

RELATION OF EFFICIENCY OF AGRICULTURAL HOLDINGS AND SUBSIDY POLICY TESTED BY STATISTIC METHODS*

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This paper deals with an analysis of the impact of enterprise efficiency measured by the earnings before tax (EBT) and the return on assets (ROA). The analysis of the agrarian sector is performed within a selected sample of agricultural holdings (approximately 150 holdings per year) in 2002–2006. These farms were divided in relation to their share of agricultural land in the LFA. The basic hypothesis of this paper is the statistical (i.e. possible to demonstrate undoubtedly) dependence of such farms to the subsidy policy with regards to the profit/loss. It was proved that received subsidies do not increase the production potential and do not generate higher efficiency of farms, therefore they are used mainly to cover operation costs.

corporation finance; profit/loss; return on assets; subsidy policy; statistical dependence

INTRODUCTION

According to the Commercial Code (Act No. 533/1991 as amended) it is possible to include the profit/loss (its positive values, i.e. the profit) in business aims. A profit and loss statement (income statement) gives detailed information on the structure of the profit/loss and items generating the profit/loss. The profit and loss statement together with a balance sheet and an annex are compulsory parts of the financial statement. Its form and content is stated in the regulation no. 500/2002 Coll., as amended. Present models are more aimed at overall indicators – ratio or systems, in which the profit/loss is included.

The measurement of financial rate of return plays a key role in an assessment of an efficiency of a company (Mařík, Maříková, 2005). This type of measurement is based on relatively large set of ratio indicators. The Return on Assets (ROA), i.e. the ratio of any profit and assets categories, called also the Basic Earning Power is the most important measure of return (financial rate of return). The EBT (Earnings before Tax) is applicable in cases of changed rate of profit tax in particular. The basic assessment is based on trend analysis with a necessary time line of three consequent accounting periods at least and a spatial comparison, i.e. comparison among companies with a need to follow a comparability of entities (Kislingerová et al., 2004).

Although the agrarian sector fulfils functions that cannot be replaced by any other sector, basic rules of economic theory must apply in this sector as well. So that companies with a loss would not be able to exist in a long-term horizon.

Preparing this paper we have been inspired by previous analyses of agricultural holdings economy – especially the method of financial share analysis and system of indicators – that have led us to the following hypothesis: *agricultural holdings are related to the subsidy policy. It*

means their profit/loss, i.e. their efficiency measured by the ROA indicator depends on the amount and rate of subsidies.

The main tasks of investigation of statistical dependence are related to their behaviour and intensity. The description of the dependence is usually performed by identifying the dependency by certain balancing analytic function. According to the regression function, it is possible to estimate the average values of dependent variables with selected values of independent variables. The regression function fully corresponds to data under which it has been constructed. Features of dependence intensity (degree of dependence) expresses the strength of mutual relation of variables (regardless the course of dependence) and assesses the strength of dependencies with regard to the estimation of the regression function (Seger et al., 1998).

Analysing linear dependence is based on the strength of linear dependency between a pair of variables, i.e. we determine pairs of correlation coefficients presented as a correlation matrix symmetric across the main diagonal (Hindls et al., 1999). The independence of variables means they are uncorrelated, while uncorrelated variables may have other than linear relations (Hebák, Hustopecký, 1987).

MATERIAL AND METHODS

Data used in this paper were based on the database of approximately 150 agricultural holdings that is a part of the NAZV QG 60042 project. Agricultural holdings were classified according to the share of the area of agricultural land in the LFA. Regarding the fact that the majority of agricultural holdings have some share in the LFA, we classified agricultural holdings according to the following criteria: Group I – less than 25% of agricultural land in the

* The paper is a part of the NAZV QG 60042 research project.

LFA; group II – 25% (incl.) to 75%; group III – 75% and more. We have calculated average values counted as a simple arithmetic average for each group. The following indicators were included: area of agricultural land according to its share in the LFA; the amount of subsidy (absolute payment per ha); the profit/loss (EBT – Profit/loss statement – row 46 – its absolute amount, per ha, including/excluding subsidy rate); return on assets (ROA, with the EBT – earnings before tax – used as the profit). The background of our paper consisted of a balance sheet, a simplified profit and loss statement and a questionnaire with specified data of agricultural holdings. Methods of regression and correlation analysis were used in order to assess dependence. It means a correlation matrix and paired correlation coefficients were determined for each group of agricultural holdings (according to their share of the LFA) and their development in years. The above mentioned methods were applied with the support of the STATISTIKA software.

