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**Extended abstract of Diploma thesis**

**Determinants of agricultural land price in the Czech  
Republic**

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# 1 Summary

The agricultural land market has gradually accelerated since the Czech Republic joined to European Union. The development of the land market was significantly influenced by different types of support from the EU, unanticipated legislative changes concerning transfers of state-owned land, and state support for purchase agricultural from private owners. At present agricultural entrepreneurs, as well as non-agricultural investors, are major players on the agricultural land market. The prices of agricultural plots increased by 77% between the years 2005 and 2011 and an increasing trend is expected in the long term, but it still cannot compete with the average prices realized in the EU15.

The thesis deals with the determinants affecting the development of land market prices in the Czech Republic between the years 2003 and 2015. In the practical part those factors that it is possible to quantify for the purpose of applying the method of linear regression and correlation are selected. The results of the econometric model will be verified with hypothesis that will be given on the basis of knowledge gained by studying literature sources. After verification the results with hypothesis it was found that the price of agricultural land is mainly influenced by increasing rental prices, resulting in gradual rise of the Single Area Payment Scheme. Other selected determinants influence the price with low intensity or they are not appropriate for this model.

**Keywords:** Agricultural Land Fund, Common Agricultural Policy, Single Payment Area Scheme, agricultural land market prices, land market, Classification code of soils

## **2 Objectives and Methodology**

### **Objectives**

The diploma thesis aims to analyse the development of the agricultural land market and to determine the factors affecting agricultural land market prices in the Czech Republic.

The aim will be fulfilled by accomplishing these research objectives:

- the characteristics of the Agricultural Land Fund in the Czech Republic,
- examining land valuation methods,
- examining the effects of the Common Agricultural Policy on the development of the land market,
- identifying main factors affecting the price of agricultural land,
- drawing conclusion about the results reached.

### **Methodology**

A deductive method will navigate the entire process in the theoretical part. This issue is particularly devoted to authors such as Němec, Medonos and Hruška.

Determinants influencing land market prices will be formulated on the basis of literature review. The data required for the analytical part was gathered from publicly accessible sources such as the Czech Statistical Office, reports issued by the Ministry of Agriculture, and other sources concerning to the information relating to the agricultural land market. Descriptive statistics will be provided for the average agricultural land market prices. A linear function will be applied for the simple regression and correlation analysis, which examine the dependence between each factor and average agricultural land market prices. The factors that are examined will be included into Single - Equation Econometric model, which shows the influences on the agricultural land market price. Econometric model will be verified economically, statistically and econometrically. All the calculations will be performed using the Gretl program and MS Excel. The results achieved will be summarized in Results and Discussion chapter.

An econometric model must contain basic assumptions (Čechura et al., 2009):

- the mean value of a stochastic variable is zero,
- the variance of stochastic variables is constant and finite,
- no autocorrelation of residuals,
- no presence of correlation of random variables and exogenous variables – estimates are unbiased,
- normal distribution of stochastic variables,
- specific assumptions (excluding irrelevant variables, right function form, only substantial variables are included, etc. ).

The model is necessarily verified and compared with the economic hypothesis. The process of verification includes the following parts:

Economic verification – comparison of the predicted hypothesis with the results reached. The direction and intensity of the explanatory variables in relation to the variables that are explained is evaluated.

Statistic verification – evaluation of the statistical significance of individual parameters and the whole model.

Econometric verification – includes different tests for the verification of the assumptions of the econometric model (Čechura et al., 2009).

### 3 Results and Discussion

The analytical part researches the influence of selected factors on the level of the average market prices of agricultural land between the years 2003 and 2015. For this analysis were used data on average market prices of agricultural land plots which are bigger than 5 hectares. Two methods were used to investigate determinants influencing average agricultural land market prices.

On the basis of Simple regression analysis all results were statistically significant except the inflation. More than 95% of the variability observed in agricultural land market prices can be explained by assessed values of *rental prices* and area of *non- agricultural land*. These parameters are also statistically significant. High Coefficient of Determination (more than 80%) was measured through the variable of *Gross Domestic Product* and the *area of state land sold*. Although both these parameters are statistically significant the influence of the variable area of state land sold is opposed to the economic assumption.

Compared to the results of other determinants the coefficient of determination for *cereal prices* is really low. The variability of agricultural land market price is explained from 33.6% by the influence of crops prices, it means that this variable is not suitable for the explanation of increasing agricultural market price.

The variability of average agricultural land market price is explained from 59.9 % by the influence of *interest rates*. Although the results are statistically significant model is not consistent with the economic theory. These problems usually arise on the basis of the inappropriateness of empirical data that were used for model estimation.

The dependence between *inflation* and average agricultural land market price is not statistically significant on the 95% level of significance. The changes of interest rates explain the variability in average land market prices from 6.1%. This variable is not in accordance with economic theory and also it is statistically insignificant.

