

AGRICULTURAL SECTOR PERFORMANCE EVALUATION IN TERMS OF FINANCIAL INDICATORS: A COMPARISON OF CZECH REPUBLIC, SLOVAKIA AND WESTERN BALKAN STATES

Jana Hornungová¹, František Milichovský¹

¹Brno University of Technology, Faculty of Business and Management, Kolejní 290614, 61200 Brno, Czech Republic

Abstract

HORNUNGOVÁ JANA, MILICHOVSKÝ FRANTIŠEK. 2018. Agricultural Sector Performance Evaluation in Terms of Financial Indicators: a Comparison of Czech Republic, Slovakia and Western Balkan States. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 66(2): 497–507.

Agriculture and food industry have become part of strategic areas for each country and each region of Europe. Important condition on companies in group A (according NACE classification) is fulfilling requirements of management in performance of financial area. Traditional financial indicators (calculated from accounting data) are still used to evaluate performance level, what have been considered to be the most appropriate approach over a long period of time in spite of different accounting and financial indicators. The main objective is to find crucial factors in the field of financial performance for agriculture companies in chosen region. Data from 10438 agricultural companies have been get from Amadeus database and analysed. For purpose of the paper there were used factor analysis, Pearson chi-square test for independence, and correspondence analysis. By application of factor analysis has reduced the basic set, originally formed by seven key financial indicators, into seven indexes according analysed countries. All observed factors were put into Pearson's chi-square test to indicate the dependency between indexes and (1) company size and (2) NACE classification. Finally, there was applied correspondence analysis, by which were found out clusters of countries, industries and size.

Keywords: financial performance indicators, agricultural companies, factor analysis, correspondence analysis

INTRODUCTION

Agriculture plays a significant role in the economics of every country. Land and farm management is a sector the main task of which is to ensure nutrition of inhabitants; nevertheless, at the present time a general perception of agriculture is shifting towards the multifunctional concept of the agriculture with the emphasis on its out-of-production functions and its position as to the sustainable development. The sustainable development is defined as such development that meets the needs of the present without compromising the ability of future generations to meet their own needs, while

preserving biodiversity and understanding natural functions of ecosystems (Act on the Environment, 1992).

Agriculture is a highly labour-intensive sector and so it can be revealing to compile a partial productivity indicator from the gross value added for agriculture and the corresponding agricultural labour input data. Despite the decline in the relative economic weight of the primary sector as an inevitable consequence of economic progress (Byerlee *et al.*, 2009), its economic role remains still significant in many rural areas. Indeed, the economic importance of agriculture is generally

much greater in the east and south of Europe than in the west and north (Eurostat, 2013).

Theoretical Background

Recently, performance evaluation methods have significantly changed. Performance evaluation can be defined as the ability of a company to boost investments, put into business activities, contributing to continuous self-improvement and accomplishment of business objectives (Šulák and Vacík, 2005; Maria, 2009; Muchiri *et al.*, 2010). Performance evaluation is one of the tools helping the company management to decide how to do the business activity effectively (Arena *et al.*, 2015; Lebas, 1995).

However, according to Tyrychtr *et al.* (2015) agricultural holdings predominantly focus on technical performance (more than 50% of all companies), only then on financial performance. At the same time, share of companies targeted at the efficient economic agriculture is increasing. Nevertheless, the level of this efficiency is below 13%.

Traditional financial indicators (calculated from accounting data) are still used today to evaluate performance; this approach to performance evaluation and comparison has been recognized as the most appropriate for a long period of time in spite of different accounting and financial indicators. Since 1980 traditional methods have been facing various views, identifying contentious issues in the use of these models, resulting in the search for other opportunities for performance evaluation (Mohamed *et al.*, 2014; Neely, 2004).

Over the time, the performance has been measured either by the company size or its productivity and profit. The scientific literature divides financial indicators of the company performance into three categories (Brignall, 2007; Nicu, 2012):

Accounting results and derivative indicators are derived from financial statements. These results explain structural analysis and express corporate performance in absolute values. The advantage of these indicators is their easy detection, since they are mandatory for companies to report.

Indicators of financial productivity provide information through the value of invested assets. The best known indicator are ROI (return on investment), ROE (return on equity). Ratio indicators of financial productivity provide information helping the company to compare its productivity, which is expected by shareholders.

New category of financial indicators is represented by the metric EVA (Economic Value Added); its positive value indicates that from purely financial point of view the company has successfully generated value after the payment of all capital investments, in particular from capital shareholders. EVA helps the top-level management of the company to maintain enterprise risk management. It also provides a foundation for calculating the market value added to analyse

the current market value of the firm over the capital contributed by investors.

Recently, researchers have begun to examine firm performance as a function of alternative managerial orientations such as an entrepreneurial orientation (Ross and Westgren, 2009; Verhees *et al.*, 2011), market orientation (Verhees and Meulenbergh, 2004; Johnson *et al.*, 2009), and strategic choice (Hansson, 2007). For a firm to achieve success in implementing orientations different from a production orientation, the manager must have a willingness to change and to question current business strategies (Michaels and Gow Hamisch, 2015).

Several studies have explored farm performance across Europe, using indicators such as profitability, economic efficiency, and technical efficiency (Latruffe *et al.*, 2012; Bojnec and Latruffe, 2013; Svatoš *et al.*, 2014). Within this study, farm economic performance is assessed through the use of gross value added indicators that have been used often for measuring industry's economic performance. Thomassen *et al.* (2009) use gross value added productivity indicators to measure the economic performance of dairy farms. Similarly, Van Passel *et al.* (2007) use partial labour productivity, capital productivity and land productivity indicators to measure economic performance (Giannakis, Bruggeman, 2015).

