

Małgorzata Just, Magdalena Śmiglak-Krajewska

Poznań University of Life Sciences, Poland

EARLY WARNING MODELS AS A TOOL OF ASSESSMENT OF THE FINANCIAL CONDITION OF FEED PRODUCING ENTERPRISES¹

MODELE WCZESNEGO OSTRZEGANIA JAKO NARZĘDZIE OCENY KONDYCJI FINANSOWEJ PRZEDSIĘBIORSTW PRODUKUJĄCYCH PASZE

Key words: discriminant analysis, feed producing enterprises, bankruptcy, financial condition

Słowa kluczowe: analiza dyskryminacyjna, przedsiębiorstwa paszowe, upadłość, kondycja finansowa

Abstract. The aim of this study was to assess the financial situation of enterprises producing feeds, focusing on the potential risk of bankruptcy. Selected Polish models of discriminant analysis were used for the assessment of the financial condition of enterprises. Studies have shown that between the years 2006 to 2011, Cargill Polska, De Heus and Polmass had a good financial situation. The situation of PPUH Pasz Konspol and Fel Pasz was unfavourable, whereas Agrocentrum and EuroPol were in a poor situation between 2007 and 2008. The assessment of the financial condition, by means of the applied early warning models, was not unequivocal for medium and small enterprises.

Introduction

The global financial crisis, which became more intense in the second half of 2008, caused a considerable increase in the number of endangered business entities around the world. In view of this fact, the problem of enterprise bankruptcy and its forecasting is more and more frequently becoming an area of interest of a wide range of stakeholders, i.e. enterprise managers, investors and creditors. According to statistics provided by Euler Hermes – an international company, the number of companies in the USA which face bankruptcy increased by 54%, in Spain – by as much as 118% and in the United Kingdom – by 56% [Karol 2010]. After 2008, the financial crisis also had an effect on the number of bankruptcies in Poland. According to the Coface Report [*Raport Coface ... 2011, Baranowska-Skimina 2013*], between the years 1997-2002, there was a steady increase in the number of bankruptcy orders (from 794 to 1863). In the six following years, there was a slow decrease in the number of bankruptcies (from 1798 in 2003 to 411 in 2008). Since 2009, the number of enterprise bankruptcies in Poland has remained at a high level. In 2011, courts declared the bankruptcy of 723 Polish companies, whereas in 2012 877 entities went bankrupt, which is an increase of more than 21% as compared with 2011. Looking at bankruptcy in terms of legal status, the highest number of limited liability companies went bankrupt between 2008 and 2011, followed by sole proprietors and joint-stock companies.

In recent years, in Poland, there has been an increasing demand for industrial feeds, which is the consequence of the continuing high dynamics of poultry production and intensive pig breeding. According to the data of the Institute of Agricultural and Food Economics, in 2011 the production of industrial feeds was 8.0 million tonnes, 1.4% higher than in 2010 [*Analizy rynkowe 2012*]. In 2011, the economic and financial situation of feed producing companies which had to submit financial reports became worse than in the previous year. The companies noted an increase in income but their profits and level of financial liquidity decreased. At the same time, financial results in the entire food industry were also worse than in the previous year. The financial situa-

¹ The publication was prepared as part of Research Area 5. The economic conditions of the development of production, infrastructure, market and turnover system and the profitability of using legumes for feeds in Poland, the long-term programme: The improvement of domestic sources of vegetable protein, their production and use in feeds.

tion of feed producing enterprises became worse mainly due to an increase in costs of materials and raw materials, which was higher than the increase in sales prices of produced feeds [*Analizy rynkowe* 2012]. Hence, the main goal of this study is an assessment of the financial situation of selected feed producing enterprises in Poland in view of the danger of bankruptcy.

Research material and methodology

Selected Polish models of discriminant analysis, with more than 50% effectiveness, were used for the assessment of the financial condition of enterprises [Hamrol, Chodakowski 2008]. The method of purposive sampling was used to select research objects. The basic criteria of research unit selection were: the main field of business activity – animal feed production² (enterprises belonging to group 10.9 according to the Polish Classification of Activities) and the availability of financial data. The research objects were divided into three groups depending on the number of people employed, i.e. small (17 enterprises), medium (9 enterprises) and large (3 enterprises) (Tab. 1). The first group included entities employing from 10 to 49 people, the second group – those employing from 50 to 249 people and the third group – those employing more than 249 people. Empirical research material was collected from financial reports published in the Official Journal of the Republic of Poland “Polish Monitor B” for the years 2006-2011 [*EMIS Emerging...* 2013]. In the case of several enterprises under study, data for 2011 were not available.

