

# The analysis of ranges of variability of selected ratios from a group of assets productivity ratios three years before the declaration of bankruptcy by companies in Poland

**Paweł Antonowicz**

*Department of Business Economics, Faculty of Management*

*University of Gdansk, Poland*

*e-mail: [pawel.antonowicz@ug.edu.pl](mailto:pawel.antonowicz@ug.edu.pl)*

This article shows the research results concerning the development of the variability of five selected ratios from the group of assets productivity in companies with extremely different financial and economic positions. The research was conducted on a test sample of 380 business entities: 190 companies subject to bankruptcy in the years 2007-2011 and 190 “healthy” companies. The research shows a different usefulness of various ratios of the financial analysis considered as one-dimensional bankruptcy predictors used to predict and early detect symptoms of companies threatened with bankruptcy.

**JEL Classifications:** G32, G33, G17

**Keywords:** Bankruptcy, insolvency, financial analysis, productivity

## Introduction

The current analytical and controlling practice is based on, among others, information deriving from companies' financial statements. The value of this information is useful provided that it may be used to diagnose not only some events from the past, but also to draw conclusions about a given company's future. The traditional use of the financial analysis does not make it possible straightforwardly. However, a method that makes it possible to make such diagnosis and draw conclusions is to compare calculated ratios to certain normative ranges of their variability. In this article, the author focuses on the analysis of the variability of selected ratios from the group of the evaluation of companies' productivity. Further, the article specifies characteristics of developing five selected assets ratios in a group of 380 companies. It is essential, however, that a half of this research group comprised companies that declared their bankruptcy in the years 2007-2011. Thanks to the ratio analysis of their financial statements, it was possible to determine the ranges of variability for the selected analysed ratios three years before the adjudication of bankruptcy. These values were compared to characteristics of these ratios for good companies, id est business entities not threatened with bankruptcy at that time. This research is a voice in the discussion on the possibility to use results obtained from the ratio analysis to evaluate a risk of a bankruptcy threat to companies. It appears that some groups of ratios for the healthy business entities differ from those characteristic as early as one year before their bankruptcy.

These results are part of wider research conducted by the author to this extent (Antonowicz, 2011). The aim of these multi-dimensional considerations is to seek financial ratios that significantly vary in the healthy companies and companies heading towards bankruptcy. On the one hand, this conducted research makes it possible to determine the level of variability of the analysed ratios characteristic for entities marching towards bankruptcy. On the other hand, this research is a source of information on these

ratios of the financial analysis which considerably discriminate (divide, differentiate) both groups of business entities. Thus, it is possible to use them in the Emergency Alert Systems which sufficiently early alert for symptoms of the upcoming bankruptcy, insolvency and, finally, a potential liquidation of the company.

### **Characteristics of the research attempt**

In order to conduct the research on a test sample of entities subject to bankruptcy and the equivalent group of the healthy entities, in 2007 the author commenced establishing a database of bankrupt companies in Poland. Consequently, the long-term research in this field resulted in gathering data on the following number of bankrupt companies in Poland: 2007 - 447 business entities, 2008 - 424 business entities, 2009 - 695 business entities, 2010 - 684 business entities, 2011 - 735 business entities. The database of bankrupt companies was updated on a current basis for five years. Information on bankruptcy proceedings derived from, pursuant to Art. 53(1) of the Act on Bankruptcy and Reorganization Law, the Court and Commercial Gazette which forthwith publicizes bankruptcy decisions. Preliminarily, from among those entities there were selected all business entities which announced their financial statements in the "Monitor Polski B" Official Gazette of the Republic of Poland for at least two financial years prior to the declaration of bankruptcy. Pursuant to Art. 64(1) of the Accounting Act the audit and the publication are required in respect of financial statements of entities that in the preceding financial year for which the financial statements are made, observed at least two of three following conditions: (1) the annual average number of employees in full-time equivalents amounted to at least 50 people; (2) the total assets as at the end of the financial year were at least the Polish zloty equivalent of EUR 2,500,000; (3) the net revenue from sales of goods and products and financial transactions for the financial year was at least the Polish zloty equivalent of EUR 5,000,000.

