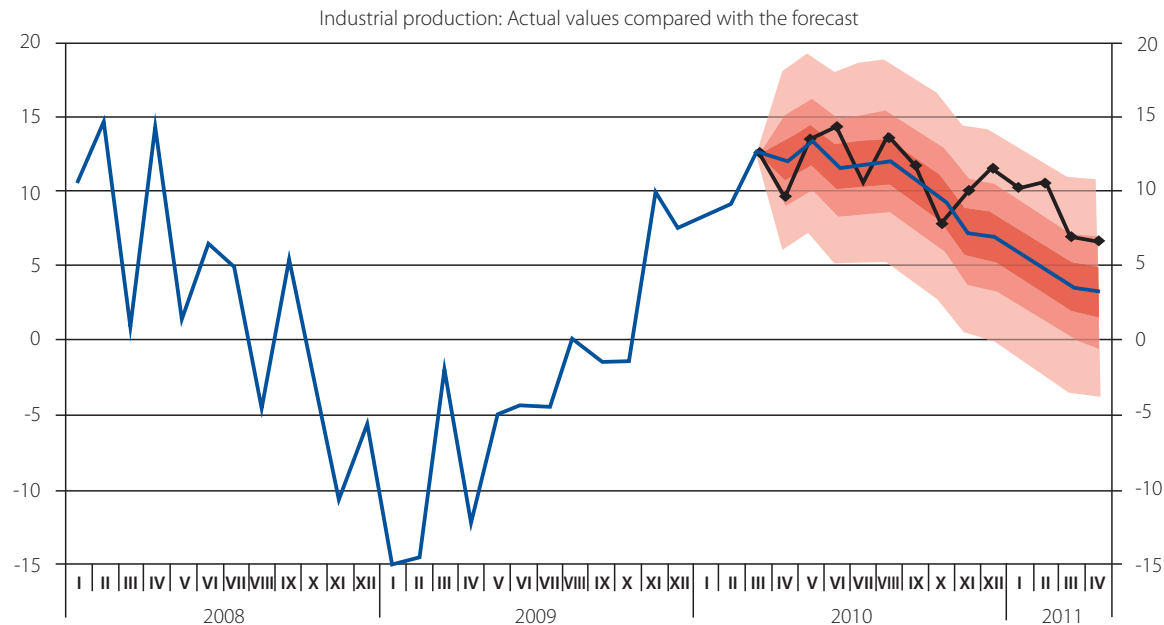


Fig. 11.7. Year-on-year changes in industrial production (%): A fan chart of predictive distribution and actually observed values; (%); sampling period to March 2010, prediction period to April 2011

Source: own study.

Industrial production: actual values compared with the forecast

In order to illustrate the predictive properties of the model in a longer timeframe, it was assumed that the last available observation is the value corresponding to March 2010. The model was then re-estimated. Figure 11.7 shows a fan chart based on the predictive distribution of industrial production with the marked realized data values. The fan chart was plotted using an informal approximation: relevant values were obtained from the marginal predictive distributions for each forecast horizon. The bands on the fan chart represent respectively 30%, 60% and 90% prediction intervals (produced by the marginal quantiles of the predictive distributions). Forecasts presented in Figure 11.6 appear to have a good ex-post accuracy. In the case of a sequence of forecasts for 13 consecutive periods, only three observations lie outside the 60% prediction intervals. The proposed methodology provides fairly accurate forecasts of turning points.

It appears that the presented methodology allows us both to analyse regular cyclical fluctuations in the sampling period and to obtain forecasts of the observable variable, which makes extensive use of the information concerning the cyclical fluctuations identified in the sample.

11.8. Var and vecm models of multivariate time series in the analysis of shock scenarios

Vector autoregression models (VAR) whose widespread use in empirical macroeconomic research was initiated by Sims (cf. e.g. Sims 1980) constitute an easy to estimate statistical tool. At the same time, years of experience confirm their suitability for the description of the dynamic properties of macroeconomic time series and scenario analyses. VAR models can be built without imposing restrictions arising from economic theory, which allows for the testing of hypotheses arising from this theory.

Let us consider an n -dimensional autoregressive process of the k -th order (VAR (k)):

$$x_t = \Pi_1 x_{t-1} + \Pi_2 x_{t-2} + \dots + \Pi_k x_{t-k} + \Phi D_t + \varepsilon_t, \quad t = 1, 2, \dots, T \quad (11.23)$$

where $x_{-k+1}, x_{-k+2}, \dots, x_0$ are the initial conditions, ε_t is the vector white noise, i.e. $E(\varepsilon_t) = \mathbf{0}$, $E(\varepsilon_t \varepsilon_t') = \Sigma$ ($\Sigma_{n \times n}$ is a positively defined matrix) and $E(\varepsilon_t \varepsilon_s') = \mathbf{0}$, when $t \neq s$. $n \times n$ -dimensional matrices Π_i , $i = 1, 2, \dots, k$ group parameters at subsequent process delays. Vector D_t contains non-random variables, such as a constant, a deterministic trend, seasonal variables, other variables of 0-1 type, while matrix Φ contains the parameters occurring at these variables.

A VAR process of any order can be represented as VAR (1):

$$X_t = \tilde{\Pi} X_{t-1} + \Phi D_t + E_t \quad (11.24)$$

where

$$X_t = \begin{bmatrix} x_t \\ x_{t-1} \\ \vdots \\ x_{t-k+1} \end{bmatrix}, \quad E_t = \begin{bmatrix} \varepsilon_t \\ 0 \\ \vdots \\ 0 \end{bmatrix}, \quad \Phi D_t = \begin{bmatrix} \Phi D_t \\ 0 \\ \vdots \\ 0 \end{bmatrix}, \quad \tilde{\Pi} = \begin{bmatrix} \Pi_1 & \Pi_2 & \dots & \Pi_{k-1} & \Pi_k \\ I_n & 0 & \dots & 0 & 0 \\ 0 & I_n & & 0 & 0 \\ \vdots & & \ddots & \vdots & \vdots \\ 0 & 0 & \dots & I_n & 0 \end{bmatrix}$$

In further considerations, we shall confine ourselves to processes that meet the following assumptions:

Assumption 1.1. Eigenvalues of matrix $\tilde{\Pi}$ lie inside the unit circle or are exactly equal to one.

Assumption 1.2. The components of vector D_t are polynomials of variable t (of a finite order).

A VAR process is covariance stationary¹² if and only if all the characteristic roots of the matrix lie inside the unit circle.

If among the roots of matrix $\tilde{\Pi}$ there are unit roots, i.e. whose modulus equals 1, then process $\{x_t\}$ is non-stationary. Assumption (1.1) reduces further considerations to stationary processes or integrated in the first degree $\{x_t\} : I(1)$, i.e. such that those their first differences are covariance stationary. These processes play an important role in the modelling of macroeconomic time series, since a number of the observed series have features that support their treatment as realizations of such processes. Using ordinary regression to model time series that constitute the realizations of non-stationary processes may lead to false associations whose symptoms may include a good model-data fit with a simultaneous high autocorrelation of residuals.

The search for an appropriate method of modelling non-stationary time series has led to the idea of co-integration. Processes are said to be cointegrated if there exists their non-zero linear combination leading to a reduction in the degree of integration. In practice, stationary combinations are particularly important. Further we shall restrict ourselves to case $C(1, 1)$, i.e. we shall seek non-zero linear combinations of components of the vector process $I(1)$ which are covariance stationary processes. The Granger representation theorem (cf. e.g. Engle and Granger 1987) states that any multivariate cointegration process can be represented in the form of an error correction mechanism, i.e. from the representation of VAR (see equation 23) we move to the VEC model:

$$\Delta x_t = \Pi x_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta x_{t-i} + \Phi D_t + \varepsilon_t, \quad t = 1, 2, \dots, T \quad (11.25)$$

where $x_{-k+1}, x_{-k+2}, \dots, x_0$ are the initial conditions, $\{\varepsilon_t\}$ is a vector white noise, $\Pi = \sum_{i=1}^k \Pi_i - I_n$, $\Gamma_i = -\sum_{j=i+1}^k \Pi_j$, whereas ΦD_t denotes the deterministic part of the model. While formulating the deterministic part of the VEC model, one should carefully investigate the impact of the adopted assumptions on both the increments and the levels of the process in question (cf. e.g. Johansen 1996, Juselius 2007). If the analysed process $\{x_t\}$ is an integrated process, then matrix Π array is an incomplete matrix ($r(\Pi) = r < n$). For $r = 0$ process $\{x_t\}$ is integrated, but it is not cointegrated; for $0 < r < n$ the process is cointegrated, hence matrix Π can be (equivocally) represented in the form of a full-column product of two matrices $\alpha_{n \times r}$ and $\beta_{r \times n}$:

$$\Pi = \alpha \beta' \quad (11.26)$$

The columns of matrix β contain the cointegration vectors that define the long-term dynamic equilibrium. In a system which remains in an equilibrium no internal factors appear, which would change the situation, however, when as a result of external factors the system is thrown out of balance, its components, in an attempt to restore balance, react to the emerging error through the adjustments parameters stored in matrix α .

¹² A stochastic process $\{X_t : t \in \mathbb{Z}\}$ is said to be covariance stationary if for any given finite integer t the following conditions are met: $E(x_t) = \mu$, $-\infty < \mu < +\infty$, $E((x_t - \mu)(x_t - \mu)') = \Sigma_0 < +\infty$ and $E((x_t - \mu)(x_{t+h} - \mu)') = \Sigma_h < +\infty, h = 1, 2, \dots$.

One of the main advantages of macroeconomic models with error correction mechanisms is thus a clear separation of short-term correlations (described by the parameters contained in matrices $\Gamma_i, i = 1, 2, \dots, k-1$) from the long-term ones, usually supported by economic theory and constituting the main focus of the analysis.

Parameters of VAR/VEC models do not have a direct interpretation, but in the representations of moving averages we can investigate the properties of the modelled processes and their relationships, for example by analysing the response to random noise function, which allows us to trace the impact of the innovation shock on its components in a selected variable of a given multi-dimensional process.

Let us introduce a covariant stationary process VAR(k) with no deterministic components (for the sake of facility of notation) as a vector moving average model of an infinite order, $MA(\infty)$: $x_t = \varepsilon_t + \Psi_1 \varepsilon_{t-1} + \dots$, where $\Psi_i = J \tilde{\Pi}^i J'$, $J_{n \times nk} = [I_n \quad 0 \quad \dots \quad 0]$. Element $\psi_{jk,i}$, i.e. element jk of matrix Ψ_i represents the reaction of the j -th variable from the system on one unit shock¹³ of variable k after i periods, assuming the absence of other disturbances (cf. e.g. Luetkepohl 2007).

When conducting a similar analysis for the cointegrated process:

$$\Delta x_t = \alpha \beta' x_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta x_{t-i} + \varepsilon_t, \quad t = 1, 2, \dots, T$$

first we should provide its VAR representation:

$$x_t = \Pi_1 x_{t-1} + \Pi_2 x_{t-2} + \dots + \Pi_k x_{t-k} + \varepsilon_t, \quad t = 1, 2, \dots, T$$

where: $\Pi_1 = \alpha \beta' + I_n + \Gamma_1$, $\Pi_i = \Gamma_i - \Gamma_{i-1}, i = 2, 3, \dots, k-$ and $\Pi_k = -\Gamma_{k-1}$. Next we determine the random disorder response functions according to the pattern shown above.

Now we shall move on to the issue of parameter estimation for VAR and VECM models using the maximum likelihood method (MLM). If we know the distribution type of the analysed process, we can use this very method to estimate its parameters. Let us suppose that process VAR(k) given by equation (11.23) has an nT -dimensional normal distribution, i.e. $\varepsilon_t \sim iN^n(0, \Sigma)$ and, for the sake of simplicity of notation, let us rewrite process (11.23) as follows:

$$x_t = B' Z_t + \varepsilon_t, \quad t = 1, 2, \dots, T \quad (11.27)$$

where:

$B' = [\Pi_1 \quad \Pi_2 \quad \dots \quad \Pi_k \quad \Phi]$, $Z_t' = [x_{t-1}' \quad x_{t-2}' \quad \dots \quad x_{t-k}' \quad D_t']$, and the initial conditions $X^0 = [x_0' \quad x_{-1}' \quad \dots \quad x_{-k+1}']$ have been established. We obtain the logarithmised likelihood function¹⁴ (cf. e.g. Juselius 2007)

$$\ln L(B, \Sigma; X) = -T \frac{n}{2} \ln(2\pi) - T \frac{1}{2} \ln |\Sigma| - \frac{1}{2} \sum_{t=1}^T (x_t - B' Z_t)' \Sigma^{-1} (x_t - B' Z_t) \quad (11.28)$$

which reaches a maximum at point

$$\hat{B}' = \sum_{t=1}^T (x_t Z_t') \left(\sum_{t=1}^T Z_t Z_t' \right)^{-1} = M_{xZ} M_{ZZ}^{-1} \quad (11.29)$$

$$\hat{\Sigma} = \frac{1}{T} \sum_{t=1}^T (x_t - \hat{B}' Z_t) (x_t - \hat{B}' Z_t)' = \frac{1}{T} \sum_{t=1}^T \hat{\varepsilon}_t \hat{\varepsilon}_t' \quad (11.30)$$

As far as the estimation of the VEC model is concerned, we should note that the main problems arising in the analysis of cointegration, both on classical and Bayesian grounds, involve the non-identifiability of the vector model parameters with the error correction mechanism. Matrix Π , which is an incomplete-rank matrix, is decomposed into the cointegrating vectors matrix β and the adjustment coefficients matrix α . Such decomposition is not unambiguous, because for any full-rank matrix the following relationship obtains: $\Pi = \alpha \beta' = \alpha C C^{-1} \beta'$; in other words, the data contain information only about the cointegrating space, and not the vectors that span it.

The use of the maximum likelihood method to estimate the VEC model parameters is based on the procedures proposed in 1951 by T.W. Anderson to analyse incomplete regressions. This approach in the analyses of VEC models was proposed and developed

¹³ Shocks that equal one standard deviation are also considered, especially when the system variables are presented on different scales.

¹⁴ $\ln(\cdot)$ is an increasing function and, as such, it does not alter the position of the extremum of the likelihood function.

by S. Johansen, hence it is called the Johansen procedure. Let us represent the VEC model as equation (11.25) using the following conventionally adopted designations (cf. e.g. Johansen 1996, Juselius 2007):

$$Z_{0t} = \Delta x_t$$

$$Z_{1t} = x_{t-1}$$

$$Z_{2t} = [\Delta x'_{t-1} \quad \Delta x'_{t-2} \quad \dots \quad \Delta x'_{t-k+1} \quad D'_t]$$

that is:

$$Z_{0t} = \alpha \beta' Z_{1t} + \Gamma' Z_{2t} + \varepsilon_t \quad (11.31)$$

where

$$\Gamma' = [\Gamma_1 \quad \Gamma_2 \quad \dots \quad \Gamma_{k-1} \quad \Phi]$$

Assuming that $\varepsilon_t \sim iin^N(0, \Sigma)$, we obtain the following logarithmised likelihood function:

$$\ln L(\alpha, \beta, \Gamma, \Sigma; X) = -T \frac{n}{2} \ln(2\pi) - T \frac{1}{2} \ln |\Sigma| - \frac{1}{2} \sum_{t=1}^T (Z_{0t} - \alpha \beta' Z_{1t} - \Gamma' Z_{2t})' \Sigma^{-1} (Z_{0t} - \alpha \beta' Z_{1t} - \Gamma' Z_{2t}) \quad (11.32)$$

Due to the complex form of the likelihood function given by equation (11.32), searching for its maximum in subsequent steps involves building a concentrated likelihood function.

Function (32), given a fixed r , reaches its maximum at the following point (cf. e.g. Johansen 1996):

$$\hat{\beta} = S_{11}^{-\frac{1}{2}} [v_1 \quad v_2 \quad \dots \quad v_r] \quad (11.33)$$

$$\hat{\alpha} = S_{01} \hat{\beta} (\hat{\beta}' S_{11} \hat{\beta})^{-1} \quad (11.34)$$

$$\hat{\Gamma}' = (M_{02} - \hat{\alpha} \hat{\beta}' M_{12}) M_{22}^{-1} \quad (11.35)$$

$$\hat{\Sigma} = S_{00} - S_{01} \hat{\beta} (\hat{\beta}' S_{11} \hat{\beta})^{-1} \hat{\beta}' S_{10} \quad (11.36)$$

where $M_{ij} = \frac{1}{T} \sum_{t=1}^T Z_{it} Z'_{jt}$, $S_{ij} = M_{ij} - M_{i2} M_{22}^{-1} M_{2j}$ for $i, j = 0, 1$, whereas $v_1, v_2, \dots, v_r$ are eigenvectors of matrix $S_{11}^{-\frac{1}{2}} S_{10} S_{00}^{-1} S_{01} S_{11}^{-\frac{1}{2}}$ corresponding r first eigenvalues of the matrix arranged in a non-increasing order.

Before commencing the description of the estimation of VAR and VEC models using the Bayesian approach, let us briefly review the idea. The main distinctive feature of Bayesian inference methods, which makes it different from the classical ones, is its interpretation of probability. Classical statistics employs its frequency interpretation, whereas the Bayesian approach makes use of its subjective interpretation, because probability is intended to express the degree of conviction as to the truth of a given proposition (cf. e.g. Osiewalski (2001)). In the Bayesian model, parameters (θ) constitute random variables, and the Bayesian statistical model is unambiguously characterized by the cumulative density function of the probability distribution of the observed vector, the projected vector and the parameter vector:

$$p(x, x_f, \theta) = p(x_f | x, \theta) p(x | \theta) p(\theta)$$

where x is the vector of observed values, x_f – the vector of future realizations, θ – the parameter vector, $p(x_f | x, \theta)$ represents the sampled predictive density, $p(\cdot | \theta)$ – the density function defined on the set of possible realizations of the phenomenon in question, and $p(\theta)$ – the density of the prior distribution that reflects our initial uncertainty as to the value of parameter θ .

Inferencing is carried out in accordance with the principles of probability theory, using, among others, the Bayes' theorem. The parameter vector θ is estimated on the basis of the conditional distribution of θ given the fixed vector of observations x , i.e. based on the so-called posterior distribution, whose density is set by the following formula:

$$p(\theta | x) = \frac{p(x | \theta) p(\theta)}{\int_{\Theta} p(x | \theta) p(\theta) d\theta}$$

Let us rewrite the VAR model (11.27) in its matrix notation:

$$X = ZB + E \quad (37)$$

where, $X' = [x_1' \ x_2' \ \dots \ x_T']$, $Z' = [z_1' \ z_2' \ \dots \ z_T']$, $E' = [\varepsilon_1' \ \varepsilon_2' \ \dots \ \varepsilon_T']$ and let us assume the following prior distributions:

1. for Σ – the inverse Wishart distribution with the matrix parameter S and q degrees of freedom: $\Sigma: iW(S, q)$,
2. for B – the matrix normal distribution conditional with respect to Σ , centred at B^* : $B|\Sigma: mN(B^*, \Sigma, G)$, where $G_{(nk+l) \times (nk+l)}$ is a known positively defined matrix and l is the number of non-random variables.

Those distributions together with the assumption of normality applied to the analysed process ($\varepsilon_t: iN^n(0, \Sigma)$) lead to the following system of full conditional posterior distributions (which makes it easier to obtain a pseudo-random sampling from the posterior distribution):

1. the inverse Wishart distribution for Σ :

$$p(\Sigma | B, X) = iW(S + (B - B^*)' G^{-1} (B - B^*) + E' E, q + nk + l + T)$$

2. the matrix normal distribution for B :

$$p(B | \Sigma, X) = mN(\mu_B, \Sigma, (G^{-1} + Z' Z)^{-1})$$

where

$$\mu_B = (G^{-1} + Z' Z)^{-1} (G^{-1} B^* + Z' X)$$

In the section devoted to the Bayesian estimation of VEC models, we shall present the model proposed by Strachan and Inder (cf. Strachan and Inder 2004) with the posterior distribution sampling design derived from Koop, León-González, Strachan (cf. Koop et al. 2010). The authors of the model for the estimation of the cointegrating space employ the class of MACG distributions with the matrix parameter $\Omega_{m \times m}$ (matrix angular central Gaussian distributions, cf. e.g. Chikuse 2002). In order to describe the space in question, Strachan and Inder (cf. Strachan and Inder 2004) use vectors that satisfy the condition $\beta' \beta = I_r$, where I_r is the identity matrix of the r -th level, i.e. the estimated matrix of cointegrating vectors is given with an accuracy to a certain orthogonal matrix Q of the r -th level, i.e. $Q \in O(r)$.

Theorem 3.1. *If the random matrix Z has dimensions $m \times r$ and a matrix normal distribution $mN_{m \times r}(0, I_r, \Omega)$, then its orientation $H_Z = Z(Z' Z)^{-\frac{1}{2}}$ has an MACG distribution with parameter Ω with the following density function:*

$$p(H_Z) = |\Omega|^{-\frac{r}{2}} |H_Z' \Omega H_Z|^{-\frac{m}{2}}$$

Any matrix $Z_{n \times r}$ of rank r (almost everywhere) can be uniquely (almost everywhere) represented in the form of the product $Z = H_Z T_Z^{\frac{1}{2}}$, where $H_Z = Z(Z' Z)^{-\frac{1}{2}}$ is a matrix with orthonormal columns and $T_Z = Z' Z$ is a symmetrical square matrix of rank r (Cadet 1996, Muirhead 1982). Matrix H_Z is called the orientation of matrix Z , $T_Z^{\frac{1}{2}}$ the elliptical part (concentration) of matrix Z .

Spaces spanned by the columns of matrices Z and H_Z are the same $sp(Z) = sp(H_Z)$. For any symmetric positive definite real matrix M we adopt the following definition of the square root: $M^{\frac{1}{2}} = C \Lambda C'$ and $M^{-\frac{1}{2}} = C \Lambda^{-1} C'$, where Λ is a diagonal matrix which contains on the main diagonal the square roots of the eigenvalues of matrix M , while C contains the orthonormal eigenvectors of M (cf. e.g. Johansen 1996).

Using the $MACG(\Omega)$ distribution parameter, it is possible to introduce into the model the initial information concerning the cointegrating space or absence thereof (then Ω is an identity matrix of the m -th rank). In the distribution of information we assume that $\Omega = P_\tau = H H' + \tau H_\perp H_\perp'$, where $H_{m \times s}$, $s \geq r$ ($H' H = I_r$) is a matrix containing initial information on the cointegrating space, $H_\perp$ – the matrix spanning the orthogonal complement of space $sp(H)$, and τ – a parameter representing the weight ascribed to space $sp(H)$.

In order to combine the above-described distribution with a convenient and efficient sampling design from the posterior distribution, Koop, León-González and Strachan (see Koop et al. 2010) propose to start from parameterization $\Pi = AB' \equiv \alpha\beta'$, where $B \in \mathbf{R}^{mr}$, $A \in \mathbf{R}^{nr}$ and $B = \beta(\beta'\beta)^{-\frac{1}{2}}$, $A = \alpha(\alpha'\alpha)^{-\frac{1}{2}}$, assuming for B and A the following normal matrix distributions: $B|\tau, r: mN(0, m^{-1}I_r, P_\tau)$, $A|\nu, r: mN(0, \nu I_r, \Sigma)$. Starting from the distribution for B , we thus obtain the following $MACG(P_\tau)$ distribution for β :

For the remaining parameters of the model the following prior distributions can be adopted:

1. for Σ – the inverse Wishart distribution with the matrix parameter S and q degrees of freedom: $\Sigma: iW(S, q)$,
2. for Γ – the matrix normal distribution centred at zero conditional with respect to Σ : $\Gamma|\Sigma, h: mN(0, \Sigma, hI_{n(k-1)+l})$, where $h > 0$ is the parameter governing the degree of dispersion of the distribution, and l denotes the number of non-random variables,
3. for τ, ν and h , if we decide to estimate them – inverse gamma distributions: gamma: $\tau: iG(s_\tau, n_\tau)$, $\nu: iG(s_\nu, n_\nu)$, $h: iG(s_h, n_h)$. The a priori distribution for τ such parameters should be adopted that the entire probability mass is within the 0 to 1 interval, so that more probability could be assigned to space $sp(H)$.

The adoption of the above-mentioned prior distributions leads to the following system of full conditional posterior distributions (cf. e.g. Wróblewska 2010):

1. the inverse Wishart distribution for Σ :

$$p(\Sigma | A, B, \Gamma, \nu, \tau, h, r, X) = iW(S + \frac{1}{h}\Gamma'\Gamma + \frac{1}{\nu}AA' + E'E, q + n(k-1) + l + r + T)$$

2. the matrix normal distribution for A :

$$p(A | \Sigma, B, \Gamma, \nu, \tau, h, r, X) = mN(\mu_A, (B'Z_1'Z_1B + \frac{1}{\nu}I_r)^{-1}, \Sigma)$$

where

$$\mu_A = (Z_0 - Z_2\Gamma)'Z_1B(B'Z_1'Z_1B + \frac{1}{\nu}I_r)^{-1}$$

3. the normal distribution for vector $vec(B)$:

$$p(vec(B) | \Sigma, A, \Gamma, \nu, \tau, h, r, X) = N(\mu_{vB}, \Omega_{vB})$$

Where

$$\Omega_{vB} = ([A'\Sigma^{-1}A] \otimes [Z_1'Z_1] + [mI_r \otimes P_1])^{-1}, \quad \mu_{vB} = \Omega_{vB}vec(Z_1'(Z_0 - Z_2\Gamma)\Sigma^{-1}A)$$

4. the matrix normal distribution for Γ :

$$p(\Gamma | \Sigma, A, B, \nu, \tau, h, r, X) = mN(\mu_\Gamma, \Sigma, (\frac{1}{h}I_{n(k-1)+l} + Z_2'Z_2)^{-1})$$

where

$$\mu_\Gamma = (\frac{1}{h}I_{n(k-1)+l} + Z_2'Z_2)^{-1}Z_2'(Z_0 - Z_1\beta\alpha')$$

5. the inverse gamma distribution for ν and h :

$$p(\nu | \Sigma, A, B, \Gamma, \tau, h, r, X) = iG(s_\nu + \frac{1}{2}tr(\Sigma^{-1}AA'), n_\nu + \frac{nr}{2})$$

$$p(h | \Sigma, A, B, \Gamma, \tau, \nu, r, X) = iG(s_h + \frac{1}{2}tr(\Sigma^{-1}\Gamma'\Gamma), n_h + \frac{n(n(k-1)+l)}{2})$$

6. for τ :

$$p(\tau | B, r, X) \propto P_\tau |^{-\frac{1}{r}} \tau^{-n_\tau-1} \exp(-\frac{1}{\tau}(s_{tau} + \frac{m}{2}tr(BH_\perp H_\perp' B')))$$

Pseudorandom sampling from the posterior distribution can be obtained using a parameter-augmented Gibbs sampling algorithm (cf. Koop et al. 2010, Wróblewska 2010):

1. Setting an arbitrary vector of initial values: $(\Sigma^{(0)}, \alpha^{(0)}, \beta^{(0)}, \Gamma^{(0)}, \nu^{(0)}, h^{(0)}, \tau^{(0)})$.
2. Random selection of a single realization $(\Sigma^{(s)}, A^{(s)}, B^{(s)}, \Gamma^{(s)}, \nu^{(s)}, h^{(s)}, \tau^{(s)})$ consists of the following steps:
 - (a) Sampling $\Sigma^{(s)}$ from the distribution

$$p(\Sigma | A = A^{(s-1)}, B = B^{(s-1)}, \Gamma = \Gamma^{(s-1)}, \nu = \nu^{(s-1)}, h = h^{(s-1)}, \tau = \tau^{(s-1)}, r, X)$$

- (b) Sampling $A^{(s)}$ from the distribution

$$p(A | \Sigma = \Sigma^{(s)}, B = B^{(s-1)}, \Gamma = \Gamma^{(s-1)}, \nu = \nu^{(s-1)}, h = h^{(s-1)}, \tau = \tau^{(s-1)}, r, X)$$

- (c) Sampling $B^{(s)}$ from the distribution

$$p(B | \Sigma = \Sigma^{(s)}, A = A^{(s)}, \Gamma = \Gamma^{(s-1)}, \nu = \nu^{(s-1)}, h = h^{(s-1)}, \tau = \tau^{(s-1)}, r, X)$$

- (d) Calculation of β and α assuming that $\beta = B(B'B)^{-\frac{1}{2}}, \alpha = (B'B)^{-\frac{1}{2}}(\Pi = \alpha\beta' = AB')$,

- (e) Sampling $\Gamma^{(s)}$ from the distribution

$$p(\Gamma^{(s)} | \Sigma = \Sigma^{(s)}, \alpha = \alpha^{(s)}, \beta = \beta^{(s)}, \nu = \nu^{(s-1)}, h = h^{(s-1)}, \tau = \tau^{(s-1)}, r, X)$$

- (f) Sampling $\nu^{(s)}$ from the distribution $p(\nu | \Sigma = \Sigma^{(s)}, \alpha = \alpha^{(s)}, \beta = \beta^{(s)}, h = h^{(s-1)}, \tau = \tau^{(s-1)}, r, X)$

- (g) Sampling $h^{(s)}$ from the distribution $p(h | \Sigma = \Sigma^{(s)}, \alpha = \alpha^{(s)}, \beta = \beta^{(s)}, \nu = \nu^{(s)}, \tau = \tau^{(s-1)}, r, X)$

- (h) For the sampling of parameter τ from the posterior distribution we can use e.g. the Metropolis-Hastings algorithm with the generation of initial values from the following distribution:

$$iG\left(s_\tau + \frac{m}{s} \text{tr}(BH \perp H' \perp B'), n_\tau\right)$$

11.9. The application of Bayesian var and vecm models in forecasting

VEC models used in the analysis of cointegration may differ with respect to the number of delays in short-term dynamics (k), the number of cointegrating relationships (r), the kind of trends (d), additional restrictions imposed on the cointegrating space ($o, o \in 0, 1, \dots, \mathfrak{A}$, where $o = 0$ represents no restriction), a form of exogeneity of selected variables (e). A detailed description of the most commonly considered linear restrictions imposed on the cointegrating space, on the space of the adjustment factors and considerations concerning the trends can be found e.g. in Johansen (1996). At this point it is worth noting that using the Bayesian VEC model these restrictions can be expressed by conditions applied directly to the co-integrating space.

Let $\xi = (k, r, d, o, e) \in \Xi$ be a vector describing the characteristics under consideration and M_ξ a model with these characteristics. Before determining the posterior probabilities, the models examined must be assigned prior probabilities, so that e.g. all the considered models have equal prior probabilities or that the more economically parameterized models are more likely. Knowing prior probabilities, we can, using the formula below, determine the posterior probability:

$$p(M_\xi) = \frac{p(M_\xi)p(X | M_\xi)}{\sum_{\xi \in \Xi} p(M_\xi)p(X | M_\xi)}, \quad \xi \in \Xi \quad (11.38)$$

where $p(X | M_\xi)$ is the marginal density of the vector of observations in model M_ξ . An analytical determination of the marginal density of the vector of observations is usually very difficult or even impossible, hence numerical methods or approximations are applied to that end.

Using the Bayesian method of combining knowledge, the posterior probabilities determined can be used to perform a further analysis of the studied phenomenon, accordingly, the conclusions drawn will not be based on a single selected model, but will reflect the uncertainty associated with its specification (cf. e.g. Osiewalski 2001).

In this section, the Bayesian idea of combining knowledge shall be presented in the context of forecasting. To produce the forecast of a cointegrated process, we move from the VEC representation to the VAR representation according to the pattern presented in subsection 2.3.

Bayesian prediction is based on predictive distribution, i.e. on the conditional distribution of the future values of the analysed process with respect to observations. Let us denote the vector of expected values by $\tilde{X} = (x_{T+1}, x_{T+2}, \dots, x_{T+h})$, where h is the forecast horizon. The predictive distribution relative to the observed values of X is obtained by averaging (on the parameter

space) the so-called predictive sampling density $p(\tilde{X}|\theta, X)$ using the density of the posterior distribution density for the parameters of the model as a weight function (Osiewalski 2001, Zellner 1971):

$$p(\tilde{X}|X) = \int_{\Theta} p(\tilde{X}, \theta|X) d\theta = \int_{\Theta} p(\tilde{X}|\theta, X) p(\theta|X) d\theta \quad (11.39)$$

In many cases it is impossible to calculate analytically the integral set by formula (11.39), therefore, in order to obtain a sample from the predictive distribution numerical methods are used. The predictive sampling density can be represented as the following product of densities:

$$p(\tilde{X}|\theta, X) = p(x_{T+1}|\theta, X) p(x_{T+2}|\theta, X, x_{T+1}) \dots p(x_{T+h}|\theta, X, x_{T+1}, x_{T+2}, \dots, x_{T+h-1})$$

In other words, in order to obtain a sample from the predictive distribution, after sampling the parameter vector from the posterior distribution, we sample x_{T+1} according to the distribution $p(x_{T+1}|\theta, X)$, and then x_{T+2} from $p(x_{T+2}|\theta, X, x_{T+1})$. Such a sampling design is continued up to the adopted forecast horizon. In the Bayesian VAR/VEC models discussed, the conditional distribution $p(x_{T+1}|\theta, X, x_{T+1}, x_{T+2}, \dots, x_{T+i-1})$ is normal, so sampling is relatively easy.