Agriculture Situation

Situation in Czech Republic

In 2016, the Czech Republic was among the EU's fastest growing economies. In 2015, investments accounted for the dominant source of Czech economic growth. In 2015, the statistics of national accounts reported the share of agricultural sector in the total creation of gross added value in regular common prices in the value of 1.68%; i.e., the year-on-year decrease by 0.23%. In contrast, the share of the food industry in the total creation of gross added value decreased by 0.01% to 2.54%. Expressing the gross added value in comparable prices of the year 2010, mentioned share in the agriculture sector decreased by 0.01% and food industry increased by 0.11%.

Agricultural production expressed in the regular common prices represented – preliminary results for 2015 – the amount of CZK 127,048.7 M. Plant production amounted to CZK 75,149.7 M and stock farming CZK 46,008.6. The remaining part (in addition to the plant production and stock farming) was constituted by agricultural works delivered by suppliers, i.e., agricultural services output (CZK 3,258.6 M) and non-agricultural secondary activities (inseparable) worthing CZK 2,631.8 M.

As the Czech agrarian foreign trade is considered both trade performance with third countries and trade in the single market with other members of the EU. In 2015, the year-on-year value of the Czech agrarian export increased by 11.5% (i.e., by CZK 20.7 B), the value of import increased by 9.7%

(i.e., by CZK 19.4 B). In 2015, the Czech agrarian export targeted primarily at Slovakia (23.6%), Germany (20.1%) and Poland (11.3%), further to Italy (6.6%), Austria (6.1%), Hungary (4.1%), France (3.5%) and the United Kingdom (2.9%). In 2015, the Czech agrarian import was mainly from Germany (20.9%), Poland (19.0%), the Netherlands (7.2%), getting ahead (until that time the third most important supplier) Slovakia (6.8%), from Italy (5.5%), Spain (5.1%), Hungary (3.7%), Austria (3.6%) and France (3.2%) (Ministry of Agriculture of the Czech Republic, 2013).

Situation in Slovakia

Slovakia's economy continues to perform extremely well both in terms of macroeconomic outcomes and public finances. GDP growth exceeded 3.5 per cent on average in 2015 and 2016 and is projected to stay strong in the next two years. Prices have been stable, the unemployment rate has fallen below 10% – its lowest level in seven years – and the current account is near balance. The fiscal situation is solid, with a deficit of well below 2% of GDP in 2016 and a public debt around 52% of GDP, far below the OECD average. International competitiveness, fiscal and financial stability and ample foreign direct investment (FDI) are all contributing to a sustained rise in living standards (OECD, 2017).

This statistic shows the distribution of the gross domestic product (GDP) across economic sectors in Slovakia from 2005 to 2015. In 2015, agriculture contributed around 3.66 percent to the GDP of Slovakia, 34.82 percent came from the industry and 61.52 percent from the service sector. In 2014, entities in the Slovak Republic created GDP in the volume of € 75,214.9 mil. in cu.p. (€ 72,840.2 mil. in co.p.), which, compared to 2013, increased (by 2.2% at cu.p.; by 2.4% at co.p.).

According to the SO SR preliminary data for 2014, agriculture reached a negative economic result, i.e. loss of - € 4.7 mil., which was higher by € 2.2 mil. than in 2013. 2014 was characterised by noticeable fall in prices of agricultural commodities that was not compensated by the significant increase of natural production. The price development of agricultural commodities was affected by short-term and long-term factors that were reflected in the economy of products and subsequently in the economy of agricultural holdings.

The territorial structure of the Slovak agricultural trade is many years almost same. Most of exports

and imports are realized with the EU 28 countries. The share of the EU as the most important partner is currently about 97%. This fact also means strong Slovakian dependence on the European Union; in 2005, this share reached already 96%. Slovakia is mostly trading with the countries as Czech Republic, Poland, Hungary and Germany. The development of foreign trade of the Slovak Republic in 2014 was characterised by a different development between the total and agri-food foreign trade. While the total foreign trade showed a growing trend, the agri-food foreign trade recorded a year-on-year drop. Significantly higher dynamics of the decrease of agro-export compared to agro-import lead to the increase of negative trade balance by as much as € 354.8 mil. (51.9%) and the negative balance accounted for – € 1,038.1 mil. From the agro-trade territorial structure point of view, it is the EU member states that continue to strengthen their dominant status. The export to the EU-28 accounted for 96.0% within the total export of agricultural and food products, and the import from the EU-28 accounted for 91.2% within the total import (Ministry of Agriculture and Rural Development of The Slovak Republic, 2015; Smutka, Rovný, Hambalková, 2016).

Situation in Western Balkan states

The Western Balkan countries (Albania, Bosnia and Herzegovina, Serbia, Montenegro, Macedonia, and Kosovo) are still in the process of transforming their economies from the socialist system of the Socialist Federal Republic of Yugoslavia (SFRY) into a capitalist one following the Western model. Croatia became member of the European Union on 1 July 2013.

The EU is the Western Balkans' largest trading partner, accounting for over 75% of the region's total trade. In 2014, the EU's main imports from Western Balkans were (1) machinery and transport equipment (26.5%); (2) miscellaneous manufactured articles (21.3%); (3) and manufactured goods classified chiefly by materials (19.8%).

The EU's exports to the Western Balkans were mainly (1) machinery and transport equipment (27.0%); (2) manufactured goods classified chiefly by material (23.4%); (3) chemicals (14.2%); (4) mineral fuels (12.3%) (European Commission, 2016).