When developing the financial database of bankrupt companies it emerged that from among almost 3,000 companies that declared bankruptcy in the years 2007 - 2011 very few entities submitted their financial statements to the "Monitor Polski B" Official Gazette. It appeared that those entities' extremely difficult situations pertaining to their deepening difficulties in their presence on the market consequently resulted in their failure to observe the annual obligation to publish those financial statements. Finally, the research attempt comprising 190 bankrupt entities (NB) was specified as: the population of business entities subject to bankruptcy in the years 2007-2011 which made and published their financial statements in the "Monitor Polski B" Official Gazette for at least two financial years before the adjudication of bankruptcy.

This defined observation group comprising business entities subject to bankruptcy was deliberately matched with a group of companies named "healthy" (H) in the research. To that end, these companies were matched in pairs. The fundamental criterion of matching was the compliance of the basic code of the conducted business activity being the only measurable and objective feature that specifies the industry of the analysed companies. For each bankrupt entity there was identified a group of 1-8 "healthy" companies, from which, at the further stage, only one entity was selected on the basis of the following criteria: (1) a comparable value of revenues from sales, thanks to which it is possible to match entities of a similar scale of activity in a given industry; (2) a comparable value of a balance amount which makes it possible to match entities of a similar scale of their assets; (3) the identical organizational and legal form used to match entities of similar establishment requirements, structure of power and the entrepreneur's responsibility.

Therefore, this article includes results of developing selected ratios of the financial analysis on a test sample of 380 companies: 190 bankrupt companies and 190 healthy companies. Financial statements of all such business entities were subject to further examinations. The aim of this research was to find such financial ratios whose average values for entities in both groups of companies show maximum differences. Since these parameters could be good one-dimensional predictors of companies' bankruptcy, and hence they could

enhance our analytical and interpretative capabilities to the extent of the broad-defined financial analysis and management accounting.

### **Assets productivity in companies subject to bankruptcy - research results**

The analysis of the company's assets productivity may be carried out through calculating a vast range of various financial ratios. In this research the author applied five selected ratios which are the most frequently used in the analytical practice such as: (1) general assets productivity ratio which is a quotient of revenues from sales to the average annual value of assets; (2) profit/loss on sales to the average annual balance sheet total ratio; (3) return on investment (ROI) which is a relation of the result on operating activity to the average annual value of assets; (4) gross asset productivity ratio which is the gross financial results to the company's total assets involved in economic processes; (5) return on assets (ROA) which is a net financial result to the average annual value of the total value of assets, (Bednarski, 2007); (Leszczyński, Skowronek-Mielczarek, 2004); (Michalski, 2008); (Sierpińska, Jachna, 2000); (Skoczylas, 2009); (Zaleska, 2005).

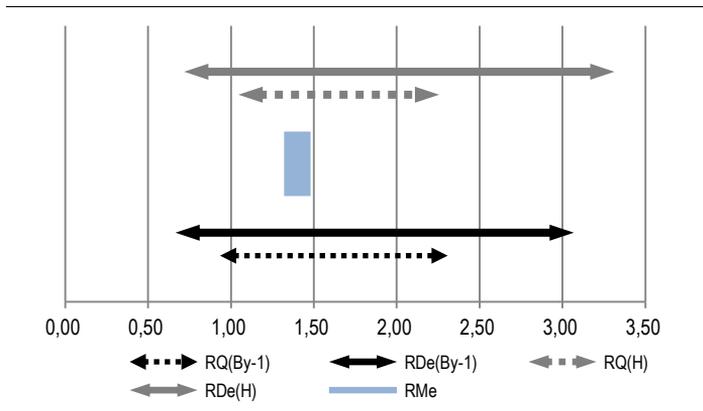
The research pertaining to the development of the selected financial ratios was each time conducted on a test sample of 190 bankrupt companies and 190 healthy companies. However, the more imminent the companies were to declare their bankruptcy, the less effective it became to acquire financial statements in the group of bankrupt companies. Therefore, the provided research results (Tables 1 and 2) include information on a number of tests conducted in each period prior to the adjudication of these companies' bankruptcy. Table 1 provides for typical ranges of variability characteristic for business entities subject to bankruptcy one year prior to their bankruptcy adjudicated by court, whereas Table 2 includes analogous statistics two and three years before their bankruptcy. Considering the existence of the so-called outliers considerably affecting such descriptive measures as average or standard deviation, Tables 1 and 2 also described their variability in the so-called typical area of variability characteristic for 50% of the middle cases and 80% of cases of the calculated ratios.