The predictive distribution takes into account the uncertainty associated with both the predicted values and with the values of the parameters. In addition, using the Bayesian technique of combining knowledge, determining the forecast may be based not on a single Bayesian model, but on a set of such models:

$$p(\tilde{X}|X) = \sum_{\xi \in \Xi} p(M_{\xi}|X) p(\tilde{X}|X, M_{\xi}) = \sum_{\xi \in \Xi} p(M_{\xi}|X) \int_{\Theta_{\xi}} p(\tilde{X}|\theta_{\xi}, X) p(\theta_{\xi}|X) d\theta_{\xi} \quad (11.40)$$

As a result of combining knowledge, we obtain a final predictive distribution, which is a weighted average of the predictive distributions in the models under consideration with respective weights corresponding to the posterior probabilities of these models.

Chapter 12

THE STARTING MECHANISM

12.1. Introduction

The starting mechanism of the Rapid Reaction Instrument comprises information about the state of the economy and its individual sectors. The information derives from the system’s research (monitoring) component based on which political decisions are made to start the implementation activities in specific enterprises eligible for support under the system.

The purpose of the starting mechanism is to provide policy-makers with information about the assumptions trigger implementation activities in individual enterprises, industries and groups of businesses that should be supported.

The source information on the subject in question should come from reports produced within the RRI’s micro- and macro-economic research component, while the decision-making procedure should be consistent with other activities undertaken within the instrument.

12.2. The general concept of the starting mechanism

It was assumed that the basic decision-making procedure should comprise a three-level scoring system for micro-, meso- and macro-level variables. It means that the RRI starting mechanism will be based on point evaluations of information on the state of the economy and its individual sectors originating from the research component of the RRI converted into a probability score.

In order to maximize the amount of information analysed in the reports of the RRI research component two complementary systems are proposed:

- The basic scoring system,
- The auxiliary information system.

The basic scoring system shall provide the direct basis for a decision to start implementation activities in enterprises, and thereby meet the postulated requirement of methodological consistency in combination with aggregation and disaggregation capacities among all levels (micro-, meso- and macro). The system would thus indicate the specific groups of enterprises, with regard to which RRI interventions should commence.

Due to the specific features of statistics compiled by different sources – some data are not calculated or available at all three levels, or are expressed from a certain point of view – the utilization of such input in the basic scoring system is not possible or would not make economic sense. After all, the data often contain valuable information about the state of the economy or of certain aspects

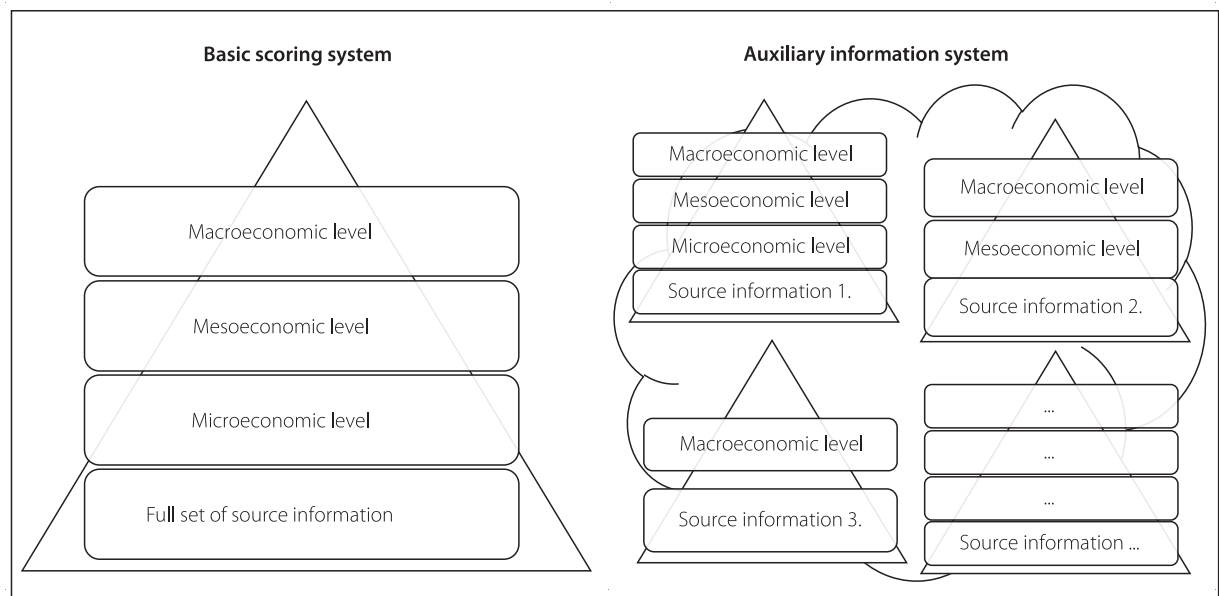


Fig. 12.1. A schematic comparison of the basic scoring system and the auxiliary information system

Source: own study.

of its operation and, therefore, their complete exclusion would not be recommended. Hence the proposal to include an auxiliary information system, which would provide additional input into the basic scoring system and offer a broader background in the decision-making process. The system could suggest areas on which aspects of enterprise operation RRI support should be focused (information concerning the object of intervention in question). Such an auxiliary information system should be open and flexible, which would make it easier, if necessary, to incorporate new information without having to modify the entire scoring system. Simultaneously, data within the auxiliary information system would be presented in the same way as in the basic scoring scheme.

12.3. The basic scoring system

Below we shall describe the general algorithm for the basic scoring. With a view to preserving scoring consistency at all three levels, we propose that the basic algorithm for calculating the point values within the basic scoring system should be sequential and run from the micro-, through the meso- to the macroeconomic level. Accordingly, the sequential scoring algorithm would run as follows:

1. Calculation of a point value at the microeconomic level – $MicroScore_{j,t} \in (0,1)$ – based on a set of source information,
 2. The calculation of a point value at the mesoeconomic level – $MesoScore_{i,t} \in (0,1)$ – based on the aggregation of results from the microeconomic level,
 3. The calculation of a point value at the macroeconomic level – $MacroScore_t \in (0,1)$ – based on the aggregation of results from the mesoeconomic level.
- (i and j – cross-sectional indices, t – the time index).

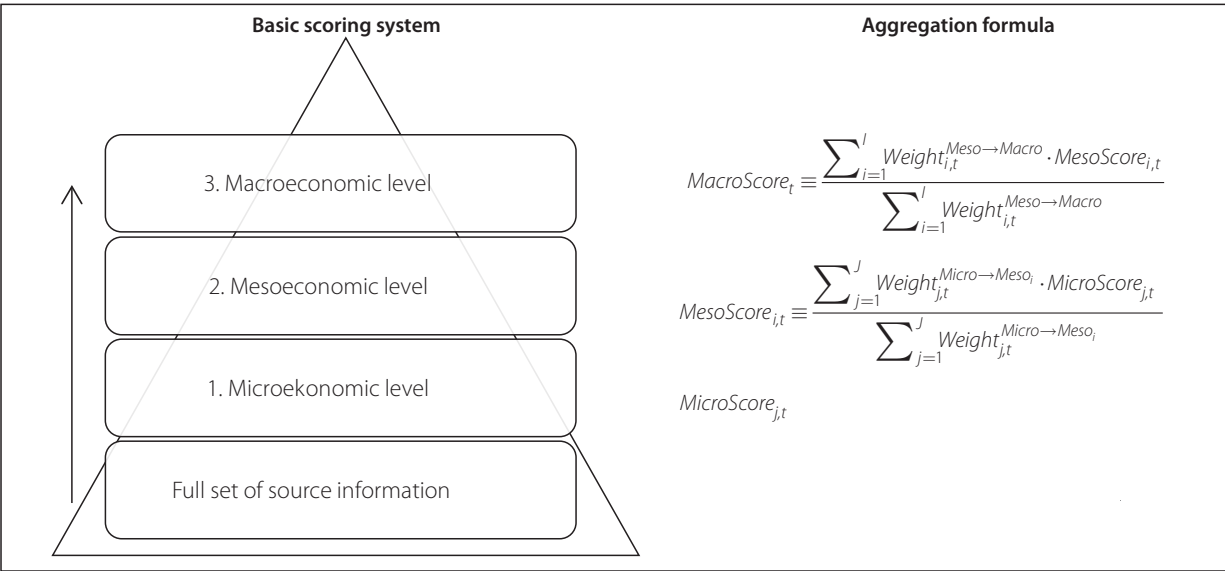


Fig. 12.2. A general algorithm of the basic scoring system

Source: own study.

Since individual data from studies F-01/I-01 are protected by statistical secrecy, research in the micro component is based on data aggregated into classes defined by the intersection of the cross-sections by NACE divisions and the number of employees (small enterprises: 10–49 employees, medium-sized enterprises: 50–249 employees, large enterprises: 250 employees or more). It should be noted that statistical confidentiality prevents access to of information if the data list consists of fewer than three entities or the share of one of them in the aggregate is greater than three-quarters. Consequently, the available data do not include certain classes of enterprises, and are incomplete with respect to certain others categories. An additional complication is posed by the fact that the data on small enterprises are updated on a semi-annual basis, whereas the data on medium-sized and large enterprises – on a quarterly basis.

Taking into account the availability of data, it is recommended that problematic classes of enterprises be aggregated by NACE section with respect to their size in terms of employee numbers (small, medium-sized, large) so as to avert the problem of the lack of data. Due to the different rules governing the updating of information on small enterprises (semi-annual) vs. medium-sized and large enterprises (quarterly) it is not advised to aggregate the classes of different size within the NACE sections.

Table 12.1 shows the suggested breakdown, in which the problematic NACE sections have been combined with those of the most similar profile of activity or – if such are missing – included in the residual category. As a result, the proposed breakdown, comprise 99 individual classes of enterprises which will be scored at the microeconomic level:

$MicroScore_{j,t}^{SC}$ – for the j -th class of enterprises under NACE section ($j \in \{1,2,..., 33\}$), size class $SC \in \{S, M, L\}$, in period t

Table 12.1. Proposed classification of enterprises at the microeconomic scoring level (xxx – absence of data for the entire period from 2007, x – absence of data for selected periods)

NACE class	NACE division	Small (semi-annually)	Medium-sized (quarterly)	Large (quarterly)
Industry				
Section B – Mining and quarrying				
1	5. Mining of coal and lignite	x	x	x
	6. Extraction of crude petroleum and natural gas	xxx	xxx	xxx
	7. Mining of metal ores	xxx	xxx	xxx
	8. Other mining and quarrying			
	9. Mining support service activities	x	xxx	xxx
Section C – Manufacturing				
2	10. Manufacture of food products			
3	11. Manufacture of beverages			
4	13. Manufacture of textiles			
	14. Manufacture of wearing apparel		x	x
	15. Manufacture of leather and related products	x	x	x
5	16. Manufacture of wood and of products of wood and cork, except furniture...			
	31. Manufacture of furniture	x	x	
6	17. Manufacture of paper and paper products			
7	18. Printing and reproduction of recorded media			
8	20. Manufacture of chemicals and chemical products			
9	22. Manufacture of rubber and plastic products			
10	23. Manufacture of other non-metallic mineral products			
11	24. Manufacture of basic metals			
12	25. Manufacture of fabricated metal products...			
13	26. Manufacture of computer, electronic and...			
14	27. Manufacture of electrical equipment			
15	28. Manufacture of machinery and equipment n.e.c.			
16	29. Manufacture of motor vehicles, trailers and semi-trailers...			
17	30. Manufacture of other transport equipment			
18	32. Other manufacturing			
	12. Manufacture of tobacco products	xxx	x	x
	19. Manufacture of coke and refined...	x	x	
	21. Manufacture of pharmaceutical, medicinal...	x	x	
19	33. Repair and installation of machinery and equipment			
Section D – Production and distribution of electricity, gas...				
20	35. Production and supply of electricity, gas...			
Section E – Water supply, sewerage, waste management and remediation activities				
21	36. Water collection, purification and supply	x	x	
	37. Sewerage			
	38. Waste collection, treatment and disposal...		x	x
	39. Remediation activities and other...	x	x	xxx

NACE class	NACE division	Small (semi-annually)	Medium-sized (quarterly)	Large (quarterly)
Trade				
Section G – Wholesale and retail trade, repair of motor vehicles and motorcycles				
22	45. Wholesale and retail trade of motor vehicles...		X	x
	46. Wholesale trade, except of motor vehicles...			
	47. Retail trade, except of motor vehicles...		x	x
Services				
Section F – Construction				
23	41. Construction of buildings			
24	42. Civil engineering...			
25	43. Specialized construction activities			
Section H – Transportation and storage				
26	49. Land transport and transport via pipelines			
	50. Water transport	x	x	xxx
	51. Air transport		xxx	xxx
	52. Warehousing and support activities for transportation	xxx		
Section I – accommodation and food service activities				
27	55. Accommodation		xxx	
	56. Food and beverage service activities			
Section J – Information and communication				
28	58. Publishing			
	59. Motion picture, video and TV programme production,...		x	x
29	60. Programming and broadcasting activities			
30	61. Telecommunications			
31	62. Computer programming, consultancy and related activities			
	63. Information service activities		x	x
Section K – Financial and insurance activities				
Section L – Activities related to real estate				
32	64. Financial service activities, except...		x	x
	65. Insurance, reinsurance and pension funding, except...	xxx	xxx	xxx
	66. Activities auxiliary to financial services...		x	x
	68. Real estate activities			
Section N – Activity in the services administration and support service activities				
Section S – Other service activities				
33	77. Rental and leasing activities			
	78. Employment activities	x	x	x
	79. Travel agency, tour operator,...	x	x	x
	80. Security and investigation activities	x	x	
	81. Services to buildings and landscape...	x	x	x
	82. Office administrative, office support and...		x	x
	94. Activities of membership organizations	x	xxx	xxx
	95. Repair of computers and personal and...	x	x	x
	96. Other personal service activities	x	x	x

Source: own calculations based on information from the RRI microeconomic research component reports.

In order to calculate the value of the *MicroScore*, we suggest that the point value at the microeconomic level should be based on the degrees of bankruptcy risk estimated and forecast within the RRI microeconomic research component. For the purposes of the basic scoring system, these values should be converted to classes defined in Table 10.

Since the bankruptcy probabilities of different classes of enterprises estimated in the microeconomic component are not directly comparable with each other in normative terms, a three-stage procedure should be applied whose purpose is to relativize the data both cross-sectionally and along the temporal dimension:

1. Removing seasonal variations from the time series of estimated and predicted bankruptcy probabilities (suggested method: TRAMO/SEATS, cf. Gomez and Maraval 1996).
2. Filtering the adjusted time series in order to remove the long-term trends and high-frequency fluctuations (suggested method: the Christiano-Fitzgerald filter (cf. Christiano and Fitzgerald 2003), with the fluctuation period from 1.5 to 8 years, assuming that filtered series are trend stationary).
3. Estimation of the random distribution of the cyclic component of the time series and calculation the value of the cumulative distribution function for each observation in the sample (suggested method: assuming that the cyclical component of the time series has a normal distribution with parameters estimated on the basis of the sample).

As a result of the proposed procedure, 99 (33 x 3) time series of point values $MicroScore_{j,t}^{SC}$ will be calculated, which will be subsequently aggregated to the mesoeconomic level, and later – to the macroeconomic one.

In order to calculate the value of the *MesoScore*, the initial division into 3 classes of enterprises by number of employees should be preserved at the mesoeconomic level and an aggregation into 3 classes designated under NACE sections should be applied (industry – *I*, trade – *T*, services – *S*). Commonly, data are presented in such a way in the RRI microeconomic component.

According to the proposed sequential algorithm, scoring at the mesoeconomic level is based on the information calculated at the microeconomic level and on a weighting system. Two scoring paths should be created comprising two weighting schemes based on the following:

- Gross value added (GVA),
- Number of employees (NE).

The use of the proposed weighting schemes based on the gross value added and on the number of employees is justified since both parameters constitute fundamental business categories of concern to economic policymakers. On the one hand, microeconomic information reflects the estimated bankruptcy probability of enterprises, on the other hand, the weighting scheme contains information about the economic importance of those enterprises, in other words, the potential cost in terms of the lost gross value added and the number of jobs generated by these enterprises, for which the bankruptcy probability is measured. The gross value added represents an insight through the lens of the final good market, while the number of employees represents an insight through the prism of the labour market(s). Since these two approaches do not always coincide, both should be analysed simultaneously, which results in two parallel scoring paths:

$MesoScore_GVA_{TA,t}^{SC}$ – a scoring path based on the gross value-added for enterprises whose size class $SC \in \{S, M, L\}$ and which are engaged in type of activity $TA \in \{I, T, S\}$.

$MesoScore_NE_{TA,t}^{SC}$ – a scoring path based on the number of employees in enterprises whose size class $SC \in \{S, M, L\}$ and which are engaged in type of activity $TA \in \{I, T, S\}$.

Adopting the previous representations, the point values at the for mesoeconomic level for a weighting scheme based on gross value added can be calculated as follows (a similar aggregation can be performed for a weighting scheme based on the number of employees by replacing *GVA* with *NE* in the formulae):

$$MesoScore_GVA_{I,t}^{SC} \equiv \frac{\sum_{j=1}^{21} GVA_{j,t} \cdot MicroScore_{j,t}^{SC}}{\sum_{j=1}^{21} GVA_{j,t}} \quad (\text{industry})$$

$$MesoScore_GVA_{T,t}^{SC} \equiv MicroScore_{22,t}^{SC} \quad (\text{trade})$$

$$MesoScore_GVA_{S,t}^{SC} \equiv \frac{\sum_{j=23}^{33} GVA_{j,t} \cdot MicroScore_{j,t}^{SC}}{\sum_{j=23}^{33} GVA_{j,t}} \quad (\text{services})$$

The formulae presented above demonstrate that aggregation applies only to industrial and service enterprises, since the share of commercial enterprises is relatively small.

Another problem is the calculation of the *MacroScore*. Since small businesses are scored semi-annually, whereas information about medium-sized and large enterprises is updated on a quarterly basis, a distinction should be introduced between macroeconomic scoring paths with a quarterly periodization (excluding small enterprises) and a semi-annual one (including small enterprises).

The same indications as before should be introduced:

$MacroScore_path_t^{1Q}$ – a macroeconomic scoring path based on the gross value added ($\{path\} = GVA$) or the number of employees ($\{path\} = NE$) updated on a quarterly basis (excluding small enterprises)

$MacroScore_path_t^{2Q}$ – a macroeconomic scoring path based on the gross value added ($\{path\} = GVA$) or the number of employees ($\{path\} = NE$) updated on a semi-annual basis (including small enterprises).

Adopting the previous representations, the point values at the for macroeconomic level for a weighting scheme based on gross value added can be calculated as follows (a similar aggregation can be performed for a weighting scheme based on the number of employees by replacing *GVA* with *NE* in the formulae):

$$MacroScore_GVA_t^{1Q} \equiv \frac{\sum_{SC \in \{M, L\}} \sum_{TA} (GVA_{TA,t}^{SC} \cdot MesoScore_GVA_{TA,t}^{SC})}{\sum_{TA} (GVA_{TA,t}^M + GVA_{TA,t}^L)}$$

$$MacroScore_GVA_t^{2Q} \equiv \frac{\sum_{SC \in \{S, M, L\}} \sum_{SC} (GVA_{TA,t}^{SC} \cdot MesoScore_GVA_{TA,t}^{SC})}{\sum_{TA} (GVA_{TA,t}^S + GVA_{TA,t}^M + GVA_{TA,t}^L)}$$

Now we shall discuss the premises for the deployment of implementation activities. The formulae presented in the previous subsections allow for scoring at the micro-, meso- and macroeconomic levels. Since the system is based on the enterprise bankruptcy probability, the numerical values of scores belong to the $<0,1>$ interval. The smaller the value adopted by the scoring, the better the condition of individual enterprises in question and the smaller the need to deploy implementation activities.

The threshold value that suggests the need to deploy implementation activities should be determined with respect to the average percentage of time in which the Polish economy was in recession, according to historical data. As defined by the National Bureau of Economic Research (NBER)¹ applied to the *OECD based Recession Indicators for Poland*,² the Polish economy was in a recession during 29.6% (approx. 30%) of the time between 2003m1 and 2013m6. In view of this fact, the deployment of implementation activities is advisable if the current or forecast scoring for the next half of the year exceeds 70%.

In terms of heuristics, we suggest that the analysis of the need to deploy implementation activities should be based on estimated and projected scoring values for classes defined at the microeconomic level, then aggregates at the mesoeconomic level should be analysed, and finally – aggregates of all the enterprises.

Scoring paths with a quarterly and semi-annual periodization are available for all the analysed levels. We suggest that any decision to initiate implementation activities in a given category of enterprises should be taken when current pertinent data are available. In the case of small enterprises, the decision-making process would involve a semi-annual periodization, whereas in the case of medium-sized and large enterprises – a quarterly one.

At the meso- and macroeconomic levels there are two scoring paths based on the gross value added and the number of employees. We suggest that in their case the score (its current or semi-annual projection) exceeding 70% in at least one of the scoring paths should be interpreted as a signal justifying intervention.

Given the above, the following algorithm of action is proposed:

1. Implementation activities should start in enterprises which belong to individual classes defined at the microeconomic level, whose scores have exceeded a certain threshold.
In the event that it is necessary to set priorities, higher priority should be assigned to enterprises which belong to individual classes defined at the microeconomic level with the highest scores and those with scores over and above a certain threshold also at the mesoeconomic level.
2. If the possibilities for launching implementation activities have not been exhausted, such activities should start in enterprises that belong to individual classes defined at the mesoeconomic level, for which the scores have exceeded a certain threshold (even if at the microeconomic level the scores have not been exceeded).
3. If the possibilities for launching implementation activities have not been exhausted and the scores exceed the threshold values at the macroeconomic level, implementation activities should start in all enterprises eligible for the RRI.

¹ Here recession is understood in economic terms as a phase of the business cycle, not in its technical sense (i.e. at least two consecutive quarters of negative GDP growth).

² [<http://research.stlouisfed.org/fred2/series/POLREC?rid=242&soid=4>].

12.4. Using auxiliary information from the rri research component

As was indicated at the beginning of the study, the auxiliary information system should fulfil a complementary role in the decision-making process concerning the need to start implementation activities in enterprises. While the basic scoring system indicates the need – or its absence – for implementation activities in specific groups of enterprises, it is the auxiliary information system which is supposed to provide additional information, a broader decision-making background and ultimately signpost the areas of business activity and the economy as a whole on which special attention should be focused. In particular, the auxiliary information system could provide the basis for the introduction of possible expert modifications and adjustments to the basic scoring system.

The authors propose that the method of presentation of the auxiliary information should correspond to the basic scoring system (i.e. comprise the three-stage procedure³ that involves removing seasonal variables, filtering the time series and calculating the cumulative distribution function for each observation in the sample) with the provision that in some cases it is impossible to present a given variable at all three requisite levels: micro-, meso- and macroeconomic.

Since the auxiliary information system does not indicate whether implementation activities should start or not, setting the intervention threshold values is purposeless. The threshold of 70% (or 30%) may, however, provide a certain nominal limit indicative of the severity of the problems in a given area.

Table 12.2 lists the variables analysed within the RRI microeconomic research component, which may be included in the auxiliary information system at all three levels – micro-, meso- and macroeconomic ones – in the corresponding cross-sections and in the basic scoring system. We have highlighted especially important variables due to their statistically significant role in predicting enterprise bankruptcy along with the information on the phenomenon of enterprise bankruptcy and the formation of new enterprises, creation of new jobs and gross value added. Additionally, only at the macroeconomic level (i.e. from the perspective of the whole corporate sector) the auxiliary information system may include negotiated bankruptcy and liquidation bankruptcy rates, respectively, which are presented in the reports submitted by the RRI microeconomic research component.

Table 12.2 also shows the variables analysed by the RRI macroeconomic research component, which may be included in ancillary information system, however, the nature of these data makes their aggregation purposeless.

Table 12.2. The proposed array of variables to be included in the auxiliary information system (the most important variables from the RRI microeconomic research component which should be given special attention are marked with x)

Information from the RRI microeconomic research component				
		Enterprises		
		Industry	Trade	Services
1	Overall financial condition indicator (OFCI)			
2	Debt sustainability indicator (DSI)			
3	Current ratio (CR)		x	
4	Quick ratio (QR)			
5	Cash conversion cycle – times (CCCT)			
6	Cash conversion cycle – days (CCCD)			
7	Asset productivity (AP)	x	x	x
8	Operating return on sales (OROS)		x	x
9	Operating margin assets (ROOA)	x		
10	Return on assets (ROA)			
11	Return on equity (ROE)			x
12	Total debt ratio (TDR)			
13	Self-financing rate	x	x	x
14	Short-term debt rate (STDTR)	x		x
15	Number of enterprises	x	x	x
16	Number of employees	x	x	x
17	Gross value added	x	x	x
18	Sales revenue (net)			
19	Capital expenditure			

³ Variables which are not expressed in percentage terms (e.g. the number of employees, gross value added) should be logarithmised.

Information from the RRI microeconomic research component				
		Enterprises		
		Industry	Trade	Services
20	Total assets			
21	Short-term liabilities			
22	Receivables and claims			
23	Net profit			
Information from the RRI macroeconomic research component				
1	Industrial production index in the analysed NACE divisions and sections			
2	Construction production index in the analysed NACE divisions and sections			
3	Retail sales index in the analysed NACE divisions and sections			
4	General business climate index in the analysed NACE divisions and sections			
5	Unemployment rate			
6	Gross domestic product divided into constituent sources:*			
7	– domestic demand			
8	– consumption			
9	– private consumption			
10	– public consumption			
11	– accumulation			
12	– gross fixed capital formation			
13	– changes in inventories			
14	– net exports			
15	– export			
16	– import			

* Since the changes in inventories and net exports may assume negative values, the contributions of individual categories to GDP growth should be analysed rather than their levels or growth rates.

Source: own study.

Chapter 13

COMMUNICATION IN THE RAPID RESPONSE SYSTEM

13.1. Introduction

Communicating the results of monitoring economic change will always pose a challenge. The key factor in this respect is the responsibility not only for what is actually said, but also for what remains unsaid or insufficiently clarified. Of strategic importance is also the capacity to anticipate the possible cuts and simplifications made by the media or the business environment organizations in an effort to extract the essence of the message, which may significantly affect its gist. The stakes in monitoring economic change are high, because paraphrases or omissions in the process of communication or publication of materials may lead to an incorrect assessment of the potential of individual NACE sectors or to a grave misinterpretation of economic forecasts.

The subject matter intended for communication as part of the Rapid Response Instrument is, by its very nature, complicated and lengthy. The RRI comprises a broad range of methods and procedures for assessing the condition of the economy as a whole and groups of enterprises, programming and implementation of well-defined public interventions targeted to enterprises, their groups and sectors of the economy affected by the economic downturn. The interpretation of forecasts presented in RRI Reports is associated with understanding the idea behind it and an appreciation of its fundamental methodological assumptions.

At the conceptual stage it was assumed that the Rapid Response Instrument should consist of two subsystems – the monitoring component (or the Early Warning System) and the programming and implementation component (or Rapid Response System). The vast majority of communication activities carried out in accordance with the guidelines prepared by the Polish Agency for Enterprise Development (PAED, Polish acronym PARP) were assigned to the Early Warning System component, however, informing about the results of the Early Warning System monitoring component served to achieve the objectives of the Rapid Response System. The communication objectives followed the objectives that guided the examination of key macroeconomic trends and other external determinants of corporate bankruptcy processes, which accounted for the contents of reports devoted to macroeconomic issues as well as the identification of economic phenomena at the sectoral level contained in the Report on the assessment of bankruptcy risk, which constitutes a microeconomic component.

First, the key aspect of communication activities involved the way of presenting information on the symptoms and the worsening situation of individual sections and NACE divisions, in particular the direct threat of losing liquidity followed by the symptoms of impending bankruptcy risk as well as communicating the bankruptcy risk to enterprises and NACE sections described in the Report. Communication activities of the macroeconomic part of RRI Reports focused on communicating the business cycles of the Polish economy, forecasts of the basic macroeconomic indicators and scenario analyses of the impacts of potential impulses affecting the Polish economy.

The implementation of this challenging and wide-ranging objective was done according to the saying ‘monitoring and prevention are better than cure,’ which became the main theme of the entire communication strategy pursued by the Polish Agency for Enterprise Development from March 2013 to March 2014.

13.2. Target groups

Monitoring Economic Change as part of the RRI project is a component of the Early Warning System which will allow decision-makers to take pre-emptive action, remedial action, but above all, to reduce the economic and social costs of periodic disturbances in the functioning of the economy. Therefore, one of the target groups includes government representatives, whose responsibilities include the implementation of public interventions that address cyclical economic risks. Some of these tasks at the regional level are faced by local governments; hence they have also become one of the target groups. Communication activities also included representatives of regional development agencies, labour market institutions, employers’ organizations, trade unions, industry associations and analysts from financial institutions. Another important group are the entrepreneurs themselves, especially those responsible for managing their firms, their financial policies and decision-makers in the area of human resources. Communication addressed to them was, however, different in nature and focused on the provision of information about the condition of the economy, the situation of their industry or sector of the economy in order to enable them to take appropriate action within their own companies based on proven and reliable data.

13.3. The challenges – what are we up against when communicating the results of monitoring economic change?

A number of communication challenges, which arose during the implementation of the RRI project, were similar to those related to other research projects of key importance for the Polish economy and worth considering when preparing communication strategies for various projects pursued by government agencies. However, there were also unique challenges.

The first challenge involved compliance with the government documents. The aims of the project Rapid Response Instrument include providing decision-makers with the information which they need in order to take pre-emptive and remedial action in order to reduce the economic and social costs of cyclical disturbances in the economy. Therefore, all communication efforts had to take into consideration the activities anticipated by the Council of Ministers (mainly in the *Long-term National Development Strategy* and the *Medium-Term National Development Strategy*, which provided for the development of state capacity to pre-emptively respond to phenomena and processes occurring in the socio-economic system). Communication activities also needed to be consistent with the objectives of the *New Opportunity Policy* – a document prepared by the Ministry of Economy.

The threat of bankruptcy is also a topic of increasing concern to the European Commission. It seeks to ensure efficient procedures leading to convergence among the national bankruptcy regulations, which would protect the interests of both debtors and creditors. Consequently, in the process of communication activities it was important to take note of and comply with the measures implemented in this area by the European Union.

Another challenge was the perception of bankruptcy. In the process of communication, the topic of bankruptcy itself posed a challenge on the one hand, due to its ardent exploitation by the media, on the other hand, by creating a barrier in dealing with entrepreneurs. Even firms which find themselves in a serious financial distress tend to avoid the subject of bankruptcy. Their representatives were clearly reluctant to be associated with support/restructuring tools or problems that affect businesses during the economic downturn. This was also noticeable when the TOP 10 of the most vulnerable NACE divisions (i.e. characterized by a serious bankruptcy risk) was compiled and communicated. The quarterly updates of the TOP 10 list made by the RRI team also take into account the growth rate of bankruptcy risk adjusted for the number of employees in a given NACE division. The purpose of communication in this case was not only to warn of a high or increasing degree of bankruptcy risk, but also to draw attention to the possible consequences that may result from the relatively high share of these sectors in the overall employment structure. It was important to talk about the threat of bankruptcy in the context of the warning system and to strengthen the belief that what is happening in the economy as whole is naturally reflected in the situation on the labour market. The challenge consisted in presenting the topic in such a way as to avoid associations merely with the economic issues while shifting the focus onto labour and employment issues. Accordingly, communication regarding the RRI project also took place during events dedicated to the labour market with the participation of policy-makers involved in the area of human resources.

The next challenge was posed by the language used by the authors of RRI reports, which did not facilitate their reception by the average interested party. Hence the materials produced as part of the communication activities had to present in an accessible way the content that had originally been described using scientific language. It should be noted that one of the target groups of the project comprises Polish entrepreneurs representing the SME sector and, therefore, the issues at hand had to be presented in a meaningful way in order to explain the phenomena that may have a direct impact on their daily activities. Moreover, the language used in the pronouncements had to be highly disciplined in terms of phrases and expressions used in order to avoid simplification or over-interpretation of the forecasts.

Another important challenge is also the issue of competition. RRI reports face serious competition in the form of well-known statistics compiled by public institutions, such as the Polish National Bank (NBP) or the Central Statistical Office (GUS) as well as the periodically updated and widely commented in the media reports by such companies as Coface Poland, Euler Hermes, IBnGR, which prepare forecasts of micro-and macro-economic indicators and bankruptcies in individual sectors of industry. The difficulty was compounded by the fact that RRI reports are based on existing data and are published with a delay with respect to the data on bankruptcy published by private companies involved in the monitoring of the economy. The solution was to provide an accurate plan of communication activities including the publication dates of competing research results and take advantage of the synergy effect in terms of communication on individual topics.

The final challenge involved the ambiguity of the acronym of Rapid Response Instrument in Polish (Instrument Szybkiego Regowania, ISs). The search engine most popular among Polish internet users returns a number of other Polish and international institutions unrelated to PARP activities, such as the Instytut Studiów Regionalnych (Institute for Regional Studies), Inteligentny System Ratunkowy (Smart Rescue System), IRS Brakes Sweden, International Schools Reviews, Information Systems Research or International Society of Radiology. For this reason, especially during the first period of communication activities, the full name of the project was often used. As the recognition of RRI reports increased, it was gradually replaced by the acronym.

