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## **THE RATIO ANALYSIS OF FINANCIAL BALANCE AND BANKRUPTCY RISK OF THE SILESIA COMPANIES IN TIME OF THE GLOBAL FINANCIAL CRISIS\*\***

**JEL Classification Codes:** G32, G33

**Keywords:** *financial analysis, financial balance, bankruptcy risk, multidiscriminant analysis, financial crisis*

**Abstract:** *The financial crisis undoubtedly exerted much pressure on the companies operating in Poland. Thus, it is important to undertake researches that reveal the paths and strength of financial crisis transmission with regard to the business entities. This paper presents partial results of the research dedicated to the analysis of the impact of financial crisis on the financial situation of companies operating in the Silesian Voivodship. It analyzes and discusses the general changes of the two sets of*

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Date of Submission: March 17, 2011; date of acceptance: February 3, 2012

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\*\* The researches are funded from the Polish budget sources for science in the years 2010-2012; project title: The influence of global financial crisis on the real sphere of the economy with the example of changes of financial situation of Silesian companies (original title: "Oddziaływanie światowego kryzysu finansowego na sferę realną gospodarki na przykładzie zmian sytuacji finansowej śląskich przedsiębiorstw"), the agreement No. 2569/B/H 03/2010/39.

*financial ratios that inform about the general financial condition of the business: the financial balance and the level of bankruptcy risk. The paper aims at analyzing the changes of the financial situation and bankruptcy risk of a population of Silesian companies with regard to the improvement or deterioration. In particular, it aims at reflecting the differences visible with the application of aggregated data characterizing the population of Silesian companies as compared to the population of all companies operating in Poland. The study is based the application of a part of authors' self-developed method – the CFS Watch, which consists of five analytical modules. In the study, two modules are applied: the GPA Module (General Performance Assessment) with regard to financial balance and the MDA Module (Multi-discriminant Analysis) with regard to the bankruptcy risk. Grounded on the theory of financial analysis and its application for corporate finance purposes, the modules are based on the selected financial ratios that are a subject for further comparison regarding their height and dynamics of changes. The analytical modules are applied for aggregated data provided by the Polish Central Statistical Office.*

## **INTRODUCTION**

It is beyond doubt that the latest financial crisis had an impact on the situation in the real sphere of the economy. It is also clear, that it will cause some turbulences in the following years, as the impact of such events is often delayed in time. The companies were affected mainly by the limited access to capital and the investment decisions taken due to the lost of confidence to financial market. The discussion over the consequences of the crisis was an inspiration for undertaking the researches that allow following the changes in the financial condition of business entities. As the main tool in these researches, the financial analysis ratios were applied. It represents a useful set of tools that allow monitoring the financial situation of the companies. Also, this is a subject for more extended methods – such as multidiscriminant analysis – that are useful in bankruptcy prediction and in generating early warning signals. The general concept of the researches is to measure a defined set of financial ratios that are commonly used to assess the corporate performance reflected in the financial statements. The researches cover the period before, during and after the boost of the global financial crisis.

The purpose of this paper is to present partial results of the above mentioned researches. The presented study focuses on companies operating in the Silesian Voivodship which is a specific, highly industrialized region. The population of the Silesian Voivodship is around 4.6 million persons (which is the 12.2% of the total population of Poland) and 41% of whom are em-

ployed in the industry (in particular, in manufacturing, mining and quarrying)<sup>1</sup>.

The presented study aims primarily at the analysis of the changes of the financial situation and bankruptcy risk of the Silesian companies, with regard to their improvement or deterioration. In particular, the methodology of the study is based on the application of a set of financial ratios that are a subject for further composition with regard to the height and dynamics of the changes. The ratios are computed on the basis of aggregated financial data characterizing a defined population of the Silesian and Polish companies, providing a platform for comparative analysis. Collected data and applied tools are designed to test the following hypotheses:

- during the period of a financial crisis the worsening of the financial balance of the population of companies operating in the Silesian Voivodship was observed,
- during the period of the financial crisis a higher risk of bankruptcy among the population of companies operating in the Silesian Voivodship was observed,
- the worsening of the financial balance and the increase in bankruptcy risk is stronger for the population of companies operating in the Silesian Voivodship as compared to the population of all companies operating in Poland.