Symptoms of bankruptcy may appear a few years before its real occurrence. Therefore, more and more often, attempts are being made to find methods of detection of financial danger well ahead of time in order to take specific preventive action. Fitzpatrick [1932] was the first to attempt to select indexes in terms of their usefulness for prediction of the danger of bankruptcy. Further intense research on the models of early warning of bankruptcy led to the development of a large number of different models, including discriminant analysis models [Altman 1968, 1983]. They enable the complex assessment of the economic and financial situation of the enterprise [Grzegorzewska 2008]. This study uses Polish models of discriminant analysis. Five models of relatively high effectiveness were selected [Hamrol, Chodakowski 2008]. They are the models of Gajdka and Stos, Hadasik, Hamrol, Czajka and Piechocki, as well as Prusak and Wierzba. The first model, by Gajdka and Stos, is expressed with the following formula:

$$Z_{GS} = 0.7732059 - 0.0856425 X_1 + 0.0007747 X_2 + 0.9220985 X_3 + 0.6535995 X_4 - 0.594687 X_5$$

where:

X_1 – net income from sales/total assets; X_2 – (short-term liabilities/income from sales of products³) x 365; X_3 – net profit/total assets; X_4 – gross profit/net sales income; X_5 – total liabilities/total assets.

This model set the critical value of the discriminant function at 0.45. A higher value of the discriminant function means the enterprise is not in danger of bankruptcy. The model was created upon the analysis of the financial reports from 40 enterprises from the period 1994-1995. In the sample of 40 enterprises 20 were qualified as bankrupt and the other 20 as not endangered by bankruptcy. The entities which were not threatened by bankruptcy were industrial, building and trade enterprises listed at the Warsaw Stock Exchange. There is no information about the branches represented by the enterprises which were presumed to be bankrupt. According to the research by M. Hamrol and J. Chodakowski the overall efficiency of the model was high and amounted to 70.7%, where the output efficiency published by the authors of the model was 92.5% [Gajdka, Stos 1996, Hamrol, Chodakowski 2008].

D. Hadasik's model is expressed with the following formula:

$$Z_H = 2.36261 + 0.365425 X_1 - 0.765526 X_2 - 2.40435 X_3 + 1.59079 X_4 + 0.00230258 X_5 - 0.0127826 X_6$$

² This study only analyses enterprises with the chief business activity of producing feeds for domesticated animals.

³ The original model uses the cost of products sold. Due to the absence of data this study replaces the cost of products sold with the income from sales of products [Bieniasz, Czerwińska-Kayzer 2007].

where:

X_1 – current assets/current liabilities; X_2 – (current assets – inventory)/current liabilities; X_3 – total liabilities/total assets; X_4 – (current assets – short-term liabilities)/total assets; X_5 – receivables/sales income; X_6 – inventory/sales income.

In Hadasik's model, enterprises can be divided into two groups: those in danger of bankruptcy and those without danger of bankruptcy. The critical value of the discriminant function is 0. The model was constructed upon the analysis of 61 enterprises, including 39 enterprises without the danger of bankruptcy and 22 bankrupts. The enterprises which submitted a bankruptcy petition to a province court in Poznań, Piła or Leszno between 1991 and 1997 were considered to be bankrupt. The entities with different ownership structures were analysed, but most of them were state-owned enterprises, limited liability companies, public limited companies and cooperatives. Hadasik's model had high output efficiency – according to the author of the model, it was 95.08%. In the studies by M. Hamrol and J. Chodakowski the overall efficiency of prediction was 57.6% [Hadasik 1998, Hamrol, Chodakowski 2008].

The model by M. Hamrol, B. Czajka and M. Piechocki, which is also called the Poznań model, uses the following equation:

$$Z_{po} = 3.562 X_1 + 1.588 X_2 + 4.288 X_3 + 6.719 X_4 - 2.368$$

where:

X_1 – net financial result/total capital; X_2 – (current assets – inventory)/short-term liabilities; X_3 – constant capital/total capital; X_4 – sales financial result/sales income.