13.4. What aided the communication activities – strengths

Strength: recognised analysts. One of the main strengths of the communication activities consisted in the fact that comments by leading economists – members of the research team and the interpretation panel – lent credence to the presented results. Their authority, knowledge and often recognition by the general public facilitated attracting media attention, increased its reach and built the credibility of forecasts presented in RRI reports. The formula of the interpretation panel implemented as part of the project and described elsewhere in the text, allowed us to gather comments from experts and arguments to be used in the communication process.

Strength: confidence. The fact that the RRI project was implemented by the Polish Agency for Enterprise Development attracted interest and confidence on the part of the recipient groups. PARP is the largest and most important implementation institution in the system for the support of enterprises in Poland, and the research component is executed by a team of recognized experts and analysts from the Malopolska School of Public Administration headed by Professor Jerzy Hausner.

Strength: innovation. The RRI project represents an innovative process prompting change in the area of planning and implementation of intervention and aid programmes to counter the negative effects of economic change on the labour market and support enterprises threatened by temporary difficulties. The innovative aspect of the system facilitated communication with the media and reaching out to its target groups. The elements that contribute to the uniqueness of RRI Reports were therefore crucial in the communication process. The original method, the largest research sample in Poland, the cyclical nature of observations and the possibility of analysing the research results from a variety of perspectives – by region, by industry or by structure – are the elements that exerted a positive influence on the effects of communication activities.

Strength: the subject matter. Communication activities were carried out during the economic downturn, the effects of which were felt by the average citizen and were reported every day by the media. The data on symptoms of a deteriorating financial condition of individual NACE sections and divisions, communication of information concerning bankruptcy risk, the forecasts of basic macroeconomic indicators, the perspectives for economic growth and scenario analyses of the impact of potential impulses on the condition of the Polish economy will always be sought out by the media.

Strength: reliability of forecasts. Most research presented in the media focuses on the analysis of the current economic situation. The forecasts contained in RRI Reports guaranteed uniqueness of the message, whereas the cyclic presentation of research results made it possible to compare the forecasts with the current economic situation. The verifiability of numerous forecast elements was supported by media coverage even in situations where the predicted values differed from other widely publicised analyses. Accordingly, communication activities focused on the forecasting aspect complete with the description of three forecast options: optimistic, neutral and pessimistic ones with an emphasis on their high accuracy.

13.5. Relations with the media – planning activities, database of journalists and topical diversity

Planning communication with the media started with the compilation of a media database, which enabled us to reach out to interested journalists with dedicated information. The PR strategy in the draft Rapid Response Instrument provided for a variety of press releases delivered to editors, which was facilitated by the presence of extensive documentation contained in the published Reports. Analyses and forecasts contained in them allowed us to prepare materials tailored to different recipients, hence relevant texts were printed in the national, regional, and trade media.

Accordingly, the database of journalists was continuously updated, depending on the topic of the press release so that, for example, analyses of specific NACE divisions reached professional and trade magazines who might potentially be interested in them, while more general macroeconomic forecasts were circulated to a broader group of journalists working for newspapers and websites devoted to business issues. Beforehand, the database was verified in order to make sure that the scope of the material matched the professional interests of individual journalists. It was the topical diversity of press releases which allowed us to initiate and maintain effective media relations with opinion-forming editorial boards, professional and trade media.

When selecting the topics and dates of circulation of each press release, the following factors were taken into consideration: importance of individual events for the economy (e.g. the decisions of the Monetary Policy Council), the schedule and subject matter of GUS reports as well as the publications of other research centres and business intelligence agencies. Thanks to the above, our research results were directly related to the current economic situation and the current problems of individual branches of industry.

Below there is a list of titles of press releases circulated to the media from April 2013 to March 2014.

- 04/2013 – ‘Economic growth or an increase in bankruptcy rates,’ ‘Services face increased bankruptcy risk’
- 05/2013 – ‘Sectors unaffected by the crisis’
- 06/2013 – ‘Is consumption going to pull us out of the recession?’, ‘Social unrest likely in Silesia’
- 07/2013 – ‘When will the condition of firms improve?’
- 08/2013 – ‘Manufacturing and exports will overcome the slowdown’
- 09/2013 – ‘2014 will bring a revival of trade’
- 10/2013 – ‘Deferred consumption or sustainable growth?’
- 11/2013 – ‘Favourable forecasts for industrial production’
- 12/2013 – ‘Hausner: construction and mining still closely watched,’ ‘2014: expected recovery in the automotive industry’
- 01/2014 – ‘PAED: economic recovery is a fact’
- 02/2014 – ‘PAED: the contribution of exports to GDP will gradually decline’
- 03/2014 – ‘PAED: industrial production growth will decline in 2015,’ ‘Likely increase in bankruptcy risk in the construction industry’

The principal objective of continuing communication activities was the presentation of the RRI as a warning system that consumes fresh data and produces information about what may happen in the economy in the course of 6–12 months. At the same time, the subject matter of RRI Reports, the issues of forecasting bankruptcies and recession imposed certain discipline in terms of drawing conclusions, or even the titles of press releases themselves so as to avoid the effect of scaring the target recipients and prevent misinterpretation. Even so, the titles of published materials given by the editorial staff, sometimes had more edge than the titles of the circulated press releases, as can be seen in the headlines, for example, conclusions from the release titled ‘Social unrest likely in Silesia’ were published by the portal wnp.pl as ‘Bankruptcies of mining firms will cause social unrest,’ whereas *Trybuna Górnicza* (The Mining Tribune) ran an article with the following headline ‘Is mining going under?’

The specialized language of RRI Reports and certain topics sometimes turned out to be hard to understand for the average recipient and required additional statements by the members of the research team and the interpretation panel, which clarified and interpreted the observed phenomena, while at the same time explaining the basis of the methodology used. Similarly, dedicated comments and specialized texts on particular industries, regions and issues were prepared in response to current questions raised by the representatives of firms affected by the economic slowdown and transmitted to us by the representatives of the media.

Owing to the in-depth analysis of the condition of the various NACE sections and divisions contained in the Report on the assessed bankruptcy risk of enterprises – the microeconomic component, a strong emphasis in the field of media relations was placed on establishing relationships with the professional and trade media. In cooperation with their editorial boards, expert articles were prepared containing comments by members of the research team, in-depth analyses of selected branches of industry and statements by members of the interpretation panel. Long-term cooperation was established with several professional and trade magazines, which resulted in cycles of publications devoted to the prospects for the Polish economy and its individual sectors based on the RRI Reports.

Below there is a list of titles of expert articles, which were published by selected professional and trade media from April 2013 to March 2014 as a response to the need for in-depth editorial materials related to the condition of individual industries.

The uniqueness of the RRI Reports and their forecasts about various economic indicators mean that their main recipients were economic journalists who present the RRI projections in comparison with other available analyses and predictions. A key role in this respect was played by maintaining contact with the editorial staff of economic news agencies (Polish Press Agency (PAP), Newseria Business, Reuters) due to their influence and impartiality. A PAP representative was granted exclusive right to participate as an observer in meetings of the interpretation panel and was the first to receive the latest data and comments from the research team. The PAP representative had the opportunity to listen to the discussions on the working versions of RRI Reports, gain a better understanding of the structure of the model and directly interview the experts. Thanks to this solution the agency despatches were subsequently quoted by major dailies thanks to their high factual quality and credibility.

- 05/2013 – ‘Can employers afford to be optimistic in the coming months?’ – Portal nf.pl
- 06/2013 – ‘Not a paper crisis’ *Przegląd Papierniczy* – (Paper Review) monthly
- 07/2013 – ‘Increased bankruptcy risk despite optimistic forecasts’ – *Gazeta samorządu i administracji* (Biweekly paper of local government and administration)
- 09/2013 – ‘Human capital in crisis’ – an interview with Professor Jerzy Hausner – *Personel Plus* (Staff Plus) monthly
- 10/2013 – ‘Food perspectives’ – *Rynek Spożywczy* (The Food Market) magazine
- 11/2013 – ‘NACE Section 10 – gaining or losing ground?’ – portalspozywczy.pl/dlahandlu.pl (internet portal)
- 11/2013 – ‘An optimistic outlook for the near future’ – *Gazeta Finansowa* (Financial Newspaper) weekly
- 11/2013 – ‘Sectors with a high degree of bankruptcy risk’ – rynekpracy.pl (internet portal)
- 12/2013 – ‘Why economic recovery has not translated into increased employment?’ – *Personel Plus* (Staff Plus) monthly
- 12/2013 – ‘Will the Poles spend the autumn shopping?’ – *Rynek Spożywczy* (The Food Market) magazine
- 12/2013 – ‘The economy accelerates as is the industry’ – *Polski Przemysł* (Polish Industry) magazine
- 02/2014 – ‘The end of the slowdown in sight’ – *Think Tank Magazine*
- 02/2014 – ‘Will Section H benefit from the recovery? Industry Perspectives for business in 2014’ – *Polski Przemysł* (Polish Industry) magazine

- 03/2014 – ‘Deferred consumption or sustainable growth? Forecasts for the food industry for 2014’ – Magazyn Spożywczy (Grocery Magazine)
- 03/2014 – ‘The automotive industry – in which gear? Forecasts for the industry’ – an interview with Dr Andrzej Kondratowicz, reviewer of RRI Reports – wnp.pl (a portal specialising in business issues)

Likewise, the issues taken up by RRI Reports constituted a platform for contacts with analysts and economists from various financial institutions. Communication activities were preceded by the preparation of database of contacts, who were then provided with selected content – specialist releases along with the *RRI Report Synthesis* by Professor Jerzy Hausner. This resulted in building the brand of RRI Reports as an analytical tool to be used by the representatives of the above group in their daily work.

13.6. The Interpretation Panel – objectives and principles of operation

One of the special and unique communication platforms within the RRI (ISR) system is the so-called Interpretation Panel (IP). In Chapters 3, 8 and 9 we have identified a number of basic conditions for an effective implementation of such a system. Unfortunately, some of these conditions, such as a considerable restraint in the modification of model specifications – one of the reasons why its users trust it¹ – also has apparent drawbacks in that it may sometimes cause excessive convergence of the results obtained. Conventional forecasting often makes use of specific ad-hoc modifications. However, an effective warning system should examine the long-term values of the tools used. The necessary adjustments and comments are thus introduced into the results without necessarily changing the models themselves too often. This was one of the reasons why the Interpretation Panel was established within the RRI (ISR) structure.

The Interpretation Panel constitutes a two-way communication platform since it ensures both expert verification of RRI (ISR) anticipatory research results and the transfer of knowledge to professional circles in the relevant problem areas.

The operating practice of RRI (ISR) demonstrated that the experts cooperated, among others, in the following areas:

- Evaluation of the results obtained as part of the RRI (ISR) research component from alternative research and analytical perspectives,
- Inclusion amongst the phenomena to be diagnosed by the RRI (ISR) of those elements considered to be important from the vantage point of bankruptcy risk assessment in the economy and its potential consequences, which cannot be included directly in the project due to the limitations (of each) methodology,
- Updating parts of ratings: it should be emphasised that forecasting tools and their practical application requires specific cut-off points, beyond which no research or analyses are carried out; however, warning systems should always take into account the most recent knowledge, hence, if there are no technical or organizational possibilities of including it in applied formal and model tools, such knowledge should constitute ‘expert input’,
- Provision of anticipatory, non-forecastable knowledge based on model approaches; it should be noted that irrespective of their class, models are based on historical knowledge and its capacity to be transferred onto future events; in the event of deep structural changes, certain shocks in the economy, etc. traditional modelling may prove to be insufficient.

The selection of experts guaranteed a successful completion of these IP tasks. The process was based on three fundamental principles:

1. First-rate professionalism.
2. Extensive knowledge/practical experience in the field of public, academic or consultancy activities related to specifics of the methods and tasks of the RRI (ISR) project.
3. Research independence.

These conditions not only guaranteed a successful completion of IP tasks, but also the achievement of the all-important expert knowledge pooling effect² (cf. e.g. Blinder 2007). Without going into formal considerations of this effect, it does not work in the absence of independent views. Naturally, the operation of such a panel would be adversely affected by differences in the competencies of its individual members. Likewise, the size of the team – 8 members – was set in accordance with the principles of optimization of such an effect (cf. e.g. Erhart, Lehment et al. 2007).

As far as the organization of IP activities is concerned, the developed solutions and procedures were based on one of the fundamental characteristics of warning systems, namely that the exchange of expert knowledge within an EWS is not supposed to resemble a seminar. What is important in such systems is the response time (a short response time means low inertia) and the accuracy of conclusions (clarity and concreteness of views). Therefore, the experts worked using RRI (ISR) reports supplied to them

¹ Frequent changes in this area generally undermine the trust of users of such a system in its inner ‘wisdom,’ among others due to the impression that the tool tends to adapt rather than anticipate.

² The activities of the central banks and their monetary policy are now, thanks to the so-called monetary policy councils, one of the better-researched areas in terms of objectives, design principles and methods of operation of decision-making and advisory collegial bodies. This was one of the reasons why this area was chosen as the main source of bibliographical references

with sufficient (but not excessive) notice before the IP plenary meeting. Plenary meetings were organized on a quarterly basis in accordance with the schedule of individual RRI (ISR) project editions.

IP members were, among others, required to submit prior to the meeting (3 working days) written, concise comments on the materials received. IP meetings were held in strictly pre-determined timeframes. Their leading topics were also determined based on the syntheses of materials supplied by the IP members. Within 7 working days after each meeting, IP members expressed their final opinion on the topics under discussion. Both the written opinions and the plenary discussion were used in drafting the final recommendations of each RRI (ISR) edition.

The experience with the IP operation can only be judged as very positive. It constituted a valuable source of verification of the anticipatory RRI (ISR) research results, strengthened the holistic effects of the tool as well as improved and expanded the research and analytical perspectives of the system.

13.7. Other public relations tools

Online debates

The RRI Reports also analyse the risk of bankruptcy by administrative area, the data is thus relevant to enterprises located throughout Poland. That is why it was so important to undertake communication efforts targeting the representatives of local administration, business support organizations as well as the entrepreneurs themselves who operate in smaller agglomerations. One of the contact channels was provided by online debates with well-known Polish journalists. Online broadcasts allowed us to reach out to the target group with conclusions of the RRI Reports without having to travel long distances. Three debates were held by means of this medium:

- 'When is the business sector likely to see a revival?' – conducted in cooperation with *Dziennik Gazeta Prawna* (a daily focussing on business and legal affairs) in October 2013,
- 'Bankruptcy and restructuring – whether and how to support firms affected by the economic downturn?' – organized in cooperation with *Rzeczpospolita* (a nationwide daily) in November 2013,
- 'Challenges to the Polish economy in 2014' – held during a symposium organized by the MSAP in January 2014.

Conferences

The planned PR activities included talks by RRI experts during conferences, which offered opportunities for direct interaction with representatives of the target groups. Opinions and questions formulated by practitioners provided clues as to which elements of the Early Warning System should be emphasized, which forecasts and research results attracted the most interest. A presentation of conclusions and recommendations worked out thanks to the project to the representatives of the business environment took place during a debate organized by the BCC in April 2013. Other ones, addressed to representatives of firms (especially financial and human resources policymakers in enterprises), took place during the Conference on Restructuring in June 2013 and the HR Congress in October 2013. Regional meetings with the managers of enterprises, in particular with their representatives responsible for making financial decisions, were planned for May 2014 in Katowice, Kraków and Poznań (at the time of writing).

An important target group of additional communication activities constituted decision-makers working in state administration. Activities in this area offered opportunities to present the RRI project and the founding principles of the Early Warning System at the meeting of the Parliamentary Commission of Economy in January 2014. Apart from attending a presentation by Bożena Lublińska-Kasprzak, President of PAED, Members of Parliament participating in the work of the Commission were given materials presenting the idea, conclusions and recommendations formulated as part of the RRI project. Communication activities also involved the participants of the Convention of Marshals of the Republic of Poland. Special publications presenting the project objectives and the most important results of RRI Reports were prepared for the Convention organized by the authorities of the Świętokrzyskie Voivodship in April 2014.

13.8. Effects of communication activities

The implemented ways of reaching the target groups and topics raised in RRI Reports proved to be effective and corresponded to the needs of opinion-forming press. From April 2013 to March 2014 in paper and electronic media at least 585 materials tailored in this way were published. Articles and news about RRI Reports appeared, among others, in the following:

- Dailies: *Rzeczpospolita*, *Gazeta Wyborcza*, *Puls Biznesu*, *Dziennik Gazeta Prawna*, *Polska The Times*, *Dziennik Trybuna*, *Dziennik Polski*, *Nasz Dziennik*, *Gazeta Giełdy Parkiet*,
- Weeklies: *Wprost*, *Forbes*,
- Horizontal portals: *onet.pl*, *wp.pl*, *interia.pl*,

- Thematic websites: money.pl, bankier.pl, inwestycje.pl, obserwatorfinansowy.pl, biznes.pl, wyborcza.biz, nf.pl, stooq.pl, waluty.com.pl, abc.com.pl, portalsamorzadowy.pl,
- Professional and trade internet portals and printed magazines: *Nowy Przemysł, Gazeta Finansowa, Świat Druku, Rynek Spożywczy, Magazyn Przemysłowy, Spółka z o.o., Wiadomości Kosmetyczne, Personel Plus, Poligrafika, Polski Przemysł, Przegląd Papierniczy, Wiadomości Handlowe*, samar.pl, portalspozywczy.pl, spedycje.pl, formutransportu.pl, rynekpracy.pl, gospodarkamorska.pl, dlahandlu.pl, pulshr.pl, poradnikhandlowca.pl, rolnicy.com, forummleczarskie.pl, propertynews.pl,
- Regional press and portals: *Dziennik Zachodni, Głos Wielkopolski, Tygodnik Ostrołęcki, Głos Koszaliński, Trybuna Górnicza, Kurier Lubelski, Dziennik Bałtycki, Gazeta Wrocławska, Nowiny, Dziennik Łódzki, Kurier Szczeciński, gospodarkapodkarpaska.pl, wrotopodlasia.pl, gazetalubuska.pl, eostroleka.pl.*

Activities in the area of media relations also included ongoing contacts with television and radio stations. The issues raised by the RRI were mentioned and commented on in newscasts, information broadcasts and feature programmes devoted to business issues, among others in Polsat Biznes, TVN24 Biznes i Świat (d. TVN CNBC), TVP Info, Polskie Radio, Radio PIN, Radio ZET and regional radio stations. The variety of content in the RRI Reports facilitated the production of such programmes, including direct presentations and the following:

- RRI experts' opinions regarding the correlations between forecasts for specific branches of industry and the quotations of shares of listed companies (recorded for TVN CNBC),
- RRI experts' comments on regional differences in bankruptcy risk (recorded in a regional radio station – Radio RDC),
- RRI experts' participation in a discussion on the condition and forecasts for selected branches of industry (recording for Polish Radio).

Data taken from the RRI Reports also appeared in the context of a tool to support students in preparing term papers, Bachelor's and Master's degree theses. An interview with a member of the research team was broadcast by Akademickie Radio Kampus.

The effects of operation of the Interpretation Panel are discussed in more detail in Section 13.7.

The success of any research project consists in the dissemination of its research results and analyses by people not directly involved in the research process. In the case of communication activities in the RRI project, the goal was not only to inform the public about the conclusions contained in the reports, but also to create a positive climate for the discussion of bankruptcy-related matters, forecasting the economic situation and the need to pursue pre-emptive activities aimed at mitigating the negative effects of the economic downturn.

Can any information campaign contribute to a systemic change in which the intervention-based approach should be replaced by a preventive approach? Although communication activities themselves are not sufficient, they may pave the way for a change of thinking about the bankruptcy of enterprises and the provision of support during the economic downturn. Virtually everyone agrees with the saying that prevention is better than cure. However, the answer to the question of how to prevent and who exactly to cure raises far more problems. Therefore it seems important to pursue a well thought-out and systematic communication campaign in the area of monitoring the economic situation.

Thanks to the effective communication strategy we have also succeeded in changing the perception of the reports themselves. The presentation of research results carried out as part of the RRI ceased to be associated exclusively with academic discourse and was given a more accessible form. It was achieved thanks to a series of publications which translated the initially difficult contents into relevant and comprehensible messages. The topical diversity of materials allowed us to reach a wide audience with our message. The RRI Reports themselves have become the basis for discussion in the business community and among policy makers at the central and regional level. The most important determinants of success of the implemented measures include the circulation of the conclusions of the RRI Reports, their recognition among the leaders of opinion-forming circles and numerous citations by the media.

Part IV

Medium-term bankruptcy risk in the Polish economy – forecasts and recommendations

Chapter 14

FORECASTS OF THE MACROECONOMIC SITUATION AND THEIR IMPACT ON BANKRUPTCY RISK

14.1. Introduction

This part of the monograph presents empirical examples illustrating the application of the proposed econometric and statistical methods for analyses conducted in the macroeconomic component of the project. These methods are described in detail in Chapter 11.

On the basis of the tools described in the previous parts of the study, a detailed analysis of the current economic situation by individual divisions of manufacturing and trade is performed. It is also possible to construct short-term forecasts concerning the development prospects for individual production divisions under consideration. In order to illustrate the results of the approach, this chapter focuses on the situation in two selected divisions: one taken from the production sector and the other from the construction sector. Manufacturing as a subdivision of production and construction in general were subject to an in-depth analysis.

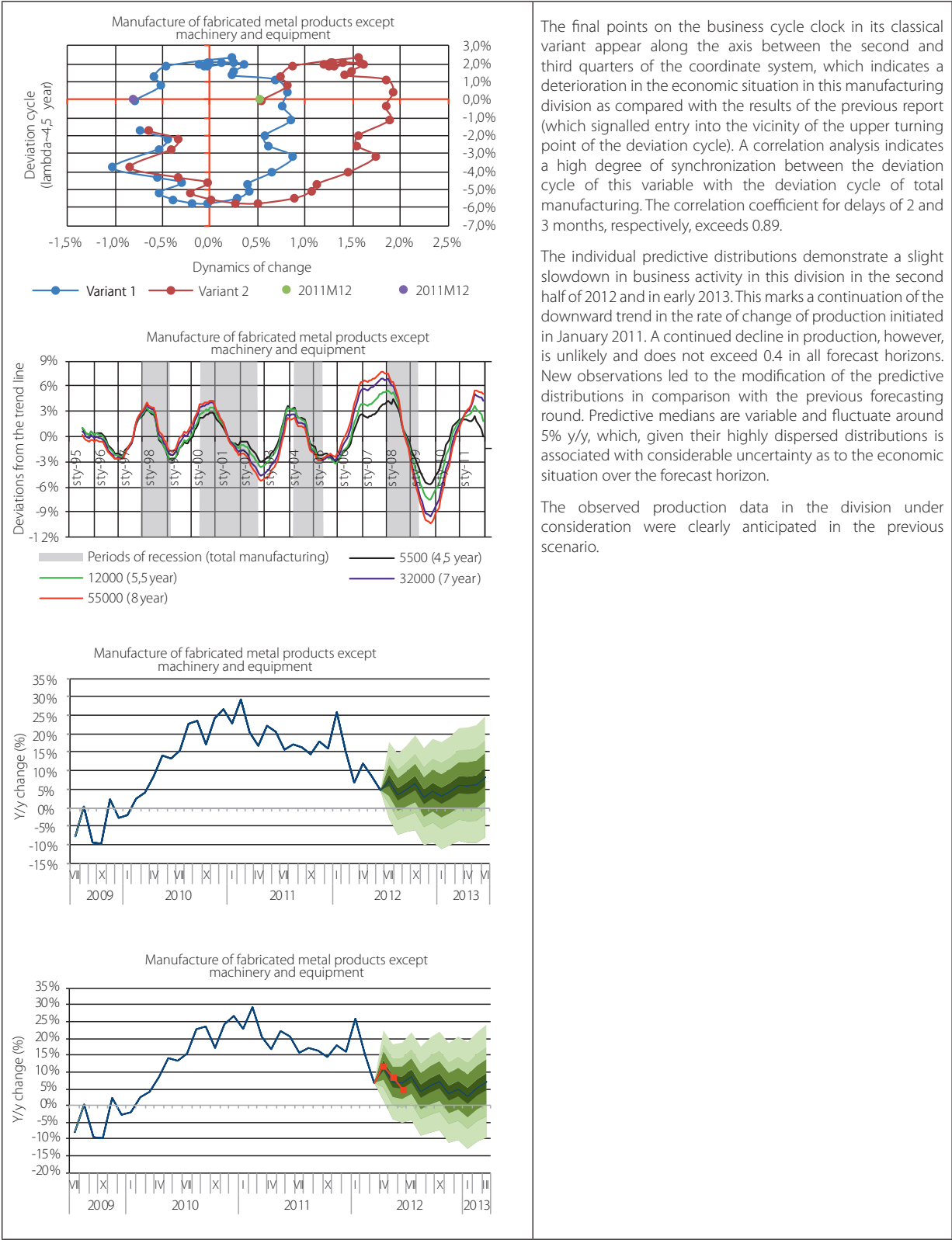
14.2. Analysis of business activity in selected nace sections (manufacturing, trade and construction)

The tools described in the previous sections enable us to perform a detailed analysis of the current economic situation in production and trade. It is also possible to produce short-term forecasts about the prospects for development in individual divisions under consideration. In order to illustrate the results of the approach discussed, this section focuses on the economic situation in two selected divisions – one in the manufacturing sector and the other in the construction sector. The in-depth analysis focuses on manufacturing and construction in general.

Table 14.1 contains a sample report on the analysis of the economic situation in the manufacturing of fabricated metal products except machinery and equipment. The analyses are based on observations made until June 2012. They are presented as a business cycle clock, a series of identified deviations, a fan chart of the predictive distribution of the production change rate production in the analysed division (based on observation until June 2012) and a fan chart based on observations made until March 2012, together with observations involving April, May and June. Table 14.2 presents synthetic information about the economic situation and development prospects in construction in general. Each report on the economic situation comes complete with a brief description of the business cycle clock, the forecasts and projections prepared for the previous cycle.

The deviation cycles identified have been analysed in correlation with the total manufacturing cycle. Tables 14.3 and 14.4 show the correlation coefficients between the deviation cycles in manufacturing and construction and delayed or anticipated deviation cycles in manufacturing. The tables include maximum absolute values of the correlation coefficients (above 0.5).

Table 14.1. The economic cycle report for the manufacture of fabricated metal products except machinery and equipment



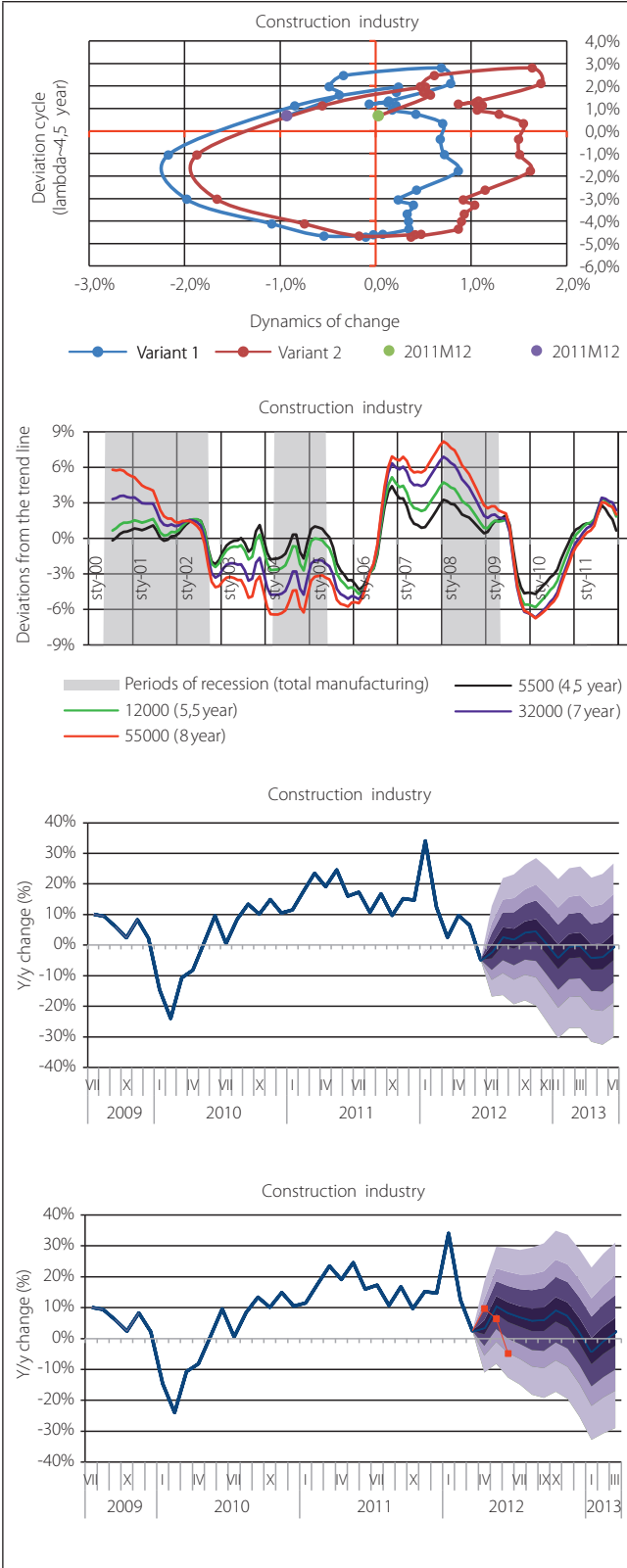
The final points on the business cycle clock in its classical variant appear along the axis between the second and third quarters of the coordinate system, which indicates a deterioration in the economic situation in this manufacturing division as compared with the results of the previous report (which signalled entry into the vicinity of the upper turning point of the deviation cycle). A correlation analysis indicates a high degree of synchronization between the deviation cycle of this variable with the deviation cycle of total manufacturing. The correlation coefficient for delays of 2 and 3 months, respectively, exceeds 0.89.

The individual predictive distributions demonstrate a slight slowdown in business activity in this division in the second half of 2012 and in early 2013. This marks a continuation of the downward trend in the rate of change of production initiated in January 2011. A continued decline in production, however, is unlikely and does not exceed 0.4 in all forecast horizons. New observations led to the modification of the predictive distributions in comparison with the previous forecasting round. Predictive medians are variable and fluctuate around 5% y/y, which, given their highly dispersed distributions is associated with considerable uncertainty as to the economic situation over the forecast horizon.

The observed production data in the division under consideration were clearly anticipated in the previous scenario.

Source: own study.

Table 14.2. The economic cycle report in construction industry



The analysis of the business cycle clock indicates the slowing down of economic recovery in the construction industry in general. The last point of the clock in its classical variant is to be found in the second quadrant of the coordinate system.

Predictive distributions of the indicator under consideration are characterized by changes in the location of the central tendencies throughout the forecast horizon. The rate of change of the indicator under consideration will oscillate around zero, with small positive values until the end of 2012. The probability of a decline in construction activity equals 0.5 almost across the entire forecast horizon. This is associated with considerable uncertainty as to the development of the industry over the next 18 months.

The observation of May 2012 was accurately forecast at the level of the predictive median in the previous edition of the report. Other observations from the second quarter of 2012 differ from the central tendencies. What was surprising was the unexpected improvement in the industry's condition in April 2012, as well as its marked deterioration in June 2012.

Source: own study.