The paper is structured as follows. The first section presents a detailed overview of the methodology of the analysis. In section two and three, the results of the analysis are presented. These results are discussed in detail in the fourth section of the paper, addressing the hypotheses formulated above. The sixth section briefly concludes the study.

## **METHODOLOGY**

The research is based on a self-developed method that is designed to analyze the key aspects of the financial situation of a company. The method, called CFS Watch (an acronym of Corporate Financial Situation Watch), was elaborated with a purpose of ‘watching’ the financial performance in five basic fields. Thus, the structure of CFS Watch covers the following modules:

- the GPA (General Performance Assessment) module
- the FLA (Financial Liquidity Assessment) module
- the DMA (Debt Management Assessment) module
- the EPA (Efficiency and Profitability Assessment) module
- the MDA (MultiDiscriminant Analysis) module.

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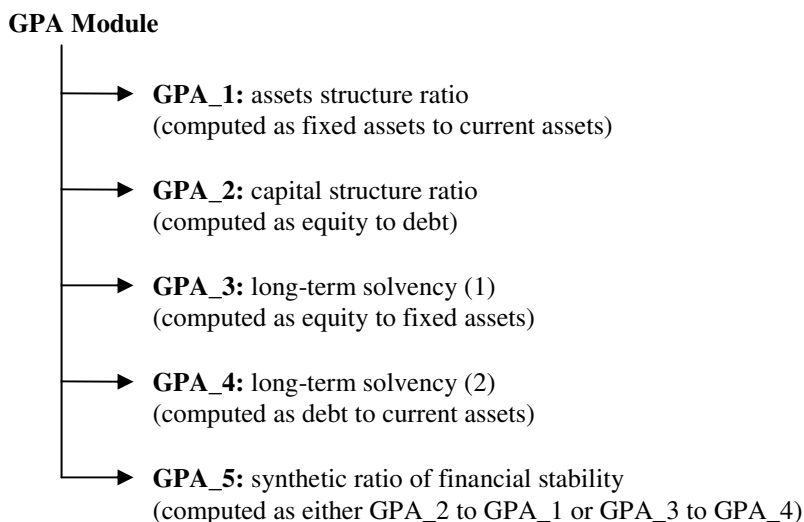
<sup>1</sup> The Silesian Voivodship Yearbook 2010, Śląski Urząd Statystyczny, Katowice 2011, [http://www.stat.gov.pl/katow/38\\_PLK\\_HTML.htm](http://www.stat.gov.pl/katow/38_PLK_HTML.htm) (11.03.2011).

This paper presents an extended results of the analysis conducted within two of the above listed modules: the GPA and the MDA.

The GPA module forms a set of five financial ratios that are commonly used to review the overall performance of a company with special regard to its financial balance (see: Nowak 2008, pp. 92-101, Jaworski 2010, p. 135, Gos, Hońko, Szczypa 2010, pp.172-176, Błach 2009, pp. 85-99, Sierpińska, Jachna 2007, pp. 69-82, Micherda 2004, p.214, Znanięcka, Gorczyńska, Wieczorek-Kosmala 2008, pp. 49-56, Waśniewski, Bednarski 1996, pp. 306-312).

The ratios applied in GPA module are based on the balance-sheet data. Thus, the GPA module indicates the common characteristics of a company regarding its assets structure, capital structure, financial balance, financial liquidity and synthetic ratio based on the structure ratios. The ratio structure of the GPA module is presented in Figure 1.

**Figure 1.** A structure of the GPA module



Source: own elaboration.

The GPA\_1 ratio reflects the assets structure of a company. It indicates the relative level of the fixed assets and the current assets. If the GPA\_1 ratio is higher than 1, it means that the company allocated more of the obtained capital in the fixed assets than in the current assets. This situation is typical for production companies, in which proper equipment is required to run the operations. However, high level of the fixed assets may lead to lower flexi-

bility of the company, as it would take more time to adapt the company's profile to the changing market conditions. Thus, the high level of the GPA\_1 ratio also indicates a relatively high level of operating risk.