I: Key Figures of International Trade with Western Balkan

Indicator	Unit	Period	Imports	Exports	Total trade	Balance
Last year	Mio euros	2015	16.193	24.548	40.742	8.355
Share in EU trade	%	2015	0.90	1.4	1.20	
Annual growth rate	%	2014–2015	7.60	5.00		
Annual average growth rate	%	2011–2015	8.50	4.30		

Source: European Commission, 2016

MATERIALS AND METHODS

The main aim of this paper is to find crucial factors in the field of financial performance in agriculture companies (as one of the most important industry sector). Partial aim of the paper is to identify relationship between observed factors and company size and NACE classification. Main hypothesis suggests dependence between realization of individual activities and their performance in connection with agriculture. Agriculture has become the very important part of industry production in the past. Data have been gathered from Amadeus database and processed by the statistical program IBM SPSS Statistics 24; subsequently, (1) factor analysis, and (2) dependency between two nominal variables by means of contingency tables and Pearson's chi-squared test have been studied. To graphical design complex view on agriculture field there were used correspondence analysis.

The conditions for choice of companies:

- geographical location (West Balkan, Czech Republic, Slovakia);
- dividing according corporate size;
- classification of economic activities according to NACE classification, reduced to agriculture sectors (A1 – Crop and animal production, hunting and related service activities; A2 – Forestry and logging; A3 – Fishing and aquaculture).

According to selected NACE groups, the basic population has been defined for individual country as follow in Tab. II. Sample population of agriculture

companies consist 10438 subject in six chosen countries (Bosnia and Herzegovina, Croatia, Czech Republic, Former Yugoslav Republic of Macedonia, The Republic of Serbia, Slovakia). Only 10015 companies have reported all required data to be used for investigation. Companies, which have not provided required data in Amadeus database, were put into missing values. Total count of companies was decreased about these missing companies (see Tab. II).

Factor analysis is based on the selection of correlation and partial correlation coefficients. The correlation coefficient represents the closeness of linear dependence of individual variables and partial correlation coefficients. The partial correlation coefficient shows a similarity of two variables in such a situation that the other variables are assumed constant. If it is possible to explain the dependence of variables using common factors, the partial correlation coefficients are very small, close to zero. To assess the suitability of the factor analysis, two tests can be used (Tarnanidis *et al.*, 2015; Conti *et al.*, 2014): (1) Kaiser-Meier-Olkin (KMO) is a coefficient which could reach values between 0 and 1. Its value consists of the rate of squares sum of the correlation coefficients and squares sum of the correlation and partial coefficients; (2) The use of Bartlett's sphericity test lies in testing the null hypothesis stating that the correlation matrix of variables is unit (on diagonal, there are only ones, others are zeros). If the null hypothesis is rejected,

II: Pivot table: country, company size and NACE groups

Countries	NACE	NACE classification				Sum	Missing	Total
		Micro	Small	Medium	Large			
Bosnia and Herzegovina (BA)	A1	365	83	10	2	460		
	A2	105	57	4	7	173	11	660
	A3	10	6	0	0	16		
Croatia (HR)	A1	1066	157	37	8	1268		
	A2	66	53	2	1	122	61	1601
	A3	132	41	6	1	180		
Czech Republic (CZ)	A1	1287	1078	490	10	2865		
	A2	169	96	19	4	288	83	3265
	A3	10	13	6	0	29		
Former Yugoslav Republic of Macedonia (MK)	A1	774	50	24	1	849		
	A2	74	5	1	1	81	1	972
	A3	38	3	0	0	41		
The Republic of Serbia (RS)	A1	961	325	92	8	1386		
	A2	48	5	3	2	58	261	1754
	A3	30	16	2	1	49		
Slovakia (SK)	A1	914	670	180	0	1764		
	A2	314	54	6	1	375	36	2186
	A3	9	2	0	0	11		
Total		6372	2714	882	47	10015	453	10438

Source: own works by authors

the factor analysis may be used for the defined variables.

For the purposes of verification of the factor analysis Cronbach's alpha indicator must be used. This indicator is understood as a reliability coefficient, used as a kind of analogy with the correlation coefficient. Normally, values oscillate in the interval (0;1). Zero, as the extreme value, describes the situation in which individual variables are uncorrelated. On the other hand, the value 1 describes correlated variables. When the value is closer to 1, a higher degree of conformity is reported (Hrach, Mihola, 2006; Cronbach 1951; Řehák, Brom, 2016).

However, high Cronbach's alpha does not imply that the measure is dimensionless. If, in addition to measuring internal consistency, you wish to provide evidence that the scale in question is dimensionless, additional analyses can be performed. Exploratory factor analysis is one of the method to check dimensionality. Cronbach's alpha is not a statistical test; it is a coefficient of reliability (or consistency). The value could be expressed as the function of number of test items and the average inter-correlation among the items. Below, for conceptual purposes, we show the formula for the standardized Cronbach's alpha:

$$\alpha = \frac{N \times \bar{c}}{v + (N-1) \times \bar{c}} \quad (1)$$

where

N equals to the number of items,

c-bar is the average inter-item covariance among the items,

v-bar equals to the average variance.

The values of Cronbach's alpha could be from 0 to 1. If the values are close to 0.5, it signifies a bad level of internal consistency. Over 0.7 means that the value is acceptable and values close to 1 are excellent. A "high" value of the alpha is often used (along with substantive arguments and other statistical measures) as evidence that the items measure an underlying (or latent) construct (Hinton *et al.*, 2004).