All of the financial ratios covered by a group of assets productivity measures are stimulants. This means that the higher these ratios are, the more advantageously the economic situation of the analysed business entity is evaluated. This also means that we should not be surprised that the value of these ratios is declining when the moment of bankruptcy of the analysed companies is approaching. On the other hand, it is logical that these ratios should averagely fluctuate in the healthy companies in higher ranges of variability. It is interesting that one year before bankruptcy the conducted research showed this dependence in all ratios except for the first analysed ratio: general assets productivity ratio. Figure 1 shows the development of the variability of this ratio one year prior to the declaration of bankruptcy by the researched companies versus healthy companies. However, the analysis of this and subsequent graphs requires the explanation of some abbreviations:

- $RQ_{(By-1)}$  - means a distance (range) between the value of quartile I and the value of quartile III of the selected ratio of the financial analysis in the group of bankrupt companies one year prior to their bankruptcy (typical area of variability of this ratio in 50% of the middle observations);
- $RD_{C(By-1)}$  - means a distance (range) between the value of decyl I and the value of decyl IX of the selected ratio of the financial analysis in the group of bankrupt companies one year prior to their bankruptcy (typical area of variability of this ratio in 80% of the middle observations);
- $RQ_{(H)}$  - means a distance between the value of quartile I and the value of quartile III in 50% of the middle observations of the variability of the ratio in the group of healthy companies;

- $RDe(H)$  - means a distance between the value of decyl I and the value of decyl IX in 80% of the middle observations of the variability of the ratio in the group of healthy companies;
- $RMe$  - means a distance between the median of the ratio calculated for both groups of entities.

FIGURE 1. TYPICAL AREAS OF VARIABILITY OF THE GENERAL ASSETS PRODUCTIVITY RATIO ONE YEAR PRIOR TO THE DECLARATION OF BANKRUPTCY AND IN THE HEALTHY COMPANIES

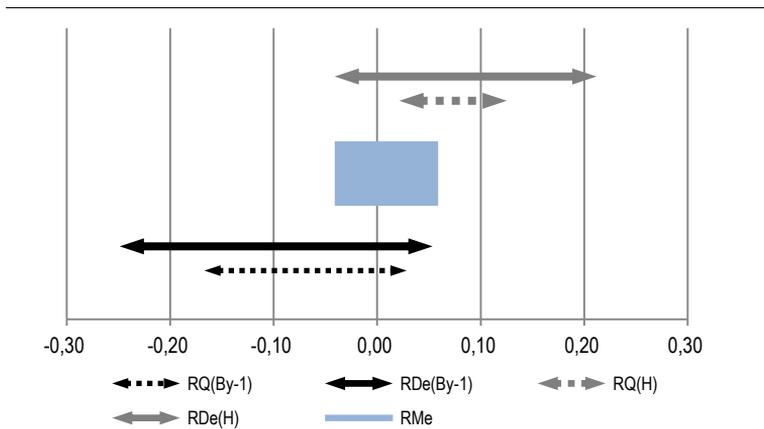


Source: Own calculations on the basis of the analysis of financial statements of N=380 companies.

The ranges of the variability of the general assets productivity ratio shown in Figure 1 prove that the variability of this ratio is not diversified in both groups of companies so much that it has discriminating features. In other words, this is not a good ratio that differs the companies subject to bankruptcy (one year prior to their bankruptcy) from the healthy companies. Therefore, there should be posed a question why it happens? This ratio is a quotient of revenues from sales generated by the company to the average assets. It emerges that, in accordance with the logic, the sooner the bankruptcy is declared, the more frequently the revenues from sales decreases. Since the company is less and less expansive and is unable to generate as high turnovers as in the past. On the other hand, this process is frequently associated with the decrease in the value of capital involved in business processes. This strategy is particularly observed in companies which deliberately make attempts to save the company against the inevitable upcoming bankruptcy. This strategy consists in reducing the assets partially and its sale-out in order to ensure that the declining revenues correspond to relatively lower fixed costs of their generation. However, it sometimes happens that the asset value declines faster in comparison with the decrease in revenues from sales. This is shown by the ostensible “growth” of its general assets productivity. Since this ratio is higher than in previous periods, but the analysis of its core proves that this productivity growth is only ostensible. Since it takes place in conditions of developing crisis in the company which, as already emphasized, means that, on the one hand, it is hard for the company to reverse the declining tendency in revenues from sales, but on the other hand there is a successful, but negative process - the reduction of the capital involved in business processes.