The GPA\_2 ratio illustrates the capital structure of a company, indicating the sources of funds used by the company to finance its assets. If the CPA\_2 ratio is higher than 1, it means that the company uses more equity capital than debt. In such circumstances, the capital structure (with regard to debt-equity mix) is treated as relatively stable and safe. Lower level of the CPA\_2 ratio indicates higher usage of debt, leading to higher level of financial risk.

Both the GPA\_1 and the GPA\_2 ratios are used in common-size analysis as a part of assets and capital structure analysis. The two following ratios – the GPA\_3 and the GPA\_4 are commonly used to assess the correctness of capital structure of a company with regard to its assets structure. Thus, these ratios match assets with liabilities.

The GPA\_3 ratio is computed as a relation of equity to fixed assets. Thus, it reflects the extent to which equity is involved in financing the company's assets. A company is assessed as financially stable if the fixed assets are fully covered with equity. Thus, if the GPA\_3 ratio is equal or higher than 1, the company's financial stability is regarded as safe in the long run. It reflects the ability to maintain long-term solvency (the risk of insolvency is perceived as low). Often, the minimum acceptable level of the GPA\_3 ratio is defined as 0.5.

The GPA\_4 ratio is computed as the relation of debt to current assets. The GPA\_4 ratio constitutes the complement of the information springing from the GPA\_3 ratio analysis as it reflects the extent to which debt is involved in financing current assets. Consequently, it should be lower than 1 to assess the company as solvent in the long run.

The GPA\_5 ratio is computed either as the relation of the GPA\_2 and GPA\_1 or the relation of the GPA\_3 to GPA\_4. The ratio forms a synthetic measure of a company's financial stability. The positive dynamic index for the GPA\_5 ratio indicates the improvement of the financial condition and the financial balance. The GPA\_5 ratio should be higher than 1 and this border level is a consequence of the desired level of GPA\_3 and GPA\_4 ratios.

The MDA module is designed to watch the changes of the bankruptcy risk of the sampled companies. There are plenty of multivariate discriminant models developed for bankruptcy risk assessment purposes (see: Kowalak 2008, p. 201-265). One of the most popular is the Altman's Z-score model. However, for the purposes of this research one of the Polish models was adapted as it is believed to be better adjusted to the Polish economic conditions. This appeals both to the financial ratios selection and the discriminant coefficients applied (Wieczorek-Kosmala, Błach, Gorczyńska 2010, pp. 437–446). The Polish model implemented in this study is called the ZH-score model and

was developed by A. Hołda through the analysis of the financial situation of a sample group of Polish companies in 1996. The Hołda's study covered 80 companies, 40 of which announced bankruptcy. According to Hołda's researches, the multidiscriminant function for bankruptcy prediction is computed as follows (see: Hołda 2006, pp. 119–156, Walczak 2007, p.435, Nowak 2008, p. 263):

$$ZH = 0,605 + 0,681X_1 - 0,0196X_2 + 0,00969X_3 + 0,000672X_4 + 0,157X_5$$

where:

$X_1$  – the current ratio (computed as the current assets divided by the current liabilities),

$X_2$  – the capital structure ratio (computed as debt to assets ratio),

$X_3$  – the profitability ratio (computed as earnings after taxes divided by total assets),

$X_4$  – the current liabilities management ratio (computed as the current liabilities divided by the cost of goods sold),

$X_5$  – the productivity of assets ratio (computed as the total revenues divided by the total assets).

The companies with the ZH-score higher than 0 are classified as “non-bankrupt”, whereas the companies with the ZH-score below 0 are classified as “bankrupt”. The uncertainty (so called “grey”) area is between (0.1) and (-0.3), which means that companies with ZH-score in this range are wrongly classified with high probability. The Hołda's model predicts bankruptcy with 92.5% accuracy (Nowak 2008, p. 264).