Correspond analysis describes relation between both two nominal variables in pivot table and individual categories. In pivot table there is category combination which should become significant or not. If any categories are similar or associated, there are located in graph near themselves. Correspond analysis itself is focused on association rate, usually by chi-square measure. There are nominal variables as input into correspond analysis, and kind of premise, that there is no ordering between variables (McGarigal *et al.*, 2000; Beh, 2008, 2010). Correspond analysis processes dimensional homogenous data which consist only positive values or zeros. Chi-square range has become coefficient which excludes zeros, and help to define relations between rows and columns.

Calculation of correspondence analysis includes three steps (Řezanková, 2010): (1) pivot table

transformation into table with support of Pearson chi-square; (2) individual value decompositions are applied into defined table, then there are calculated new values and new vectors; (3) new matrix operations serve as input to graph design. Basis for two dimensional pivot tables is data matrix $n \times 2$, in which categorical variable A get r values (a_1, a_2, \dots, a_r) and categorical variable B get s values (b_1, b_2, \dots, b_s). Due realised observation there is created table by two dimensional separations of both variables. In the table is used n_{ij} frequency, which represents intersect of both variables This n_{ij} provides number of observations, where are both a_i and b_j . Except n_{ij} there are used marginal frequency n_{i+} , where ow observation with a_i value are observed (similar approach is for n_{+j}).

In that table there are applied relative frequencies (Beh, 2010; Kudlats *et al.*, 2014):

$$\sum_{i=1}^r \sum_{j=1}^s p_{ij} = \sum_{i=1}^r p_{i+} = \sum_{j=1}^s p_{+j} = 1 \quad (2)$$

Set structure is described by contingent relative frequency $p_{j/i}$ in two possible ways:

1. from point of variable B view, if variable A reaches value a_i ;

$$p_{i/j} = \frac{n_{ij}}{n_{i+}} = \frac{p_{ij}}{p_{i+}} \quad (3)$$

2. from point of variable B view, if variable A reaches value a_j ;

$$p_{i/j} = \frac{n_{ij}}{n_{+j}} = \frac{p_{ij}}{p_{+j}} \quad (4)$$

Any changes in these values transform variable dependence, which is usually measured by Pearson chi-square test (Beh, 2008):

$$\chi^2 = \sum_{i=1}^r \sum_{j=1}^s \frac{\left(\frac{n_{ij} - \frac{n_{i+} \times n_{+j}}{n}}{\frac{n_{i+} \times n_{+j}}{n}} \right)^2}{\frac{n_{i+} \times n_{+j}}{n}} = n \times \sum_{i=1}^r \sum_{j=1}^s \frac{(p_{ij} - p_{i+} \times p_{+j})^2}{p_{i+} \times p_{+j}} \quad (5)$$

After estimating the theoretical frequencies there is designed chi-square statistics. This statistic has chi-square distribution and number of degrees of freedom $(r-1)(s-1)$. On this basis, it is decided if exist dependency between variables in the population, and by using correspondence analysis is also possible to determine the structure of dependence (Beh, 2010; Kudlats *et al.*, 2014).

RESULTS

Economic data were obtained from Amadeus database – all cases and data were involved to same year 2015. It is evident that companies commonly

use traditional financial indicators for measurement of their own performance. These indicators were analysed:

- x_1 – Cash flow [th EUR];
- x_2 – P/L for period (Net income) [th EUR];
- x_3 – Operating revenue [th EUR];
- x_4 – ROA using P/L before tax [%];
- x_5 – ROE before tax [%];
- x_6 – Operating P/L (EBIT) [th EUR];
- x_7 – Shareholder funds [th EUR].

Based on the statistical characteristics of the examined groups the conclusions could be presented as an approximate result, limited by the resulting reliability. In the results of the paper there are characteristics of research barriers and future research possibilities.

For the purpose of factor analysis the value of Kaiser-Meier-Olkin test should reach the value of at least 0.5 (value range is between 0 and 1). In order to assess whether it is possible to use the factor analysis, Kaiser-Meyer-Olkin method (KMO) and Bartlett's test of sphericity have been used. The KMO method is based on selective correlation and partial correlation coefficients. For the indicators in factor analysis KMO are observed according to the highest

level of acceptance, which means that the performed level of usefulness of the factor analysis reaches high value. Bartlett's test of sphericity is a statistic test used to examine the hypothesis that the variables are correlated or uncorrelated (see Tab. III).

The total variance of the performance indicators is explained by means of eigenvalues, representing the total variance explained by each factor. The eigenvalues show that only five items have reached the minimum value of 1. From this point of view, Extraction Sums of Squared Loadings with cumulative percentage are important. Factor analysis has extracted different numbers of factors, which explains variances (see Tab. IV).

Results of all factor analysis in five countries provide in total thirteen factors. From that amount acceptable values of Cronbach's alpha for individual factors have been specified for seven indexes according to observed results in Tab. V for five countries. Other six factors have Cronbach's alpha value under minimal acceptable value (under 0,500).