Therefore, the general assets productivity ratio becomes an unimportant measure which - from the perspective of the opportunity to early detect symptoms of the upcoming bankruptcy - is not useful.

FIGURE 2. TYPICAL AREAS OF VARIABILITY OF THE SECOND RATIO OF THE GROUP OF ASSETS PRODUCTIVITY RATIO ONE YEAR PRIOR TO THE DECLARATION OF BANKRUPTCY AND IN THE HEALTHY COMPANIES



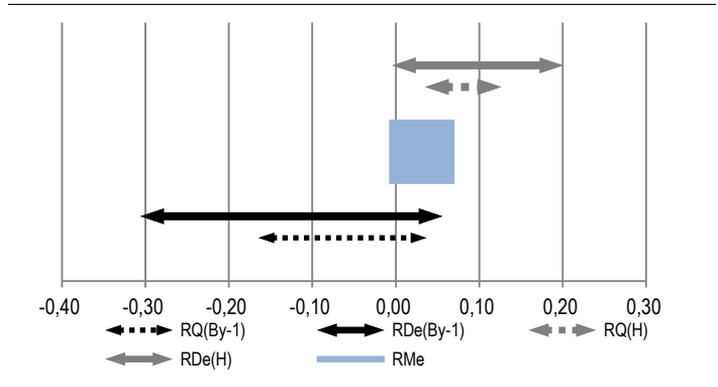
Source: Own calculations on the basis of the analysis of financial statements of N=380 companies.

Therefore, is it definitely possible to state that other ratios of this group are not useful to early detect any bankruptcy threats to companies, either? On the basis of the conducted research it appears that average typical areas of the variability of the remaining four ratios of this group calculated for the companies subject to bankruptcy and their corresponding healthy companies looks completely different. Figure 2 shows the development of the variability of the second ratio analysed in this article, id est the relationship between the profit/loss on sales and total capitals involved in business processes.

Contrary to the general assets productivity ratio shown in graph 1, the quotient of the profit/loss from sales to the balance sheet total ratio has in 50% of the middle cases of both groups of the examined companies ranges that almost completely exclude each other. As for the usefulness of this measure to evaluate the risk of a bankruptcy threat to companies, this measure seems to be much more useful than the previous ratio. A half of the companies subject to bankruptcy examined one year prior to their bankruptcy showed that the level of the analysed ratio was in the range of  $<-0.17;0.03>$ . Whereas, 50% of the middle cases of the healthy companies obtained the ratio which was almost completely covered by a separate range:  $<0.02;0.13>$ . If this ratio is used in connection with other “good” discriminating ratios of the financial analysis with respect to the classification of entities threatened with bankruptcy versus entities not threatened with bankruptcy, then this measure would considerably make it possible to classify the companies correctly. Here, it is noteworthy that other measures of such evaluation should derive from possibly diversified areas of the financial analysis in order to prevent too high correlation among variables aimed at diagnosing the bankruptcy threat. Otherwise, it could appear that the evaluation comprises the multiplied information, through the implication of correlated variables, and hence the synthetic scoring would be distorted.

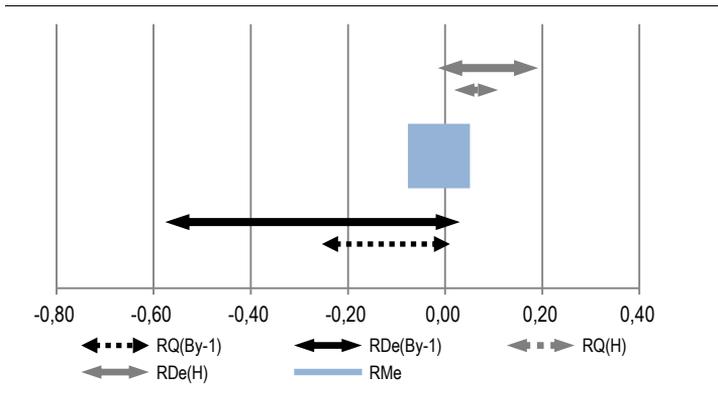
The following graphs (Figures 3, 4 and 5) depict the development of typical ranges of variability of three subsequent analysed ratios from the assets productivity ratios. In this case, the distance between medians of the ratio in both groups of companies decreased in comparison with ratio II, but the ranges of the ratio variability evaluated not only with respect to typical 50% of the middle observations, but also for typical 80% of the middle observations, are much more separate.

