

PREDICTION MODEL OF DIVIDEND PAYMENT OF CZECH JOINT STOCK COMPANIES

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ABSTRACT

The dividend payment is the very important part of investment decision for many stockholders. Results of this text identify finance factors that influence the management in dividend policy within the examined branch "Production and distribution of electric energy, gas and water". Seven regressive models were created and they identify and define the effect of individual factors on the dividend payment among individual owner's types. The retained earnings, the rate of return of invested assets in total and the size of company have the positive effect on the dividend payment. For the purpose of better interpretation the individual factors were quantified in form of the chance that the company will pay the dividend when compared to the fact that the company is not going to pay any dividend. The resulting regressive model was subsequently validated using the classification table and the receiver operating characteristic curve.

KEY WORDS

Dividend policy, factors, management, model.

JEL CLASSIFICATION

G35, M21

INTRODUCTION

The decision on the economic result distribution is one of key spheres of the financial management of company. The dividend payment can be, provided the legal conditions are fulfilled, one of options how to distribute the economic result. The dividend payment is the important part of the investment decision making for many stockholders. The financial management must perform the dividend policy according to other financial decisions, i.e. mainly to the financial (with what sources to finance own business) and investment (how much and in what assets to invest) decisions. From the point of view of the financial theory the dividend policy is usually reviewed based on the original goal of the company that is, according to the current financial economy, to maximize the market value of the company. The existence of market imperfections, as the cost of agency are, the information asymmetry and different taxation of capital and dividend incomes are the important reason why the company pays out the dividends. It is the dividend payment that can to some extent

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reduce these market imperfections. The dividend theory of company life cycle explains how companies adapt the payment ratio in relation to its development, when on one hand the costs of external capital acquisition are decreasing and on the other hand the costs of authorisation are incurring. For many stockholders the dividend payment is the very important part of their investment decision making. This text aims to identify factors that explain differences between the dividend payment by the company controlled by foreign or domestic owner and the prediction model definition that shall quantify the probability of dividend payment depending on the type of ownership.

1 REASONS WHY COMPANIES PAY OUT DIVIDENDS

Various theories were developed relating the reasons why companies pay out dividend. From the point of view of the financial theory the dividend policy is usually examined on the background of the primary goal of the company that, according to current financial economy, consists in the maximisation of the company's market value. In the year 1961 the economists issued (Miller and Modigliani 1961) the theoretical text titled "Dividend policy, growth and evaluation of stocks" that is still one of the most discussed controversies within the financial theory. Authors of this text presented the scientific proof that the stockholder or the potential investor is irrelevant towards the dividend policy of the company as this one does not influence the company's value. It results from the authors' text that the dividend does not increase the company's value as itself but only mediated through the market imperfection.

The existence of the theory of costs for representation is the important reason why companies pay out dividend. The separation of the management and the ownership of the company causes the conflict of representation when there can be the situation in which the stockholders' interest and the management's interest can differ and can even be in conflict. This especially includes the option of investment devaluation, the fear from ineffective use of entrusted financial means as well as the opportunist behaviour by the management or the minimisation of business risk. This is just the dividend payment, pursuant to (Easterbrook 1984; Jensen 1986), that can to some extent reduce this kind of conflict between the management and the stockholders. There is also a conflict between majority and minority stockholders in the company. La Porta et al. (2000) present two models of dividend policy of company towards minority stockholders that are modified and empirically tested in various forms. At first, the minority stockholders use their right and require the dividend payment for the reason of limitation of potential personal profit on the side of majority stockholders. Such hypothesis is supported by the empiric study of authors (Chae et al. 2009). The second model presents the dividend as the substitution mechanism for reduction of conflict between minority and majority stockholders. The majority stockholders are motivated to pay the dividend mainly in countries with low protection of minority stockholders in order to create the good company's reputation and thus to ensure better access to sources of company's financing. This hypothesis is supported, for example, by the authors' empiric study (Jo et al. 2009). In the end, the third problem of authorisation relates to the conflict between the company itself and third persons, mainly creditors of the company. Nash et al. (2003) state several ways how stockholders can dispossess the creditors' wealth. One of the most often ways are the insufficient investments when the stockholders prefer the dividend distribution to the prejudice of investments in new projects that can finally cause the risk increase from the point of creditor's view.