Final values calculating acceptable factors need the transformation of individual coefficients. These coefficients express significance of the used elements. Their sum total must be 1. The individual

III: Kaiser-Meyer-Olkin test and test of sphericity (Bartlett's test)

	KMO	Bartlett's test	Accepted
Bosnia and Herzegovina (BA)	0.463	0.000	NO
Croatia (HR)	0.634	0.000	YES
Czech Republic (CZ)	0.856	0.000	YES
Former Yugoslav Republic of Macedonia (MK)	0.521	0.000	YES
The Republic of Serbia (RS)	0.605	0.000	YES
Slovakia (SK)	0.771	0.000	YES

Source: own works by authors

IV: Total variance of Chosen Indicators in Selected Countries

	CZ	HR	MK	RS	SK
Total variance explained [%]	89.498	90.445	90.061	82.886	84.617
Number of indexes	2	3	3	3	2
x_1	I1	I2	I1	I1	I1
x_2	I1	I2	I1	I1	I1
x_3	I1	I1	I2	I3	I1
x_4	I2	I3	I3	I2	I2
x_5	I2	I3	I3	I2	I2
x_6	I1	I1	I1	I1	I1
x_7	I1	I1	I2	I3	I1

Source: own works by authors

V: Cronbach's alpha for individual factors according to countries

	CZ	HR	MK	RS	SK
Factor 1	0.601	0.708	0.949	0.944	0.501
Factor 2	0.323	0.825	0.106	0.279	0.285
Factor 3	X	0.263	0.516	0.408	X

Source: own works by authors

factor indices have been defined by the procedures as follow:

$$Factor 1_{HR} = 0,3149 \times x_3 + 0,3475 \times x_6 + 0,3376 \times x_7 \quad (6)$$

$$Factor 2_{HR} = 0,2692 \times x_1 + 0,7308 \times x_2 \quad (7)$$

$$Factor 1_{CZ} = 0,2025 \times x_1 + 0,2021 \times x_2 + 0,1911 \times x_3 + 0,2022 \times x_6 + 0,2021 \times x_7 \quad (8)$$

$$Factor 1_{MK} = 0,2971 \times x_1 + 0,3594 \times x_2 + 0,3435 \times x_6 \quad (9)$$

$$Factor 3_{MK} = 0,5213 \times x_4 + 0,4787 \times x_5 \quad (10)$$

$$Factor 1_{RS} = 0,3512 \times x_1 + 0,3171 \times x_2 + 0,3317 \times x_6 \quad (11)$$

$$Factor 1_{SK} = 0,2091 \times x_1 + 0,1988 \times x_2 + 0,2001 \times x_3 + 0,2022 \times x_6 + 0,1898 \times x_7 \quad (12)$$

These factors can be calculated for the individual agricultural company and on the basis of their results a list of businesses can be compiled. Companies could apply these factors to compare own business

results on the way of improving processes. Factors can determine important variables of business, playing the key role in achieving the set of objectives. Proposed financial performance indicators should help companies to demonstrate a progress towards the objectives of sustainability. Also we can see basic statistics of observed indexes in Tab. VI.

Pivot tables have been employed to find possible dependencies between observed factors and company size and NACE classification, for results of the dependency tests see Tab. 7. Results of the dependence examination in individual variable categories are depicted in the following results of Pearson's chi-square test.

Maintaining the % reliability of the test, the values for connection between individual factors and company size have been determined within 0.05, which represents 5% reliability level. Established values of Pearson's test for the variables are showed in Tab. VII (i.e., less than 0.05).

Therefore, that bring us to the conclusion that an alternative hypothesis is applied – there are dependencies between all observed factors and company size for all observed indexes. Past results have revealed the relationship between indexes

VI: Descriptive statistics of observed indexes

	Mean	Median	Variance	Std. deviation
Index 1 – HR	824.3820	107.9335	39341638.75	6272.29135
Index 2 – HR	36.1622	10.4988	708435.765	841.68626
Index 1 – CZ	1358.3720	455.3022	261767244.7	16179.22262
Index 1 – MK	9.3446	3.3435	12416.952	111.43138
Index 3 – MK	8.1245	5.9574	1217.821	34.89729
Index 1 – RS	57.991758	2.814500	289355.918	537.9181332
Index 1 – SK	560.9654	150.2338	19894716.40	4460.34936

Source: own works by authors

VII: Pearson's test of the relationship between individual indexes, company size and NACE classification

		Corporate size		NACE classification	
		Value	Asymp. Sig.	Value	Asymp. Sig.
Index 1 – HR	Pearson Chi-Square	595.033	0.000	7.543	0.274
	Contingency Coefficient	0.540		0.071	
Index 2 – HR	Pearson Chi-Square	321.857	0.000	7.868	0.248
	Contingency Coefficient	0.447		0.077	
Index 1 – CZ	Pearson Chi-Square	2314.067	0.000	53.398	0.000
	Contingency Coefficient	0.649		0.127	
Index 1 – MK	Pearson Chi-Square	146.230	0.000	13.492	0.096
	Contingency Coefficient	0.362		0.117	
Index 3 – MK	Pearson Chi-Square	24.148	0.019	14.710	0.065
	Contingency Coefficient	0.156		0.122	
Index 1 – RS	Pearson Chi-Square	386.549	0.000	14.692	0.023
	Contingency Coefficient	0.459		0.094	
Index 1 – SK	Pearson Chi-Square	1402.331	0.000	101.673	0.000
	Contingency Coefficient	0.628		0.211	

Source: own works by authors

and company size and NACE classification. Subsequently, degree of such dependence has been examined. To that end, the intensity of dependence determined by means of contingency coefficient.