Concerning the results of the ZH-score model, in this study within the MDA module, the analyzed population of companies was classified as presented in Table 1:

**Table 1.** MDA module categorisation with regard to Hołda's ZH-score model

Category	ZH-score	Interpretation
MDA_B (bankrupt)	$ZH < (-0.3)$	Bankruptcy is highly probable
MDA_I (indefinite)	$(-0.3) < ZH < 0.1$	Company cannot be classified correctly, uncertainty area
MDA_N (non-bankrupt)	$ZH > 0.1$	Bankruptcy threat is very low, good financial condition

Source: own elaboration.

The study is based on data provided by the Polish Central Statistical Office in the years 2006–2009. These data cover a wide number of companies operating in Poland that are further structured with regard to numerous criteria, i.e. the voivodship belonging<sup>2</sup>. Thus, the collected data enabled to apply the GPA and the MDA modules to the following two populations of companies:

- the population of all Polish non-financial companies (hereafter denoted as MAPP), that is embodied in the aggregated financial data provided by the Polish Central Statistical Office (GUS),
- the population of non-financial companies operating in the Silesian Voivodship (hereafter denoted as MEPP), that is embodied in the aggregated financial data provided by the Polish Central Statistical Office (GUS).

The precise number of companies covered by the Polish Central Statistical Office within both analyzed populations of companies is provided in Table 2.

**Table 2.** The number of companies providing statistical data to GUS statistics

Group of companies	2006	2007	2008	2009
MAPP	47048	48165	53847	53148
MEPP	6042	6341	6740	6823

Source: own elaboration based on the GUS reports: *Financial Results of Economic Entities in 2006, 2007, 2008, 2009*.

The GPA and the MDA modules were applied to aggregated data of the MAPP and the MEPP populations. Further, the results (financial ratios in each module) were a subject for comparative analysis of the quality of given signals. The GPA module is based on the balance sheet data and – as a part of common size analysis – is supposed to indicate the worsening or improvement of general financial conditions. It examines primarily the financial balance in the context of long-term solvency. The MDA module is based on a set of ratios concerning also the profit and loss account performance. As the tools involved in this module (the ZH-score function) are commonly used to bankruptcy prediction, the worsening or improvement in the MDA

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<sup>2</sup> These data concern business entities keeping account ledgers, where the number of employed persons exceeds 9 persons, excluding bank, insurance institutions, brokerage institutions, tertiary education institutions, independent health care institutions and private farms in agriculture. *Financial Results of Economic Entities in 2006, 2007, 2008, 2009*, GUS, Warsaw 2007, 2008, 2009, 2010, <http://www.stat.gov.pl> (11.03.2011).

module is assessed. The study takes into account the direction of the dynamics of the observed changes.

### THE RESULTS OF THE FINANCIAL BALANCE ASSESSMENT (THE GPA MODULE)

As mentioned above, the GPA module is designed to observe the changes of the general financial situation in terms of maintaining financial balance of the analyzed population of companies. The module computations are based on the set of basic balance sheet data presented in Table 3. Each of the computed ratio included in the structure of the GPA module (see Figure 1) was computed for the MAPP population (presented in Table 4) and the MEPP population (presented in Table 5), and then compared.

**Table 3.** Aggregated volume of Assets and Capitals of the MAPP and MEPP populations in billion PLN

Characteristics	MAPP				MEPP			
	2006	2007	2008	2009	2006	2007	2008	2009
Fixed assets	865.4	1038.4	1127	1192.9	99.3	125.7	132.7	139.6
Current assets	591.9	690.4	773,4	794.6	73.7	87.2	90.5	93.2
Equity	744.1	918.9	959,2	1025.1	86.2	115	112.2	122
Debt	713.2	809.9	941,2	962.4	86.8	97.9	111	110.8

Source: own elaboration and calculations based on the GUS reports: *Financial results of economic entities in 2006, 2007, 2008, 2009*.