The Poznań model assumes the critical value of the discriminant function as 0. The model was created upon the analysis of the financial reports of 100 Polish commercial law companies from 1999 to 2002, where 50 enterprises were healthy. The enterprises with bankruptcy or arrangement proceedings were considered to be bankrupt. The healthy companies were selected according to the volume of assets. The output efficiency of the model presented by its authors was 96%, whereas according to the research by M. Hamrol and J. Chodakowski, the overall efficiency of the model after a change in the data was 54.8% [Hamrol et al. 2004, Hamrol, Chodakowski 2008].

B. Prusak's model assumes the following formula:

$$Z_p = 1.438 X_1 + 0.188 X_2 + 5.023 X_3 - 1.871$$

where:

X_1 – (net profit + depreciation)/total liabilities; X_2 – operating costs/short-term liabilities; X_3 – sales profit/total assets.

Prusak's model assumes the critical value as -0.295, whereas the 'grey zone' refers to the discriminant function values from the interval $<-0.7; 0.2>$. When constructing the model the data under analysis were divided into the training sample and the testing sample. The first sample contained 40 enterprises endangered by bankruptcy and 40 enterprises in good financial condition. The enterprises were paired according to branches. The other testing sample contained 39 bankrupt entities and 39 enterprises without the danger of bankruptcy. The model correctly classified 97.40% of the entities from the training sample and 94.87% from the testing sample. The model was the most efficient – 91.3% in the group of companies analysed by M. Hamrol and J. Chodakowski [Hamrol, Chodakowski 2008, Korol, Prusak 2005].

D. Wierzba's model is described with the following formula:

$$Z_w = 3.26 X_1 + 2.16 X_2 + 0.3 X_3 + 0.69 X_4$$

where:

X_1 – (operating profit – depreciation)/total assets; X_2 – (operating profit – depreciation)/income from sales of products; X_3 – current assets/total liabilities; X_4 – working capital/total assets.

The critical value in the model is 0. The enterprises with a negative discriminant function value are in danger of bankruptcy, whereas the enterprises with a high positive discriminant function value are considered to be the best. The data from the financial reports of 24 enterprises endangered by bankruptcy and 24 enterprises in good financial condition were used to construct the model. The entities whose bankruptcy was announced in the sentence of the commercial court or those where arrangement proceedings were in progress between 1995 and 1998 were considered to be threatened by bankruptcy. The efficiency of the model in the training sample was 92%, whereas the overall efficiency of prediction in the research by M. Hamrol and J. Chodakowski was 75.9% [Hamrol, Chodakowski 2008, Wierzba 2000].

Research results

Table 1 lists the models of discriminant analysis, which indicated the poor financial situation of feed producing enterprises under study. Table 2 also shows the total number of small, medium and large enterprises in poor and good condition according to individual models.

As can be seen from the data in Table 1, of all the large enterprises under study from 2006 to 2011, the companies Cargill and De Heus were in a financial situation. Gajdka and Stos's model indicated the danger of bankruptcy in those companies for a period of one year (the discriminant function values were only slightly lower than the critical value), whereas Prusak's model labelled them as 'grey zone' enterprises. In the third large company, Wipasz, the indications of discriminant models were not unequivocal. According to Gajdka and Stos's model as well as Prusak's model, the enterprise was not in good financial condition, whereas the other models indicated favourable conditions of Wipasz.

When analysing medium feed producing enterprises, it is possible to note the fact that most enterprises were in big danger of bankruptcy between the years 2007-2008. In those years the danger of bankruptcy was signalled for most enterprises by Gajdka and Stos's model as well as Prusak's model. During that period, the Poznań model also gave Agrocentrum a warning. The Poznań model and Wierzba's model also sounded a warning to PPUH Pasz Konspol. Apart from Hadasik's model, between 2008 and 2011, all of the discriminant analysis models pointed to the unfavourable financial situation of PPUH Pasz Konspol. Hadasik's model signalled a bad financial situation only to Sano NZZ, whereas the other models failed to signal any danger to that company. This is a consequence of the heavy weight of liquidity ratios in the model and high excess liquidity in Sano NZZ during the period under analysis.