Another market imperfection consists in the existence of information asymmetry between stockholders and the management. According to Miller & Modigliani (1961) the dividend itself does not increase the value of company. The value of the company is increased by the information on expected future profits that the dividend brings. If the theory of signal is true, then the investors can, through changes in dividend policy, deduce the information on future company profitability.

The theory of signal is specified by the presumption of information asymmetry between managers and investors related to the access to information on company's perspectives. Such asymmetry can be mastered through the dividend signal. The large empiric researches, made so far, do not give unambiguous support to the theory of signal. There are proofs that there is the relation between the dividend and the stock price, confirmed by most of empiric researches (Michaely & Roberts 2006). Whereas the empiric proofs that the dividends bear the information on future company profitability are not so unambiguous. The empiric studies that confirm that the dividends bear the information on the future profitability are for example (Healy and Palepu 1988; Nissim and Ziv 2001). To the contrary, the relation between the dividend and the future profit was not confirmed by the empiric research Benartzi et al. (1997).

Various tax loads on dividends and capital incomes cause that there are investors' group interested in various dividend policies of companies. If the capital incomes are subject to taxation with lower rate than the dividends' income, then the investors with higher profits will prefer the capital incomes. On the other hand, there are such investors with lower or null taxation of dividends' income on the market who unambiguously prefer stocks with high dividends in relation of the clientele effect. If the changes of dividend policy in their preferred company occur, then the investors can sell stocks of this company, or this company can attract another group of investors that can finally influence the prices of stocks. The empiric verification of this theory is made using the stock price decrease on the ex-dividend day. Elton and Gruber (1970) were the first who have empirically confirmed the theory of clientele effect. It results from the authors' conclusions that investors with higher tax load shall prefer companies with lower dividend incomes and vice versa. The tax clientele effect confirmed the authors Korkeamaki et al. (2010), to the contrary the tax effect was not confirmed in the empiric study by authors Travlos and Milonas (2001).

The theory of company life cycle can be included among further key factors. The theory of life cycle presumes that the dividend payment relates to the development stage of company when the financial indexes, as profitability, size, investment opportunities and capital structure, change during the time course. When the company reaches some life stage, it is not capable to find suitable investment means for its generated cash flows and thus the dividend payment can be seen as the most suitable strategy how to distribute cash flows to investors in form of dividends. This dividend theory explains how companies adapt the payment ratio depending on their development when, on one hand the costs of external capital acquisition decrease, and on the other hand costs of authorisation incur (Brockman & Unlu 2011). Fama and French (2001) believe that large reputable companies with high profit and slower growth are more willing to pay dividends. Deangelo et al. (2006) present the ratio of the undivided profit to the basic capital as the index of the life cycle stage. Recently the management follows the psychologic analysis in its decision making according to Novotný (2014). Under insecure conditions the dividend decision becomes the behavioural issue for the management, when the profit increase is transferred into the dividend only when the company is sure that it should not need to review its decision in the future.

2 GOALS OF THE RESEARCH AND THE METHODOLOGY

This text aims to summarize the dependencies of individual financial indexes on the dividend payment in the Czech Republic. The research was focused on the branch "Production and distribution of electric energy, gas and water" that is, from the point of view of profitability and frequency of dividend payment, the most interesting among Czech joint stock companies. There are 221 joint stock companies in this branch in total. This basic set was subsequently reduced based on the availability of complete final accounts. After performed adaptations the final accounts of 137 companies for the period 2008-2013 were the main data sources. With regard to the character of

discussed variable (dividend is paid out or not) in the examined analysis, the logistic regression was used for the analysis of relation between the explained and the explaining variables.

The task of regression model is to:

- 1) Define main variables that explain differences in dividend payment between the company controlled by foreign or domestic owner,
- 2) Define the influencing force of individual explaining variables on the explained variable, i.e. if the company will pay out the dividend or not.
- 3) Create models by which the investor can, for known values of financial indexes, predict the dividend payment of Czech joint stock companies.