**Table 4.** GAP module results for the MAPP population

Ratio	The level of the ratio				Dynamic indices for ratios changes		
	2006	2007	2008	2009	2007/2006	2008/2007	2009/2008
GPA_1 MAPP	1.462	1.504	1.457	1.501	2.87%	-3.13%	3.02%
GPA_2 MAPP	1.043	1.135	1.019	1.065	8.82%	-10.22%	4.51%
GPA_3 MAPP	0.860	0.885	0.851	0.859	2.91%	-3.84%	0.94%
GPA_4 MAPP	1.205	1.173	1.217	1.211	-2.66%	3.75%	-0.49%
<b>GPA_5 MAPP</b>	<b>0.714</b>	<b>0.754</b>	<b>0.699</b>	<b>0.710</b>	<b>5.60%</b>	<b>-7.29%</b>	<b>1.57%</b>

Source: own elaboration and calculations based on the GUS reports: *Financial results of economic entities in 2006, 2007, 2008, 2009*.



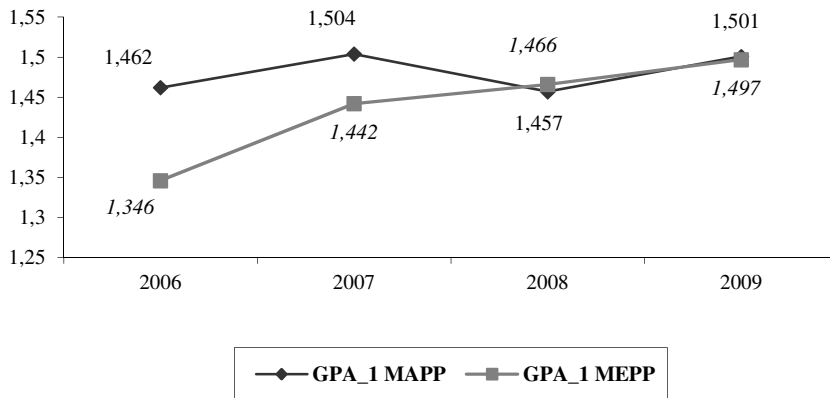
On the following figures (Figures 2. to 6.) the results of MAPP population are compared with the results of MEPP population, separately for each GAP module ratio.

**Table 5.** GAP module results for the MEPP population

Ratio	The level of the ratio				Dynamic indices for ratios changes		
	2006	2007	2008	2009	2007/2006	2008/2007	2009/2008
GPA_1 MEPP	1.347	1.442	1.466	1.498	7.05%	1.66%	2.18%
GPA_2 MEPP	0.993	1.175	1.011	1.101	18.33%	-13.96%	8.90%
GPA_3 MEPP	0.868	0.915	0.846	0.874	5.41%	-7.54%	3.31%
GPA_4 MEPP	1.178	1.123	1.227	1.189	-4.67%	9.26%	-3.10%
<b>GPA_5 MEPP</b>	<b>0.737</b>	<b>0.815</b>	<b>0.689</b>	<b>0.735</b>	<b>10.58%</b>	<b>-15.46%</b>	<b>6.68%</b>

Source: own elaboration and calculations based on the GUS reports: *Financial results of economic entities in 2006, 2007, 2008, 2009.*

**Figure 2.** GPA\_1 ratio for the MAPP and MEPP population of companies in the years 2006–2009

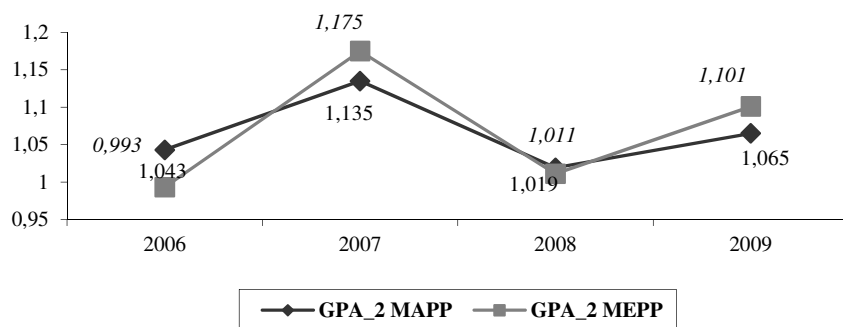


Source: own elaboration.