When analysing small enterprises, it is worth noting that similarly to medium companies, Gajdka and Stos's model as well as Prusak's model proved to be particularly sensitive to the deteriorating situation of feed producing enterprises. Out of all companies, Polmass was in the best financial condition, while Fel Pasz was in the worst financial condition during the whole period under analysis. The financial condition of Eurołpol was poor from 2007 to 2008. The danger of bankruptcy in these companies was signalled by three and four models, respectively. It is necessary to note the fact that in the following years (2009-2011) all of the applied early warning models pointed to the good financial situation of Eurołpol. As far as most small enterprises are concerned, their financial situation deteriorated from 2007 to 2008. The assessment of the financial situation by means of the applied discriminant models was not unequivocal for medium and small enterprises under investigation. This fact points out the necessity of supplementing the assessment of the financial situation of the enterprises with e.g. a ratio analysis.

Table 1. The financial situation of selected feed producing enterprises according to various models
 Tabela 1. Sytuacja finansowa wybranych przedsiębiorstw paszowych według różnych modeli

Company/Przedsiębiorstwo	Models indicating danger (grey zone)/ Modele wskazujące zagrożenie (przynależność do szarej strefy)					
	2006	2007	2008	2009	2010	2011
Large enterprises/Duże przedsiębiorstwa						
Cargill Polska Sp. z o.o.	-	-	-	-	-	GS; (P)
De Heus Sp. z o.o.	GS; (P)	-	-	-	-	-
Wipasz S.A.	(P)	GS	GS; P	GS; (P)	GS; (P)	GS; (P)
Medium enterprises/Średnie przedsiębiorstwa						
Agrocentrum Sp. z o.o.	GS; P	GS; PO; P	GS; PO; P	GS; P	GS; P	GS; P
Dossche Sp. z o.o.	GS; (P)	GS; (P)	GS; (P)	GS	GS; (P)	GS; (P)
Golpasz S.A.	-	GS; (P)	GS; (P)	GS; P	(P)	GS*
Polsanders Sp. z o.o.	GS; (P)	GS; P	GS; P	GS; (P)	GS; P	no data
PPUH Pasz Konspol Sp. z o.o.	P	GS; P	GS; PO; P; W	GS; PO; P; W	GS; PO; (P); W	GS; PO; (P); W
PZZ w Wałczu Sp. z o.o.	GS; P	P	P	-	-	-
Sano NŻZ Sp. z o.o.	H	H	H	H	H	H
Trouw Nutrition Polska Sp. z o.o.	GS; P	GS; P	GS; (P)	-	-	(P)
Wytwórnia Pasz Lira Sp. z o.o.	GS	GS	GS; (P)	GS; (P)	GS	no data
Small enterprises/Male przedsiębiorstwa						
Drobex-Pasz Sp. z o.o.	GS(P)	GS; P	GS; (P)	GS; (P)	GS; P	GS; (P)
Eurołpol Sp. z o.o.	-	H; PO; P; W	H; PO; P; W	-	-	-
Fel Pasz Sp. z o.o.	GS; PO; P	GS; PO; P	GS; PO; (P)	GS; PO; (P)	GS; PO; P	no data
GSSCH w Koszalinie	GS; P	GS; P	GS; (P)	GS; (P)	GS; (P)	no data
Neorol Sp. z o.o.	GS; (P)	GS	GS	GS	GS	GS
Pol Pasz Sp. z o.o. Siedlce	GS; P	GS; P	GS (P)	GS (P)	GS; P	GS (P)
Polmass S.A.	-	-	-	-	-	-
POR Pro Agro Wytwórnia Pasz i Koncentratów Sp. z o.o.	-	-	-	-	H	H
PPH Słaro J. Bębniasta U. Duda A. Drożdż S. Słomczewski Sp. j.	GS; (P)	GS; (P)	GS	-	-	-
PPH Util Pasz Andrzej Sójka Sp. j.	-	GS	GS	GS	-	-
PPHU Wola Pasze Sp. z o.o.	GS; P	GS; P	GS; P	GS; P	GS; PO; P	GS; (P)
PRP Skioldpasz Sp. z o.o.	P	P	P; W	P	P	b.d.
San Vit A W Haliszczak Sp. j.	-	-	GS; (P)	GS; (P)	GS; P	GS; (P)
SBP PASZE Sp z o.o.	GS; (P)	-	GS; P	GS; (P)	GS	GS; (P)
Schaap Pol Sp. z o.o.	GS	GS	GS	GS	GS	GS
Wytwórnia Pasz Solpasz Sp. z o.o.	GS; P	GS; (P)	GS; (P)	GS; (P)	GS; (P)	no data
Zakład Produkcji Pasz Super Feedmix Sp. z o.o.	P	(P)	P	-	P	-