Table 14.3. Relationships between the deviation cycles in individual NACE manufacturing divisions and the delayed or anticipated deviation cycles in total manufacturing

Section/Division ↓ Anticipated cycle (months) →		8	7	6	5	4	3	2	1	0	-1	-2	-3	-4	-5	-6	-7	-8
	Mining and quarrying, manufacturing, electricity, gas, steam and hot water, construction	0,15	0,30	0,45	0,58	0,71	0,82	0,90	0,96	0,99	0,98	0,93	0,86	0,76	0,65	0,52	0,38	0,24
	Intermediate goods	0,27	0,41	0,54	0,66	0,77	0,86	0,92	0,96	0,97	0,93	0,87	0,78	0,66	0,53	0,39	0,24	0,09
	Energy-related goods (excluding Section E)	-0,04	0,08	0,20	0,32	0,43	0,53	0,61	0,68	0,72	0,74	0,73	0,70	0,64	0,56	0,47	0,36	0,25
	Energy-related goods (excluding Sections D and E)	-0,05	0,06	0,18	0,30	0,41	0,51	0,60	0,67	0,72	0,73	0,72	0,68	0,61	0,52	0,41	0,29	0,17
	Investment goods	-0,07	0,07	0,22	0,36	0,49	0,62	0,73	0,81	0,87	0,90	0,90	0,88	0,83	0,76	0,67	0,57	0,45
	Durable consumer goods	0,42	0,53	0,63	0,72	0,78	0,82	0,83	0,81	0,77	0,69	0,59	0,47	0,33	0,18	0,03	-0,12	-0,26
	Non-durable consumer goods	0,46	0,54	0,61	0,67	0,70	0,72	0,72	0,69	0,64	0,56	0,47	0,36	0,25	0,13	0,01	-0,11	-0,22
SECTION B	Mining and quarrying	0,03	0,12	0,20	0,29	0,37	0,45	0,51	0,58	0,62	0,64	0,63	0,60	0,55	0,48	0,40	0,30	0,20
	Mining of coal and lignite	-0,06	0,02	0,10	0,19	0,27	0,34	0,41	0,47	0,51	0,53	0,53	0,51	0,46	0,40	0,32	0,23	0,13
	Other mining and quarrying	0,07	0,16	0,25	0,34	0,44	0,53	0,61	0,68	0,73	0,76	0,76	0,73	0,69	0,64	0,57	0,49	0,39
	Mining and quarrying support service activities	0,34	0,42	0,49	0,54	0,57	0,59	0,59	0,58	0,55	0,51	0,47	0,41	0,35	0,29	0,22	0,15	0,07
SECTION C	Manufacturing	0,19	0,34	0,49	0,63	0,75	0,85	0,93	0,98	1,00	0,97	0,92	0,83	0,72	0,60	0,46	0,31	0,16
	Manufacture of food products	-0,04	0,06	0,16	0,26	0,35	0,42	0,48	0,52	0,54	0,53	0,50	0,46	0,40	0,33	0,26	0,19	0,11
	Manufacture of beverages	0,33	0,27	0,20	0,12	0,04	-0,04	-0,12	-0,19	-0,26	-0,33	-0,39	-0,42	-0,45	-0,46	-0,45	-0,43	-0,39
	Manufacture of tobacco products	0,33	0,30	0,25	0,20	0,14	0,08	0,01	-0,05	-0,12	-0,17	-0,21	-0,24	-0,26	-0,26	-0,26	-0,24	-0,21
	Manufacture of textiles	0,23	0,36	0,49	0,60	0,70	0,78	0,84	0,87	0,88	0,87	0,82	0,75	0,66	0,56	0,44	0,31	0,18
	Manufacture of wearing apparel	0,13	0,21	0,30	0,39	0,47	0,55	0,61	0,66	0,69	0,69	0,67	0,64	0,58	0,51	0,43	0,33	0,23
	Manufacture of leather and related products	0,32	0,42	0,51	0,59	0,66	0,71	0,74	0,76	0,75	0,73	0,68	0,62	0,54	0,45	0,36	0,26	0,15
	Manufacture of wood and of products of wood and cork, except furniture, manufacture of straw and plaiting materials	0,44	0,56	0,66	0,73	0,79	0,83	0,84	0,83	0,78	0,71	0,61	0,49	0,35	0,21	0,08	-0,06	-0,18
	Manufacture of paper and paper products	0,55	0,64	0,71	0,77	0,80	0,81	0,79	0,75	0,68	0,59	0,48	0,35	0,21	0,08	-0,06	-0,19	-0,32
	Printing and reproduction of recorded media	0,43	0,52	0,58	0,64	0,68	0,70	0,70	0,70	0,67	0,64	0,58	0,52	0,43	0,35	0,25	0,15	0,05
	Manufacture of coke and refined petroleum products	0,04	0,15	0,26	0,37	0,46	0,55	0,62	0,68	0,71	0,72	0,71	0,67	0,61	0,53	0,44	0,33	0,22
	Manufacture of chemicals and chemical products	0,44	0,55	0,64	0,72	0,78	0,82	0,84	0,84	0,81	0,75	0,66	0,56	0,44	0,31	0,17	0,03	-0,11
	Manufacture of pharmaceutical, medicinal chemical and botanical products	0,07	0,06	0,05	0,03	0,01	-0,01	-0,04	-0,08	-0,12	-0,18	-0,24	-0,29	-0,35	-0,39	-0,43	-0,46	-0,48
	Manufacture of rubber and plastics products	0,36	0,48	0,60	0,70	0,78	0,84	0,88	0,90	0,87	0,82	0,73	0,62	0,50	0,36	0,22	0,08	-0,06
	Manufacture of other non-metallic mineral products	0,28	0,39	0,50	0,59	0,68	0,75	0,80	0,83	0,83	0,80	0,75	0,67	0,58	0,48	0,37	0,25	0,13
	Manufacture of basic metals	0,06	0,20	0,35	0,49	0,63	0,74	0,84	0,91	0,95	0,95	0,92	0,86	0,77	0,65	0,52	0,38	0,23
	Manufacture of fabricated metal products, except machinery and equipment	-0,12	0,01	0,14	0,27	0,40	0,52	0,64	0,74	0,82	0,87	0,89	0,89	0,86	0,81	0,75	0,66	0,56
	Manufacture of computer, electronic and optical products	0,46	0,53	0,59	0,63	0,65	0,66	0,65	0,61	0,56	0,48	0,38	0,26	0,14	0,01	-0,12	-0,25	-0,38
	Manufacture of electrical equipment	0,17	0,32	0,46	0,59	0,70	0,78	0,85	0,89	0,89	0,87	0,82	0,74	0,65	0,54	0,41	0,28	0,15
	Manufacture of machinery and equipment n.e.c.	-0,11	0,02	0,15	0,28	0,40	0,51	0,61	0,68	0,73	0,76	0,77	0,75	0,70	0,64	0,55	0,45	0,35
	Manufacture of motor vehicles, trailers and semi-trailers except motorcycles	0,14	0,27	0,41	0,53	0,64	0,74	0,82	0,87	0,89	0,87	0,83	0,77	0,68	0,58	0,46	0,33	0,20
	Manufacture of other transport equipment	-0,49	-0,41	-0,32	-0,22	-0,11	0,00	0,12	0,23	0,33	0,43	0,51	0,57	0,62	0,66	0,69	0,70	0,70
	Manufacture of furniture	0,27	0,36	0,43	0,50	0,55	0,60	0,63	0,65	0,65	0,62	0,58	0,53	0,46	0,39	0,32	0,24	0,16
	Other manufacturing	-0,14	-0,08	-0,01	0,05	0,11	0,17	0,23	0,29	0,33	0,36	0,37	0,37	0,37	0,36	0,34	0,32	0,29
	Repair, maintenance and installation of machinery and equipment	-0,40	-0,27	-0,14	0,00	0,15	0,29	0,42	0,54	0,64	0,72	0,78	0,81	0,83	0,82	0,79	0,74	0,67
SECTION D	Electricity, gas, steam, hot water and conditioning supply	-0,13	-0,04	0,05	0,13	0,20	0,26	0,30	0,34	0,36	0,37	0,37	0,36	0,33	0,31	0,27	0,24	0,20

Source: own study.

Table 14.4. Relationships between the NACE subdivisions of construction and the delayed or anticipated deviation cycles in industrial production as a whole

Variable↓ Anticipated (months) →	8	7	6	5	4	3	2	1	0	-1	-2	-3	-4	-5	-6	-7	-8
Construction (total)	-0,18	-0,16	-0,13	-0,10	-0,06	-0,01	0,05	0,11	0,18	0,25	0,31	0,37	0,43	0,49	0,54	0,59	0,62
Construction of buildings	-0,56	-0,49	-0,41	-0,30	-0,18	-0,06	0,06	0,19	0,30	0,43	0,53	0,63	0,70	0,76	0,79	0,80	0,79
Civil engineering	0,42	0,37	0,30	0,22	0,14	0,07	0,00	-0,06	-0,10	-0,16	-0,21	-0,23	-0,24	-0,22	-0,19	-0,14	-0,09

14.3. Forecasts of macroeconomic aggregates

The methodological approach outlined above enables its users to generate short-term forecasts of economic aggregates. This section presents examples of predictions made for both for data updated on a monthly and on a quarterly basis. The forecast monthly time series include the rate of change in total production and the rate of change in retail sales. In the case of quarterly data, the forecast includes the percentage change (year on year) in GDP, domestic demand, exports and gross value added in the industry.

Figure 14.1 shows fan charts representing the predictive distributions constructed for the series of rates of change of production and sales, respectively. The analyses are based on data collected until October 2013. The red dots on the graph indicate the actual values of the projected time series in November, December 2013 and in January 2014. The graph also shows the plot of the cyclic factor estimated on the basis of the expected posterior values of the model (black-and-white line).

Figure 14.2 shows fan charts of predictive distributions constructed for the series of changes in the Gross Domestic Product, domestic demand, exports and gross value added in industry. The fan charts are contrasted with the forecasts with the cyclical factor excluded (blue line). As is the case with the monthly time series, the cyclic component is shown as a black and white line. Variant projections with the cyclical factor excluded assume that the component is constant in time and its value approximates the arithmetic mean of the sample taken from the time series. Actual values of the forecast series are marked in red. Figure 14.2 shows forecasts related to the XI RRI Macroeconomic Report based on observations comprising the third quarter of 2013.

The analysis of the impact of new observations, dynamically incorporated into the time series, on the plot of the forecasts is shown in Figure 14.3. The cyclical component resulting from the eight forecasting rounds is plotted on the basis of observations comprising the time period from the first quarter of 2012 (1st forecast) to the fourth quarter of 2013 (8th forecast) and is marked in green.

The shape (plot) of the regular cyclical component changes as a result of new observations included in the updated time series under consideration. The impact of changes affecting this component after factoring in the observations from the fourth quarter of 2013 concerning the four macroeconomic aggregates of interest is shown in Figure 14.4. The RRI reports discussed such changes, but adding a single observation did not usually significantly alter the shape of this component of the model. In consequence, the economic development scenarios presented in subsequent macroeconomic reports were relatively similar. With the exception of data which indicate the presence of a turning point and an imminent trend reversal, the overall tone of the forecast generally

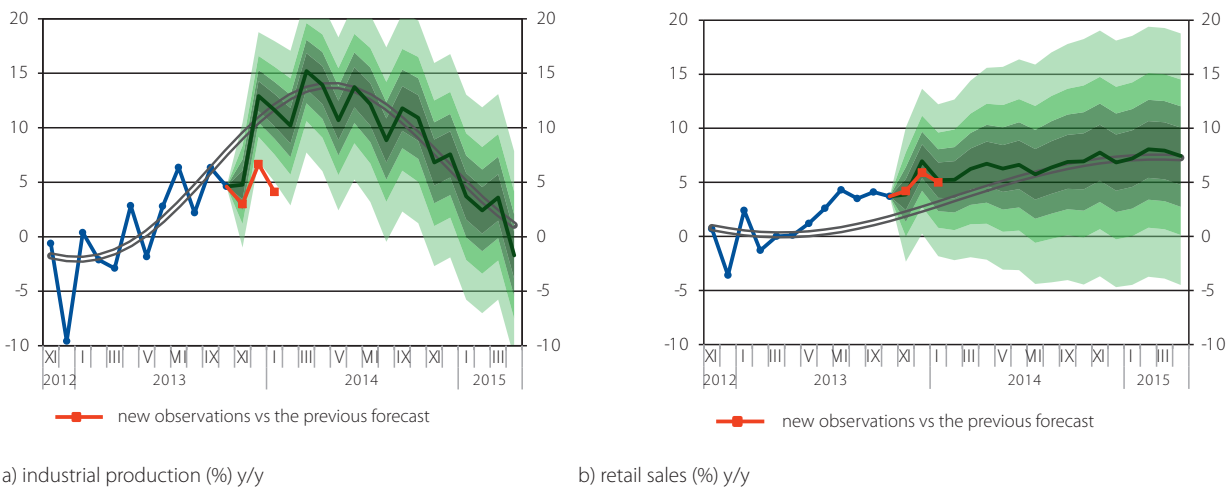


Fig. 14.1. Monthly data: forecasts with observations added ex-post
Source: own study.

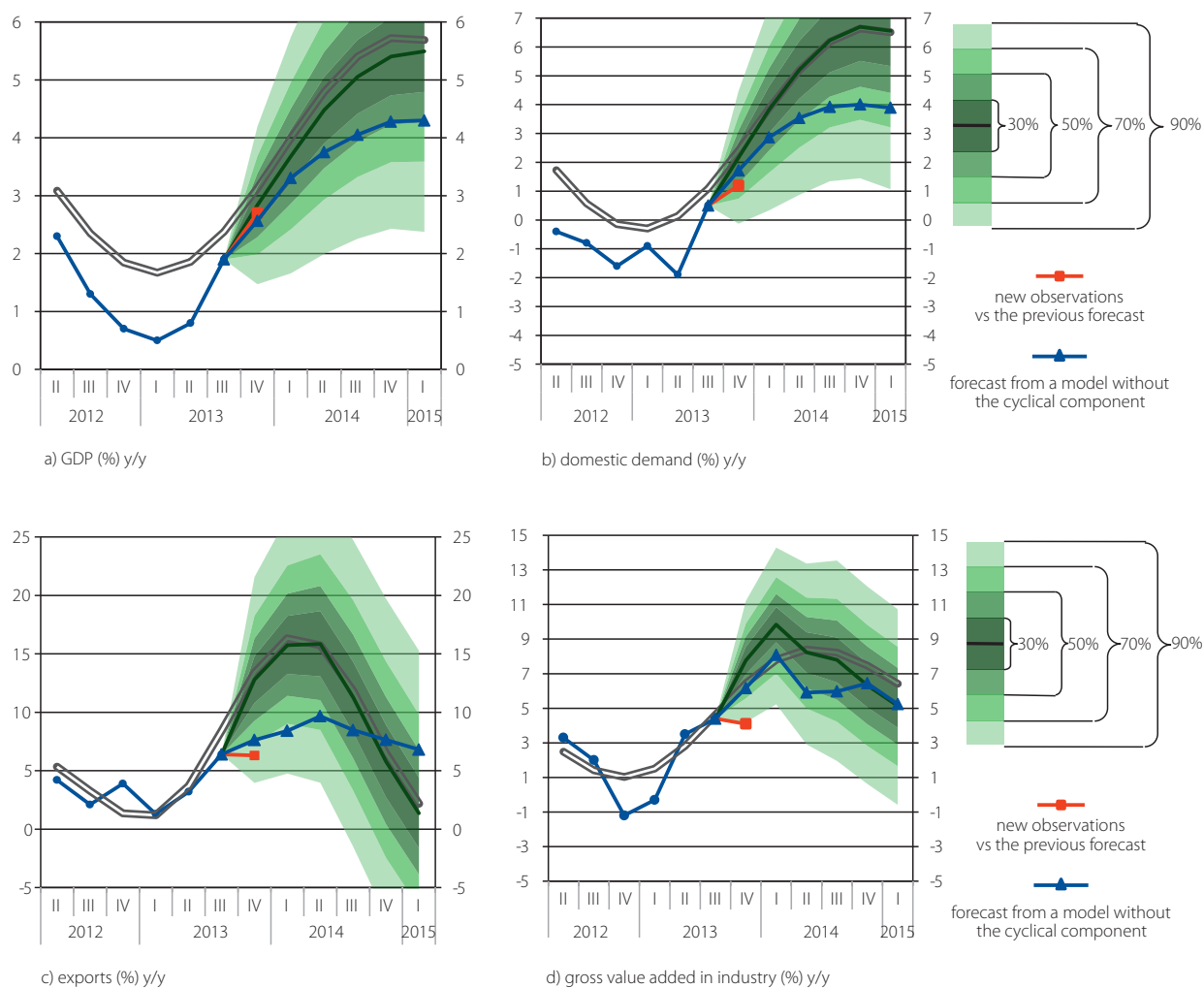


Fig. 14.2. Quarterly data: forecasts with observations added ex-post

Source: own study.

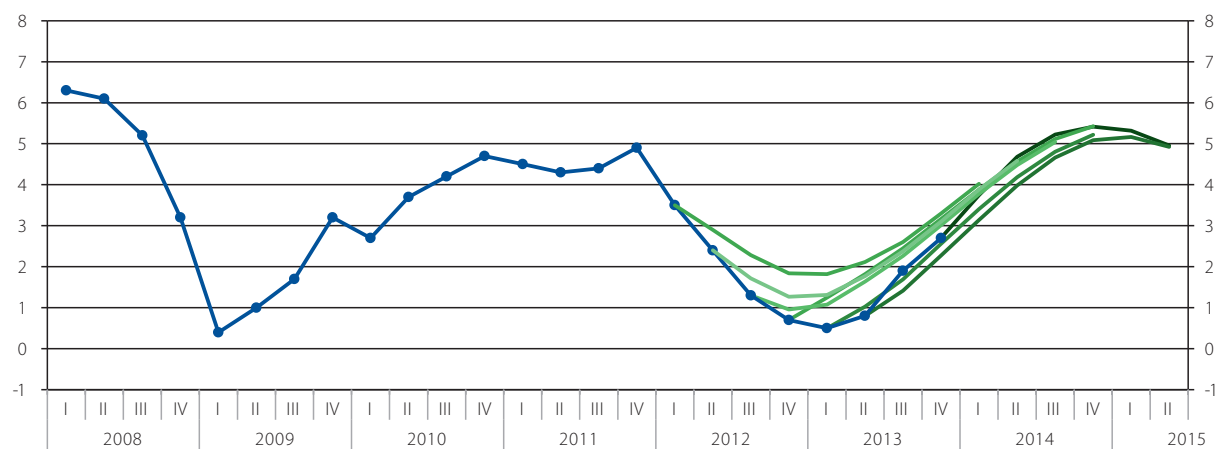
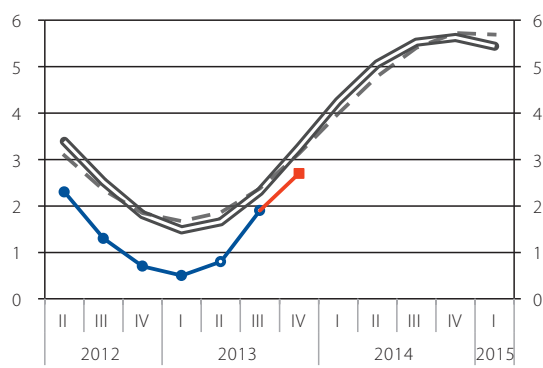


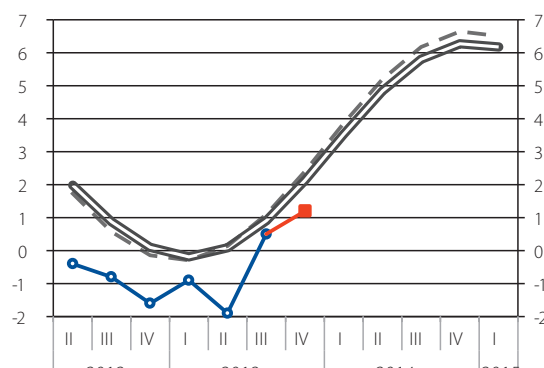
Fig. 14.3. Gross GDP (%) y/y: a comparison of the current and previous point forecast paths

Source: own study.



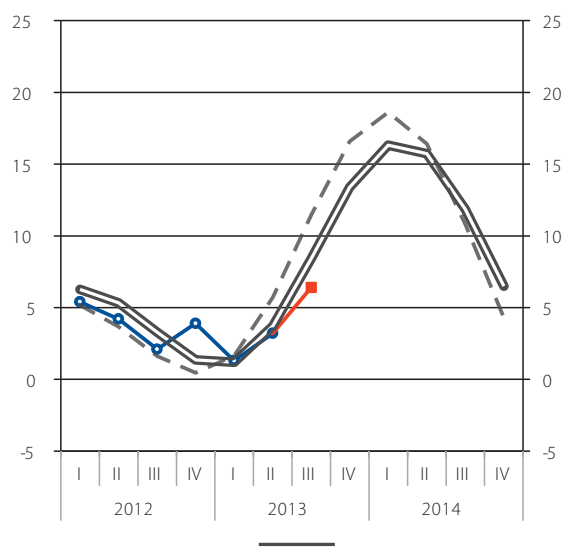
The regular cyclical component in the current forecast
(including the new observation)

a) GDP (%) y/y



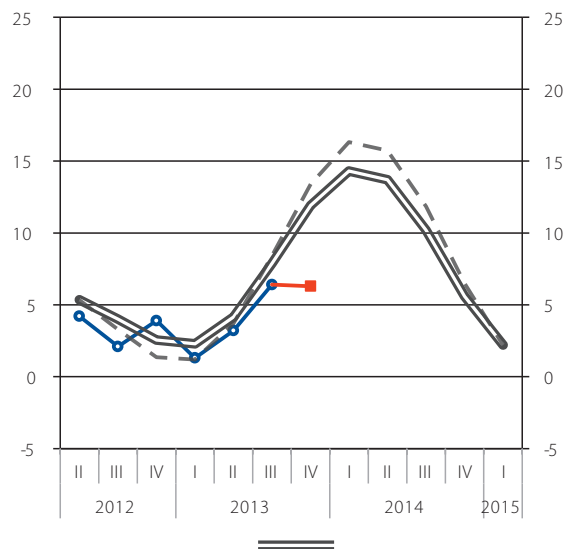
The regular cyclical component in the current forecast

b) domestic demand (%) y/y



The regular cyclical component in the current forecast
(including the new observation)

c) exports (%) y/y



The regular cyclical component in the current forecast
(including the new observation)

d) gross value added in industry (%) y/y

Fig. 14.4. Quarterly data: the impact of new observations on the point forecasts of the regular cyclical component

Source: own study.

remains unchanged, nevertheless adjustments are made as to the predictive probability of a recession. The methodology developed quite accurately predicted the economic slowdown and the trend reversal which occurred in the second quarter of 2011. Similarly, the end of the downturn and a small likelihood of recession in the first quarter of 2013 were fairly accurately predicted.

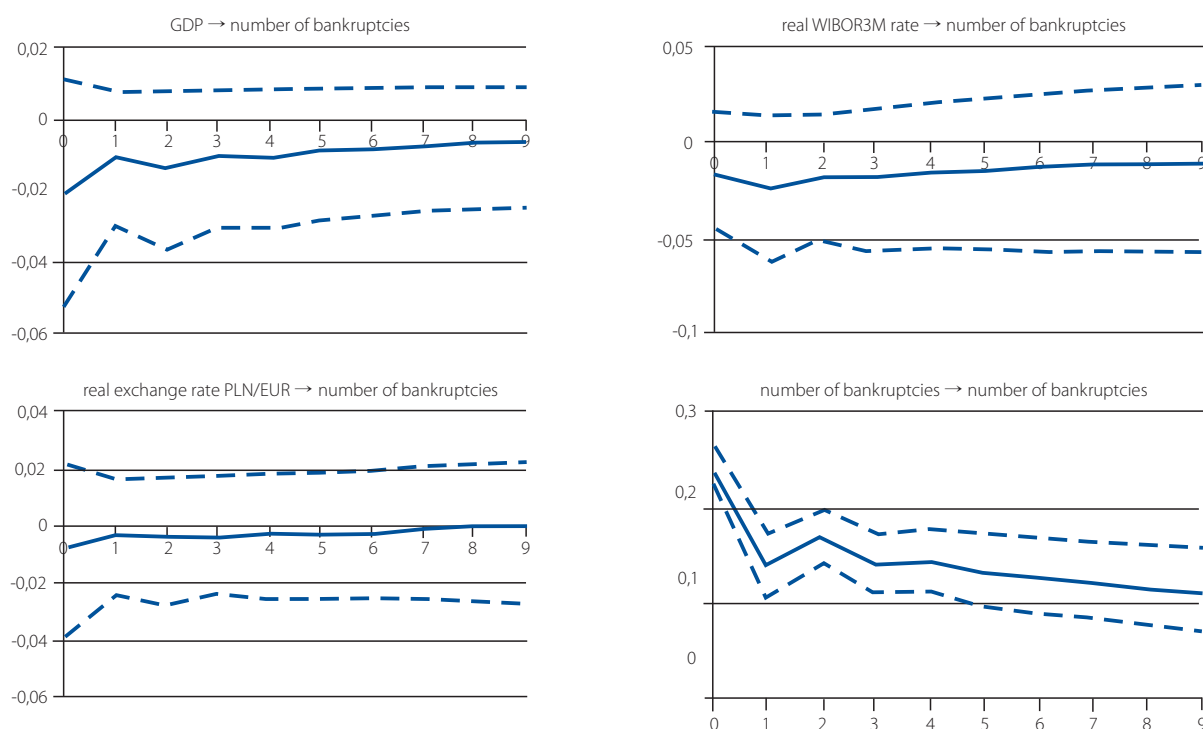
14.4. Sensitivity analyses

Using the response to random shock function, we analysed the effect of exogenous shocks/innovations affecting the variables under consideration on the number of bankruptcies, which, as in the previous reports, allowed us to trace the influence of selected economic categories on enterprises.

Table 14.5. Quantiles of the posterior distribution of the response function of the number of entities in bankruptcy to random shocks affecting selected variables (shock size equals one posterior standard deviation for each variable, which entails an increase in the logarithm (ln) of the GDP by about 0.011 in the zero period, the real interest rate by 0.393%, the logarithm of the exchange rate by 0.039 and the logarithm of the number of bankruptcies by 0.239).

IRF	GDP → no of bankruptcies			WIBOR3M → no of bankruptcies			EUR/PLN → no of bankruptcies			no of bankruptcies → no of bankruptcies		
Horizon	Quantile			Quantile			Quantile			Quantile		
	0.16	0.5	0.84	0.16	0.5	0.84	0.16	0.5	0.84	0.16	0.5	0.84
0	-0.053	-0.021	0.011	-0.046	-0.016	0.016	-0.039	-0.009	0.021	0.219	0.239	0.262
1	-0.031	-0.010	0.008	-0.061	-0.023	0.014	-0.023	-0.003	0.016	0.107	0.139	0.174
2	-0.036	-0.013	0.009	-0.052	-0.018	0.014	-0.027	-0.004	0.018	0.144	0.168	0.194
3	-0.030	-0.010	0.008	-0.055	-0.018	0.017	-0.024	-0.003	0.018	0.111	0.142	0.175
4	-0.031	-0.010	0.009	-0.054	-0.015	0.021	-0.025	-0.002	0.019	0.112	0.143	0.177
5	-0.029	-0.009	0.008	-0.055	-0.013	0.023	-0.025	-0.002	0.019	0.096	0.132	0.170
6	-0.028	-0.008	0.009	-0.056	-0.012	0.026	-0.025	-0.002	0.020	0.089	0.129	0.168
7	-0.026	-0.008	0.009	-0.057	-0.011	0.027	-0.025	-0.002	0.021	0.080	0.122	0.164
8	-0.026	-0.007	0.009	-0.057	-0.011	0.029	-0.026	-0.001	0.022	0.073	0.116	0.162
9	-0.025	-0.006	0.009	-0.057	-0.010	0.030	-0.026	-0.001	0.022	0.065	0.110	0.159
10	-0.024	-0.006	0.010	-0.057	-0.009	0.031	-0.027	-0.001	0.024	0.060	0.106	0.157

Tables 14.5 and 14.6 and Figures 14.4 and 14.5 show the quantiles of the posterior distribution function of the response of the number of bankruptcies to a single isolated shock (i.e. assuming that other variables remain constant) in the economic figures under consideration. When identifying shocks (orthogonalization), the following order of variables was adopted: variables representing Poland's economic environment (EUR/USD exchange rate, Germany's GDP, the price of crude oil), the GDP, the basic interest rate, PLN/EUR exchange rate and the number of companies in bankruptcy. It was assumed, therefore, that the GDP has an immediate effect on the interest rate, the exchange rate and on the number of bankrupt entities. The interest rate, in turn, has an immediate effect on the exchange rate and the number of actors, while the exchange rate – on the number of entities in bankruptcy.¹



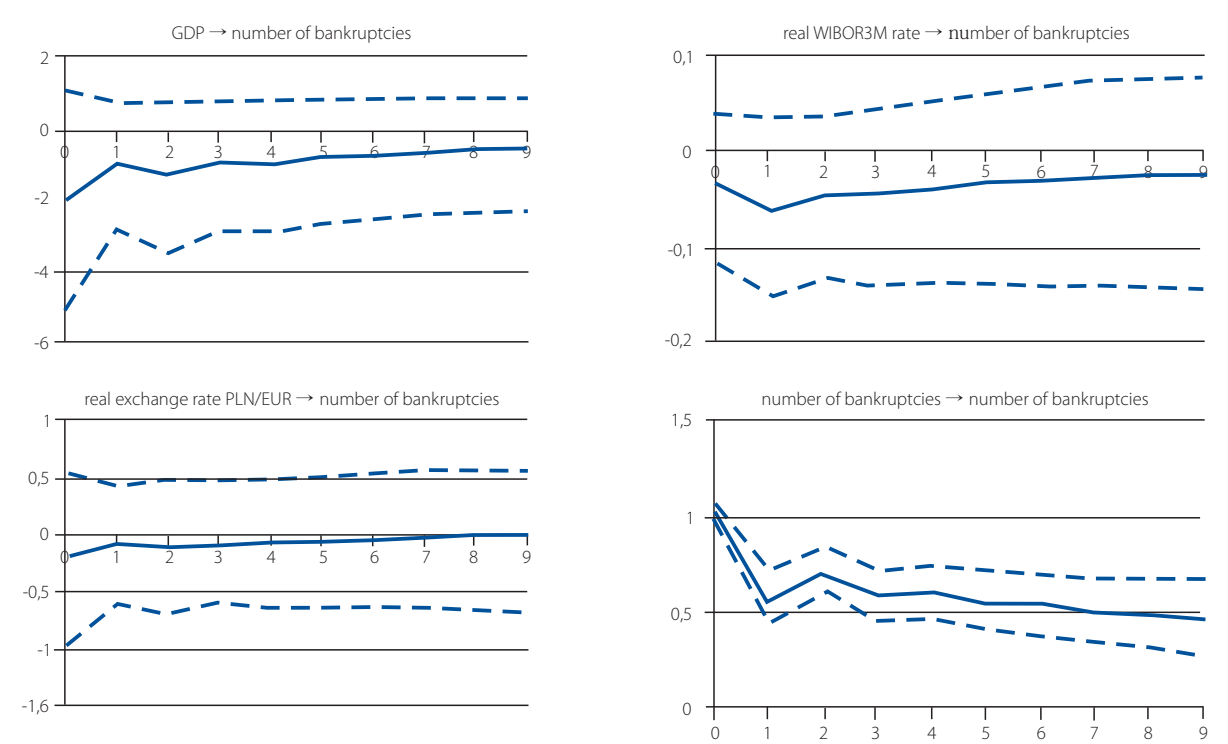
* The solid line represents the median, whereas the dotted lines represent 0.16th and 0.84th quantiles.

Fig. 14.5. Quantiles of the posterior distribution of the response function of the number of entities in bankruptcy to random shocks affecting domestic variables (size of the shock equals one posterior standard deviation)

Source: own study.

¹ The order of the variables – domestic GDP, basic interest rate, PLN/EUR exchange rate – was adopted from an article by (Haug 2012).

For comparison, the charts below show the response to random shock functions, which have been normalized so that the size of the shock is equal to 1.



* The solid line represents the median, whereas the dotted lines represent 0.16th and 0.84th quantiles.

Fig. 14.6. Quantiles of the posterior distribution of the response function of the number of entities in bankruptcy to random shocks affecting domestic variables (unit shock)

Source: own study.

Only responses of the number of bankruptcies to domestic shocks are important. The scores of responses of the remaining variables to shocks are associated with a very high degree of uncertainty. However, most of the posterior probability mass for the response function of bankruptcies to an increase in the real interest rate remains on the negative side, which makes it more likely that the model shows a weak negative correlation between the interest rate and the number of initiated bankruptcy proceedings. Assuming that the response function remains at the level of the median posterior distribution, we can conclude that a single isolated (i.e. assuming that other variables remain constant) WIBOR3M rate increase by one percentage point will result in a decline in the number of bankruptcies by approximately 3.8% in the same period. The most noticeable response occurs after one quarter (–5.7%) and then gradually disappears (to about –1.4% after 4 years). The supply of new information slightly strengthened the assessment of the response intensity of the number of bankruptcies to interest rate changes.

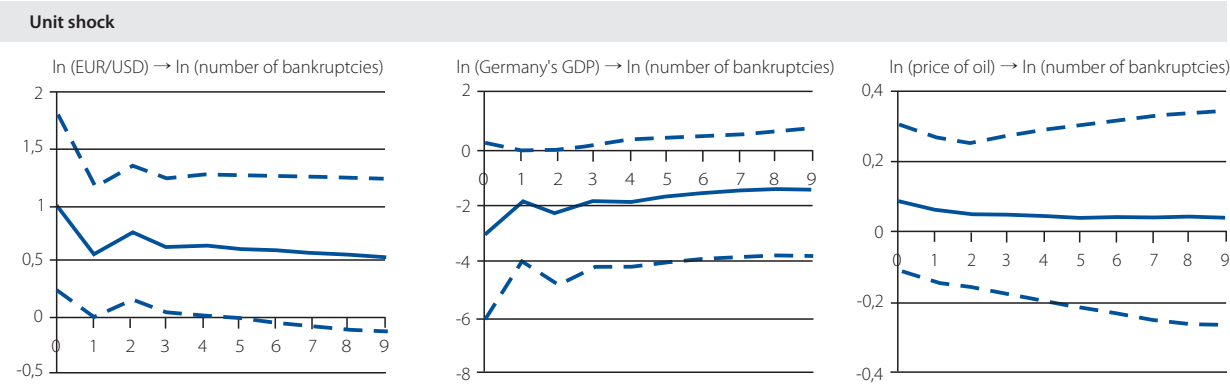
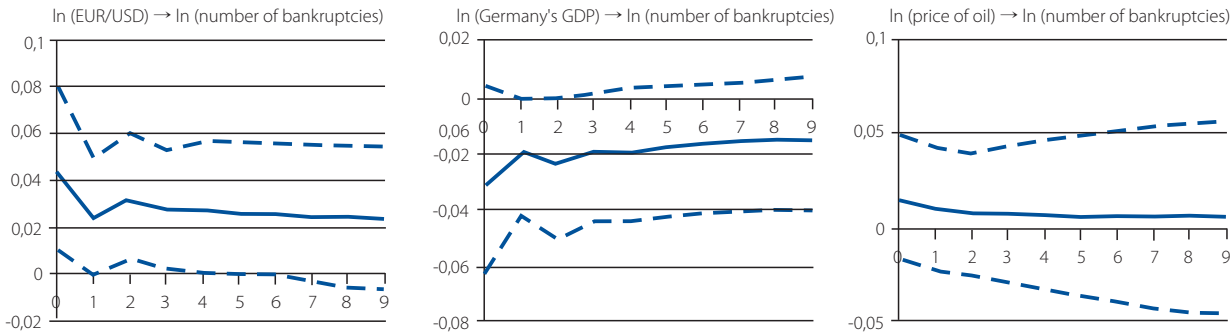
It can also be argued that GDP growth is very likely to result in a decrease in the number of enterprises at risk of bankruptcy. According to the median of the posterior distribution, a one-percent increase in GDP results in a decline in the number of bankruptcies by approximately 1.9% in the same period. In subsequent quarters, the observed relationship gradually diminishes (non-monotonically) to reach the level of 0.2% after 5 years. No significant changes with respect to the results presented in the previous report have been observed.