For both examined populations of companies the value for the GPA\_1 ratio was on a slightly different level in 2006 and 2007 (with lower levels for the MEPP population), whereas in 2008 and 2009 the ratios were at the comparable level (see Figure 2). In the MEPP population, the ratio was in an upward trend ranging from 1.346 in 2006 to 1.497 in 2009 (which gives an increase of 11.22%). In the MAPP population the ratio fluctuated slightly in a band of c.a. 1.46–1.5. These results indicate the higher level of fixed assets

as compared to the level of current assets (which signals quite significant level of operating risk). The overall tendency shows the increasing importance of fixed assets and decreasing level of companies' flexibility.

**Figure 3.** GPA\_2 ratio for the MAPP and MEPP population of companies in the years 2006–2009

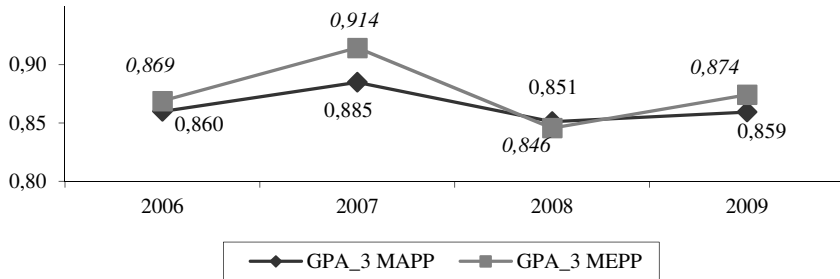


Source: own elaboration.

The observed changes of the level of GPA\_2 ratio (Figure 3) indicate that the results were quite similar in case of the MEPP and MAPP population, with slightly better levels observed for the MAPP population. During the analyzed period the ratio remained higher than 1 (except from 2006 in MEPP population), which means that the volume of equity capital was slightly higher than the volume of debt capital. As the ratio did not fluctuate significantly it can be stated, that the capital structure during the analyzed period remained relatively stable. However, it is worth to mention that the highest level of equity financing as compared to total sources of funds was observed both in MEPP and MAPP population in 2007 (see Table 3), which explains the height of debt to equity ratio in 2007.

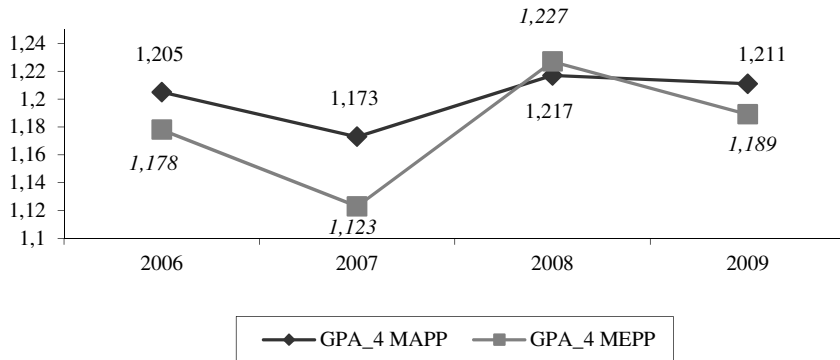
With regard to GPA\_3 ratio (presented in Figure 4) it must be stated that during the analyzed period the ratio did not reach the recommended level of 1. The best situation was observed in 2007 with regard to MEPP population, when the ratio reached 0.914. However, in 2008 the ratio declined to c.a. 0.85 (the decline of 7.5%) and in the following year did not increase significantly. However, in 2009 the ratio was higher for the MEPP population as compared to MAPP population.

**Figure 4.** GPA\_3 ratio for the MAPP and MEPP population of companies in the years 2006–2009



Source: own elaboration.