Models: Gajdka and Stos's model – GS, Hadasik's model – H, the Poznań model – PO, Prusak's model – P and Wierzba's model – W/Modele: Gajdki i Stosa – GS; Hadasik – H, Poznańskiego – PO, Prusaka – P, Wierzyby – W, * due to absence of data models P and W were not calculated/ze względu na brak danych nie obliczono modelu P; W
 Source: own study

Źródło: opracowanie własne

Table 2. The financial situation of small, medium and large feed producing enterprises
 Tabela 2. Sytuacja finansowa małych, średnich i dużych przedsiębiorstw paszowych

Number of large enterprise/ <i>Liczba dużych przedsiębiorstw</i>							
Model/ <i>Model</i>	Financial situation/ <i>Sytuacja finansowa*</i>	2006	2007	2008	2009	2010	2011
Gajdka & Stos's	TB	1	1	1	1	1	2
	NB	2	2	2	2	2	1
Hadasik's	TB	0	0	0	0	0	0
	NB	3	3	3	3	3	3
Poznań	TB	0	0	0	0	0	0
	NB	3	3	3	3	3	3
Prusak's	TB	0	0	1	0	0	0
	GZ	2	0	0	1	1	2
	NB	1	3	2	2	2	1
Wierzba's	TB	0	0	0	0	0	0
	NB	3	3	3	3	3	3
Number of medium enterprises/ <i>Liczba średnich przedsiębiorstw</i>							
Model/ <i>Model</i>	Financial situation/ <i>Sytuacja finansowa*</i>	2006	2007	2008	2009	2010	2011
Gajdka & Stos's	TB	6	7	7	6	5	4
	NB	3	2	2	3	4	3
Hadasik's	TB	1	1	1	1	1	1
	NB	8	8	8	8	8	6
Poznań	TB	0	1	2	1	1	1
	NB	9	8	7	8	8	6
Prusak's	TB	4	5	4	3	2	1
	GZ	2	2	4	2	4	3
	NB	3	2	1	4	3	2
Wierzba's	TB	0	0	1	1	1	1
	NB	9	9	8	8	8	5
Number of small enterprises/ <i>Liczba małych przedsiębiorstw</i>							
Model/ <i>Model</i>	Financial situation/ <i>Sytuacja finansowa*</i>	2006	2007	2008	2009	2010	2011
Gajdka & Stos's	TB	10	10	12	11	10	7
	NB	7	7	5	6	7	6
Hadasik's	TB	0	1	1	0	1	1
	NB	17	16	16	17	16	12
Poznań	TB	1	2	2	1	2	0
	NB	16	15	15	16	15	13
Prusak's	TB	7	7	5	2	7	0
	GZ	4	3	6	7	2	5
	NB	6	7	6	8	8	8
Wierzba's	TB	0	1	2	0	0	0
	NB	17	16	15	17	17	13

* TB – threat of bankruptcy, NB– no threat of bankruptcy, GZ – grey zone/TB – zagrożenie upadłością, NB– niezagrożone upadłością, GZ – należące do szarej strefy

Source: own study

Źródło: opracowanie własne

Summary

Upon analysis, two large companies, Cargill Polska and De Heus, were found to be in a good financial situation. As far as the third company is concerned, i.e. Wipasz, two discriminant models indicated a worse financial condition between 2008 and 2011. As far as smaller enterprises are concerned, their financial situation most commonly worsened in 2007 and 2008. During the whole period under investigation, Polmass was in the best financial condition, but PPUH Pasz Konspol and Fel Pasz were in the worst, whereas the financial situation of Agrocentrum and Eurołpol was bad between 2007 and 2008.

It is noteworthy that Gajdka and Stosa's model as well as Prusak's model proved to be particularly sensitive to the deteriorating situation of feed producing enterprises. The assessment of the financial situation by means of the applied early warning models was not unequivocal for most of the medium and small feed producing enterprises. This fact highlights the need to supplement the process of assessing the financial situation of enterprises with other methods.