As a second method econometric model was applied to determine the direction and intensity of influences of selected factors on agricultural land market price. The model had to be modified because of the high correlation between the variables. The multicollinearity was eliminated using first differences for variable Single Area Payment Scheme which correlated

with rental prices. Other correlated variables were omitted from the model. The best results were gained in model 2 which includes only statistically significant variables. The model was estimated by the Ordinary Least Squares method and consists of these determinants:

- rental prices (RC)
- first differences of Single Area Payment Scheme (d\_SAPS)
- cereal prices (CP)
- inflation (IF)

The following results indicate that agricultural land market prices are explained by performance determinants given here to the tune of 91%.

*Interpretation of results:*

- Whenever the rental price will increase by 1 CZK/ha, the market price of agricultural land will increase by 92.8883CZK/ha directly proportional.

*Economic assumption was fulfilled.*

- Whenever the annual change of SAPS will increase by 1 CZK/ha, the average market price of farmland will increase by 5.70229 CZK/ha directly proportional.

*Economic assumption was fulfilled.*

- Whenever the crops prices increase by 1 CZK/t, the average market price of farmland will decrease by 3.68149CZK/ha indirectly proportional.

*Economic assumption was not fulfilled.*

- Whenever the inflation will increase by 1 percentage point, the average market price of farmland will increase by 2381.98CZK/ha indirectly proportional.

*Economic assumption was fulfilled.*

The Single Area Payment Scheme is increasing gradually after the year 2004. Ciaian et al. (2010) showed that direct payments were capitalized at the strongest rate into land values. In the opinion of Medonos (2015), the SAPS payment influences the level of rent price required by the owners of agricultural land. In some production areas with high soil fertility (Polabí, Haná, Prague – East) price of land rental reached the level of payments SAPS in last two years. An increasing rental charge is main indicator of the agricultural land market

development because it has increased demand for agricultural land purchases, not only on the side of economically prosperous agriculture entities but also non-agricultural investors.

Cereal prices were selected because of their highest share at total area of arable land. World consumption of cereals represents the biggest share of agricultural plants cultivated on arable land. The model does not confirm the economic hypothesis and increasing crops prices affects the average agricultural land market prices negatively. The reason for this can be that cereal prices have fluctuated in each year because their demand is also dependent on natural climatic conditions, not only in this country but also throughout the world. If weather conditions are favourable for two or more seasons it is usually reflected in a price reduction and vice versa. Another indicator that influences cereal prices positively is the production of alternative sources of energy. There are various EU programmes supporting the production of bio - energy (e.g. bio fuels, biogas stations).

Unlike previous research the inflation included in this econometric model affect the price of farmland but still the price of agricultural land grows faster than the inflation rate. Since 2003 the average agricultural land market price is more than three times higher than it would be its price based on the inflation rate in 2015. This hypothesis supports the opinion of Geman (2015), who stated that farmland, is not influenced by the inflation since it is a real asset that is linked to food and energy production.

Low interest rates on financial deposits, bonds and other financial funds change the preferences of investors. In recent years agricultural land becomes interesting commodity for investors. As mentioned above, in fertile areas rental prices in the last three years have increased up to the level of the subsidies provided, this means that rental prices reached 4000 - 6000 CZK/ha in localities with quality soil. Current land rentals are moving around 2-3 % of market price of agricultural land (Novotný, 2016).

The results of the analysis may differ in relation to the used source of data on market prices of agricultural land. Institutions dealing with agricultural land market prices use different methodology of data collection. For this research were used publically available data provided by Farmy.cz. The company specializing in the agricultural land market collects data on the basis of realized trade agreements on land purchase.

## 4 Conclusion

The situation on the agricultural land market is important in the context of agricultural production, food safety, and protection of the Agricultural Land Fund. In the Czech Republic the share of leased land is still higher than in the old countries of the EU. However, the economic conditions of farmers are stabilizing and it can be expected that the share of leased land could gradually decrease.

Generally speaking, the development of the land market in the Czech Republic was influenced by transfers of public land in 1999 and the enacting of a subsidy policy (1997). The volume of land traded from 2001 to 2003 reached more than 160, 000 hectares. Since 2004 the Czech land market has been positively affected by subsidies from EU funds and also by national support for purchases of agricultural land. Although, the volume of traded land has decreased, the average price per hectare of agricultural land has grown.

On the basis of the analysis, it was found that the important economic factors which influence price of agricultural land include land rental and the Single Area Payment Scheme. Other factors affect the price with low intensity. The quality of the model could be improved by including other important variables or extend the time series of variables.

Another problem is that each institution uses different methods for monitoring of agricultural land market prices. The results of the analysis could be change in relation to the source of data used.

The diploma thesis deals with statistically quantifiable factors that determine quite high variability, but agricultural land market price is also influenced by determinants that cannot be statistically examined. Among these factors belong the size of plots and their location and accessibility, the soil type and its fertility, the relations between the seller and buyer, and other subjective and speculative aspects. There are also some technical factors such as digitization and landscaping whose completion will facilitate the sale of agricultural land.

Furthermore, without taking into account current conditions and their spill – over effect on agriculture and investment behaviour the results suggest that the price of agricultural land will rise in the coming years. However, it is not assumed that agricultural land prices will reach the level of existing prices in the Netherlands or in Denmark. Underdevelopment compared to Western states was caused by the previous regime – a centrally planned economy that stopped the development of a public market in agricultural land.



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