**Figure 5.** GPA\_4 ratio for the MAPP and MEPP population of companies in the years 2006–2009



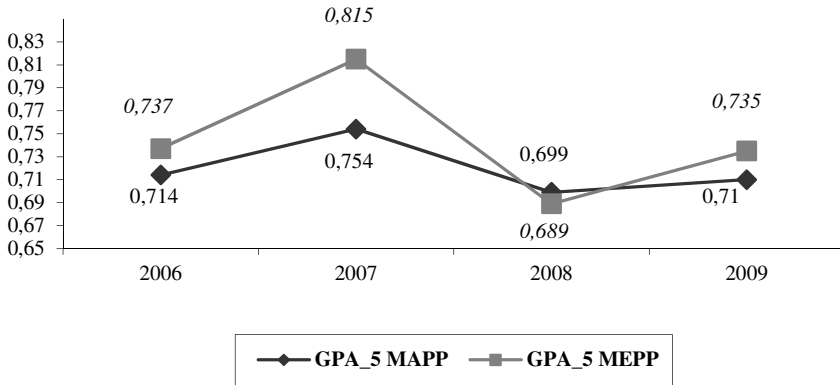
Source: own elaboration.

The GPA\_4 ratio, presented in Figure 5, supplies the information included in the GPA\_3. It indicates that during the analyzed period the volume of debt was higher than the volume of current assets. These results can be partially explained with regard to liquidity maintenance. Better perspectives of liquidity maintenance were observed in 2007, then declined a little as the total debt (including both short- and long-term debt) increased as relatively compared to the level of current assets.

The synthetic ratio of financial stability (the GPA\_5, presented in Figure 6) was fluctuating in the analyzed period both in the MEPP and MAPP population. However, these fluctuations were more significant in MEPP population. Both in MEPP and MAPP population the ratio did not reach the

recommended level of 1, thus it can be stated that the financial balance was not maintained. In general, a better situation was observed with regard to MEPP population as the GPA\_5 ratio was higher as compared to MAPP population with the exception of 2008 (when both MEPP and MAPP gained similar levels).

**Figure 6.** GPA\_5 ratio for the MAPP and MEPP population of companies in the years 2006–2009



Source: own elaboration.

**THE RESULTS OF BANKRUPTCY RISK ASSESSMENT (THE MDA MODULE)**

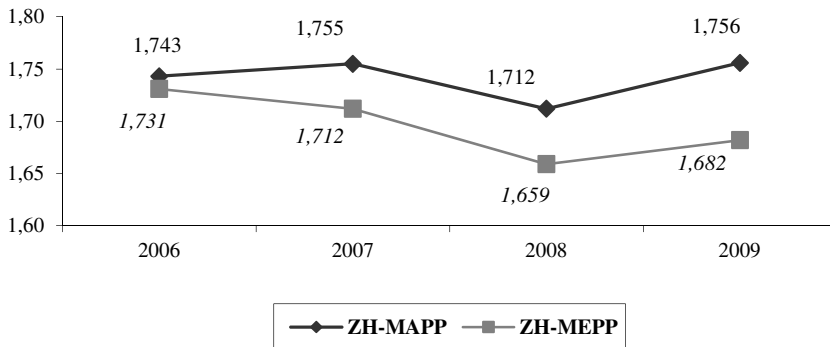
The MDA module is dedicated to the analysis of the changes in the level of bankruptcy risk of the analyzed populations of companies. For the purposes of implementing the ZH-score model it is assumed that the aggregated data reflect the typical, average company in each population. The bankruptcy prediction is based on a set of financial ratios that are then applied in the multidiscriminant function. The level of particular ratios is presented in Table 6, together with the ZH-score achieved. The results of ZH-score function for the both group of companies were compared in Figure 7.

**Table 6.** MDA module results for the MAPP and MEPP population

Indicator	MAPP				MEPP			
	2006	2007	2008	2009	2006	2007	2008	2009
X1	1.389	1.414	1.352	1.426	1.351	1.346	1.256	1.307
X2	0.489	0.468	0.495	0.484	0.501	0.460	0.497	0.475
X3	0.055	0.063	0.040	0.049	0.065	0.066	0.041	0.039
X4	0.249	0.250	0.265	0.257	0.253	0.264	0.267	0.269
X5	1.282	1.244	1.243	1.200	1.371	1.269	1.326	1.244
<b>ZH-score</b>	<b>1.743</b>	<b>1.755</b>	<b>1.712</b>	<b>1.756</b>	<b>1.731</b>	<b>1.712</b>	<b>1.659</b>	<b>1.682</b>

Source: Own elaboration and calculations based on the GUS reports: *Financial results of economic entities in 2006, 2007, 2008, 2009.*

**Figure 7.** ZH-score function for the MAPP and MEPP population of companies in the years 2006–2009



Source: own elaboration.