The effect of a one-percent increase in the number of bankruptcies in the next quarter drops to about 0.6 %. In the subsequent period it increases slightly (to 0.7 %) and then diminishes to about 0.3% after 5 years. Despite the supply of new information, the reaction has not changed as compared with the results obtained in the previous edition of the report. The median of the posterior distribution of the number of bankruptcies to PLN/EUR exchange rate shocks response function is close to zero. The response of the number of bankruptcies to a one-time increase of variables representing the situation in the world was also analysed (Figure 14.3).

Table 14.6. Quantiles of the posterior distribution of the response function of the number of entities in bankruptcy to random shocks affecting variables related to the international situation (shock size equals one posterior standard deviation for each variable, which entails an increase in the logarithm (ln) of the EUR/USD exchange rate by about 0.044 in the zero period, the logarithm of Germany's GDP by 0.010 and the logarithm of the price of crude oil by 0.162).

IRF	EUR/USD * no of bankruptcies			Germany's GDP * no of bankruptcies			Price of crude oil * no of bankruptcies		
	Quantile			Quantile			Quantile		
	0,16	0,5	0,84	0,16	0,5	0,84	0,16	0,5	0,84
0	0.010	0.043	0.078	-0.063	-0.031	0.002	-0.017	0.015	0.047
1	0.001	0.025	0.051	-0.043	-0.020	0.001	-0.022	0.011	0.044
2	0.006	0.032	0.059	-0.049	-0.024	0.001	-0.024	0.009	0.041
3	0.002	0.027	0.054	-0.044	-0.020	0.002	-0.028	0.008	0.044
4	0.002	0.028	0.056	-0.044	-0.019	0.003	-0.032	0.007	0.046
5	0.000	0.026	0.054	-0.043	-0.018	0.004	-0.035	0.007	0.049
6	-0.001	0.026	0.055	-0.042	-0.017	0.005	-0.039	0.007	0.051
7	-0.003	0.025	0.055	-0.041	-0.016	0.006	-0.041	0.006	0.054
8	-0.005	0.024	0.055	-0.041	-0.015	0.006	-0.043	0.006	0.056
9	-0.006	0.024	0.055	-0.040	-0.014	0.008	-0.044	0.006	0.057
10	-0.008	0.023	0.055	-0.040	-0.014	0.008	-0.047	0.005	0.058

Shock size – one posterior standard deviation, which entails an increase in the logarithm of the EUR/USD exchange rate by about 0.044 in the zero period, the logarithm of Germany's GDP by 0.010 and the logarithm of the price of crude oil by 0.162



* The solid line represents the median, whereas the dotted lines represent 0.16th and 0.84th quantiles.
Fig. 14.7. Quantiles of the posterior distribution of the response function of the number of entities in bankruptcy to a one-time increase in variables describing Poland's economic environment

Source: own study.

As is the case with the relationships described above, the impact assessments of selected parameters describing the global environment on the number of bankruptcies are associated with a considerable uncertainty. Within this group of models, it is impossible to judge the strength and direction of the impact of crude oil prices on the number of enterprises in bankruptcy, although the shift of the posterior distribution slightly above zero suggests that a positive correlation is more likely, therefore an increase in the crude oil prices is slightly more likely to result in an increase in the number of bankruptcies.

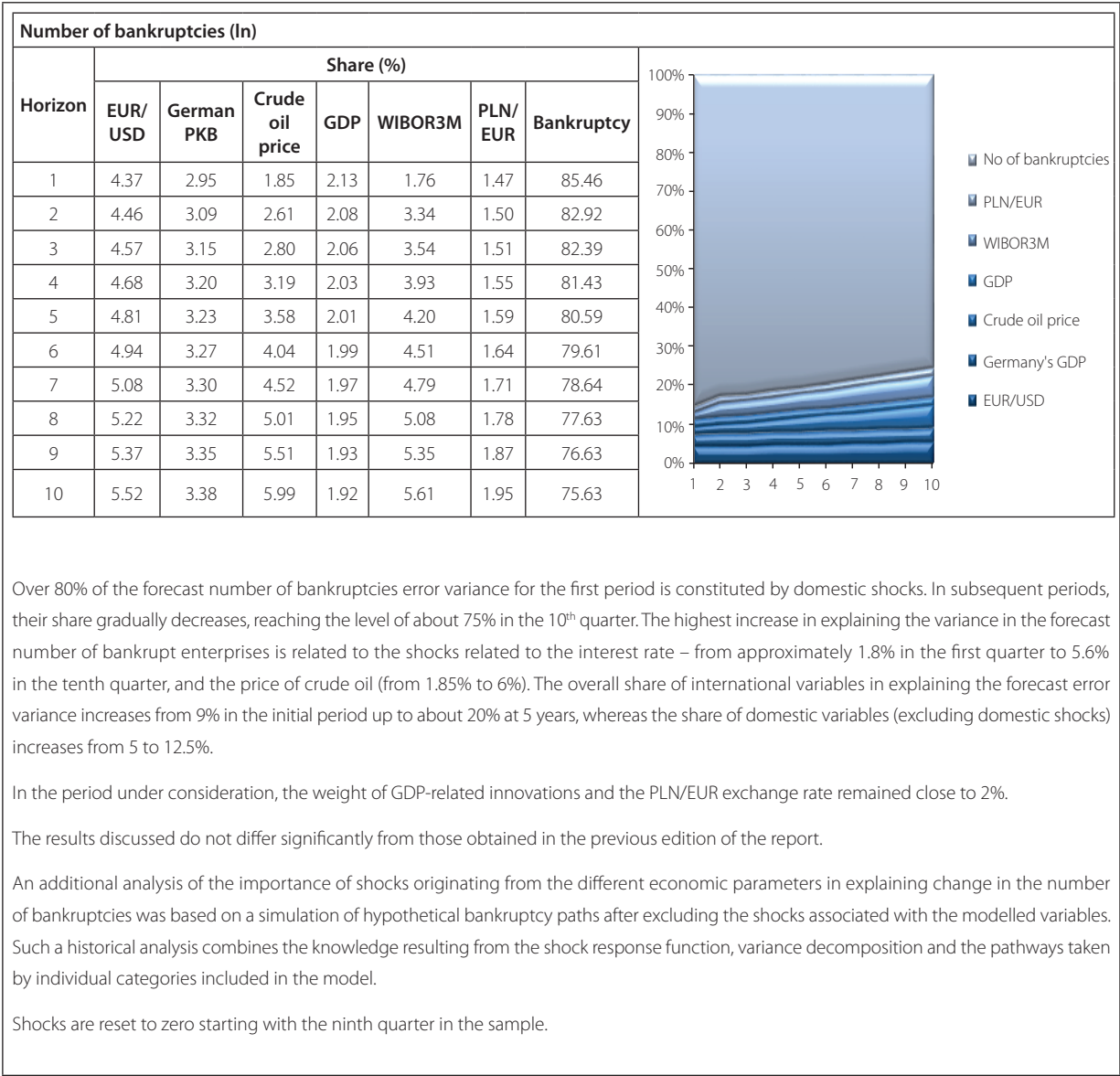
A negative correlation can be observed between the number of bankrupt enterprises in Poland and Germany's GDP. After one quarter, a one-time, isolated, one-percent increase in Germany's GDP results in a decline in the number of bankruptcies by about 2%. The strength of this response is maintained in the subsequent three quarters, and then slowly diminishes to 0.8% after 5 years.

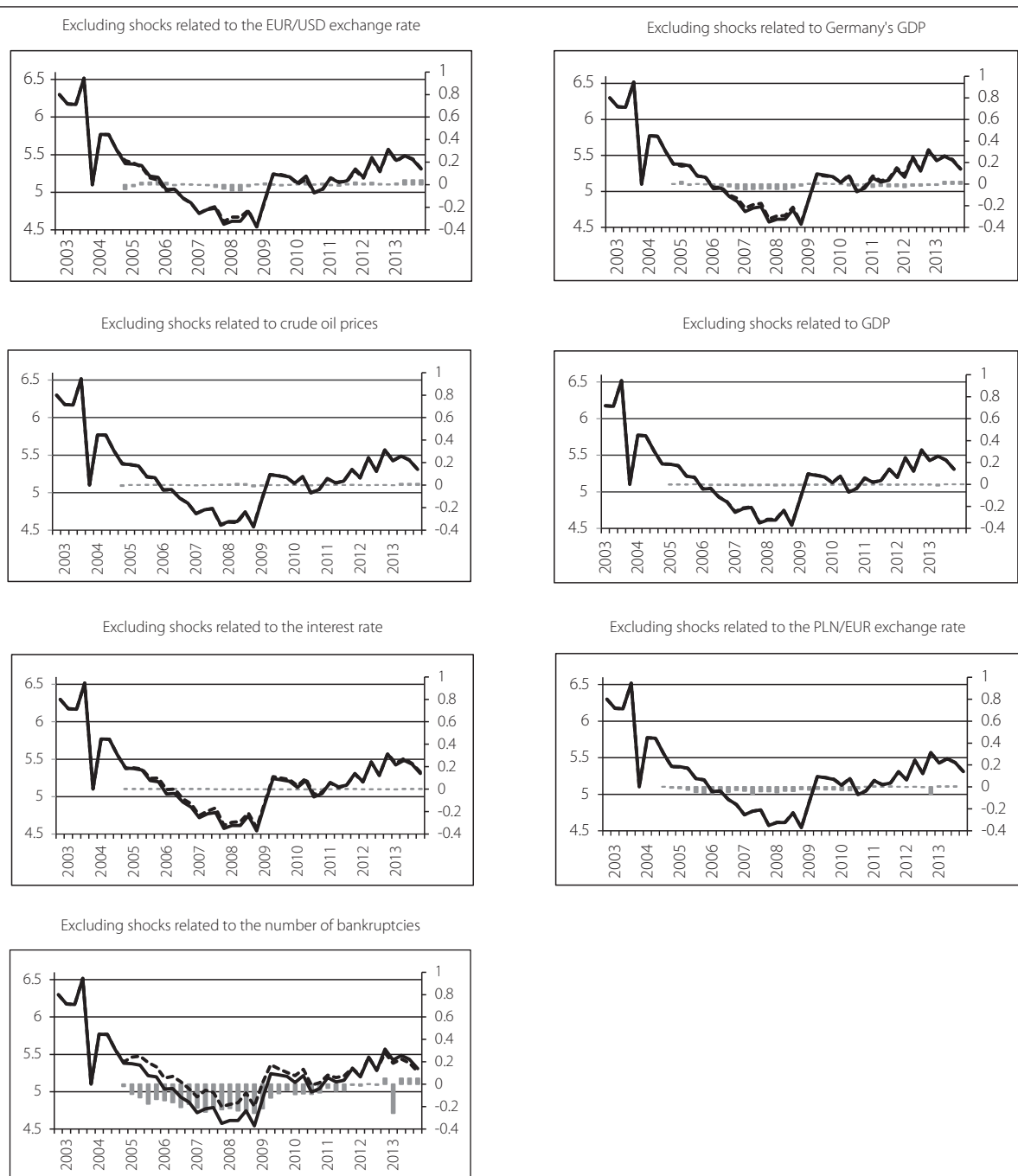
Conversely, a positive correlation can be observed between the number bankruptcies in response to an increase in the EUR/USD exchange rate: the weakening of the euro against the dollar increases the number of bankruptcies, for example, an increase by 1% results in an increase in the number of bankruptcies by approximately 1% in the same period. After 5 years, the strength of this correlation still exceeds 0.4%. Both above-mentioned correlations appear to be consistent with intuition.

It should be emphasized that those relationships may be helpful in predicting the direction of change in the number of bankrupt entities in response to changes observed in the analysed economic categories, and, as such, may provide useful insight to decision-makers. The picture can be made more complete by invoking historical analyses, i.e. a forecast error variance decomposition, and simulations of the hypothetical paths excluding shocks in the analysed economic data.

Arranging the variables according to the pattern adopted for the identification of random shocks, below the above-mentioned analyses are presented with respect to the number of bankruptcies and the gross domestic product.

Table 14.7. Forecast error variance decomposition for the number of bankruptcies and GDP



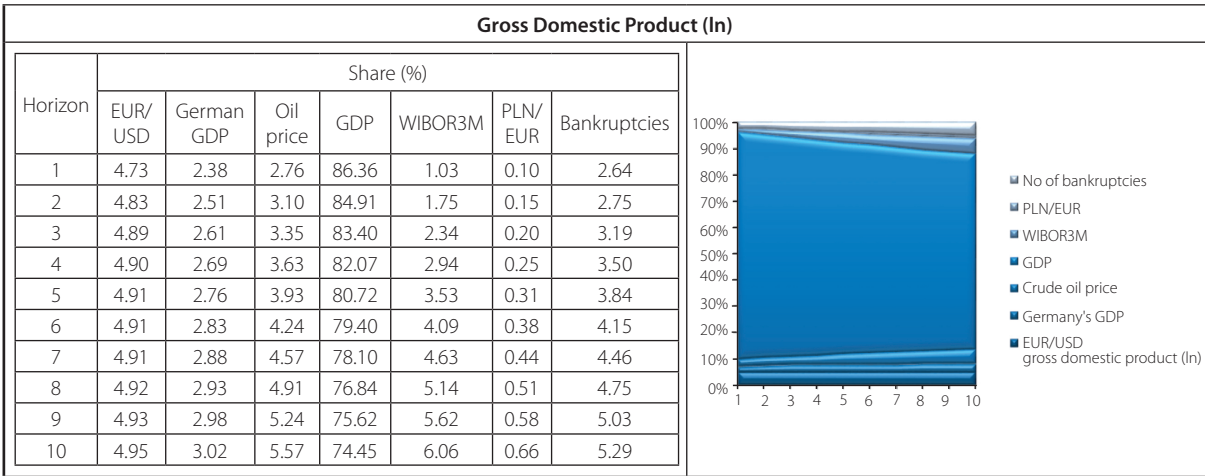


The solid line represents the actual path of the number of bankruptcy petitions, the dotted line – a hypothetical evolution trajectory assuming no individual shocks in the period 2004q4–2013q4 (left axis), while the bars represent the differences between the actual and simulated values (right axis).

In accordance with the decomposition of the variance, the greatest differences to the actual plot of the path are observed after the exclusion of domestic shocks. The greatest differences between the real plot and all the seven simulated plots can be observed in 2007–2009 and in most cases the observed differences are negative. Eliminating the shocks associated with the EUR/USD exchange rate causes the most perceptible negative differences at the turn of 2007/2008 and positive ones in 2013. The former period was dominated by negative shocks, which confirms the positive relationship between the average number of bankruptcies and the path observed. The elimination of shocks caused by changes in Germany's GDP in 2006–2009 and again in 2011–2012 results in an increase in the hypothetical number of bankruptcies in relation to those actually observed. The greatest negative differences can be seen in 2008, which is associated with the high rate of GDP growth in Germany in the quarters preceding the under consideration. The negative growth rate, which was observed in 2009, resulted in a decrease of this difference leading to a reversal of the relationship in 2010. Subsequent recovery of 2011–2012 improved the situation of enterprises.

In both above-mentioned cases, what appears to be mysterious is the last year of the survey, in which the observed differences have the opposite sign to the expected one.

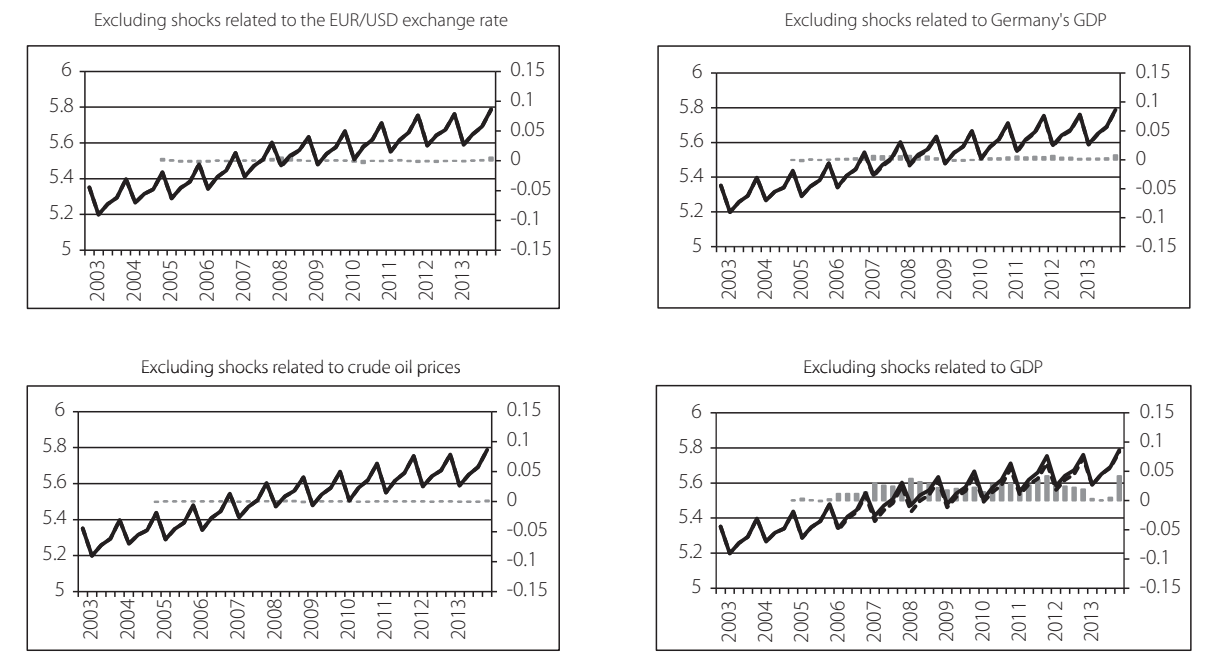
The exclusion of shocks due to the PLN/EUR exchange rate results in an increased number of bankruptcies, which is particularly evident in 2005–2011 and in the fourth quarter of 2012. Although the resulting negative differences are conspicuous, when we take into account both the path of the exchange rate and the estimated shocks, it is difficult to indicate the direction of the relationship, which is also reflected in the assessment of the uncertainty response function to shocks due to the PLN/EUR exchange rate. Since the population of bankrupt enterprises includes both net importers and net exporters, the observed uncertainty as to the direction of the relationship appears to be natural.

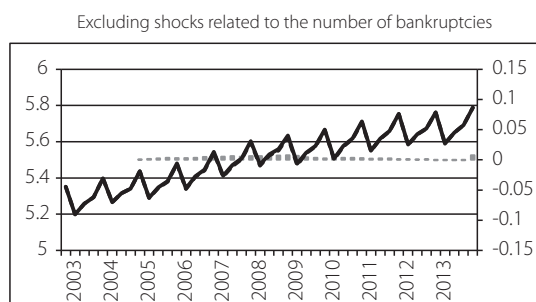
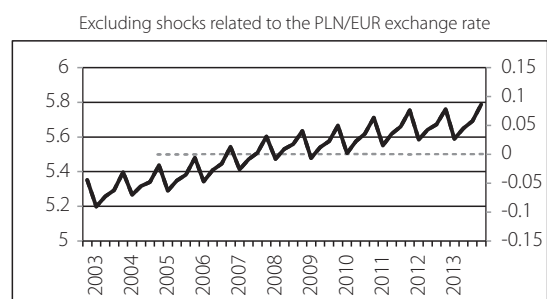
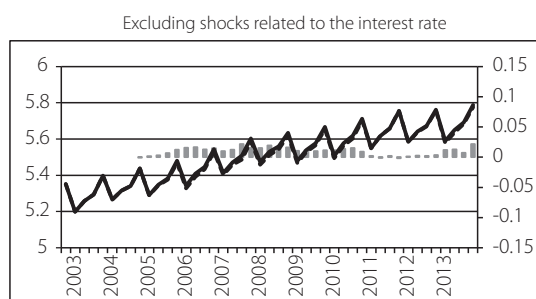


In the period under consideration, the share of domestic shocks in the GDP forecast error variance exceeds 70% (ranging from 86% for the first quarter forecast to about 75% for the 2.5-year forecast horizon). The share of shocks related to the PLN/EUR exchange rate is low – 0.1%–0.7 % – which indicates little relevance of this parameter for GDP changes. The longer the forecast horizon, the greater the importance of interest rate shocks (increase from 1% to 6 %) and those involving the number of bankruptcies (increase from 2.6% to 5.3%). The total share of the remaining variables increases from 8% to about 13.5% for the 10-quarter forecast horizon and 17% for the 5-year forecast, with the largest increase observed in the case of shocks related to the price of crude oil.

Compared with the results of the previous report, we have noted a slight decrease in the importance of domestic shocks in explaining the variance in the first quarters of the forecast.

In order to obtain a more in-depth analysis of the impact of shocks originating from different economic parameters on GDP, a simulation of a hypothetical GDP path was run to the exclusion of shocks associated with the analysed variables, just as was done for the number of bankruptcies. Shocks are reset to zero at the beginning of the ninth quarter in the sample.





The solid line represents the actual path of the number of bankruptcy petitions, the dotted line – a hypothetical evolution trajectory assuming the absence of shocks in 2004q4–2013q4 (left axis), while the bars represent the differences between the actual and simulated values (right axis).

The greatest differences between hypothetical GDP paths and the actually observed ones emerge after the exclusion of domestic shocks, the basic interest rate and Germany's GDP. Resetting domestic shock to zero shifts the entire plot down with the provision that in 2012 and in the first two quarters of 2013, the observed difference is clearly decreasing. In this period, we can observe a decline in GDP growth; consequently, the identified shocks are negative.

The elimination of shocks related to Germany's GDP also leads to a downward shift of the path of Poland's GDP, with the greatest differences observed in 2006–2008, in 2010–2011 and again in the last two quarters of 2013. In other periods, the actual values of Poland's GDP are located above the hypothetical values, but the differences are considerably smaller. These periods correspond with the years of a marked slowdown in the German economy.

Likewise, positive differences arise after the exclusion of shocks related to the short-term interest rate. The differences disappear in 2011–2012, when the rates were low and mainly negative shocks were identified in the equation.

Chapter 15

BANKRUPTCY RISK AT ENTERPRISE LEVEL – A MICROECONOMIC ASSESSMENT

15.1. Introduction

The aim of assessing the overall financial standing of enterprises in the microeconomic component consists in effectively identifying the symptoms of their steadily deteriorating economic condition, with a view to mapping out the areas most vulnerable to bankruptcy, while making use of the well-established analytical methods, instruments and procedures, inclusive of bankruptcy prediction modelling (i.e. the SZU models estimated on the aggregated values in the first stage of the study, as completed up to the 2nd half of 2012, and then in the second stage, pursued as of the 1st half of 2013, the MW models estimated against the respective values pertaining to the set of nearly fifty non-financial enterprises studied and included in public domain statistics). All the above facilitated the quantification, analyses and the actual estimation of potential bankruptcy risk affecting the enterprises under consideration.

The basic analytical cross-section applied throughout the present study consists in the appraisal of enterprises in terms of specific type of business activity (manufacturing, trade, services) and their respective sizes (small, medium-sized, large). Some additional profiles (structures) have also been addressed in due consideration of NACE terminology (inclusive of sections and divisions), their respective legal status and regional location. Their presentation in this study is somewhat limited, however, it remains in line with the adopted editorial constraints.¹

15.2. Financial standing of enterprises

The assessment of financial standing of enterprises was carried out against the key components of economic potential and the economic and financial indicators deemed viably predictive of the degree of bankruptcy risk, while making due reference to relevant values within the corresponding period of the previous year. The actual analytical scope of the economic potential was augmented with the descriptive statistics pertaining to the variability of the analysed values, expressed through standard deviation and minimum and maximum values, as reported throughout the period under consideration. The adopted set of analytical cross-sections, apart from the analytical total, consists in their diversity in terms of the actual type of business activities pursued (manufacturing, trade, services), and the respective sizes (small, medium-sized, large).

In terms of the revenue generated from sales, capital expenditure, value of assets, and net financial result actually achieved, manufacturing firms had by far the largest share, followed by the services sector (with the exception of revenues and the net profit) and trading firms. Both in the aggregated group of enterprises, as well as in the ones differentiated by the respective types of business activity pursued, the actual change trends in pertinent variables throughout the period under study (1st half of 2007 – first half of 2013) were similar, even though they still differed in terms of intensity and time of occurrence. Following the adverse impact of the 2008 economic crisis, by mid-2010 the capital expenditure, revenues and net financial results were reported to drop (even though overall value of assets was not subject to any significant changes throughout the period under consideration).

In the case of capital expenditure, this trend occurred earliest and lasted longest in the services sector, i.e. as early as of mid-2008, in the trade sector as of mid-2009, whereas in the manufacturing sector it came latest and had the shortest duration, i.e. as of mid-2009. The above notwithstanding, the services sector was the only one not to have experienced any drop in the revenues, whereas some reduction in the net financial result was encountered in the late 2008 and late 2010 only (relatively the most favourable situation among the remaining types of business activity).

An appreciably worse situation in this respect befell the trading entities (decrease in the revenues throughout 2009, poorer financial result in the late 2008, early 2009, and early 2010), as well as the manufacturing ones (despite a drop in revenues in the early 2009 only, these entities experienced not only a reduction in earnings throughout 2008 and in the 1st half of 2010, but also loss-making business activities in the 2nd half of 2008).

As of early 2010, in the service companies (as the first ones), and as of late 2010 in the trading and manufacturing companies, the situation improved, although the signs of deterioration, i.e. a perceptible drop in the value of pertinent indicators, began

¹ A broader presentation of the results of analysis and evaluation of economic and financial situation and the exposure to the degree of bankruptcy risk of enterprises, completed with the aid of widely acknowledged economic indicators, methods and tools, models for predicting bankruptcy assuming the analytical cross-sections, as defined for the period spanning early 2007 – early 2013 and the third quarter of 2013, can be found in: Kaczmarek, Kolegowicz, Krzemiński, Fijorek (June 2011 – April 2014).

to reappear as early as in the 2nd half of 2011. The first and most prominently visible adverse changes, still to be encountered up to mid-2013, were recorded in the services sector, unlike in the trading and manufacturing companies, where certain signs of improvement were noted in the 1st half of 2013, i.e. the year rounding off the present analytical span.

In the companies highlighted in terms of their respective sizes with regard to the indicators under study (revenues, capital expenditure, assets, and net profit) the large companies had by far the largest share, followed by medium-sized and small firms. Amongst the large entities, the greatest share is claimed by manufacturing firms (followed by services and trading ones), in the medium-sized ones – manufacturing and trading companies (service companies claiming the smallest proportion), whereas in the small ones it was the services sector that claimed the lion's share (followed by the trading and manufacturing ones). The symptoms of deteriorating economic climate occurred the earliest in the medium-sized entities (reduced net profits in the period spanning early 2008 – early 2009, capital expenditure – as of mid-2008 until early 2010, revenues – as of mid-2009).

In small entities, adverse changes were noted in the 1st half of 2009 (in the case of capital expenditure up to the end of 2010), whereas in the large entities this happened latest and had the shortest duration, i.e. as of mid-2009 until early 2010 (although accompanied by loss-making business operations in the late 2009). In the large entities, a period of relative improvement, lasting from mid-2010 until early 2012, was followed by a renewed deterioration in their financial standing. In the small entities the signs of improvement occurred a little earlier, i.e. as of mid-2009, although they did not refer to all economic indicators, as was the case with the large, although with perceptible signs of improvement in the early 2013. By far the worst situation in this respect characterized the medium-sized entities (further reduction of net profits occurred as early as in mid-2010 and lasted until the end of 2012, reduction in assets as of mid-2010 until early 2011, capital expenditures – throughout 2012, revenues – from mid-2012 until early 2013).

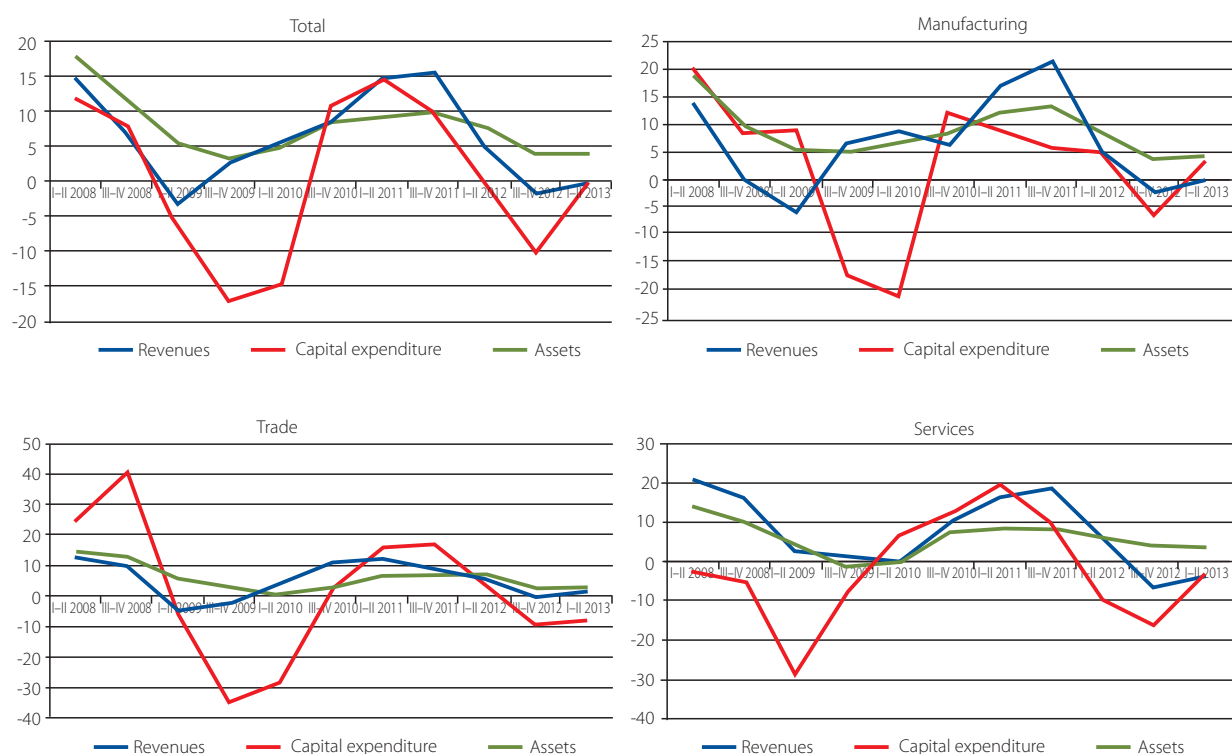


Fig. 15.1. Rate of change in sales revenues, capital expenditure and assets owned by enterprises in Poland from the 1st half of 2011 to the 1st half of 2013 in total and by respective types of business activity (in %, y/y)

Source: own study based on: Kaczmarek, Kolegowicz, Krzemiński, Fijorek (December 2013).

A closer scrutiny of the variability of the basic economics indicators implies that it was in the manufacturing activity that the highest average values of all variables under study were encountered (revenues, capital expenditure, assets, net financial result), as well as their highest variability. The highest average values are consistent with the favourable situation in the manufacturing sector, although their high variability indicates at the same time certain instability in this particular sector of national economy, which is only further corroborated by the negative values in recorded earnings (loss-making periods) in the manufacturing activities only. In the trading business, on the other hand, the lowest average values were noted in capital expenditure and assets. Trading was also characterized by the lowest variability of the indicators under study, thus effectively corroborating rather stable situation in this sector. Service activities were characterized by the higher mean values than in the case of the trading activities, with the exception of the sales revenue.