The intensity of dependence ranges between (0;1). That means that the higher the absolute value, the greater the intensity of dependence. Tab. VII shows that observed indexes in each country are close connected within the size of the company – all significance values are in 5 % of limit of error, and three indexes (in Czech Republic, Slovakia and Republic of Serbia) are close connected within the NACE classification. Intensity of the dependence is given by Contingency coefficient, which provides view in this connection. There is defined intensity between indexes and company size in four partial intervals, in which dependence fall inside:

1. values within (0;0,25) have intensity of dependence is low and weak, they couldn't be under continue monitoring ($\Pi_{MK} = 0,362$; $I3_{MK} = 0,156$);
2. values between (0,25; 0,5) reach rather low dependence between two variables and become

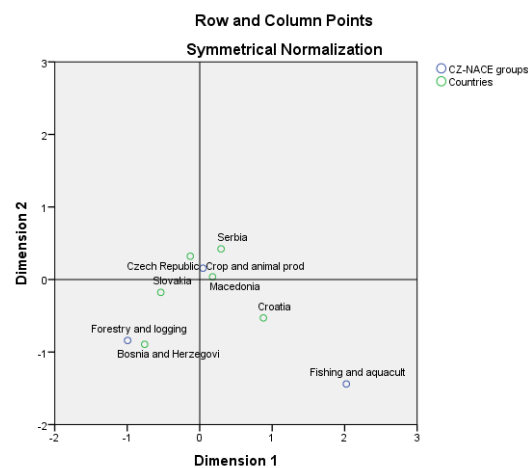
more interesting for monitoring ($I2_{HR} = 0,447$; $\Pi_{RS} = 0,459$);

3. interval (0,5; 0,75) shows strong dependences as important field for observation ($\Pi_{HR} = 0,540$; $\Pi_{CZ} = 0,649$; $\Pi_{SK} = 0,628$);
4. interval (0,75; 1,0) shows strong dependences, which should be crucial (none).

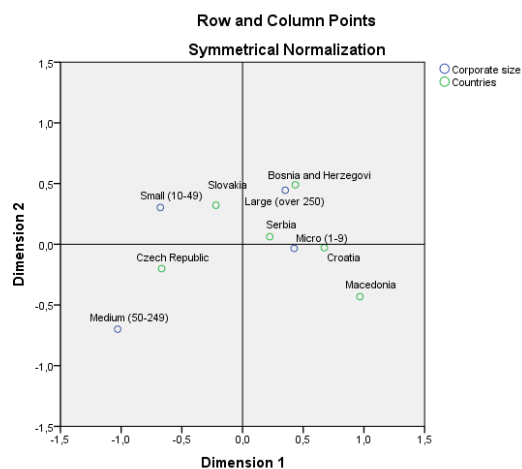
In terms of NACE classification, all dependencies are in the first interval, which means a low intensity of these dependencies.

Load indicators (Mass) indicate load line which represents the percentage of information across the table in appropriate category. That loads are obtained as the ratios of the row and column marginal frequencies (n_{i+} , n_{+j}) in whole table of individual categories (n).

Score in dimension describes individual variables score in two main dimensions. These dimensions don't represent any specific area, because they are reduced to from multi-dimension space. All data in rows and columns have been usually in multi-dimension space, which are reduced into



1: Symmetrical correspond map of countries and NACE. Source: own works



2: Symmetrical correspond map of countries and corporate size. Source: own works

two. Providing information of raw data has not been modified after multi-dimension space reduction of these variables. Inertia indicator represents the share comprehensive information on the profile (on the relevant point). This characteristic is independent of the number of dimensions. Corresponding map includes a graphical representation of both row and column categories according to their dimension scores (Hebák *et al.*, 2007; D'Esposito *et al.*, 2014).

Results of correspondence analysis are included in graphs, which illustrate relations between individual categories and variables. Fig. 1 shows row and column points of two dimensional solution. By using symmetrical normalization simplifies examining the relationships between individual categories of the variables. Both dimension 1 and dimension 2 provide only „describing space“, in which were realisation of marketing activities and size of company. Gained results are confirmed by significance value of Chi-square test. According to computation this significance is at value 0,000 (see Tab. VII).

An illustrative graph, attached as Fig. 1, displaying the relations among the individual categories

and variables, specific links among countries and NACE classification items, is the output of the correspondence analysis. Three separate groups of categories can be identified. We can say that the Czech Republic, Slovakia and Macedonia focus on the agricultural and animal production, Bosnia-Herzegovina aims mainly at forestry and logging. Moreover, it has been further confirmed that Croatia is a leading producer in the sector of fishing and aquaculture, also based on its geographical location.

Furthermore, a relation between the size of the company and defined countries has been investigated. Interlinks between investigated categories see Fig. 2.

Generally, scheme (Fig. 2) indicates that micro-companies are primarily established in Croatia and Macedonia, small agricultural companies mainly in Slovakia. The Czech Republic reported the largest number of medium-sized agricultural companies. Large companies employing more than 250 people are located in Serbia and Bosnia-Herzegovina.

CONCLUSION

The purpose of this paper was to analyse the performance evaluation in terms of financial indicators, specified in agricultural sector in chosen countries. According to Weill *et al.* (2005), there is not a universally or even commonly used set of measures for evaluating the financial performance of firms. Multiple measures covering investor and accounting returns are typically recommended including: profitability, efficiency and market value (Poláková *et al.*, 2015).

The main aim of this paper has been to find crucial factors in the field of financial performance in agriculture companies from selected areas and identify relationship between observed factors and company size and NACE classification. Empirical research deals with factor analysis that gives up reduction of surveyed indicators. Our research has showed that there are new two indexes for Czech Republic, three indexes for Croatia, three indexes for Macedonia, three indexes for the Republic of Serbia and two indexes for Slovakia. These indexes are specific groups of financial indicators in the area of agricultural companies and consist of traditional financial indicators complemented of (for instance): Cash flow, P/L for period, Operating revenue, ROA, ROE, EBIT and Shareholder funds. At the same time, dependence among the above mentioned factors (indices) and company size and NACE classification has been identified. Observed indexes in each country are close connected within the size of the company – all significance values are in 5% of limit of error, and three indexes (in Czech Republic, Slovakia and Republic of Serbia) are close connected within the NACE classification. Than two correspond maps were constructed. Based on correspondence analysis, we can therefore say that the countries Czech Republic, Slovakia and Macedonia are focused on agricultural and livestock production, Bosnia and Herzegovina focuses mainly on forestry and logging, and further confirmed that Croatia is mainly a producer within the field of fishing and aquaculture. The second result of correspondence analysis is finding that that micro-enterprises can be found mainly in Croatia and Macedonia, small farms are mainly in the Slovak Republic, the Czech Republic has the largest representation among medium-sized agricultural enterprises and in Serbia and Bosnia and Herzegovina we can see the representation of large businesses.