For both MAPP and MEPP population the ZH-score was clearly higher than 0.1 which is interpreted as low bankruptcy risk. However, for the assessment of changes in the financial situation it must be stated, that a slight downward trend was observed till 2008, with a better results in 2009 as compared to 2008. In the MAPP population the downward trend observed to 2008 was weaker as compared to the MEPP population. Also, the results of MAPP population are a little bit better than the results of the MEPP population.

## DISCUSSION

As outlined previously, there were three plausible hypotheses addressing the financial situation of the examined companies before, during and after the financial crisis. The research results lent some support to the second and third hypothesis, but no evidence was found to support the first one.

In line with the first hypothesis about the worsening of financial balance of the population of companies operating in the Silesian Voivodship, it must be stated that the hypothesis did not find confirmation. The worst level of synthetic ratio of financial stability was observed in 2008. In 2009 the ratio reached the level comparable to the level achieved in 2006.

The worsening of the financial balance observed in 2008 was caused by the changes within assets structure with quite stable situation within capital structure. Within the analyzed period a constant growth of fixed assets was observed with relatively stable level of current assets. As a result, the flexibility of the population of companies was decreasing. In 2008 the level of debt and equity used was comparable, which also influenced the worsening of the financial balance in 2008. However, in 2007 and 2009 there was a reverse situation, which means that equity was higher than debt. Also, in 2008 the level of equity to fixed assets was at the lowest as compared to other analyzed periods. The growth of fixed assets in 2008 was founded from the increase in debt, which also negatively influenced the financial balance. In general, it must be stated that the financial balance ratio did not reach the recommended level of 1 during the analyzed period. However, knowing that the Silesian Voivodship is highly industrialized, such situation should be regarded as acceptable.

The research lent some support to the second hypothesis about the increase in the bankruptcy risk of the population of the Silesian Voivodship companies. The multidiscriminant analysis with an application of ZH-score model by Hołda allowed to observe a constant decline in the ZH-score. It means that with regard to different fields of companies' activities, the financial condition was worsening during the analyzed period. Once again, the worst situation is observed in 2008. In 2009 as compared to 2008 a slight improvement was observed, but the ZH-score did not reach the level observed in 2007.

With regard to the third hypothesis about the higher strength of deterioration of financial balance and the increase in the level of bankruptcy risk for the population of the Silesian Voivodship companies as compared to all companies operating in Poland, partial evidence was found. The level of financial balance of the Silesian companies was relatively better as compared to all Polish companies included in the research data. However, the financial balance of the population of all Polish companies remained on a relatively

comparable level during the whole analyzed period regarding the level of synthetic ratio of the financial stability. The synthetic ratio for the population of the Silesian companies was fluctuating more significantly.

Concerning the level of bankruptcy risk, the situation is quite contrary. The data provided for the population of all Polish companies indicated a relatively better situation as compared to the population of the Silesian companies. Also, it is worth noticing that once again the lowest levels of ZH-score were observed in 2008. However, in 2009 the ZH-score for the population of all Polish companies reached the level from 2007 whereas the ZH-score for the population of the Silesian companies – did not.

## CONCLUSIONS

In general, the conducted research proved that with regard to the aggregated financial data included in financial statements, the impact of the financial crisis might be observed. In the analyzed populations of the companies (Silesian as compared to Polish), all of the analyzed parameters in 2008 were clearly deteriorating as compared to 2007. Also, in most of the cases, the situation improved in 2009.

It is worth noticing that the analysis based only on data provided by the balance sheet proved that the financial stability of the population of the Silesian companies was better than in the population of all Polish companies. However, the ZH-score model ratios that cover different aspects of the financial performance indicated quite contrary results.

Thus, it is recommended to conduct further researches into basic analytical problems regarding liquidity, profitability and debt capacity of the companies. Further inquiries should be conducted to explain the reasons for the observed differences. In particular, it should be examined whether the research results were not affected by the imperfections of the applied models as both are charged with these.

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