RESULTS

Statistical dependence of agricultural holding's efficiency to subsidies

The analysis of linear dependency is based on assessing the strength of linear dependence between pairs of these variables, i.e. pairs of correlation coefficients presented as a correlation matrix symmetric across the main diagonal are determined.

The correlation matrix (Table 1) reveals relatively strong relation of the volume of subsidies and an overall area of agricultural holdings (pair correlation coefficient of 0.74). This dependence seems to be logical as some types of subsidies (see above) are paid according to the area of agricultural land. The relation of the profit/loss measured by the EBT indicator and the volume of subsidies can be classified as average (0.61). This does not apply to the relation of the profit/loss (EBT) and a subsidy per ha – only a weak dependence was proved in this case (32% only). Paired correlation coefficient of the profit/loss (EBT) and the area of agricultural land is weak (0.42). The return on assets (ROA) and the volume of subsidies (subsidies per ha respectively) are uncorrelated, i.e. linear independent variables. This implies that the greater the volume of subsidies, the greater profit but it does not mean greater efficiency of a farm measured by the return on assets (ROA).

The dependence of the profit/loss (EBT) and the subsidy volume is shown in the scatter chart (representation of 635 pairs of the EBT and subsidy volume variables observation) in which it is possible to use a linear regression function to appreciate investigated relation (Fig. 1).

The calculations of basic features of linear selective function (see Table 2) revealed that only 0.37% of the variability of observed values of the EBT is explicable by this regression model. This implies the fact that selected regression is not suitable for regression estimations. This is caused mainly by the fact that the profit/loss of a farm is influenced by a number of other factors, in addition to subsidies. The estimation of the absolute term of selective linear regression function (–2,223) is also an intersection of the selective regression function with the y-axis with the standard estimation error of 259.46. Selective regression coefficient that is also the slope of the axis gives what increment of the median of the EBT variable is equal to unit increment of the subsidy variable value. The *F*-test is significant, i.e. a relation of the EBT and overall subsidies has been proven. Partial *t*-tests of individual parameters are significant (as indicated by the minimal level of significance).

As the volume of subsidy payment differs according to the LFA share, the relations of the profit/loss and subsidies were measured within the classification according to this share. The following tables (Tables 3–5) will show individual paired correlation coefficients for each group in the investigated period. Table 3 displays linear dependence of the profit and the volume of subsidies. All groups have shown uncorrelated indicators in the period of 2002 and 2003 (before the EU accession). The above-mentioned dependence has become significant after the Czech Republic entered the EU, with more tight relation within farms with the LFA share of more than 25%.

However, the same conclusions do not apply for the dependence of the above-mentioned indicators calculated per ha (Table 4). Observed indicators for both groups and all farms are almost uncorrelated.

The return on assets indicators (ROA) and subsidy per ha have shown a weak linear dependence (Table 5). Agricultural holdings with 75% and more of the LFA share revealed these two indicators as uncorrelated in the whole investigated period. The tightest dependence (with paired correlation coefficient of 0.44) was identified within agricultural holdings with 25-50% share of the LFA in 2005. Agricultural holdings with the LFA share up to 25% had higher dependence (0.32%) in 2005 in comparison with remaining years.

Table 1. Correlation matrix in 2002–2006 (highlighted correlation are significant at the level of $p < 0.05000$, $N = 635$)

	EBT	EBT/ha	ROA	Area	Subsidy	Subsidy/ha
EBT	1.00	0.74	0.09	0.42	0.61	0.32
EBT/ha	0.74	1.00	0.13	0.06	0.26	0.36
ROA	0.09	0.13	1.00	–0.04	0.01	0.10
Area	0.42	0.06	–0.04	1.00	0.74	–0.08
Subsidy	0.61	0.26	0.01	0.74	1.00	0.49
Subsidy/ha	0.32	0.36	0.10	–0.08	0.49	1.00