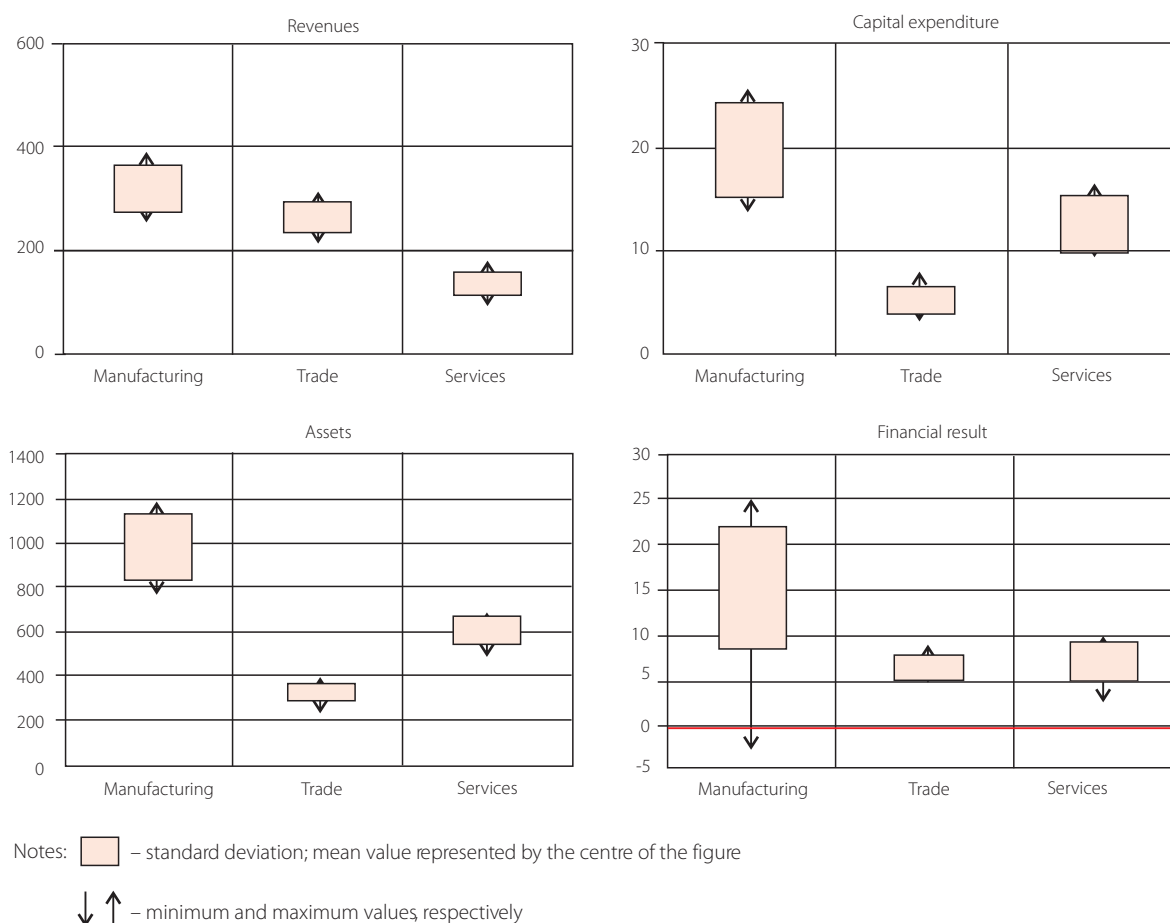


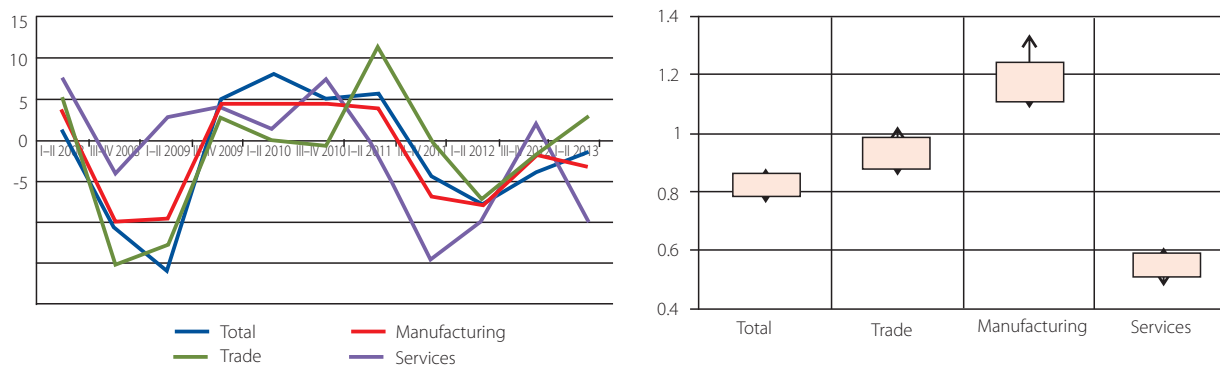
Fig. 15.2. Descriptive statistics on the variation in sales revenues, capital expenditure, assets and financial results of enterprises in Poland by type of business activity from the 1st half of 2011 to the 2nd half of 2013 (in billions of PLN)

Source: own study based on: Kaczmarek, Kolegowiec, Krzemiński, Fijorek (December 2013).

The analysis of the rate of change in the overall financial standing index (WOSF value) for companies in total, and as stratified by respective types of business activity, brings similar indications as when making use of basic economic indicators of their economic potential. It may in fact be indicated that the fallout of the 2008 financial crisis initially affected most the trading and manufacturing sectors (WOSF value was significantly reduced in the period spanning mid-2008 and early 2009), whereas the services sector was least affected. As a result, the improvement in overall financial situation was first recorded by the services sector, i.e. in the 1st half of 2009, while by the trading and manufacturing sectors in the 2nd half of 2009. This situation prevailed until 2011, whereupon the symptoms of a deteriorating overall financial situation of the enterprises re-emerged, lasting until mid-2013. The first one to experience the economic adversity was the services sector (as of mid-2011), then the manufacturing (as of the 1st half of 2012) and the trading one (as of the 2nd half of 2012) followed in quick succession. Among the latter, certain signs of improvement were noted in the early 2013. In the manufacturing sector the downward trend was effectively arrested, whereas in the services one the WOSF value was reported to drop (by far the least favourable situation).

Having made due allowances to the respective sizes of the enterprises, since early 2012 there seems to be an appreciable improvement in the overall financial situation of small firms, unlike the large ones in which by the end of 2011 a perceptible deterioration was recorded. In this respect, the medium-sized firms seemed to have had the bumpiest ride, i.e. as since the late 2009 (with a notable exception of early 2011) a consistent reduction in their WOSF value was reported.

Assessment of the variability rate in the overall financial standing index (WOSF) of commercial enterprises indicates its highest average and maximum values with regard to the trading activities. The minimum WOSF value actually reached in the trading activities was greater than the maximum value attained in all other types of business activity, which only goes to corroborate the most favourable overall situation in this particular group of enterprises. The lowest mean WOSF value, while at the same time its smallest variability characterized the business activities pursued by the services sector, where its lowest value was also achieved. Analysis of the variability of this index gives credence to the earlier analyses and appraisal of the companies' overall financial standing, as pursued with the aid of basic economic indicators of their economic potential.

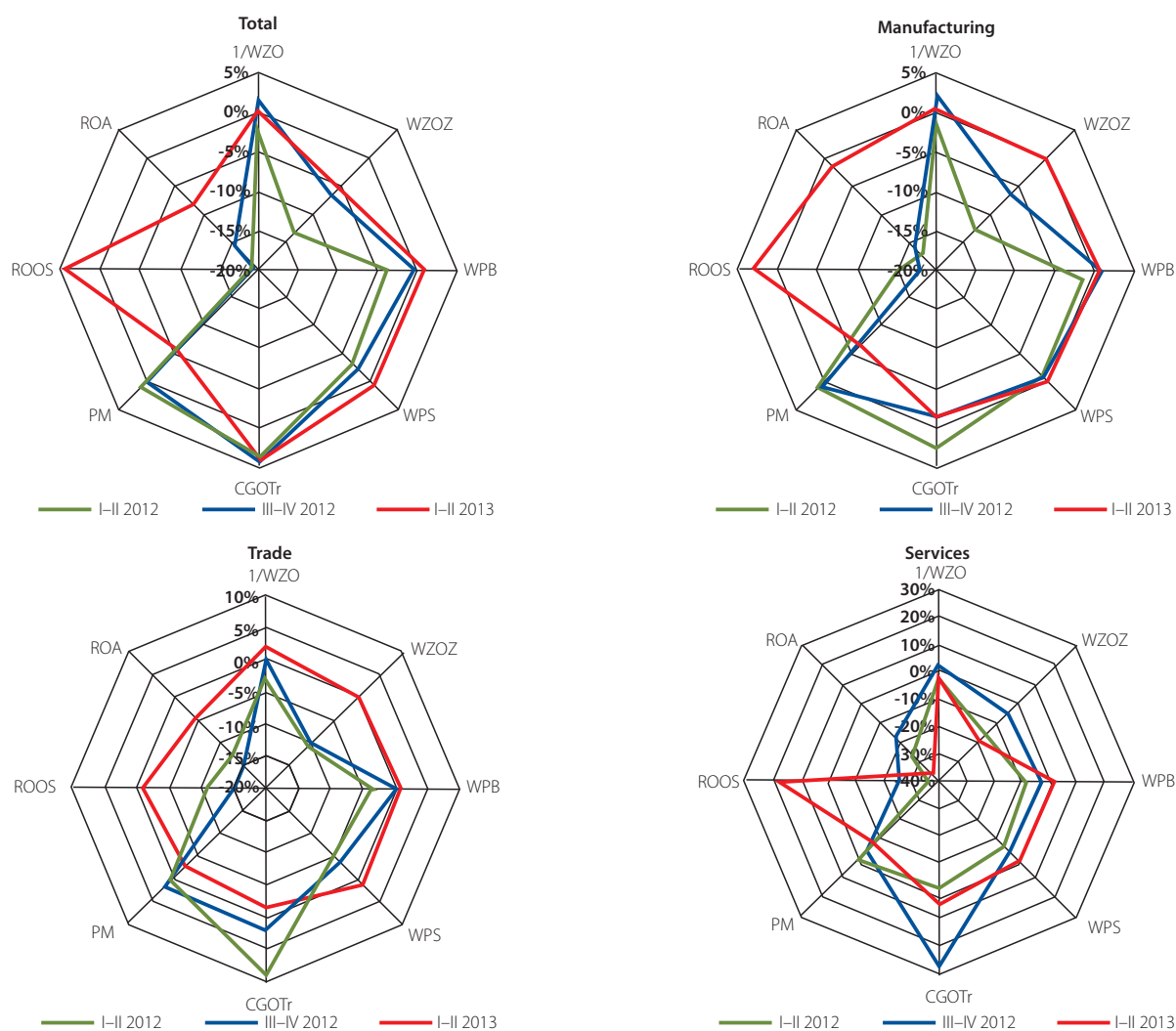


Notes: as for Figure 15.2.

Fig. 15.3. The rate of change in the overall financial standing index (left panel, expressed in %, y/y) and its variability (right panel) in enterprises in Poland from the 1st half of 2011 to the 2nd half of 2013: total values and by type of business activity

Source: own study based on: Kaczmarek, Kolegowiec, Krzemiński, Fijorek (December 2013).

The figure below shows the rate of change in the values of selected key economic and financial indicators in the period spanning early 2012–2013, for the business enterprises in total, and then divided by the respective types of activities that may be of indubitable significance in the overall assessment of their exposure to the degree of bankruptcy risk.



Note: on the charts, in order to standardize the directions of changes in the indicators under study, CCC value was itemised and the inverse value of the TDR was adopted.

Fig. 15.4. The rate of change in fundamental groups of economic and financial indicators in enterprises in Poland from the 1st half of 2011 to the 1st half of 2013: total and by type of business activity

Source: own study based on: Kaczmarek, Kolegowiec, Krzemiński, Fijorek (December 2013).

Within the analytical period spanning the 1st half of 2007 – the 1st half of 2013, the highest level of total debt (TDR) was shown by the trading companies, whereas the lowest one – by the manufacturing ones. A systematic and significant increase in debt over the same period (with the exception of the 4th quarter of 2012) characterized firms in the services sector, notably irrespective of their sizes, as opposed to other types of business activity and company sizes. In the trading and the manufacturing enterprises, the changes in total debt alternated, although without any significant changes in the actual total debt level (excluding the medium-sized manufacturing firms, in which the initial rise in total debt until the end of 2011 was eventually arrested). This was not without an impact upon the actual level of debt in the companies in total, in which a slight increase was also duly noted.

Concomitant adverse changes consisted in reduced debt sustainability (DSI) in the enterprises pursuing all types of business activity, whereas the most, i.e. nearly by one-half, in the services sector (companies of all sizes) and the manufacturing one with regard to the medium-sized companies. The reduction of debt sustainability was noticeable in the companies of all sizes, especially in the medium-sized entities.

These disturbing signals with regard to the changes in total debt (TDR) and the ability to service it (DSI) were somewhat alleviated by the results of the analysis in the areas of current and quick liquidity (CR and QR), which, despite its slight deterioration up to the early 2009 for the companies pursuing all types of business activity, underwent a systematic improvement in the periods spanning late 2009 – early 2011, and then in the early 2013. This was most noticeable in the services sector, then in the trading firms, but least in the manufacturing sector. In this particular respect, small companies seemed to lead the way, as opposed to the medium-sized and large ones, in which only a slight improvement was noted.

Along with the improvement in liquidity parameters within the periods indicated with regard to all types of business activity and company sizes, the waiting time for cash (CCC) was slightly reduced, which also was most noticeable in service firms of all sizes (perceptibly less so in the trading firms, with no appreciable changes in the manufacturing ones). It is hard to determine the actual sustainability of the observed improvement, though, as particularly in the service companies it was achieved through the extension of deadlines for the payment of short-term receivables (a negative trend for service firms).

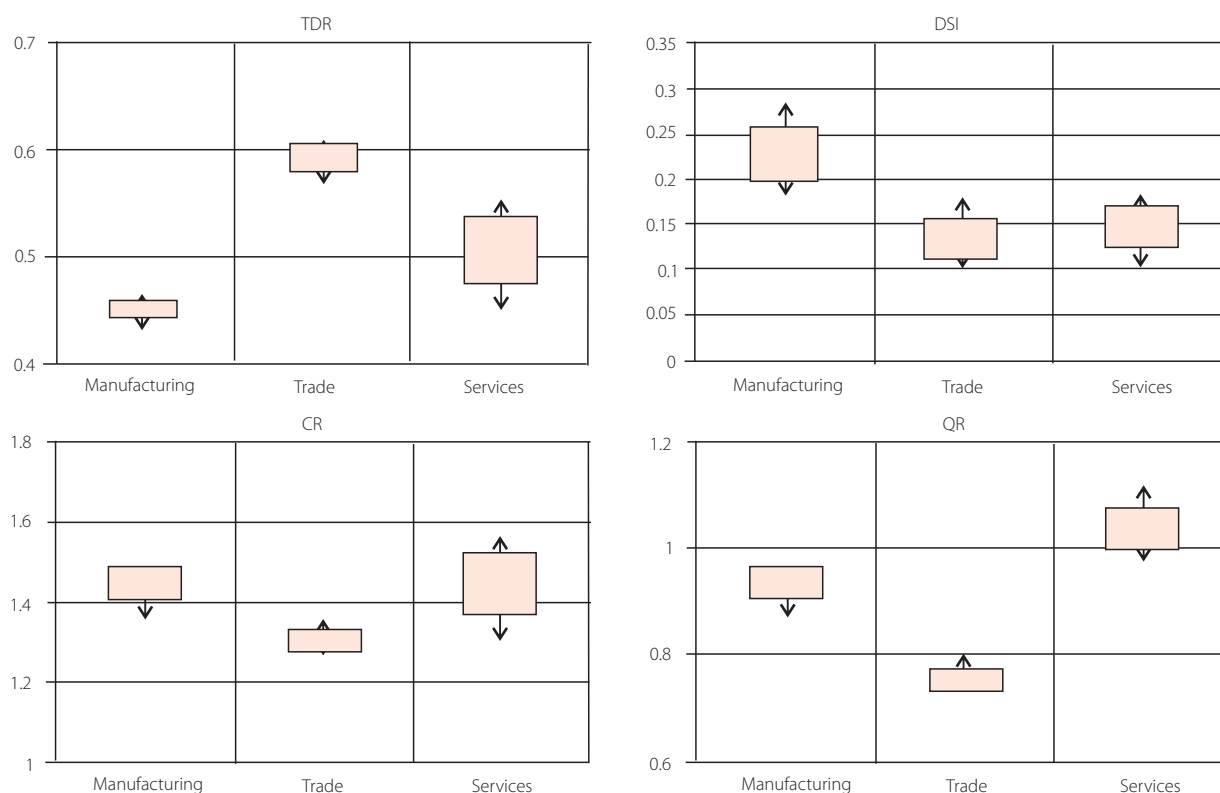
In the manufacturing firms, unlike in the services and trading ones, asset productivity (AP) showed a downward trend within the period under consideration, whereas in the services and trading companies its value fluctuated. There was no correlation whatsoever between those trends and the actual sizes of the companies, even though it was in the large trading firms that a perceptible increase in the productivity of assets was noted, as opposed to the small and medium-sized ones, where it was reduced.

Despite the fact that during the period under consideration in neither group of companies broken down by respective types of business activity was there any loss-making activity reported, the operating return on sales (OROS) and the return on assets (ROA) in all the entities (irrespective of the actual type of stratification) exhibited fluctuations, with a discernible downward trend (to the greatest extent by almost half of the service companies, and least in the manufacturing sector). Slight improvement in the return on sales (very much like in the case of some of the above referenced indicators) was observed in the 1st half of 2013 with regard to the manufacturing and the services sectors.

The highest average total debt ratio (TDR) and its low variability throughout the period under consideration pertained to the trading activities. The high variability of the debt also applied to the services sector, while its average value was at a much lower level than in the trading one. The most favourable situation regarding the amount of debt throughout the period under study pertained to the manufacturing activities, as it was characterized by the lowest average value of the TDR, and the highest value of the DSI. The unfavourable situation in the trading activities is corroborated by the lowest average liquidity ratios (CR and QR) and the low variability indicative of stagnation. The highest average and maximum values of the CR and the QR were observed in the services sector.

In the manufacturing sector the average waiting time for cash (CCC) was at the highest level, whereas its minimum values were close to the average for the trading activities. This type of activity was also characterized by the high average operating return on sales (OROS) and assets (ROA). The high average values of both asset productivity (AP) and operating return on sales (OROS) in the trading activities and their low variability corroborate the stable and favourable position within this sector. In the services sector the average cash turnover cycle was the shortest, and also accompanied by high variability. Furthermore, the lowest mean value of both the asset productivity (AP) and the return on sales (OROS) was also observed there. High variability of the above referenced indicators implies rather unstable situation in the services sector throughout the period under consideration.

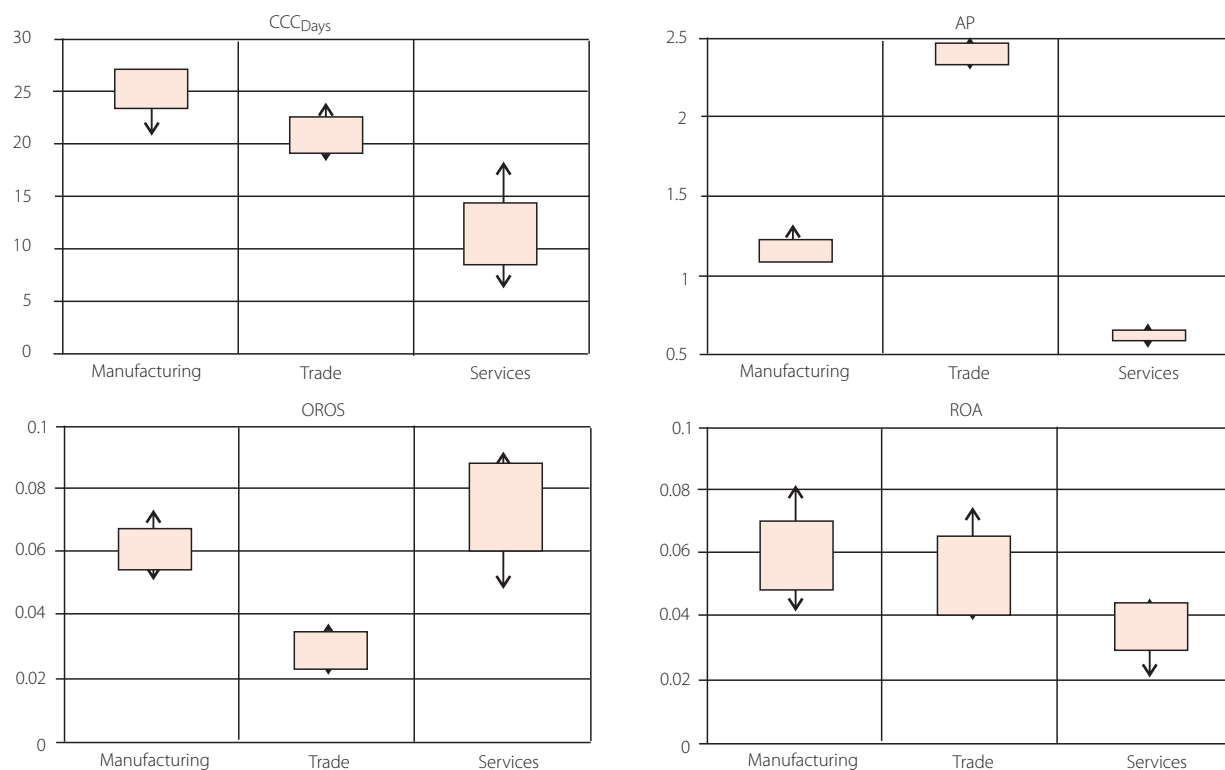
In summary, it might well be pointed out that in the aftermath of the financial crisis of 2008, and after a period of deteriorating economic and financial situation of firms until 2009, a slow but steady improvement was encountered in the specifically indicated areas only (e.g. liquidity and efficiency of operation), as well as only within the periods under consideration. It should be noted at this point that within the actual period under consideration the unfavourable trends which occurred and persisted across different types of business activity and respective company sizes were actually indicative of the increase in debt and a decrease in the ability



Notes: as for Figure 15.2.

Fig. 15.5. Descriptive statistics on the variability of TDR, DSI, CR and QR values in enterprises in Poland from the 1st half of 2011 to the 1st half of 2013 by type of business activity

Source: own study based on: Kaczmarek, Kolegowicz, Krzemiński, Fijorek (December 2013).



Notes: as for Figure 15.2.

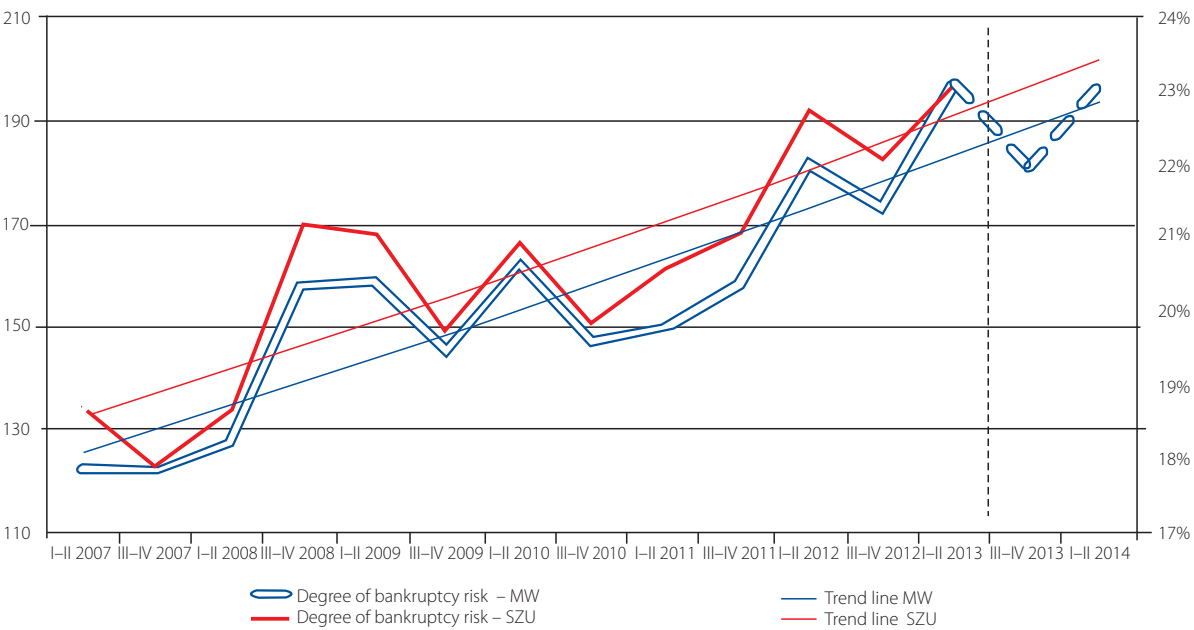
Fig. 15.6. Descriptive statistics on the variability of CCC (in days), AP, OROS and ROA in the enterprises in Poland in the period spanning the 1st half of 2011 – the 1st half of 2013 by type of business activity

Source: own study based on: Kaczmarek, Kolegowicz, Krzemiński, Fijorek (December 2013).

to service it (especially in the services sector), as well as of a reduction in the productivity of assets (with the exception of the large trading firms), and the return on assets in all types of business activity and company sizes. Certain positive signs indicating slight improvement in the select areas in terms of relevant economic and financial indicators regarding specific groups of companies may be observed only in the last period under study, i.e. early 2013. It would be quite hard to determine the actual sustainability of those symptoms, though.

15.3. The key aspects of bankruptcy risk assessment

current models for estimating potential bankruptcy risk (MW), the subject matter of the present study, are based on the actual sizes of individual firms. In relation to the previously estimated and applied models based on the aggregated sizes of the enterprises (SZU), no significant changes occurred in the indications for the degree of bankruptcy risk (as was also pointed out in Chapter 10 of the present study), be that in terms of general estimation, or the one in consideration of the respective types of business activity. The plots of the SZU and MW curves run quite close together (linear correlation coefficient $r = 0.98$), whereas the trend lines are almost parallel to each other. The results obtained with the aid of a new class of models, and based on the individual values, corroborate the previously formulated conclusions which made use of the models based on the aggregate sizes, and thus indicate their utility as viable predictors in effectively assessing the degree of bankruptcy risk.



Note: the total value was determined as a weighted mean (number of employees) out of the values calculated for respective types of business activity. The blue dashed line represents the predictions.

Fig. 15.7. Comparison of the degree of bankruptcy risk faced by total companies from the 1st half of 2011 to the 2nd half of 2013 assessed with the aid of the following models: SZU (aggregated values) and MV (respective individual values)

Source: own study based on: Kaczmarek, Kolegowicz, Krzemiński, Fijorek (December 2013).

The estimates of the degree of bankruptcy risk were conducted using models specifically tailored to the actual type of business activity pursued by firms (cf. Chapter 10). The analyses of the changes in the degree of bankruptcy risk broken down by respective types of business activity, leading NACE divisions and the respective company sizes, were augmented with the predictions of the degree of bankruptcy risk with respect to a one-year horizon.² Additionally, with regard to the quantitative analysis of the uncertainty associated with the predicted degrees of bankruptcy risk, the instruments of a scenario analysis were applied. Apart from a neutral scenario, both a pessimistic scenario and an optimistic one were developed. For this purpose, the upper and the lower confidence limits (80% value, adjusted for outliers) for the projected magnitude of the degree of bankruptcy risk were used, developed in line with the analysis of historical deviations in the parameter in question relative to the percentage of court bankruptcy proceedings.

² These predictions are estimated on the basis of the variables determining the degree of bankruptcy risk using one-dimensional time series. A broader discussion of this issue is to be found in Chapter 10 of the present paper, as well as in: Kaczmarek, Kolegowicz, Krzemiński, Fijorek (May 2011); Kaczmarek, Kolegowicz, Krzemiński, Fijorek (June 2011).

The analyses of changes in the degree of bankruptcy risk for enterprises in total broken down by the type of business activity and respective sizes, retrospectively indicated an increase in the estimated measurement since the 1st half of 2007, although with perceptible differences in terms of value and the nature of MW changes pertaining to selected groups of entities and their respective sizes.

Since early 2007 until mid-2008 it was the manufacturing companies that reacted fastest and strongest to an increase in bankruptcy risk. Successive periods spanning the 1st half of 2009 – 1st half of 2011 indicated a different, i.e. decreasing trend in the MW changes in relation to the trading and service firms, reaching a low level in the early 2011 level (MW value below 160). Despite a slight increase in the degree of bankruptcy risk as of mid-2011, and the MW value reaching the warning level (i.e. in the range of 160–200), the manufacturing firms (very much like the trading ones), both with regard to the past and the projected periods, were characterized by overall stability. The trading firms also reacted to a rapid increase in the degree of bankruptcy risk spanning mid-2007 and early 2009. At this point it should also be noted that among the selected groups the entities pursuing trading activities were actually characterized by changes of a substantially different nature in the variables under study resulting from the seasonality factor, which, having been offset for the purpose of the present assessment by the trend line, indicated a slower increase in the degree of bankruptcy risk since mid-2009, followed by stabilization, both for the period spanning early 2012 and early 2013, and the projected periods studied (mid-2013 – early 2014).

It should also be noted that despite the increasing trend in the degree of bankruptcy risk for the trading companies, as compared to the services and manufacturing ones, that risk was the smallest, while additionally assuming its low levels (below 160), the situation appeared favourable enough. The general conclusion that can be drawn for the service companies, despite their rather sluggish first reaction, is a continuous and intense increase in the degree of bankruptcy risk within the period in question and the achievement of the highest MW values (over 200 – a high level) out of the three groups under study. This has been particularly noticeable since mid-2010, and these results are owed primarily to prevalent situation in the general construction industry, transport, IT, and communications. Furthermore, for the current period of analysis, i.e. early 2013, only the services sector was characterized by an increase in the degree of bankruptcy risk, and only for that particular sector the changes within the neutral scenario projected by the end of 2014 indicated a further increase in the bankruptcy risk. Accordingly, the situation in this particular group of firms must be deemed as negative.

Note: The value 'Total' is determined as a weighted average (number of employees) out of the values calculated for respective types of activities. The values for the optimistic scenario are marked in green, and for the pessimistic one – in red.

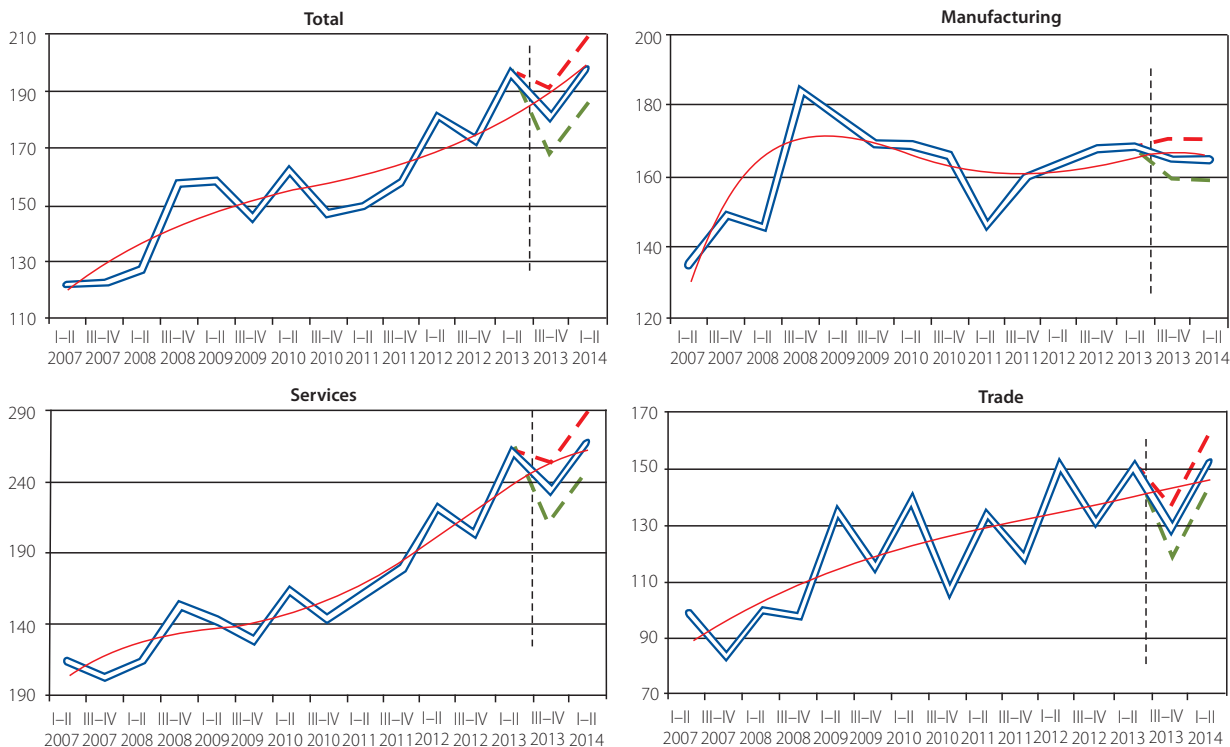


Fig. 15.8. Evolution of the degree of bankruptcy risk from the 1st half of 2007 to the 1st half of 2014 by type of business activity

Source: own study based on: Kaczmarek, Kolegowicz, Krzemiński, Fijorek (December 2013).