FIGURE 3. TYPICAL AREAS OF VARIABILITY OF THE RETURN ON INVESTMENT (ROI) ONE YEAR BEFORE THE DECLARATION OF BANKRUPTCY AND IN THE HEALTHY COMPANIES



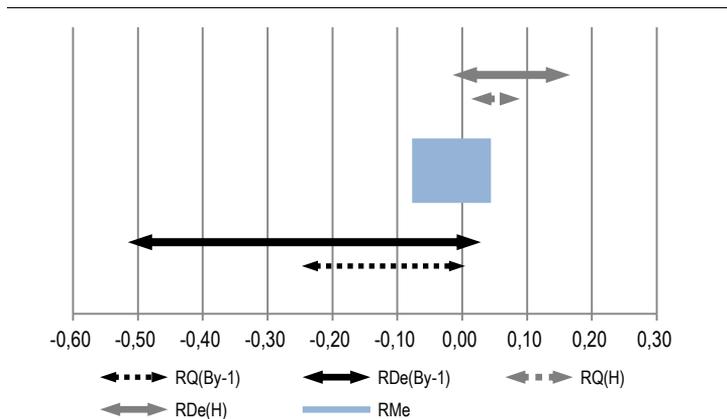
Source: Own calculations on the basis of the analysis of financial statements of N=380 companies.

FIGURE 4. TYPICAL AREAS OF VARIABILITY OF THE GROSS ASSETS PRODUCTIVITY RATIO ONE YEAR BEFORE THE DECLARATION OF BANKRUPTCY AND IN THE HEALTHY COMPANIES



Source: Own calculations on the basis of the analysis of financial statements of N=380 companies.

FIGURE 5. TYPICAL AREAS OF VARIABILITY OF THE RETURN ON ASSETS (ROA) ONE YEAR BEFORE THE DECLARATION OF BANKRUPTCY AND IN THE HEALTHY COMPANIES



Source: Own calculations on the basis of the analysis of financial statements of N=380 companies.

All three assets productivity ratios shown in Figures 3, 4 and 5 are similarly useful for the preceding evaluation of a possible threat of the companies' bankruptcy. The return on investment shown in Figure 3 averagely fluctuates in 80% of the analysed bankrupt companies one year before the adjudication of bankruptcy in the range of  $\langle -0.31; 0.06 \rangle$ . Whereas, this ratio in an analogous group of 80% of the middle healthy companies was in the range of  $\langle 0.00; 0.20 \rangle$ . The distance between medians of this ratio in both groups of the examined business entities ranged from -0.01 in the companies subject to bankruptcy to 0.07 in the healthy companies. Moreover, the separate ranges of variability considerably took place in 80% of the analysed entities when the gross assets productivity ratio was used (Figure 4). This measure is useful in practice as it does not consider tax effects in the process of its calculation which generates much more clear view in comparative analyses between the companies. In case of typical 80% of the companies subject to bankruptcy the gross assets productivity ratio one year before the adjudication of bankruptcy was in the range of  $\langle -0.58; 0.03 \rangle$ , whereas in the healthy companies it fluctuated in the range of  $\langle -0.01; 0.19 \rangle$ . The analogous ranges of variability of 80% of the middle cases of the analysed companies when using the last of the identified ratios - return on assets (Figure 5) - were in the range of  $\langle -0.52; 0.03 \rangle$  and  $\langle -0.01; 0.17 \rangle$ .

Here, it is noteworthy that it would be perfect to find such ratio (not only in the assets productivity group, but also the sales profitability, financial liquidity, debt, activity and turnover) in which the ranges of variability for the entities of both groups would be maximally separate and they would not cover each other and in which the distance between medians for both groups of companies would be possibly high. The research conducted by the author to this extent has so far showed that none of the ratios traditionally used in the financial analysis have such features. Unfortunately, it seems to be a true thesis since otherwise the multi-dimensional analyses based on econometric models used to assess the bankruptcy threat to companies on the multi-dimensional basis would not apply. These methods are as follows: multi-dimensional discriminating analysis, linear regression models, logit and probit models, step division models, gambling models, expert

models, mathematical software, neural networks or the implication of the fuzzy set theory (McKee, 2000).