The basis of logistic regression consists in the logit presumption, i.e. in the natural logarithm of the chance that the explained index will get the specific value from two possible ones. The model creation always requires the analysis of the number of variable that we let to enter into the multiple regression. The inclusion of very similar indexes into the model would be useless. Thus only one explaining variable from the groups of indexes in the table No. 1 enters into the model, when such variable is the one able to improve the maximum model's credibility to the maximum. The choice of variables influencing the dividend payment was based on empiric studies and in addition, these variables are enlarged in detail by ratio indexes of financial analysis, indexes of company's performance and by main company characteristics, i.e. the size and the growth stage of the company. The method of maximum credibility was used for the parameters estimation. The test based on Wald statistics was used for testing of chosen variables importance. The step method was used for analysis, consisting in the subsequent choice of indexes based on the order of their importance for the model. The deviation G2 was used for the determination of the model importance in the whole. The curve ROC (receiver operating characteristic) and the classification table were used for verification of resulting regression model.

3 RESULTS

According to (Hosmer & Lemeshow 2000) it is suitable, when creating the logistic regression model, to start with one-factor analysis which means to test every variable influencing the dividend payment separately. The table 1 displays values of the test of analysis of the influence of individual explaining variables on the dividend payment. The indexes in the table are classified in the descendent order according to the credibility score criterion.

Table 1 Explaining variables having influence on the dividend payment

Group	Index	P – value
Rate of return and absolute indexes of performance	ROA (net profit/assets)	0.000
	Added value	0.000
	Economic results	0.000
	Operational economic results	0.000
	Added value/revenues	0.158
	ROE (net profit/equity)	0.305
	ROS (net profit/revenues)	0.455
Indebtedness	Credits/debts	0.000
	Regular indebtedness (short-term external capital/assets)	0.107
	Credit indebtedness (credits/equity)	0.233
	Leverage effect (assets/equity)	0.300
	Indebtedness of equity (external capital/equity)	0.304
	Total indebtedness (external capital/assets)	0.357
Liquidity	Immediate liquidity (money/short-term liabilities)	0.000
	Stand-by liquidity ((OA -reserves/short-term liabilities))	0.008
	Immediate liquidity (money/short-term liability)	0.009
Size of the company	Balance sheet total	0.000
	Revenues	0.000
Development of company	Retained earnings	0.000
	Retained earnings/equity	0.000
	Increment of fixed assets	0.125
	Increment of revenue	0.254

(Source: Own)

After having analysed the statistic importance of influence of separated variables, 10 indexes in total were eliminated. The rate of return and the absolute performance indexes belong to the most numerous group of statistically important determinants.

The table 3 shows individual models that quantify variables influencing the dividend payment pursuant to the ownership and the influence of particular explaining variables on the dividend payment. In the first step, the model with the only one explaining variable (Model 1) is estimated – depending on the owner of company (Table 3). This model serves for comparison and can help to determine how large the differences of dividend payment are among individual owners if we do not consider any other variables. It results from this model that the company controlled by a foreign owner has, when compared with the company owned by a domestic owner, approximately the ten times chance of dividend payment. For better understanding the coefficient e^{β} is transferred to estimated probabilities. Such probability for the company controlled by a foreign owner is 80.7%, for the company controlled by a domestic owner such probability goes to 29.1%.

In further steps the explaining variables are added to the model and the effect of company ownership change is observed. In the second model, the index *Return on assets (ROA)* was added. Just the single-factor analysis has shown that this relative index is more important for the explained variable than the absolute index in form of the economic result. This index is statistically important and the individual statistics of model quality have also considerably improved. The inclusion of this control variable decreased the size of the coefficient “foreign owner”. The table 3 shows that the ratio of chances decreased from 10.13 to 4.62, it effectively means a considerable decreasing. Even this control variable is included, the company controlled by a foreign owner, has nearly fivefold chance when compared with the domestic ownership that it will pay out the dividend. The value of estimated parameter β *Return on assets (0.41)* is positive and statistically important. Such value can be interpreted so that the chance for the dividend payment increases with increasing rate of return by 1% when compared with the non-payment by a multiple, i.e. by approx. 51%.