The changes occurring within the business environment prompted an altogether different reaction from the companies depending on their respective sizes. The results yielded by the analyses indicated that small entities were highly susceptible to adverse changes in their business environment, moreover, they appeared to be unable to react with sufficient flexibility when compared with larger entities. They were characterized by multi-directional, alternating changes in response to the degree of bankruptcy risk, with its strong increase in the early 2010 followed by a decline in the amplitude of fluctuations as of the 1st half of 2011, and a stabilisation of the absolute values as projected for the 2nd half of 2013 and the 1st half of 2014, although without a prospective growth path (with the exception of the trading sector and construction as a subdivision of services). Accordingly, their situation must be assessed as neutral. Medium-sized enterprises, despite their alternating fluctuations in the period under study, demonstrated a relatively even-paced increase in the MW value, with the arrested upward trend within the final period under study (i.e. the plot of the curve reflecting the changes in the exposure to the degree of bankruptcy risk is similar to the plot of the curve representing firms in total).

The projected changes (from the 3rd quarter of 2013 to the 2nd quarter of 2014) indicate stabilization and a departure from the historical growth of MW value, which prompts a careful transition from a negative assessment to a neutral one (it should be pointed out that the results achieved by the medium-sized entities are owed to the prevalent situation within the services sector, including construction industry in general, for which the forecasts remain unfavourable). An altogether different response to adverse changes in the business environment broken down by company size was demonstrated by the large entities, which, having noted a sudden rise in the MW value to a high level at the beginning of 2009, in the period from the 2nd quarter of 2009 to the end of 2011 effectively mobilised their existing restructuring potential and managed to significantly reduce their exposure to bankruptcy risk to a low level. From 2012 to the 2nd quarter of 2013, the situation of large entities, characterised by changes in the MW value, indicated a steady increase in their exposure to bankruptcy risk (approaching high levels), which was caused by an overall deterioration of the situation in the services sector (including IT services and communications). The projected changes for the period from the 3rd quarter of 2013 to the 2nd quarter of 2014 indicate a likelihood of stabilization in the degree of bankruptcy risk, which is going to be highly dependent, however, on the positive changes within the services sector. A truly tell-tale observation, though, consists in the convergence of the degree of bankruptcy risk among all the firms regardless of their size.

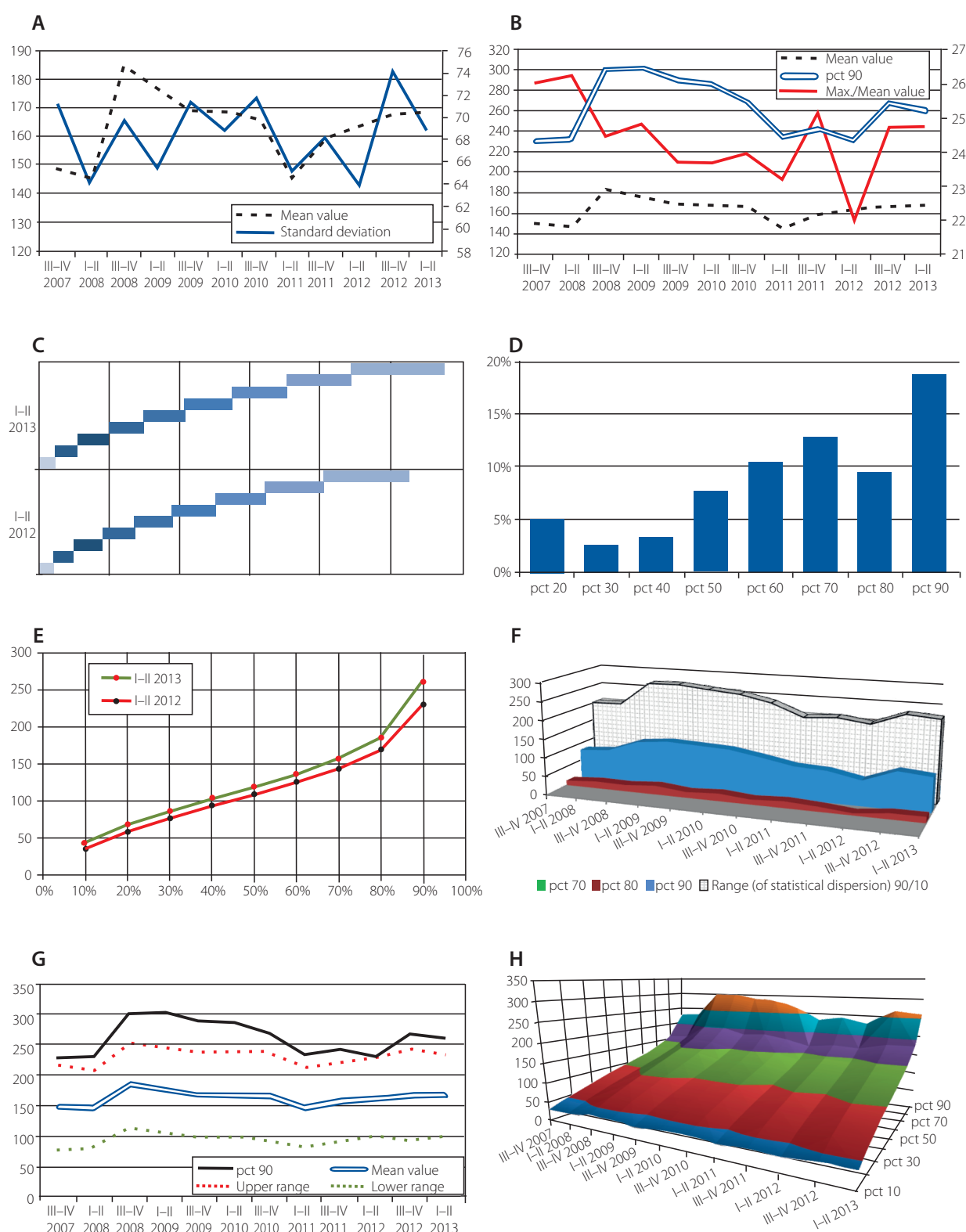
Despite perceptible signs of improvement in the 3rd quarter of 2013, the assessment of the degree of bankruptcy risk – both retrospective and in terms of current predictions – serves as the basis for a negative overall assessment, and well justifies sounding the alarm bells with regard to the financial condition of the companies within the sector under review, as the exposure to the degree of bankruptcy risk, as determined under the conditions of the early 2013, was higher both in relation to the corresponding period of the previous year, and the previous half-year.

Predictions regarding the likely direction of changes in the degree of bankruptcy risk in the perspective of up to mid-2014, in the neutral scenario, suggest a slight change, as well as envisage the value in 2014 to be identical with the one of the early 2013, whereas under the pessimistic scenario in the early 2014 the value of the parameter in question is likely to be higher than that of the early 2013 (maintaining a slight upward trend). The optimistic scenario, despite the signs of an overall upturn in the economy, appears to be even less likely. The identified increase in the degree of bankruptcy risk also affects a possible increase in the number and percentage of the instigated court insolvency proceedings within the two successive half-years, relative to the current period (early 2013). It should be noted, nevertheless, that the actual extent of those changes will depend on multiple factors, i.e. the filed bankruptcy petitions ultimately running out, changes in the relationship between the number of actually instigated insolvency proceedings and the number of filed petitions, the duration of formal proceedings as well as the number of the already 'processed' cases in the most vulnerable sectors (mainly in the construction industry in general, transport and tourism).

Apart from the estimated MW value calculated with the aid of model variables, the possibility to have those values determined for respective firms (for the previous 11 research editions) effectively extended the scope of the presented assessment of the degree of bankruptcy risk, both in terms of the total value for each specific type of business activity and in detail for the respective sections of business activities and NACE. Due to the limited framework of the present study, the descriptive statistics of the bankruptcy risk for the manufacturing firms from the 1st half of 2007 – early 2013 are shown below.

The average value of the degree of bankruptcy risk for the manufacturing firms in the early 2013 increased from 163 by 3.1% year on year. The value of the ninth decile of the degree of bankruptcy risk increased within the same period from 231 to 261 (i.e. by 13.0%). This means that the overall situation of the manufacturing firms facing a relatively high bankruptcy risk has actually deteriorated over the last year by more than was the case with the manufacturing companies facing medium bankruptcy risk.

The distribution of the degree of bankruptcy risk is characterized by a significant right-sided asymmetry. In this type of distribution, the mean value is clearly greater than the median, i.e. the central value. In right-sided asymmetric distributions, the mean value as a rule is strongly affected by a relatively small part of the population under study boasting by far the highest values of the analysed characteristics, i.e. the actual degree of bankruptcy risk. It should be noted that this rather general observation applies not only to the manufacturing firms, but also to other business activities under study and the respective NACE divisions/sectors of the domestic economy.



Notes: A – the time series of the mean value and standard deviation, B – the time series of the mean value, the ninth decile and the relationships of the maximum to the mean value, C – values of deciles for the two periods under comparison, D – change in the interdecile ranges for the two periods under comparison, E – the cumulative distribution function for the two periods under comparison, F – the time series of positive deviations from the mean of positive deciles and the series of the range between the ninth and the first deciles, G – the time series of the mean value, the upper range (mean value + standard deviation) and the lower range (mean value – standard deviation) and the ninth decile, H – the time series of the decile distribution.

Fig. 15.9. Descriptive statistics on the degree of bankruptcy risk faced by manufacturing firms in Poland from the 1st half of 2007 to the 1st half of 2014

Source: own study based on: Kaczmarek, Kolegowicz, Krzemiński, Fijorek (December 2013).

The decile distribution indicates the high value of the eighth and ninth decile (Diagram H in Figure 45), which to a large extent contributes to the high mean value located between the seventh and the eighth deciles. As a result, 20% of the firms in the group under study to a large extent determine the actual direction and intensity of changes in the degree of bankruptcy risk, as measured synthetically, with the aid of the mean value which is deemed representative of the overall situation within the set of enterprises studied.

The distribution function for the two comparative periods (1st half of 2012 and 1st half of 2013) changed slightly (cf. Diagram C and E). Particularly small changes in were noted in the first up to the eighth deciles, whereas in the ninth decile the magnitude of changes was relatively higher, as the hiatus between the ninth and the eighth decile increased by approximately 19%, as compared with the corresponding period of the previous year (Diagram D). The range for 80% of the observations actually conducted, i.e. between the ninth and the first decile increased from 194 in the early 2012 to 219 in the early 2013 (by 12.9%), with a 3.1% increase in the mean value, i.e. from 163 to 168. The range of fluctuations in the value of the ninth decile (i.e. the difference between the maximum and the minimum value over the period under study) is 73, and is actually broader than the fluctuation range of the mean value equalling 38, i.e. 92%. The standard deviation shows alternating fluctuations without a significant correlation with the changes in the mean value (linear correlation coefficient $r = 0.31$).

15.4. Diversity of degree of bankruptcy risk across the NACE divisions

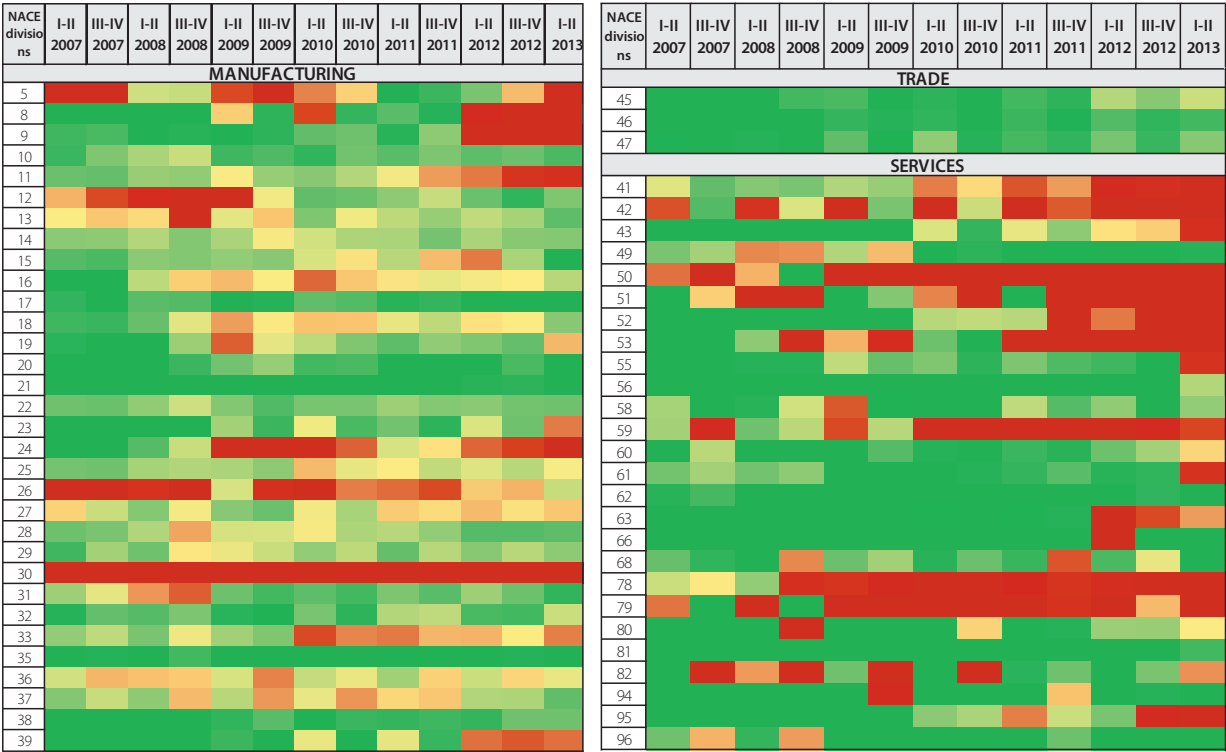
An important research direction on how the degree of bankruptcy risk may affect the trading sector and how it can be managed under the Early Warning System – Rapid Response Instrument Project, is the actual assessment of the degree of bankruptcy risk made in due consideration of specific types of business activity pursued in Poland (in line with NACE terminology), and the respective sizes of the enterprises concerned (small, medium-sized and large ones). This assessment was carried out in the three stages, i.e. assessment based on the degree of bankruptcy risk (MW) value, allocation of relevant normative standards (I–IV) to each type of business activity pursued based on the assessment of the deviation from the value expressing the degree of bankruptcy risk for a specific NACE section (oMW D), the deviation of the number of employees in a specific NACE section from the average for that particular type of business activity (oLP D), and the development of a ranking list of NACE divisions taking into account the value of the synthetic measure called MSO.

A retrospective analysis of the changes in the degree of bankruptcy risk (MW) of trade firms operating in Poland from the 1st half of 2007 to the 1st half of 2013, as illustrated by the ‘heat maps’, facilitates the assessment of the level and evolution of the parameter in question. In the manufacturing sector, the above-average value reflecting potential bankruptcy risk for was observed in firms involved in the manufacture of ‘other transport equipment’ (30) and the ‘mining of coal and lignite’ (05). Assessment of changes in the actual degree of bankruptcy risk adjusted for the respective company sizes indicates above-average levels with regard to small companies falling into the four NACE divisions, an average one – in eight NACE divisions, and a large one – in seven NACE divisions. An appreciably more favourable situation was reported in the trading sector than in the manufacturing and the services ones, which is further attributable to the fact that it would be impossible to identify a specific NACE section in which the degree of bankruptcy risk would remain consistently above average throughout the period under study. The highest value of bankruptcy risk was noted in the services sector, whereas the values above the average for the service activities were observed in construction industry (41, 42, 43), transport (51, 52), in the activities related to employment (78), and in the activities of the tour operators, travel agencies, and travel agents (78). With regard to the small companies the exposure to the degree of bankruptcy risk throughout the period under study remained above the average for 3 NACE divisions, for the medium-sized ones – for 4 NACE divisions, and for the large ones – for 6 NACE divisions.

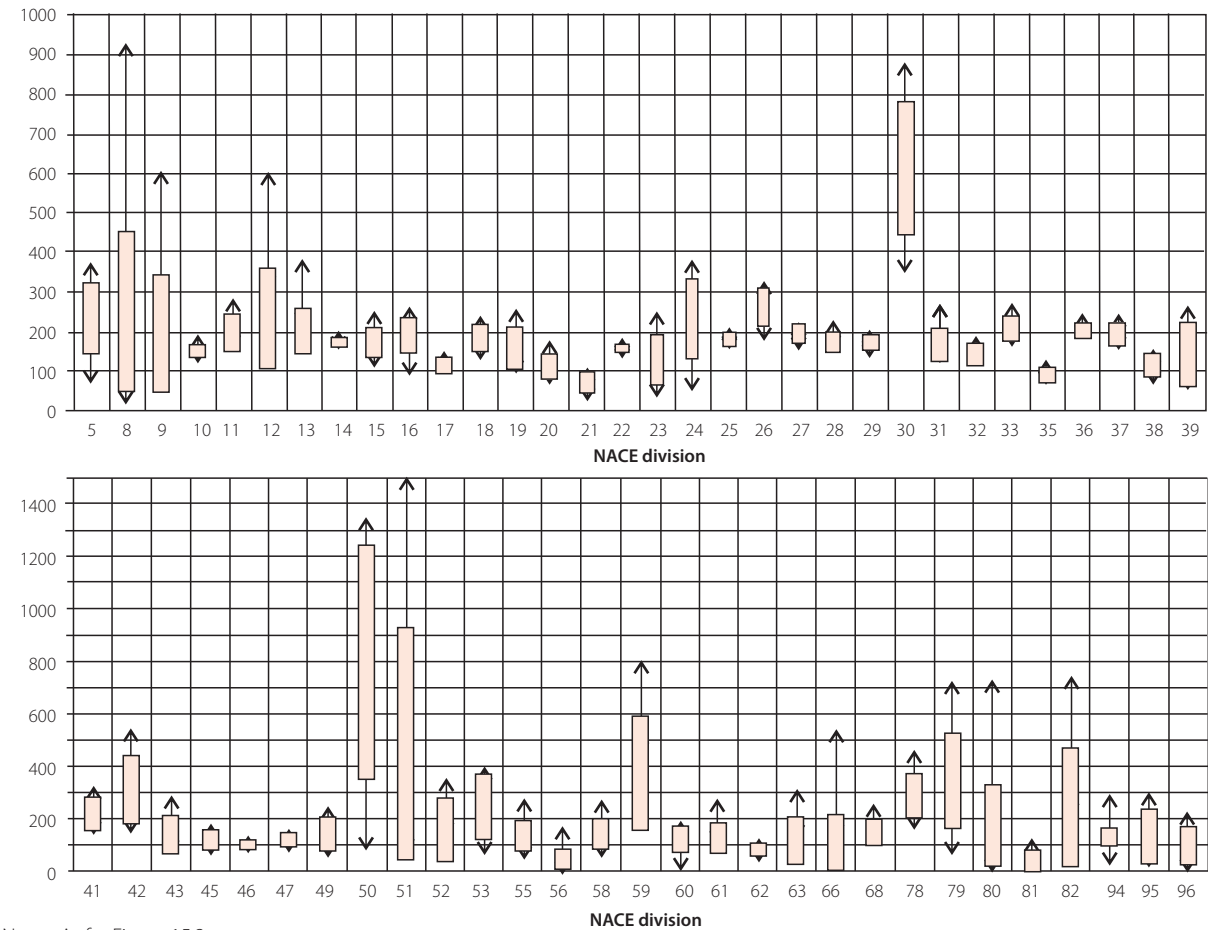
The ‘heat maps’ indicate a distinctly greater exposure to bankruptcy risk in the services sector than in the manufacturing and the trading ones, especially after 2010, whereupon a significant increase occurred.

An analysis of variability of the degree of bankruptcy risk indicates its highest average values and the greatest variability in the business activities associated with: manufacturing of other transport equipment (30), other mining and quarrying (08), manufacture of tobacco products (12), and service activities supporting mining and quarrying (09). The following NACE divisions applied to small enterprises: manufacture of other transport equipment (30), manufacture of basic metals (24), manufacture of electrical equipment (27), travel agency activities, tourism (79). In medium-sized enterprises, very much like in the small ones, the highest average value and the greatest variability was observed in the manufacture of other transport equipment (30), travel agency activities, travel agents (79). With regard to the large entities the same observations applied to manufacture of other transport equipment (30), manufacture of computer, electronic and optical products (26), and the mining of coal and lignite (05). The most stable situation in the small business entities was noted in the service activities related to the maintenance of order within the buildings and greenery (81), among the medium-sized companies in the manufacture of basic pharmaceutical products, medicines and other pharmaceutical products (21), whereas in the large companies in the activities involved in the manufacture and supply of electricity, gas, steam, hot water and air conditioning supply (35).

Table 15.1. Variations in the degree of bankruptcy risk faced by enterprises in Poland by NACE division from the 1st half of 2007 to the 1st half of 2014



Source: own study based on: Kaczmarek, Kolegowicz, Krzemiński, Fijorek (December 2013).



Notes: As for Figure 15.2.

Fig. 15.10. Descriptive statistics on the degree of bankruptcy risk faced by enterprises in Poland by NACE division from the 1st half of 2007 to the 1st half of 2013

Source: own study based on: Kaczmarek, Kolegowicz, Krzemiński, Fijorek (December 2013).

The next step of the analysis consisted in allocating a specific type of normative standard (I, II, III or IV) to each NACE division within a specific period under study based on the assessment of the deviation from the degree of bankruptcy risk for a particular NACE division (oMW D), and the deviation of the number of employees within such a NACE division from the average for that type of business activity (oLP D).

The dispersion of NACE divisions pertaining to manufacturing activities is shown graphically in the figures below. Respective NACE divisions are placed on the cross graph within the four areas (normative standards I–IV) where the horizontal and vertical axes represent the mean values of corresponding measures (the degree of bankruptcy risk and the number of employees). The actual location of a particular NACE section on the graph makes it possible to characterize its position in relation to the two measures covered by the analysis.

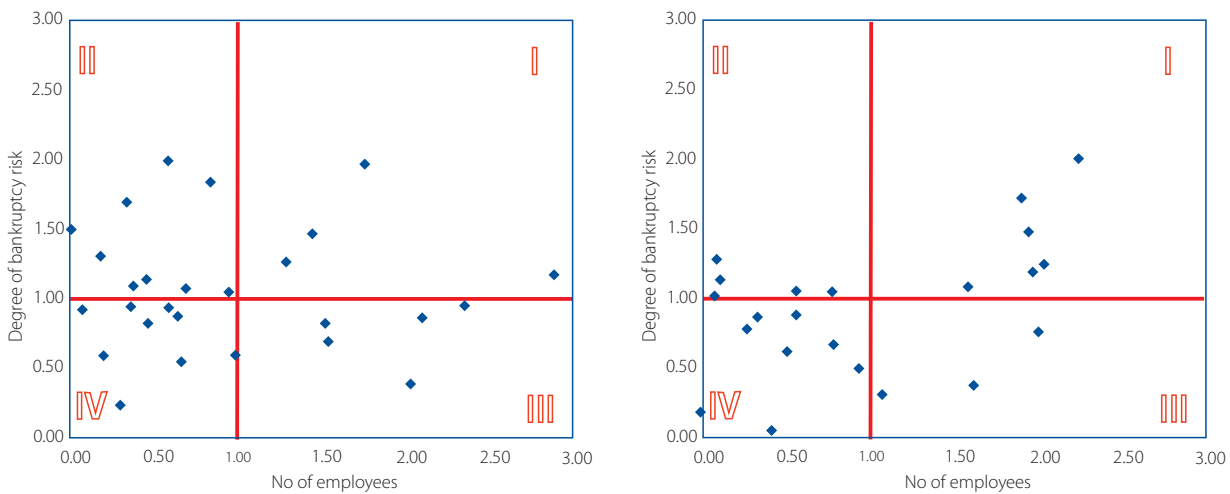


Fig. 15.11. NACE manufacturing divisions (left panel) and services divisions (right panel) by degree of bankruptcy risk and the number of employees in the 1st half of 2013

Source: own study based on: Kaczmarek, Kolegowiec, Krzemiński, Fijorek (December 2013).

A comprehensive picture of the normative standards for various NACE divisions in the period spanning early 2007 – early 2013 is shown in the ‘heat maps’ in which the four colours correspond to the respective normative standard (red – standard I, yellow – standard II, pale green – standard III, and dark green – standard IV).³ This particular way of representation clearly demonstrates how the above-mentioned standards were established over the entire period under study for the respective NACE divisions. Thanks to the ‘heat maps’ of the normative standards it was possible to see the concentration of standard I (high risk area) in construction industry since 2010, and in the activities related to retail trade throughout the period under consideration.

The final step of the analysis consisted in establishing a ranking list of the respective NACE divisions on the basis of a synthetic measure MSO. An analysis of the distribution of NACE divisions in the respective cross graphs (attributable to standards I–IV), and the resultant MSO value measures facilitate the drawing up of a ranking list of respective NACE divisions starting with the ones most exposed to bankruptcy risk to the least exposed ones (the lower the rank, the higher the risk; the higher the value, the lower the risk). Additionally, for the purpose of a comparative analysis, the respective ranks were allocated to the corresponding NACE divisions for small, medium-sized and large business enterprises, thus indicating the actual position of particular NACE divisions within a particular class of company size. The analysis of the ranking indicates a rather difficult economic situation, with a significant share in the number of employees in activities related to coal mining in all enterprises, in large enterprises as well as in business activities related to the manufacture of other transport equipment regardless of company size. Despite the generally sound situation in the trading sector, particular attention should be paid to wholesale trade. Within the services sector, on the other hand, the key sections that merit due monitoring are those related to transport and construction. An overall difficult situation and a high level of workforce concentration were reported in tourism (79).

³ The rationale behind the normative standards is discussed in Chapter 10 section 6.

Table 15.2. Heat map of normative standards in NACE divisions by type of business activity in Poland from the 1st half of 2007 to the 1st half of 2013



where:



Source: own study based on: Kaczmarek, Kolegowicz, Krzemiński, Fijorek (December 2013).

Table 15.3. Ranking list of NACE manufacturing divisions by MSO measure and by company size from the 1st half of 2007 to the 1st half of 2013

NACE divisions	Position in the ranking			
	TOTAL	Small	Medium-sized	Large
MANUFACTURING				
05 Mining of coal and lignite	1	•	27	2
30 Manufacture of other transport equipment	2	1	1	1
25 Manufacture of fabricated metal products, except machinery and equipment	3	3	4	4
27 Manufacture of electrical equipment	4	17	25	3
16 Manufacture of wood and of products of wood and cork, except furniture; manufacture of straw and plaiting materials	5	7	3	15
28 Manufacture of machinery and equipment n.e.c.	6	9	16	6
31 Manufacture of furniture	7	23	11	11
26 Manufacture of computer, electronic and optical products	8	13	10	7
10 Manufacture of food products	9	5	2	14

→

NACE divisions	Position in the ranking			
	TOTAL	Small	Medium-sized	Large
MANUFACTURING				
29 Manufacture of motor vehicles, trailers and semi-trailers except motorcycles	10	15	19	10
24 Manufacture of basic metals	11	2	6	5
33 Repair, maintenance and installation of machinery and equipment	12	8	20	8
12 Manufacture of tobacco products	13	•	8	17
13 Manufacture of textiles	14	11	14	22
08 Other mining and quarrying	15	18	7	9
36 Water collection, purification and supply	16	26	13	28
18 Printing and reproduction of recorded media	17	28	12	24
37 Sewerage and wastewater treatment	18	30	30	13
11 Manufacture of beverages	19	10	17	16
23 Manufacture of other non-metallic mineral products	20	4	5	12
09 Mining support service activities	21	16	•	•
14 Manufacture of wearing apparel	22	6	21	23
35 Electricity, gas, steam, hot water and conditioning supply	23	20	29	19
22 Manufacture of rubber and plastics products	24	19	9	20
39 Remediation activities and other waste management services	25	22	18	•
15 Manufacture of leather and related products	26	14	24	18
19 Manufacture of coke and refined petroleum products	27	12	15	21
32 Other manufacturing	28	27	22	27
20 Manufacture of chemicals and chemical products	29	25	31	25
17 Manufacture of paper and paper products	30	29	23	29
38 Waste collection, treatment and disposal activities; materials recovery	31	24	26	26
21 Manufacture of pharmaceutical, medicinal chemical and botanical products	32	21	28	30

Source: own study based on: Kaczmarek, Kolegowicz, Krzemiński, Fijorek (December 2013).

Table 15.4. Ranking list of NACE trade divisions by MSO measure and by company size from the 1st half of 2007 to the 1st half of 2013

NACE divisions	Position in the ranking			
	TOTAL	Small	Medium-sized	Large
TRADE				
47 Retail trade, except of motor vehicles and motorcycles	1	1	1	1
46 Wholesale trade, except of motor vehicles and motorcycles	2	3	2	2
45 Wholesale and retail trade and repair of motor vehicles and motorcycles	3	2	3	3

Source: own study based on: Kaczmarek, Kolegowicz, Krzemiński, Fijorek (December 2013).

Table 15.5. Ranking list of NACE services divisions by MSO measure and by company size from the 1st half of 2007 to the 1st half of 2013

NACE divisions	Position in the ranking			
	TOTAL	Small	Medium-sized	Large
SERVICES				
49 Land transport and transport via pipelines	1	17	1	1
42 Civil engineering	2	2	2	6
50 Water transport	3	20	3	•
41 Construction of buildings	4	4	6	8
78 Employment activities	5	9	9	3
51 Air transport	6	25	•	•
79 Travel agency, tour operator, reservation service and related activities	7	6	8	2
59 Motion picture, video and television programme production, sound recording and music publishing activities	8	18	5	7
52 Warehousing and support activities for transportation	9	14	12	5
80 Security and investigation activities	10	15	19	4
53 Postal and courier activities	11	•	•	•
68 Real estate activities	12	1	11	20
82 Office administrative, office support and other business support activities	13	11	4	17
43 Specialized construction activities	14	13	10	13
95 Repair of computers and personal and household goods	15	10	18	9
96 Other personal service activities	16	3	22	22
61 Telecommunications	17	8	14	14
58 Publishing activities	18	7	13	18
63 Information service activities	19	16	23	16
81 Services to buildings and landscape activities	20	24	21	10
66 Activities auxiliary to financial service and insurance activities	21	23	15	21
94 Activities of membership organizations	22	21	•	•
62 Computer programming, consultancy and related activities	23	12	20	19
60 Programming and broadcasting activities	24	19	17	15
55 Accommodation	25	5	7	11
56 Food and beverages service activities	26	22	16	12

Source: own study based on: Kaczmarek, Kolegowicz, Krzemiński, Fijorek (December 2013).

15.5. Areas highly exposed to bankruptcy risk

In identifying the most vulnerable NACE divisions, the MSO measure was used, including an evaluation of two categories: 1. the relationship of the degree of bankruptcy risk and 2. the number of employees within a particular NACE section relative to the average value for that particular type of business activity in NACE. The NACE divisions which require special monitoring were identified as the ones assigned to standard I, i.e. those characterized by the degree of bankruptcy risk above the average value assumed for that particular type of business activity and those where the number of employees is above average. The identification

was done separately for manufacturing, trade and services sectors, as was outlined in the previous section with the aid of the ranking lists for the respective NACE divisions on the basis of the synthetic MSO measure. Consequently, a set of 10 NACE sections (i.e. 'TOP 10') is presented, although due to the significance of information on the areas exposed to particular bankruptcy risk (NACE divisions); it was assumed that this set may be subject to some variations. The table below shows the areas of activity (NACE divisions) deemed particularly vulnerable (since the 3rd research edition as part of the Early Warning System – Rapid Response Instrument Project).

Table 15.6. Selected areas of NACE divisions with the highest exposure to bankruptcy risk by MSO measure from the 1st half of 2011 to the 1st half of 2013

NACE divisions	I-II 2011	III-IV 2011	I-II 2012	III-IV 2012	I-II 2013
Manufacturing					
05 Mining of coal and lignite	-	-	√	√	√
08 Other mining and quarrying	-	-	√	√	-
09 Mining support service activities	-	-	√	√	-
24 Manufacture of basic metals	-	-	√	√	-
25 Manufacture of fabricated metal products, except machinery and equipment	√	√	-	√	√
26 Manufacture of computer, electronic and optical products	-	√	-	√	-
27 Manufacture of electrical equipment	√	√	√	√	√
29 Manufacture of motor vehicles, trailers and semi-trailers except motorcycles	-	-	√	√	-
30 Manufacture of other transport equipment	-	√	√	√	-
31 Manufacture of furniture	√	√	-	-	-
33 Repair, maintenance and installation of machinery and equipment	-	-	-	-	√
Trade					
45 Wholesale and retail trade and repair of motor vehicles and motorcycles	√	√	√	√	-
47 Retail trade, except of motor vehicles and motorcycles	√	√	√	√	√
Services					
41 Construction of buildings	√	√	√	√	√
42 Civil engineering	√	√	√	√	√
43 Specialized construction activities	√	√	-	√	√
49 Land transport and transport via pipelines	√	√	-	-	-
51 Air transport	-	-	√	√	-
52 Warehousing and support activities for transportation	√	√	x	√	√
78 Employment activities	x	-	√	√	√
79 Travel agency, tour operator, reservation service and related activities	-	-	√	√	-

Notes:

'-' – did not occur during the period in question, √ – occurred during the period in question, √ – occurred during the period in question and was additionally characterized by the specification comprised within a NACE section.