## Conclusion

The fragmentary research results included in the article show a specific dichotomy of the possibility of the practical use of the financial analysis ratios to forecast the bankruptcy threat to the companies. It appears that the analysed five measures from the group of the assets productivity assessment cover both ratios whose ranges of variability considerably diversify for the companies subject to bankruptcy (one year before the adjudication of bankruptcy) from levels of these ratios characteristic for the healthy companies. However, there are such measures as the first of the analysed ratios - the general assets productivity ratio which does not differ at all in the healthy companies and the companies subject to bankruptcy. The author's research also refers to other 25 ratios of the financial analysis, going beyond the area of the assets productivity assessment and they have been continuously conducted since 2007. So far, the author has not managed to find a measure that perfectly discriminates both groups of companies, which means that more advanced and sophisticated analytical methods, such as discriminating analysis, are justified and invaluablely significant for the diagnosis and fast detection of financial symptoms of the risk of the bankruptcy threat to companies.

## References

- Antonowicz, P., 2011. "Evaluation of creditworthiness and the threat of bankruptcy of Polish enterprises based on financial reporting", *AD ALTA: Journal of Interdisciplinary Research: Relevant results and theoretical developments of science and research in Central and Eastern Europe*, Vol. 1, Issue 2, pp.12-15
- Bankruptcy and Reorganization Law, 2003. Act of 28 February 2003, *Journal of Laws*, No 60, item 535
- Bednarski, L., 2007. „Analiza finansowa w przedsiębiorstwie“, PWE, Warszawa, pp.103-113
- Leszczyński, Z., Skowronek-Mielczarek, A., 2004. *Analiza ekonomiczno-finansowa spółki*, PWE, Warszawa, pp.140-142
- McKee, T.E., 2000. "Developing a Bankruptcy Prediction Model via Rough Sets Theory", *International Journal of Intelligent Systems in Accounting, Finance and Management*, Vol. 9, pp.159-175, [http://dx.doi.org/10.1002/1099-1174\(200009\)9:3<159::AID-ISAF184>3.0.CO;2-C](http://dx.doi.org/10.1002/1099-1174(200009)9:3<159::AID-ISAF184>3.0.CO;2-C)
- Michalski, G., 2008. *Ocena finansowa kontrahenta na podstawie sprawozdań finansowych*, Wyd. ODDK, Gdańsk, pp.71-74, 97-99, 105, 189-190
- Sierpińska, M., Jachna, T., 2000. *Ocena przedsiębiorstwa według standardów światowych*, Wyd. Naukowe PWN, Warszawa, pp.103-104
- Skoczylas, W., 2009. „Instrumenty oceny rentowności przedsiębiorstw“, in: Skoczylas, W. (Eds.), *Analiza sprawozdawczości finansowej przedsiębiorstwa*, Wyd. Stowarzyszenie Księgowych w Polsce, Warszawa, pp.200-208
- Zaleska, M., 2005. *Ocena ekonomiczno-finansowa przedsiębiorstwa przez analityka bankowego*, Wyd. Szkoła Główna Handlowa w Warszawie - Oficyna Wydawnicza, Warszawa, pp.81-89

## Appendix

TABLE 1. TYPICAL RANGES OF VARIABILITY OF FIVE SELECTED RATIOS OF ASSETS PRODUCTIVITY IN BUSINESS ENTITIES ONE YEAR BEFORE THE ADJUDICATION OF BANKRUPTCY (NB(-1)=47 BUSINESS ENTITIES) AND IN THE HEALTHY COMPANIES (NH=190 BUSINESS ENTITIES)