In the third model, the variable *Retained earnings* is added. Pursuant to the theory of life cycle the companies paying out the dividend are profitable and dispose of undivided economic result that is sufficient for covering of investment needs. The coefficient e^{β} for the ownership is in this model increased from the value 4.62 to the value 6.04. It can be stated that the amount of undivided economic result, after having checked the equity rate of return, explains the difference in the chance for the dividend payment among individual types of ownership. At the same time the total parameters of model have considerably improved. The value of estimated parameter β *Retained earnings (0.00148)* is positive and statistically important. The estimated parameter for the unit change (1 million CZK) is very small and thus we interpret it's ten times amount. If the undivided economic result is increased by 10 million CZK and the values of other independent variables remain unchanged, the chance that the company pays out the dividend, compared to its non-payment, increases by the multiple 1.0149 ($e^{10 \cdot 0.00148} = 1.0149$).

The cash availability is an important factor for decision made by the company on the dividend payment. Within the one-factor analysis the index of immediate liquidity was important among liquidity indexes. Thus, in the fourth model, the categorical dichotomous variable *Immediate liquidity* is added. The recommended value within the scope 0.9 – 1.1 is valid for the immediate liquidity. The average value of immediate liquidity of examined companies, amounting to 1.4, was added into the regression model. The liquidity lesser than 1.4 was indicated by a zero, the liquidity higher than 1.4 was indicated by the number one. The table 3 shows that the effect of this variable, after having checked the variables *Return on assets* and *undivided economic results*, does not considerably explain the differences in the coefficient of ownership. The coefficient of ownership in this model is decreased from the value 6.04 to 5.87. In fact it means the minimal decreasing and also the statistics of model quality does not indicate any considerable positive progress. The value of estimated parameter β *Immediate liquidity (-0.6056)* is negative and statistically important. This negative coefficient can be interpreted so that if the index of stand-by liquidity is higher than 1.4, than the chance to the dividend payment by the company, when compared to its non-payment, is decreased by the multiple 0.55. The negative value can be interpreted so that too much high level of liquidity can be a negative effect when the free financial means do not work on behalf of increasing of the rate of return, and this can finally cause the limitation of dividend payment.

The fifth model adds the variable of *Indebtedness*. The single-factor analysis proves that the ratio index of bank credits sum and of total sources is, among indexes of indebtedness, statistically important. Again, this index was used in form of dichotomous variable. The average sum of this index for examined companies is 8%. This variable in regressive model gets the value 0 for companies with index under 8% and the value 1 for the index higher than 8%. The table 3 shows that, after having checked the return on invested assets, the undivided economic result and the immediate liquidity, the coefficient of ownership is in this model decreased from the value 5.87 to

5.51. Again, this is only a marginal change and after inclusion of control variables the companies under foreign owner control have nearly five and half times chance of dividend payment when compared to the domestic company. The value of estimated parameter β *Indebtedness* (-0.853) is negative and statistically important. This negative coefficient can be interpreted so that if the given index of indebtedness is higher than 8%, than the chance of dividend payment by the company is decreased by the multiple 0.43.

In the end, the sixth and seventh models test the theory of the influence of company size on the dividend payment. The variable *Company size* is measured based on the balance sheet amount. First, the company size in form of quantitative coherent variable is included into the model (model 6) and then the factor of Company size in form of categorical variable is included into the model 7. In case of the categorical variable the company size is divided based on the balance sum into small companies (balance sheet total not exceeding 270 mil. CZK), medium companies (balance sheet total within 270 – 1300 mil. CZK) and large companies (balance sheet total exceeding 1 300 mil. CZK). The large company was chosen as the reference level. It is obvious in both cases that the model improvement as well as the change of the ownership type coefficient happened. Thus the company size is not the main determinant that would be able to explain differences in the chance of dividend payment among individual types of ownership. The value of estimated parameter β *Company size* is, in case of coherent variable (model 6), positive and statistically important ($p=0.049$). The estimated parameter for the unit change of variable (1 mil. CZK) is very small (0.00007) and thus, for better interpretation, the company size in form of categorical variable was chosen. The small company, when compared with the big one, has the chance of dividend payment 0.55 times lesser and the value of parameter is statistically important. On the contrary, the middle company when compared with the big one, has the chance of dividend payment 1.37 times higher. In spite of it this parameter is statistically important just at the higher level of importance ($p=0.055$).