Bibliography

- Altman E.I. 1968: *Financial ratios, discriminant analysis and the prediction of corporate bankruptcy*, Journal of finance, No 4, Vol. 23, p. 589-609.
- Altman E.I. 1983: *Corporate financial distress: A complete guide to predicting, avoiding, and dealing with bankruptcy*, John Wiley & Sons, New York.
- Analizy rynkowe. Rynek pasz – stan i perspektywy (wrzesień 2012), IERiGŻ-PIB, Warszawa, nr 32, s. 18, 21.
- Baranowska-Skimina A. 2013: *Upadłość firm w Polsce w 2012 r.*, www.egospodarka.pl, access 03.01.2013.
- Bieniasz A., Czerwińska-Kayzer D. 2007: *Cykl środków pieniężnych i jego przydatność w określaniu płynności finansowej oraz sprawności działania przedsiębiorstwa*, Roczn. Nauk. SERIA, t. IX, z. 3, s. 20-24.
- Fitzpatrick P.J. 1932: *A comparison of ratios of successful industrial enterprises with those of failed firms*, Certified Public Accountant, Vol. 12, October, November, December, p. 598-605, 656-662, 727-731.
- Gajdka J., Stos D. 1996: *Wykorzystanie analizy dyskryminacyjnej w ocenie kondycji finansowej przedsiębiorstw*, [W:] R. Borowiecki (red.) *Restrukturyzacja w procesie przekształceń i rozwoju przedsiębiorstw*, Wyd. Akademii Ekonomicznej w Krakowie, Kraków, s. 56-65.
- EMIS Emerging Markets Information Service, www.securities.com, access 10.01.2013.
- Grzegorzewska E. 2008: *Ocena zagrożenia upadłością przedsiębiorstw w sektorze rolniczym*, Zesz. Nauk. SGGW w Warszawie, Ekonomika i Organizacja Gospodarki Żywnościowej nr 64, Wyd. SGGW, Warszawa, s. 230.
- Hadasik D. 1998: *Upadłość przedsiębiorstw w Polsce i metody jej prognozowania*, Zesz. Nauk., Seria II, nr 153, Wyd. Akademii Ekonomicznej w Poznaniu, Poznań.
- Hamrol M., Chodakowski J. 2008: *Prognozowanie zagrożenia finansowego przedsiębiorstwa. Wartość predykcyjna polskich modeli analizy dyskryminacyjnej*, Badania operacyjne i decyzyjne, nr 3, s. 21-23, 29.
- Hamrol M., Czajka B., Piechocki M. 2004: *Upadłość przedsiębiorstwa – model analizy dyskryminacyjnej*, Przegląd Organizacji, nr 6, s. 35-39.
- Korol T., Prusak B. 2005: *Upadłość przedsiębiorstw a wykorzystanie sztucznej inteligencji*, CeDeWu, Warszawa.
- Karol T. 2010: *Prognozowanie upadłości firm przy wykorzystaniu miękkich technik obliczeniowych*, www.e-finance.com/artykuly_eng/140.pdf, access 20.01.2013.
- Raport Coface nt. upadłości firm w 2011 roku, www.coface.pl, access 10.01.2013.
- Wierzba D. 2000: *Wczesne wykrywanie przedsiębiorstw zagrożonych upadłością na podstawie analizy wskaźników finansowych – teoria i badania empiryczne*, Zesz. Nauk. WSE-I w Warszawie nr 8, Warszawa.

Streszczenie

Celem badań była ocena sytuacji finansowej przedsiębiorstw produkujących pasze z punktu widzenia zagrożenia upadłością. Do oceny kondycji finansowej przedsiębiorstw wykorzystano wybrane polskie modele analizy dyskryminacyjnej. Z badań wynika, że w dobrej sytuacji finansowej w latach 2006-2011 znajdowały się spółki Cargill Polska, De Heus i Polmass, a w niekorzystnej PPUH Pasz Konspol, Fel Pasz oraz spółki Agrocentrum i Eurołpol w latach 2007-2008. Ocena kondycji finansowej za pomocą zastosowanych modeli wczesnego ostrzegania w przypadku średnich i małych przedsiębiorstw nie była jednoznaczna.

Correspondence address

Małgorzata Just Ph.D, Magdalena Śmiglak-Krajewska Ph.D
Poznań University of Life Sciences, Finance and Accounting Department
28 Wojska Polskiego St., 60-637 Poznań
phone: 61 846 61 01, e-mail: m.just@up.poznan.pl, smiglak-krajewska@up.poznan.pl