Source: Source: own study based on: Kaczmarek, Kolegowicz, Krzemiński, Fijorek (June 2011 – April 2014).

The selected NACE divisions are characterized by such parameters as: the number of employees, share in total employment, number of companies, value of sales, assets, and equity. Exposure to bankruptcy risk was presented and discussed, followed by the estimations of the same in terms of future likelihood, whilst taking into account changes in the variables describing bankruptcy risk and their predicted values (asset productivity, short-term debt, self-financing, operating return on assets). Additionally, the actual length of the cash turnover cycle and its components (cycle inventories, receivables and liabilities), as well as current liquidity were also taken into consideration.

Due to the limited scope of the present publication, below follows a detailed description of NACE division 41 (Construction of buildings) from the 1st half of 2007 to the 1st half of 2013 along with the predictions regarding bankruptcy risk for the 2nd half of 2013 and the 1st half of 2014, the characteristics and descriptions of pertinent model variables, as well as basic information on the NACE division under study.

NACE division	CONSTRUCTION OF BUILDINGS				
No of companies	1 909	No of employees	108 079	Share in the number of employees	2.23%
Sales revenues	PLN 40 922.50 m	Assets	PLN 56 803.48 m	Net book value	PLN 22 387.60 m

Degree of bankruptcy risk

I-II 2012	III-IV 2012	I-II 2013	Tempo r/r
297	286	333	12.06%

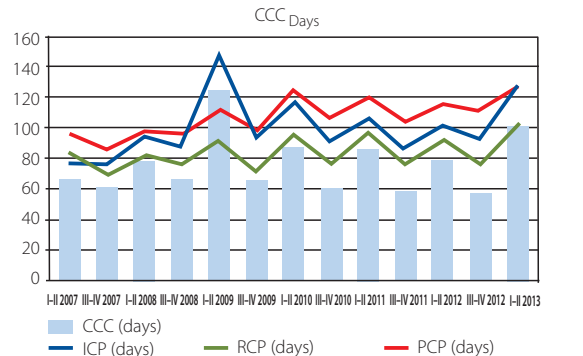
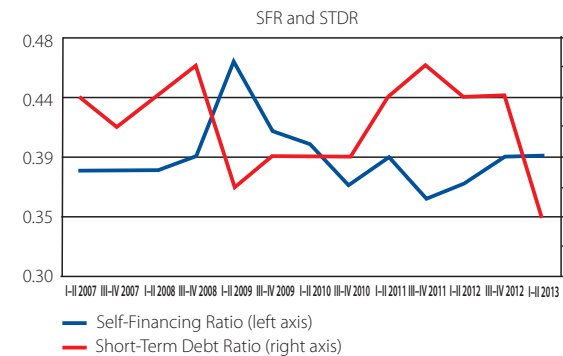
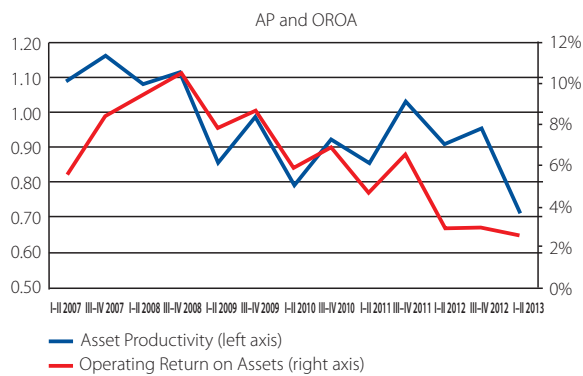
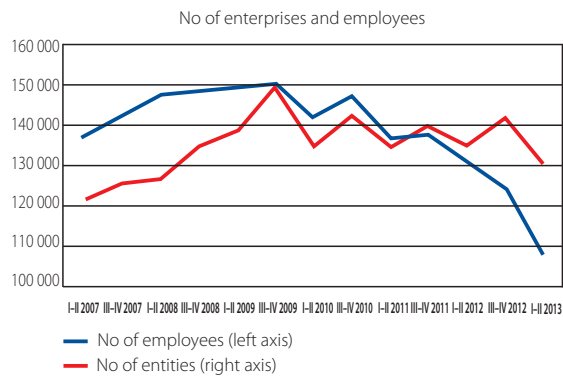
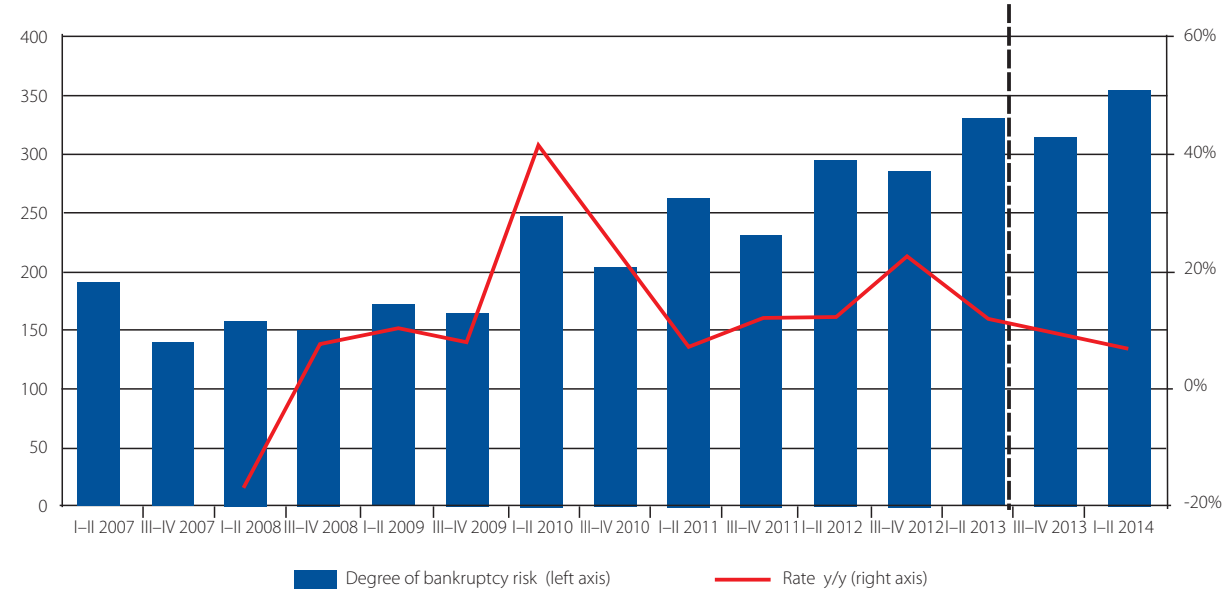


Fig. 15.12. Detailed characteristics of a single NACE division using the basic information, MW values and model variables reflecting the degree of bankruptcy risk from the 1st half of 2011 to the 1st half of 2014

Source: own study based on: Kaczmarek, Kolegowicz, Krzemiński, Fijorek (December 2013).

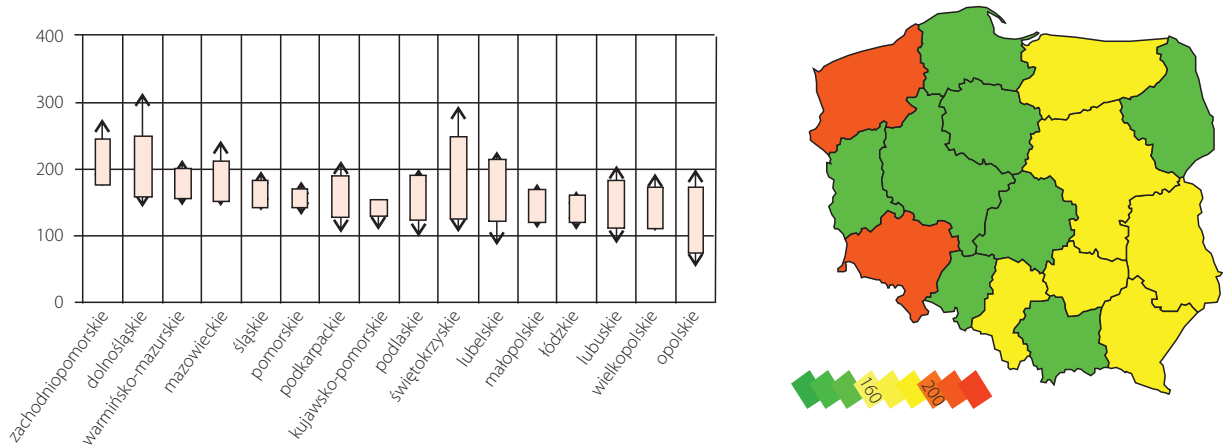
This particular NACE division is characterized by an increased exposure to bankruptcy risk (+12.06% y/y) expressed by the value of up to 333 in the early 2013. The projected changes in this parameter indicate its continued rise in the late 2013 and early 2014 (312 and 356, respectively), which thus merits diligent monitoring until early 2015. The number of enterprises decreased (−5.26% y/y, i.e. by 106 entities), with an accompanying significant reduction in the number of employees (−17.67% y/y, i.e. by 23,202 persons). An increase in bankruptcy risk was partly due to the diminished asset productivity (−20.88 % y/y) and a similar decline in the operating return on assets (−16.01 % y/y). There was a slight increase in current liquidity (7.02% y/y), and a reduction in short-term debt (−11.11% y/y). The cash conversion cycle increased (30.67% y/y) to 102 days as a result of the extended inventory conversion cycle (25.58 % y/y) and the receivables conversion cycle (10.33 % y/y), which only to a certain extent offset the extended time for the repayment of short-term liabilities (9.89% y/y).

These NACE divisions – addressed in more detail in the microeconomic component – Microeconomic Reports along with the analysis of economic conditions (cyclical fluctuations) and the development prospects (forecasts with predictive distributions) in the manufacturing, trade and construction sectors of the Polish economy (addressed in more detail in the macroeconomic component – Macroeconomic Reports) – offer a comprehensive evaluation of each NACE division complete with indications as to its specific development prospects.

15.6. Bankruptcy risk – a regional profile

Another important direction of research aimed at assessing the degree of bankruptcy risk under the Early Warning System – Rapid Response Instrument Project consists in the assessment of that risk on a regional basis. It involves 16 Poland’s regions and specifies the risk level for total enterprises, by type of business activity (manufacturing, trade and services). The assessment was carried out in the three stages: on the basis of the MW value and its variability within the respective regions with respect to the adopted analytical criteria, the allocation of normative standards (standards I–IV) for each region based on the assessment of the deviation from the degree of bankruptcy risk for a particular region (oMW D), and the deviation of the number of employees within a given region from the average for that type of business activity (oLP D), as well as the development of a NACE-based ranking list taking into account the value of the synthetic MSO measure.

The degree of bankruptcy risk for business entities in total is highest in Zachodniopomorskie and Dolnośląskie regions (voivodships). This measure in the selected regions was at its highest level throughout the entire period of analysis. In six regions located in eastern Poland, the average degree of bankruptcy risk remained at the warning level. A graphical illustration of the distribution of the mean values across the regions clearly points to the presence of a ‘north-south divide’ of the country. Regions located in western Poland, with the exception of Zachodniopomorskie and Dolnośląskie, are characterized by a low degree of bankruptcy risk, whereas the eastern part of the country remains at the warning level. Variability of the exposure indicates the highest levels in Dolnośląskie and Świętokrzyskie regions. The lowest levels of bankruptcy risk as well as the most stable situation was reported in Małopolskie, Łódzkie, Lubuskie, Wielkopolskie and Opolskie regions.

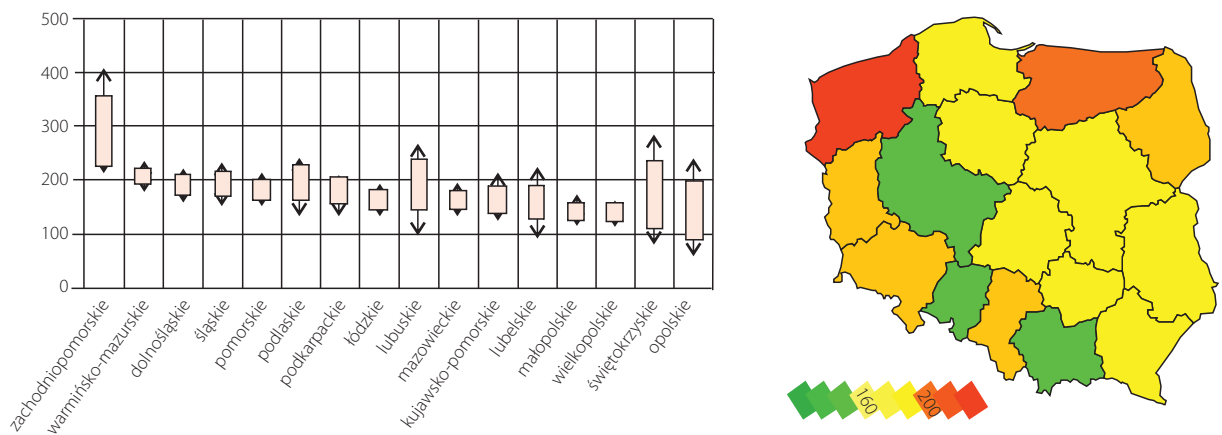


Notes: As for Figure 15.2.

Fig. 15.13. Regional variation in the degree of bankruptcy risk faced by all enterprises in Poland (right panel) and its descriptive statistics (left panel) from the 1st half of 2007 to the 1st half of 2013

Source: own study based on: Kaczmarek, Kolegowicz, Krzemiński, Fijorek (December 2013).

When assessing the regional degree of bankruptcy risk for manufacturing firms, it should duly be noted that it is structured differently than was the case for business entities in total. In Zachodniopomorskie alone the highest values of bankruptcy risk were reported. Unlike the business entities in total, high values of bankruptcy risk among the manufacturing companies were reported in Warmińsko-Mazurskie. Analysis of the changes in the MW value indicates its largest variability (standard deviation) in Zachodniopomorskie, Świętokrzyskie, Lubuskie and Opolskie. The most stable situation within the period under consideration was reported in manufacturing (low standard deviation) located across Małopolskie and Wielkopolskie.

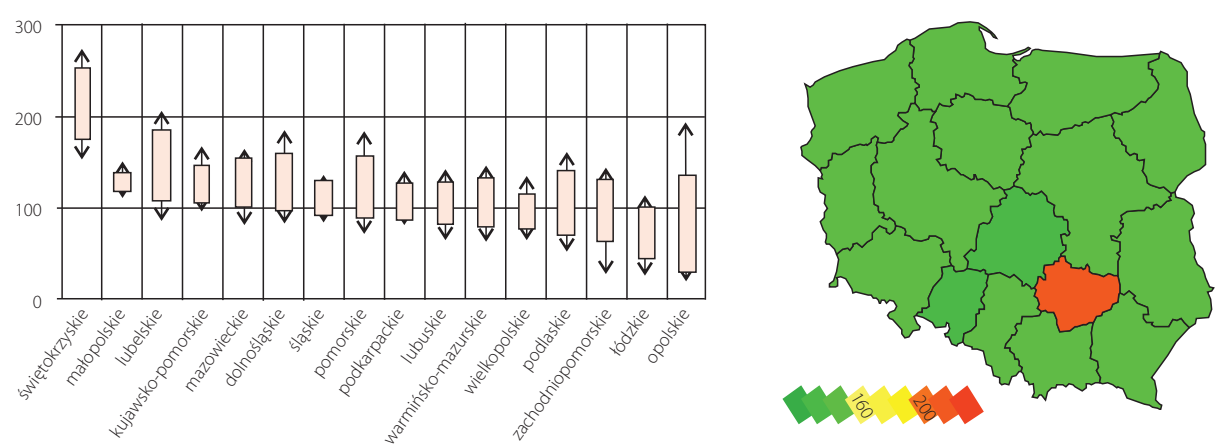


Notes: As for Figure 15.2.

Fig. 15.14. Regional variation in the degree of bankruptcy risk (right panel) and its descriptive statistics (left panel) for manufacturing companies in Poland from the 1st half of 2007 to the 1st half of 2013

Source: own study based on: Kaczmarek, Kolegowicz, Krzemiński, Fijorek (December 2013).

The degree of bankruptcy risk for trading companies, when assessed regionally, is characterized by significantly lower values, as compared to the other types of business activity. The high value of exposure to the degree of bankruptcy risk in the Świętokrzyskie region should duly be noted, though, as it is not reported for any other type of business activities (warning level) within this region. In the remaining regions potential bankruptcy risk remained at a low level. Despite the so structured MW values for the trading entities in the respective regions (with the exception of the above referenced Świętokrzyskie region), their variability was relatively high within the period under study, except for the Małopolskie region. The most stable situation in this respect was observed in the Łódzkie region.

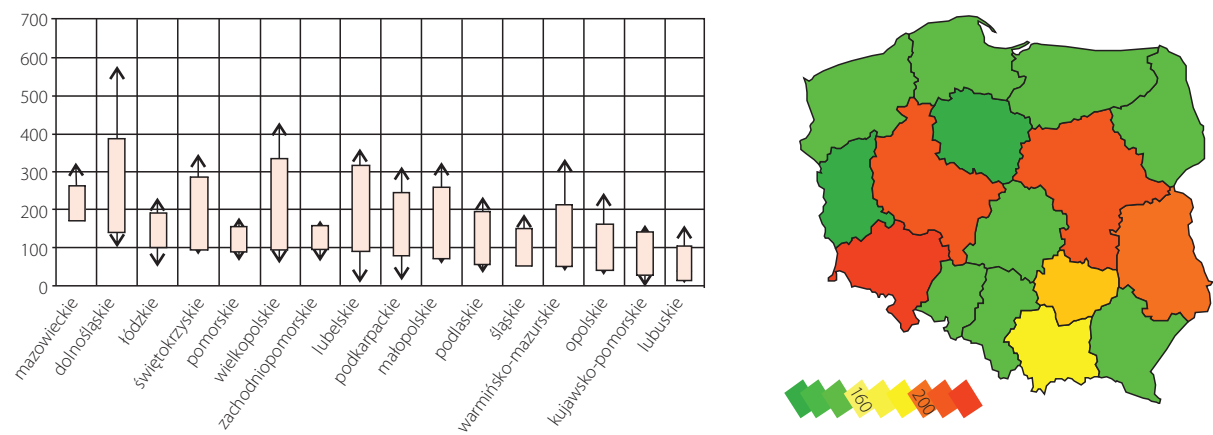


Notes: As for Figure 15.2.

Fig. 15.15. Regional variations in the degree of bankruptcy risk (right panel) and its descriptive statistics (left panel) for trading companies in Poland from the 1st half of 2007 to the 1st half of 2013

Source: own study based on: Kaczmarek, Kolegowicz, Krzemiński, Fijorek (December 2013).

The regionally assessed degree of bankruptcy risk in the services sector indicates that most of regions characterised by its elevated levels are located in central-eastern and central-western Poland. Despite the fact that the highest average MW value for the services sector was recorded in Mazowieckie, its highest maximum levels were actually reported in Dolnośląskie. In the northern regions of the country low MW values were reported, which means that this part of the country is least exposed to bankruptcy risk as regards the sector under consideration. Warning recommendations with regard to this sector were given to Świętokrzyskie and Małopolskie, though. The greatest stability in the services sector (low risk and low variability) was observed in Pomorskie and Zachodniopomorskie.



Notes: As for Figure 15.2.

Fig. 15.16. Regional variations in the degree of bankruptcy risk (right panel) and its descriptive statistics (left panel) for the services sector in Poland from the 1st half of 2007 to the 1st half of 2013

Source: own study based on: Kaczmarek, Kolegowicz, Krzemiński, Fijorek (December 2013).

The next step in the analysis and assessment of the degree of bankruptcy risk faced by firms operating in different regions of Poland consisted in the allocation of an appropriate standard (I–IV) to each region. This was done on the basis of the MSO value obtained throughout the different periods of analysis in conjunction with the parameter of economic significance of a given region reflected in the size of its resident workforce (i.e. concentrated employment structure). The ‘heat maps’ depicting the actual distribution of standards across different regions indicate diverse ‘characteristics’ for the respective types of business activity and business entities in total. Particular attention should be focused on regions in which standard I (marked in red) prevailed throughout the period studied. As far as manufacturing and trading enterprises are concerned, a certain improvement was noted across the regions, whereas the services sector since 2010 has seen a steady growth in the number of regions characterized by a high and moderately high bankruptcy risk (standards I and II).

Table 15.7. Regional differences in MSO measures of by reference pattern and type of business activity in Poland from the 1st half of 2007 to the 1st half of 2013

Regions(voivodships)	I-II 2007	III-IV 2007	I-II 2008	III-IV 2008	I-II 2009	III-IV 2009	I-II 2010	III-IV 2010	I-II 2011	III-IV 2011	I-II 2012	III-IV 2012	I-II 2013
dolnośląskie													
mazowieckie													
śląskie													
zachodniopomorskie													
warmińsko-mazurskie													
lubelskie													
pomorskie													
świętokrzyskie													
wielkopolskie													
łódzkie													
małopolskie													
podkarpackie													
podlaskie													
lubuskie													
kujawsko-pomorskie													
opolskie													

Manufacturing													
Regions (voivodships)	I-II 2007	III-IV 2007	I-II 2008	III-IV 2008	I-II 2009	III-IV 2009	I-II 2010	III-IV 2010	I-II 2011	III-IV 2011	I-II 2012	III-IV 2012	I-II 2013
śląskie													
dolnośląskie													
zachodniopomorskie													
pomorskie													
warmińsko-mazurskie													
podlaskie													
łódzkie													
kujawsko-pomorskie													
lubuskie													
mazowieckie													
małopolskie													
wielkopolskie													
podkarpackie													
świętokrzyskie													
opolskie													
lubelskie													

Trade													
Regions (voivodships)	I-II 2007	III-IV 2007	I-II 2008	III-IV 2008	I-II 2009	III-IV 2009	I-II 2010	III-IV 2010	I-II 2011	III-IV 2011	I-II 2012	III-IV 2012	I-II 2013
dolnośląskie													
mazowieckie													
małopolskie													
lubelskie													
świętokrzyskie													
śląskie													
pomorskie													
kujawsko-pomorskie													
wielkopolskie													
łódzkie													
lubuskie													
podkarpackie													
podlaskie													
warmińsko-mazurskie													
zachodniopomorskie													
opolskie													

Services													
Regions (voivodships)	I-II 2007	III-IV 2007	I-II 2008	III-IV 2008	I-II 2009	III-IV 2009	I-II 2010	III-IV 2010	I-II 2011	III-IV 2011	I-II 2012	III-IV 2012	I-II 2013
dolnośląskie													
mazowieckie													
wielkopolskie													
małopolskie													
pomorskie													
lubelskie													
świętokrzyskie													
podkarpackie													
śląskie													
warmińsko-mazurskie													
łódzkie													
lubuskie													
podlaskie													
zachodniopomorskie													
opolskie													
kujawsko-pomorskie													

where:

	standard I		standard II		standard III		standard IV
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Source: own study based on: Kaczmarek, Kolegowicz, Krzemiński, Fijorek (December 2013).

The final step of the present analysis consists in drawing up a ranking list of regions based on the MSO values throughout the period under consideration. The regions were thus allocated respective ranks of 1 to 16, whereby the lower ranks indicate regions facing the highest bankruptcy risk, whereas the higher ranks represent regions least exposed to it. The regions were then arranged in line with the allocated ranks for business entities in total and by specific types of business activity. The ranking list clearly indicates that the following regions merit special attention: Dolnośląskie with respect to business entities in total, Śląskie with respect to manufacturing activities as well as Dolnośląskie and Małopolskie with respect to the trading and services sectors.

Table 15.8. Ranking list of regions by MSO measure score and type of activity in Poland from the 1st half of 2007 to the 1st half of 2013

Regions (voivodships)	Position in the ranking			
	TOTAL	Small	Medium-sized	Large
dolnośląskie	1	2	1	1
mazowieckie	2	10	2	2
śląskie	3	1	6	9
zachodniopomorskie	4	3	15	14
warmińsko-mazurskie	5	5	14	10
lubelskie	6	16	4	6
pomorskie	7	4	7	5
świętokrzyskie	8	14	5	7
wielkopolskie	9	12	9	3
łódzkie	10	7	10	11
małopolskie	11	11	3	4
podkarpackie	12	13	12	8
podlaskie	13	6	13	13
lubuskie	14	9	11	12
kujawsko-pomorskie	15	8	8	16
opolskie	16	15	16	15

Source: own study based on: Kaczmarek, Kolegowicz, Krzemiński, Fijorek (December 2013).

15.7. Verification of bankruptcy risk assessments

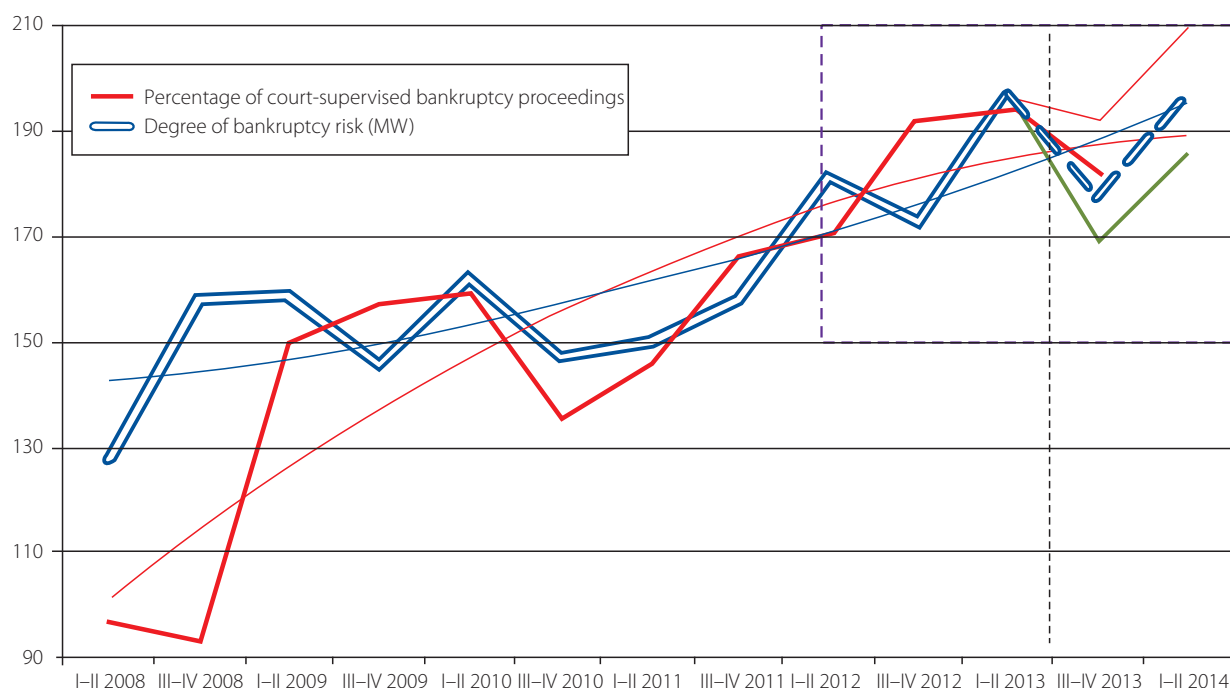
An empirical verification of the assessment of changes in the overall condition of the sector under consideration in terms of respective degrees of bankruptcy risk (MW) consists in a comparison of the obtained parameters with the percentage of initiated court-supervised insolvency proceedings over time. Both time series are statistically significant and highly correlated and the trend line for the initiated insolvency proceedings determines the values falling within a limited range of values reflecting the degree of bankruptcy risk (i.e. an optimistic and a pessimistic scenario).

Values reflecting the degree of bankruptcy risk and the percentage of court-supervised bankruptcy proceedings initiated in the 1st half of 2013 essentially reached identical levels (197 and 194, respectively) with the correlation coefficient $r = 0.82$. Another observation, in late 2013, corroborates the high empirical verifiability of bankruptcy risk assessment results as yielded by the present analysis of the percentage of the actually instigated court-supervised bankruptcy proceedings, because the MW value was 178, compared to OU 182 (the difference between them is only ca. 2.2%). The coefficient of linear correlation MW and OU also increased up to $r = 0.85$.

The other plane of this empirical verification reflects the accuracy of predictions concerning the degree of bankruptcy risk (cf. Figure 15.18).

The plot of the curve describing the time series of the actual MW values implies that it falls well within the predicted range defined by the optimistic and the pessimistic scenarios, respectively. The observation for the period spanning late 2011 – early 2012 was deemed the only aberration, as the actual MW values exceeded the prediction limits anchored in the pessimistic scenario of the early 2011. Further observations substantiate the conclusion that the actual MW values are, in fact, much closer to the upper limit

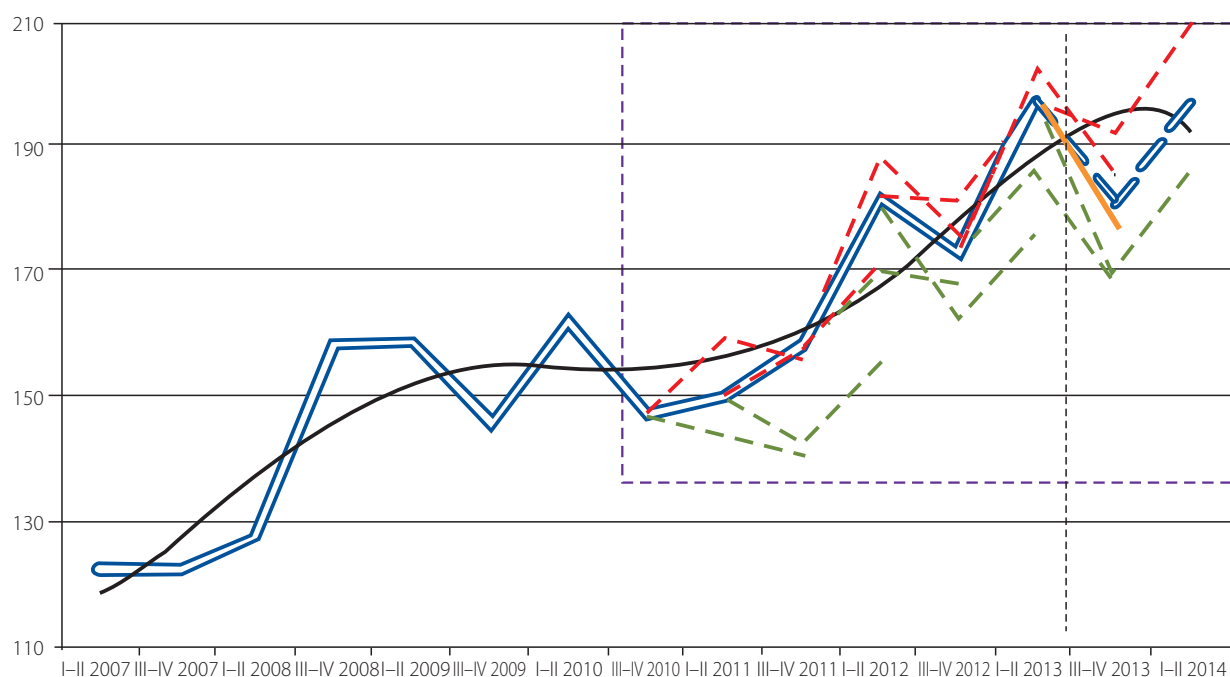
of the prediction range (the pessimistic scenario). The available data for the 2nd half of 2013 clearly indicate (an orange line) that the actual MW value differed from the predicted one only by 1.7% (178 vs 181), which only goes to prove high accuracy of all predictions for the concluding period of the present study.



Note: the total value is determined as a weighted mean (number of employees) out of the values calculated for respective types of business activity. The values for the optimistic scenario are marked in green, whereas those for the pessimistic one – in red. The predicted values are represented by the dashed line.

Fig. 15.17. The degree of bankruptcy risk and the percentage of initiated court-supervised bankruptcy proceedings for total companies from the 1st half of 2008 to the 1st half of 2014

Source: own study based on: Kaczmarek, Kolegowiec, Krzemiński, Fijorek (December 2013).



Note: the total value is determined as a weighted mean (number of employees) out of the values calculated for respective types of business activity. The values for the optimistic scenario are marked in green, whereas those for the pessimistic one – in red. The predicted values are represented by the dashed line. The actually observed value for the 2nd half of 2013 is marked in orange.

Fig. 15.18. Comparative analysis of the degree of bankruptcy risk faced by all types of companies and the forecast intervals based on respective scenarios from the 2nd half of 2010 to the 1st half of 2014

Source: own study based on: Kaczmarek, Kolegowiec, Krzemiński, Fijorek (December 2013).

Prospectively identified warning signals (subjected to an in-depth analysis in 12 successive *Report on the assessment of enterprise bankruptcy risk – the microeconomic component*) indicating a likely deterioration in the overall financial standing of firms have been positively verified for the following sectors of the domestic economy: construction industry, air transport, mining and quarrying, tourism activities, IT services and communications.

The positive verification of identified warning signals along with the proposals for revising the assessment of the degree of bankruptcy risk by adjusting it for the percentage of actually initiated court-supervised bankruptcy proceedings, as well as the accuracy of predictions regarding the degree of bankruptcy risk in terms of a selection of scenarios effectively confirm the high efficacy of this particular assessment method which employs novel estimated prediction models, whilst making due allowances for respective types of business activity.

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