If the first model is compared to the last one, the ownership coefficient value decreased by approx. 50%. It can be stated that companies controlled by a foreign owner have higher chance of dividend payment especially due to the more effective use of assets and retained earnings. The influence of other factors, as the liquidity, indebtedness or company sizes are, has marginal effect. For better understanding the differences between individual types of ownership were documented again on estimated probabilities for individual categories. Based on coefficients of final model the companies under foreign owner control have the probability of dividend payment at 40.5% and those under domestic owner control 7.8%. When compared with the model without explaining variables the differences is decreased by a third approximately (from 52 to 32.7 percent points).

The influence of explaining variable on dividend payment is in case of factors *Return on assets*, *Retained earnings* and *Company size* positive, on the contrary in case of factors *Immediate liquidity* and *Indebtedness* it is negative.

The resulting regression model can be recorded in following form

$$\ln\left(\frac{P(\text{DIV} = 1)}{1 - P(\text{DIV} = 1)}\right) = -2.032 + 1.647\text{ownership} + 0.434\text{ROA} + 0.001\text{retained earnings} - 0.634\text{liquidity} - 0.873\text{credits/debts} - 0.595(\text{company: small}) + 0.312(\text{company: medium}) + 0.283(\text{company: large}) \quad (1)$$

Whereas:

$$\begin{aligned} (\text{ownership}) &= \begin{cases} 1, & \text{ownership} = \text{foreign} \\ 0, & \text{ownership} = \text{domestic} \end{cases} \\ (\text{liquidity}) &= \begin{cases} 1, & \text{liquidity} > 1,4 \\ 0, & \text{liquidity} < 1,4 \end{cases} \\ (\text{credits/debts}) &= \begin{cases} 1, & \text{credits/debts} > 8\% \\ 0, & \text{credits/debts} < 8\% \end{cases} \end{aligned}$$

The above stated equation of model represents the relation between the logarithm of chance of dividend payment compared to the dividend non-payment (left side of equation) under conditions given by values of mentioned explaining factors (right side). Using the logit transformation of model equation it is possible to calculate the probability of dividend payment (or the probability of dividend non-payment) for the company with foreign owner and the company with domestic owner depending on given factors. Based on the rule of combinatorial product up to 24 different groups can be set that will represent the probability of dividend payment based on the type of ownership.

The level of probability of dividend payment for the company with domestic and foreign owner is expressed in the following formula:

$$\begin{aligned} &\text{Domestic owner (DIV = 1)} \\ &= \frac{e^{-2.032+0.434ROA+0.001RE-0.634liquidity-0.873 \text{ credits/debts} - 0.595(CS)+0.312(CM)+0.283(CL)}}{1 + e^{-2.032+0.434ROA+0.001RE-0.634liquidity-0.873 \text{ credits/debts} - 0.595(CS)+0.312(CM)+0.283(CL)}} \end{aligned} \quad (2)$$

$$\begin{aligned} &\text{Foreing owner (DIV = 1)} \\ &= \frac{e^{-0.385+0.434ROA+0.001RE-0.634liquidity-0.873 \text{ credits/debts} - 0.595(CS)+0.312(CM)+0.283(CL)}}{1 + e^{-0.385+0.434ROA+0.001RE-0.634liquidity-0.873 \text{ credits/debts} - 0.595(CS)+0.312(CM)+0.283(CL)}} \end{aligned} \quad (3)$$

3.1 Model verification

For verification of resulting regression model the classification table and ROC curve were used. The table 2 represents results of reliability validation of dividend payment prediction by the proposed regression model.

Table 2 Classification table of regression model reliability

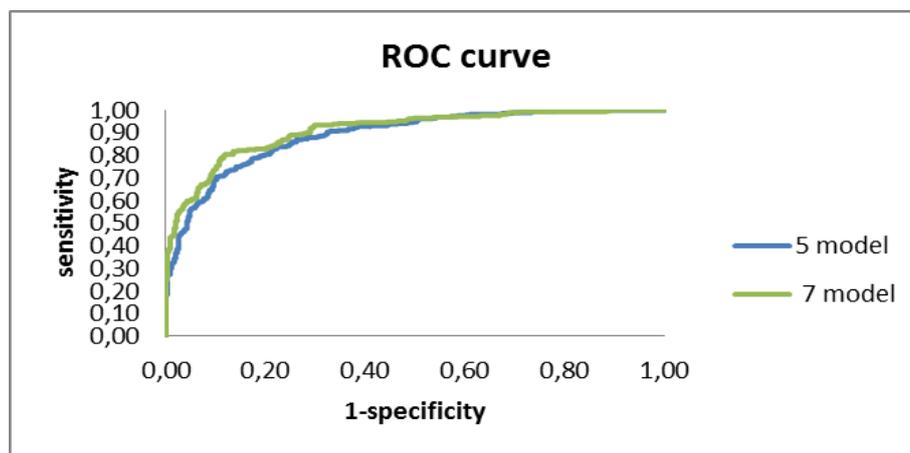
Depending variable DIVIDEND	Found by model		Total
	YES	NO	
YES	230	62	292
NO	39	317	356
Total	269	379	648