Source: Own investigation

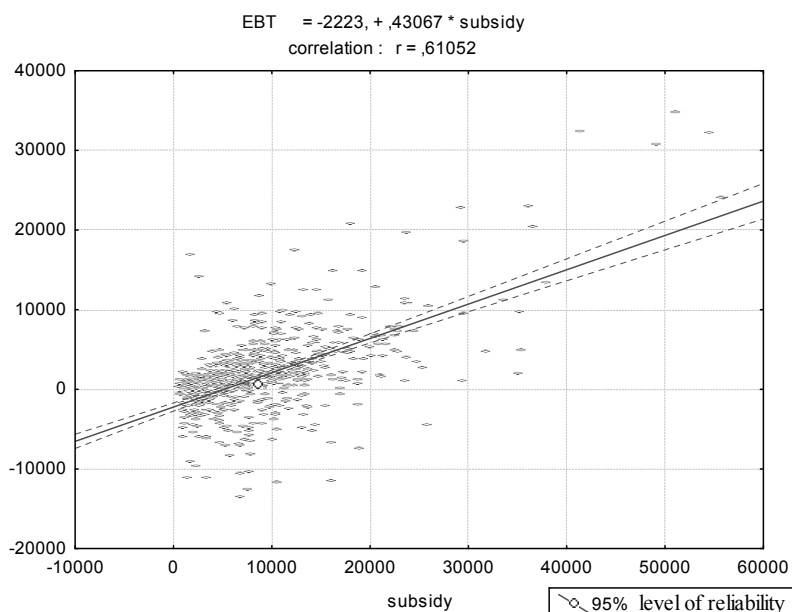


Fig. 1. Scatter chart of the dependence of the EBT and subsidies
Source: Own investigation

Calculated correlation matrices revealed that received subsidies had the greatest influence on the profit/loss (EBT), especially after the change of the subsidy system, i.e. since 2004 (after the Czech Republic entered the EU) and especially within farms with more than 25% of the LFA share. The farm efficiency measured by the ROA indicator was influenced by subsidies as well but the statistical dependence was not significant enough. The volume of subsidies was reflected in the profit/loss and partially in the assets (the increment of financial resources) at the same time. For that reason, the subsidy effect is reduced in the ROA indicator. This reason is followed by the fact that agricultural holdings have a large volume of assets causing grinding of profit per 1 CZK of assets. Our calculation has shown that subsidies received were used mainly to operational cost payment so that they do not increase farm's production potential and they do not generate greater efficiency of a farm.

It is not possible to determine the investment subsidy effect that could mean an increase of farm's efficiency followed by an increase of the ROA indicator in such short period of time as it is usually expressed with a certain delay. However, this subsidy type was not a subject of our analysis as it is not concerned in the financial statements and it is difficult to be identified. This subsidy type is charged as a decrease of entry price of purchased assets. It should be mentioned that the major part of agricultural holdings' assets is renewed by such investment subsidies, so that an important increase of assets availability does not have to occur.

CONCLUSION

According to performed analysis, it is possible to state that investigation of statistical dependence revealed the fact that subsidies influence mostly the profit/loss (mainly since 2004) especially of agricultural holdings with more than 25% share of the LFA. The value of correlation coefficient ranged between 0.71 and 0.89 in the investigated period suggesting relatively strong relation. This conclusion is not surprising, however, similar conclusion could have been expected for the relation of the ROA indicator and subsidy/ha indicator. In this case, an analysis revealed a weak statistical dependence both as a whole (paired correlation coefficient of 0.10) and for each group of agricultural holdings. Therefore, received subsidies are used mainly to cover operation costs and they do not increase the production potential and do not generate higher efficiency of farms. Note that Czech agricultural holdings do not receive the same amount of subsidies as the "old" member states of the EU. In 2006, Western Europe states acquired the biggest part of the European budget. However, the share of ten new member states doubled in 2006 compared to 2004. The amendatory act that has recently passed will allow transferring an additional milliard of CZK from revenues of the Land Fund of the Czech Republic to top-up direct payments to farmers so that direct payments should amount to 90% compared to original member states of the EU.