Chosen indicators of productivity of assets	1. Productivity of assets		2. Profit from the sale to assets		3. Return on investment (ROI)	
	Bankrupt enterprises NB(-1)=47	Healthy enterprises NH=190	Bankrupt enterprises NB(-1)=47	Healthy enterprises NH=190	Bankrupt enterprises NB(-1)=47	Healthy enterprises NH=190
Basic statistics for the variables						
N-important observations	47	190	47	190	47	190
Missing data	143	0	143	0	143	0
MIN - minimum	0,01	0,02	-0,40	-0,29	-0,67	-0,51
MAX - maximum	3,77	7,67	0,23	0,62	0,54	1,89
Average value (for all variables)	1,61	1,76	-0,07	0,08	-0,07	0,09
Standard deviation	0,94	1,11	0,13	0,12	0,20	0,18
Average value (for all variables QI-QIII)	1,42	1,53	-0,05	0,06	-0,03	0,07
n important observations (QI-QIII)	23	94	23	94	23	94
n important observations %	48,94%	49,47%	48,94%	49,47%	48,94%	49,47%
Average value (for all variables Del-DelX)	1,54	1,62	-0,07	0,07	-0,05	0,08
n important observations (Del-DelX)	37	152	37	152	37	152
n important observations %	78,72%	80,00%	78,72%	80,00%	78,72%	80,00%
QI - quartile I	0,93	1,05	-0,17	0,02	-0,16	0,03
Me - median	1,32	1,48	-0,04	0,06	-0,01	0,07
QIII - quartile III	2,31	2,26	0,03	0,13	0,04	0,13
Del - decile I	0,67	0,72	-0,25	-0,04	-0,31	0,00
DelX - decile IX	3,07	3,31	0,05	0,21	0,06	0,20
<i>Typical areas of variability:</i>						
50% of group <QI - QIII>	0,93-2,31	1,05-2,26	-0,17-0,03	0,02-0,13	-0,16-0,04	0,03-0,13
80% of group <Del - DelX>	0,67-3,07	0,72-3,31	-0,25-0,05	-0,04-0,21	-0,31-0,06	0,00-0,20

Source: Own calculations on the basis of the analysis of financial statements of 237 companies.

TABLE 1 (CONT-D). TYPICAL RANGES OF VARIABILITY OF FIVE SELECTED RATIOS OF ASSETS PRODUCTIVITY IN BUSINESS ENTITIES ONE YEAR BEFORE THE ADJUDICATION OF BANKRUPTCY (NB(-1)=47 BUSINESS ENTITIES) AND IN THE HEALTHY COMPANIES (NH=190 BUSINESS ENTITIES)

Chosen indicators of productivity of assets	4. Gross productivity of assets		5. Return on assets (ROA)	
	Bankrupt enterprises NB <sub>(-1)</sub> =47	Healthy enterprises NH=190	Bankrupt enterprises NB <sub>(-1)</sub> =47	Healthy enterprises NH=190
Basic statistics for the variables				
N-important observations	47	190	47	190
Missing data	143	0	143	0
MIN - minimum	-1,35	-0,63	-1,32	-0,52
MAX - maximum	0,23	1,67	0,17	1,32
Average value (for all variables)	-0,19	0,08	-0,19	0,06
Standard deviation	0,32	0,18	0,31	0,15
Average value (for all variables QI-QIII)	-0,10	0,06	-0,10	0,05
n important observations (QI-QIII)	23	94	23	94
n important observations %	48,94%	49,47%	48,94%	49,47%
Average value (for all variables Del-DelX)	-0,14	0,07	-0,14	0,05
n important observations (Del-DelX)	37	152	37	152
n important observations %	78,72%	80,00%	78,72%	80,00%
QI - quartile I	-0,25	0,02	-0,25	0,01
Me - median	-0,08	0,05	-0,08	0,04
QIII - quartile III	0,01	0,11	0,00	0,09
Del - decile I	-0,58	-0,01	-0,52	-0,01
DelX - decile IX	0,03	0,19	0,03	0,17
<i>Typical areas of variability:</i>				
50% of group <QI - QIII>	-0,25-0,01	0,02-0,11	-0,25-0,00	0,01-0,09
80% of group <Del - DelX>	-0,58-0,03	-0,01-0,19	-0,52-0,03	-0,01-0,17

Source: Own calculations on the basis of the analysis of financial statements of 237 companies.