Management of the agricultural company can compare its performance with performance of other companies in the market and can identify its weaknesses. The set of performance financial indicators was created and used especially for this study and in the future may be extended to other countries or other indicators. These must be available and discoverable, which may be a limitation in the context of other research.

REFERENCES

- ARENA, M., AZZONE, G. and BENGIO, I. 2015. Performance Measurement for Social Enterprises. *Voluntas: International Journal of Voluntary and Nonprofit Organizations*, 26(2): 649–672.
- BEH, E. J. 2010. Elliptical confidence regions for simple correspondence analysis. *Journal of Statistical Planning and Inference*, 140(9): 2582–2588.
- BEH, E. J. 2008. Correspondence analysis of aggregate data: The 2×2 table. *Journal of Statistical Planning and Inference*, 138(10): 2941–2952.
- BOJNEC, L. and LATRUFFE, L. 2013. Farm size, agricultural subsidies and farm performance in Slovenia. *Land Use Policy*, 32: 207–217.
- BRIGNALL, T. J. S. 2007. A financial perspective on performance management. *Irish Accounting Review*, 14(1): 15–29.
- BYERLEE, D., DE JANVRY, A. and SADOULET, E. 2009. Agriculture for Development: Toward a New Paradigm. *Annual Review Resource Economics*, 1(1): 15–31.
- CONTI, G., FRÜHWIRTH-SCHNATTER, S., HECKMAN, J. J. and PIATEK, R. 2014. Bayesian exploratory factor analysis. *Journal of Econometrics*, 183(1): 31–57.
- CRONBACH, L. J. 1951. Coefficient alpha and the internal structure of tests. *Psychometrika*, 16(3): 297–334.
- D'ESPOSITO, M. R., DE STEFANO, D. and RAGOZINI, G. 2014. On the use of Multiple Correspondence Analysis to visually explore affiliation networks. *Social Networks*, 38(1): 28–40.
- EUROPEAN COMMISSION. 2016. *European Union, Trade in goods with Western Balkans*. Available at: http://trade.ec.europa.eu/doclib/docs/2006/september/tradoc_111477.pdf [Accessed: 2018, March 15].
- EUROSTAT. 2013. *Eurostat Regional Yearbook 2013*. Luxembourg: Publications Office of the European Union.
- GIANNAKIS, E. and BRUGGEMAN, A. 2015. The highly variable economic performance of European agriculture. *Land Use Policy*, 45: 26–45.
- HANSSON, H. 2007. Strategy factors as drivers and restraints on dairy farm performance: Evidence from Sweden. *Agricultural Systems*, 94(3): 726–737.
- HEBÁK, P., HUSTOPECKÝ, J., PECÁKOVÁ, I., PRŮŠA, M., ŘEZANKOVÁ, H., SVOBODOVÁ, A. and VLACH, P. 2007. *Vícerozměrné statistické metody*. Praha, CZ: Informatorium.
- HINTON, P. R., BROWLOW, CH., McMURRAY, I. and COZENS, B. 2004. *SPSS explained*. Hove: Routledge.
- HRACH, K. and MIHOLA, J. 2006. Metodické přístupy ke konstrukci souhrnných ukazatelů. *Statistika*, 86(5): 398–418.
- JOHNSON, A. J., DIBRELL, C. C. and HANSEN, E. 2009. Market orientation, innovativeness, and performance of food companies. *Journal of Agribusiness*, 27(1/2): 85–106.
- KUDLATS, J., MONEY, A. and HAIR, J. F. 2014. Correspondence analysis: A promising technique to interpret qualitative data in family business research. *Journal of Family Business Strategy*, 5(1): 30–40.
- LATRUFFE, L., FOGARASI, J. and DESJEUX, Y. 2012. Efficiency, productivity and technology comparison for farms in Central and Western Europe: the case of field crop and dairy farming in Hungary and France. *Economic Systems*, 36(2): 264–278.
- LEBAS, M. J. 1995. Performance measurement and performance management. *International Journal of Production Economics*, 41(1-3): 23–35.
- MARIA, B. 2009. Information system for modeling economic and financial performances. *Annals of the University of Oradea. Economic Science Series*, 18(4): 902–907.
- MCGARIGAL, K., CUSHMAN, S. and STRATFGORD, S. 2000. *Multivariate statistics for wildlife and ecology research*. New York: Springer.
- MICHEELS, E. T. and GOW, H. R. 2015. The Effect of Market Orientation on Learning, Innovativeness, and Performance in Primary Agriculture. *Canadian Journal of Agricultural Economics*, 63(2): 209–233.
- MINISTERSTVO ZEMĚDĚLSTVÍ ČR. 2013. V roce 2015 pokračoval pozitivní trend agrárního zahraničního obchodu ČR. *eAGRI*. [Online]. Available at: <http://eagri.cz/public/web/mze/ministerstvo-zemdelstvi/zahranicni-vztahy/agrarni-zahranicni-obchod/v-roce-2015-pokracoval-pozitivni-trend.html> [Accessed: 2018, March 15].
- MINISTERSTVO PŮDOHOSPODÁRSTVA A ROZVOJA VIDIEKA SROV. 2015. *Report on agriculture and food sector in the Slovak Republic 2014 (Green report)*. Available at: <http://mpsr.sk/en/index.php?navID=16&id=45> [Accessed: 2018, March 15].
- MOHAMED, R., HUI, W. S., RAHMAN, I. K. A. and AZIZ, R. A. 2014. The Relationship between strategic performance measurement system and organisational capabilities: The role of beliefs and boundary control systems. *Asian Journal of Business and Accounting*, 7(1): 107–142.
- MUCHIRI, P. N., PINTELON, L., MARTIN, H. and DE MEYER, A.-M. 2010. Empirical analysis of maintenance performance measurement in Belgian industries. *International Journal of Production Research*, 48(20): 5905–5924.
- NEELY, A. 2004. *Business performance measurement: Theory and practice*. Cambridge: University Press.
- NICU, I. E. 2012. Company performance measurement and reporting methods. *Annals of the University of Oradea. Economic Science Series*, 1(2): 700–707.