Table 2. Results of the regression with the dependent variable of the EBT in 2002–2006

R = 0.61051991 R ² = 0.37273457 adjust. R ² = 0.37174362 F(1,633) = 376.14 p > 0.0000						
	Beta	St. error	B	St. error	t(633)	p-level
Absolute term			-2223.00	259.4587	-8.56783	0.000000
Subsidy	0.610520	0.031479	0.43	0.0222	19.39438	0.000000

Source: Own investigation

Table 3. Paired correlation coefficients of the EBT and subsidies variables according to the classification based on the LFA share in 2002–2006 (highlighted correlations are significant at the level of $p < 0.05000$)

Farm (% LFA)	2002	2003	2004	2005	2006
All farms	0.08	0.10	<i>0.69</i>	<i>0.73</i>	<i>0.63</i>
Group I	0.22	0.12	<i>0.54</i>	<i>0.52</i>	<i>0.31</i>
Group II	-0.34	0.13	<i>0.77</i>	<i>0.89</i>	<i>0.77</i>
Group III	0.06	0.02	<i>0.78</i>	<i>0.76</i>	<i>0.71</i>

Source: Own investigation

Table 4. Paired correlation coefficients of the EBT/ha and subsidies/ha variables according to the classification based on the LFA share in 2002–2006 (highlighted correlations are significant at the level of $p < 0.05000$)

Farm (% LFA)	2002	2003	2004	2005	2006
All farms	0.14	0.08	0.05	0.11	<i>0.18</i>
Group I	0.06	0.08	-0.07	0.25	-0.01
Group II	0.21	-0.22	-0.04	<i>0.41</i>	0.21
Group III	0.24	0.15	0.21	0.25	0.26

Source: Own investigation

Table 5. Paired correlation coefficients of the ROA and subsidies/ha variables according to the classification based on the LFA share in 2002–2006 (highlighted correlations are significant at the level of $p < 0.05000$)

Farm (% LFA)	2002	2003	2004	2005	2006
All farms	<i>0.22</i>	0.14	-0.20	<i>0.22</i>	0.11
Group I	0.05	0.13	-0.12	<i>0.32</i>	-0.10
Group II	0.23	-0.19	0.09	<i>0.44</i>	0.16
Group III	<i>0.33</i>	<i>0.35</i>	0.20	0.21	<i>0.33</i>

Source: Own investigation

NOVOTNÁ, M. – SVOBODA, J. (Jihočeská univerzita, Ekonomická fakulta, České Budějovice, Česká republika):

Relace výkonnosti zemědělských podniků a dotační politiky testované statistickými metodami.

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Příspěvek se zabývá analýzou dopadu výkonnosti podniků měřené výsledkem hospodaření před zdaněním (EBT) a rentabilitou aktiv (ROA) ve vztahu k dotacím. Cílem stati bylo prokázat, nakolik jsou tyto podniky statisticky závislé na dotační politice vzhledem k jejich ekonomickému výsledku. Analýza je provedena u agrárního sektoru na vzorku vybraných zemědělských podniků (cca 150 podniků ročně), které byly rozděleny podle jejich podílu výměry zemědělské půdy spadající do LFA, a to v letech 2002 až 2006. Ke stanovení závislosti bylo využito metod regresní a korelační analýzy. Na základě provedených analýz lze konstatovat, že dotace nejvíce ovlivňují výsledek hospodaření (zejména od roku 2004). Silnější závislost byla zjištěna u podniků hospodařících na více než 25 % LFA. Zde se korelační koeficient pohybuje v jednotlivých letech od 0,71 do 0,89. Pochopitelně se zde nejedná o překvapující zjištění, ovšem stejně nebo obdobné závěry by mohly být očekávány i při sledování závislosti mezi ukazatelem ROA. Zde ovšem provedená analýza prokázala slabou statistickou závislost, a to jak celkově (párový korelační koeficient 0,10), tak pro jednotlivé skupiny zemědělských podniků. Bylo prokázáno, že poskytnuté dotace nezvyšují produkční potenciál podniku, negenerují vyšší výkonnost a slouží pouze k úhradě provozních nákladů.

podnikové finance; výsledek hospodaření; rentabilita aktiv; dotační politika; statistická závislost

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