TABLE 2. TYPICAL RANGES OF VARIABILITY OF FIVE SELECTED RATIOS OF ASSETS PRODUCTIVITY IN BUSINESS ENTITIES TWO AND THREE YEARS BEFORE THE ADJUDICATION OF BANKRUPTCY (NB(-2)=186 BUSINESS ENTITIES; NB(-3)=165 BUSINESS ENTITIES)

Chosen indicators of productivity of assets	1. Productivity of assets		2. Profit from the sale to assets		3. Return on investment (ROI)	
	Bankrupt enterprises NB(-2)=186	Bankrupt enterprises NB(-3)=165	Bankrupt enterprises NB(-2)=186	Bankrupt enterprises NB(-3)=165	Bankrupt enterprises NB(-2)=186	Bankrupt enterprises NB(-3)=165
Basic statistics for the variables						
N-important observations	186	165	186	165	186	165
Missing data	4	25	4	25	4	25
MIN - minimum	0,00	0,00	-1,72	-0,59	-1,13	-0,63
MAX - maximum	13,38	15,11	0,44	0,58	0,43	0,56
Average value (for all variables)	1,91	1,99	-0,02	0,01	-0,02	0,02
Standard deviation	1,40	1,47	0,19	0,15	0,18	0,16
Average value (for all variables QI-QIII)	1,68	1,75	0,00	0,02	0,01	0,04
n important observations (QI-QIII)	92	83	92	83	92	83
n important observations %	49,46%	50,30%	49,46%	50,30%	49,46%	50,30%
Average value (for all variables Del-DelX)	1,73	1,82	0,00	0,02	0,00	0,03
n important observations (Del-DelX)	148	131	148	131	148	131
n important observations %	79,57%	79,39%	79,57%	79,39%	79,57%	79,39%
QI - quartile I	1,01	1,10	-0,07	-0,03	-0,07	-0,02
Me - median	1,63	1,71	0,01	0,02	0,02	0,04
QIII - quartile III	2,45	2,43	0,06	0,07	0,06	0,08
Del - decile I	0,74	0,81	-0,20	-0,18	-0,20	-0,18
DelX - decile IX	3,11	3,45	0,11	0,15	0,13	0,16
<i>Typical areas of variability:</i>						
50% of group <QI - QIII>	1,01-2,45	1,10-2,43	-0,07-0,06	-0,03-0,07	-0,07-0,06	-0,02-0,08
80% of group <Del - DelX>	0,74-3,11	0,81-3,45	-0,20-0,11	-0,18-0,15	-0,20-0,13	-0,18-0,16

Source: Own calculations on the basis of the analysis of financial statements of 351 companies.

TABLE 2 (CONT-D). TYPICAL RANGES OF VARIABILITY OF FIVE SELECTED RATIOS OF ASSETS PRODUCTIVITY IN BUSINESS ENTITIES TWO AND THREE YEARS BEFORE THE ADJUDICATION OF BANKRUPTCY (NB(-2)=186 BUSINESS ENTITIES; NB(-3)=165 BUSINESS ENTITIES)

Chosen indicators of productivity of assets	4. Gross productivity of assets		5. Return on assets (ROA)	
	Bankrupt enterprises NB(-2)=186	Bankrupt enterprises NB(-3)=165	Bankrupt enterprises NB(-2)=186	Bankrupt enterprises NB(-3)=165
Basic statistics for the variables				
N-important observations	186	165	186	165
Missing data	4	25	4	25
MIN - minimum	-14,58	-0,88	-14,56	-0,88
MAX - maximum	0,41	1,60	0,29	1,60
Average value (for all variables)	-0,13	0,00	-0,14	-0,01
Standard deviation	1,08	0,21	1,08	0,20
Average value (for all variables QI-QIII)	-0,02	0,02	-0,02	0,01
n important observations (QI-QIII)	92	83	92	83
n important observations %	49,46%	50,30%	49,46%	50,30%
Average value (for all variables Del-DelX)	-0,03	0,01	-0,03	0,00
n important observations (Del-DelX)	148	131	148	131
n important observations %	79,57%	79,39%	79,57%	79,39%
QI - quartile I	-0,11	-0,03	-0,11	-0,05
Me - median	0,00	0,02	0,00	0,01
QIII - quartile III	0,03	0,06	0,02	0,05
Del - decile I	-0,29	-0,21	-0,28	-0,21
DelX - decile IX	0,10	0,13	0,08	0,11
<i>Typical areas of variability:</i>				
50% of group <QI - QIII>	-0,11-0,03	-0,03-0,06	-0,11-0,02	-0,05-0,05
80% of group <Del - DelX>	-0,29-0,10	-0,21-0,13	-0,28-0,08	-0,21-0,11

Source: Own calculations on the basis of the analysis of financial statements of 351 companies.