(Source: Own)

Based on values of classification table we can state on the tested regression model of dividend payment that its level of discrimination success is at 84.44% (547 of 648). In 230 cases from 292 ones, (in 78.77%), when companies paid out dividends, the model identified correctly this situation, in resting 62 cases (21.23%) the model wrongly estimated the situation. In 356 cases when the

company did not pay the dividend, the model estimated such fact in 317 cases correctly (89.04%), in 39 cases (10.96%) the model was wrong.

Figure 1 The regression model quality is evaluated by ROC curve



(Source: Own)

The shape of curves proves good classification capability of logistic models. The ROC curve on the fig. 1 is approaching the left upper corner which means high model reliability. The surface under the curve of seventh model is AUC = 0.91 (area under curve) and of fifth model is AUC = 0.88 which is very close to the ideal value, i.e. the value of 1.

CONCLUSION

The proposal for economic result distribution undoubtedly belongs to basic financial decisions of management. The dividend payment to stockholders can be, under fulfilment of legal provisions, considered as the profit distribution. The results of this text identify the financial factors that influence the management in its dividend policy within the examined branch. This issue is under conditions of Czech joint stock companies very actual as no more complex study of this branch are available. Nevertheless today most of joint stock companies regularly pay out the dividend. The analysis was performed using the logistic regression analysis. Seven regression models were made to identify and define the influence of individual factors on the dividend payment. In addition, the task of this regression analysis was to explain differences in dividend payment among companies controlled by the foreign or domestic owner. The analysis has shown that differences in dividend payment frequency between individual types of ownership are mainly given by the *rate of return of the total capital* and by the *retained earnings*. The influences of other factors, i.e. *liquidity*, *indebtedness* or *company size*, have marginal effect. The undivided economic result, and the rate of return of total invested assets have positive influence on dividend payment, on the contrary the immediate liquidity and the indebtedness have negative effect. The individual factors were, for better interpretation, quantified in form of a chance on dividend payment by the company compared to the dividend non-payment. The resulting mathematic regression model was subsequently validated. The success rate of the model was evaluated based on the classification table and ROC curve. It results from the model validation that it has relatively high capability of classification, the success rate of the model was 84.44%, i.e. the model has correctly identified 547 cases of 648 in total. The value of the surface under the ROC curve amounts to 0.91 which is very near to the ideal value, i.e. the value of 1. The research results can be practically used by stock brokers and financial advisors for timely investment of clients in order to get dividend incomes.

Table 3 Regression models

variable	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	β	e^β												
ownership	2.315	10.129	1.530	4.620	1.798	6.036	1.771	5.875	1.707	5.512	1.651	5.214	1.647	5.191
ROA			0.410	1.507	0.382	1.466	0.377	1.459	0.390	1.477	0.398	1.488	0.434	1.544
Retained profits					0.001	1.001	0.001	1.001	0.001	1.001	0.001	1.001	0.001	1.001
Imm. liquidity							-0.606	0.546	-0.588	0.555	-0.518	0.595	-0.634	0.530
Credit/debts									-0.853	0.426	-0.813	0.444	-0.873	0.418
Company size											0.000	1.000		
<i>Size (large comp. - refer. level)</i>														
Small comp.														-0.595 0.552
Medium comp.														0.312 1.366
Absolute elem.	-0.891		-2.015		-2.329		-2.153		-1.948		-2.050		-2.032	
Deviance	736.800		548.800		511.900		506.600		495.500		490.800		484.900	
Log-Likelihood	-368.400		-274.400		-255.900		-253.300		-247.700		-245.300		-242.400	
AIC	740.800		554.800		519.900		516.580		507.500		504.800		500.900	

(Source: Own)

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