- OECD. 2017. *Economic Survey of the Slovak Republic 2017*. Available at: <http://www.oecd.org/economy/surveys/economic-survey-slovak-republic.htm> [Accessed: 2018, March 15].
- POLÁKOVÁ, J., KOLÁČKOVÁ, G. and TICHÁ, I. 2015. Business Model for Czech Agribusiness. *Scientia Agriculturae Bohemica*, 46(3): 128–136.
- ROSS, R. B. and WESTGREN, R. E. 2009. An agent-based model of entrepreneurial behavior in agri-food markets. *Canadian Journal of Agricultural Economics*, 57(4): 459–480.
- ŘEHÁK, J. and BROM, O. 2016. *SPSS: Praktická příručka*. Brno, CZ: Computer Press.
- ŘEZANKOVÁ, H. 2010. *Analýza dat z dotazníkových šetření*. Praha, CZ: Professional Publishing.
- SMUTKA, L., ROVNÝ, P. and HAMBALKOVÁ, M. 2016. Foreign trade with agricultural products in the Slovak Republic. In: *International Scientific Days 2016. The Agri-Food Value Chain: Challenges for Natural Resources Management and Society*. Nitra: Slovak University of Agriculture in Nitra. Available at: http://www.slpk.sk/eldo/2016/dl/9788055215037/files/01/smutka_rovny_hambalkova.pdf [Accessed: 2018, March 15].
- SVATOŠ, M., SMUTKA, L. and SELBY, R. 2014. Capital stock value development in relation to the new EU countries' agricultural sector development. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 62(6): 1437–1450.
- ŠSTATISTICKÝ ÚRAD SLOVENSKEJ REPUBLIKY. 2016. *Slovenská republika v číslach 2016*. Available at: <https://slovak.statistics.sk/PortalTraffic/fileServlet?Dokument=8f7caa44-edc2-4f5b-92be-07fb72f48fa7> [Accessed: 2018, March 15].
- ŠULÁK, M. and VACÍK, E. 2005. *Měření výkonnosti firem*. Praha, CZ: Eupress.
- TARNANIDIS, T., OWUSU-FRIMPONG, N., NWANKWO, S. and OMAR, M. 2015. A confirmatory factor analysis of consumer styles inventory: Evidence from Greece. *Journal of Retailing and Consumer Services*, 22: 164–177.
- THOMASSEN, M. A., DOLMAN, K. J., VAN CALKER, K. J. and DE BOER, I. J. M. 2009. Relating life cycle assessment indicators to gross value added for Dutch dairy farms. *Ecological Economics*, 68(8-9): 2278–2284.
- TYRYCHTR, J., ULMAN, M. and VOSTROVSKÝ, V. 2015. Evaluation of the state of the Business Intelligence among small Czech farms. *Agricultural Economics*, 61(2): 63–71.
- VAN PASSEL, S., NEVENS, F., MATHIJS, E. and VAN HUYLENBROECK, G. 2007. Measuring farm sustainability and explaining differences. *Ecological Economics*, 62(1): 149–161.
- VERHEES, F. J. H. M., KUIPERS, A. and KLOPCIC, M. 2011. Entrepreneurial proclivity and farm performance: The cases of Dutch and Slovenian farmers. *The International Journal of Entrepreneurship and Innovation*, 12(3): 169–177.
- VERHEES, F. J. H. M. and MEULENBERG, M. T. G. 2004. Market Orientation, Innovativeness, Product Innovation, and Performance in Small Firms. *Journal of Small Business Management*, 42(2): 134–154.
- WEILL, P., MALONE, T. W., D'URSO, V. T., HERMAN, G. and WOERNER, S. 2005. *Do some business models perform better than others? A study of the 1000 largest US firms*. Working Paper No. 226. MIT Center for Coordination Science.
- ČESKO (bylo ACT ON THE ENVIRONMENT). 1992. Zákon č. 17/1992 Sb., o životním prostředí a ve znění pozdějších předpisů. In: *Sbírka zákonů České republiky*. Částka 4/1992.
- ZIVKOV, G. 2013. *Association of farmers in the Western Balkan countries*. FAO Regional Office for Europe and Central Asia: Policy Studies on Rural Transition No. 2013-1. Available at: <http://www.fao.org/3/a-ar592e.pdf> [Accessed: 2018, March 15].

Contact information

Jana Hornungová: hornungova@fbm.vutbr.cz

František Milichovský: milichovsky@fbm.vutbr.cz