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ECONOMIC PERFORMANCE FORECASTING ACCORDING TO THE TYPE OF MANAGEMENT

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ABSTRACT. Forecasting the audited entities' performances in correlation with management typology (local or foreign) proves to be useful in terms of estimating the impact of a particular type of management of the audited entities upon indebtedness policies, the efficiency of using the shareholders' assets and capitals, and upon the contribution of revenues to strengthen the self-financing capacity. Establishing a mathematical model, tested on a stratified sample within a representative county at national level, provide relevance to the present research results. The study found a positive linear correlation between the performance of audited entities from Cluj County regardless of the type of management and the financial years.

Keywords: audited entities, regression model, type of management, forecasting performance

JEL classification: M42, M41, M48

1. Introduction and Review of Literature

The method of least squares is widely used in the field of social sciences to analyze quantitative data. Its recognition in accounting as a data analysis method has not been easy (Lee, 2011). However, processing

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the data obtained from financial statements through this mathematical method used to assess the evolution of entities' performance in time is considered relevant within specialized literature (Albu, 2003). Among scholars there are convergent views regarding the fact that a set of corporate governance mechanisms can be correlated to a more effective use of the companies' resources and to an increase of turnover (Azim, 2012). Despite this, literature offers few studies able to establish a statistical correlation between a particular type of corporate governance and performance (Schultz and Tan, 2010). The effect of corporate governance on financial performance can be approached from the perspective of creating a regression model (Pham and Chan, 2011, Klein and Morck, 1988, Mehran, 1995). In order to ensure a high level of relevance and credibility, studies approach the correlation between corporate governance and financial performance from the perspective of several governance variables: board structure, mandate duration of board's members, governance structure, support to the increase of performance and added value (Coles, 2001). This study aims to take into account the following variables: foreign management, local management, audited entities and the level of financial performance represented through the five indicators for establishing a mathematical model, using the method of the least squares to allow the forecasting of the audited entities' performance evolution.

In order to achieve this objective the following empirical hypothesis is intended to be tested:

H1: if the linear regression model is appropriate to represent the evolution of audited entities' performance with foreign or local management;

For the indicators for which the above mentioned hypothesis is confirmed, we shall create a linear regression model in order to obtain credible forecasting regarding the evolution of their performance within a timeframe, taking into account the nature of the management (foreign or local), starting from the data included in the financial statements.

2. Material and Method

In order to conduct this study, we used a stratified sampling method, which is a probabilistic procedure based on dividing the population after a certain criterion. These samples have a superior degree of representativeness in comparison with simple random samples and they are more relevant for clearly defined population groups. In this context, Cluj County was selected in order to achieve a statistical model on the performance of audited entities at national level. The relevance of the data collected in this county is conferred by the fact that, economically, Cluj County is very active, and according to the data provided by the National Trade Register Office, it is situated above the national average for the period 1990-2012 regarding the frequency of the following operations: registration of new entities, registration of modifications and deregistration of existent entities in Romania. Within each category of operations in Cluj County, the registration of new entities, the registration of modifications and deregistration of existing entities are equal to the average registered in Romania (table 1).

Table 1. Positioning the economic activity of Cluj County at Romania's level

Level	Operations performed on categories at the Trade Register Office during 1990-2012							
	Percentages counties at national level -% -		Percentages on categories of operations within each county -% -					
			Registration		Modification		Deregistration	
	Level	*Deviation from average*	*Level*	*Deviation from average*	*Level*	*Deviation from average*	*Level*	*Deviation from average*
Cluj County	4.41%	85%	15%	0%	79%	0%	6%	0%
The farthest value	0.80%	-66%	12%	-20%	72%	-9%	4%	-33%
National average	2.38%	-	15%	-	79%	-	6%	-

Source: Processing performed by authors according to the Romanian National Trade Register Office data

Within Cluj County there were taken into consideration, in an exhaustive manner, all entities whose financial statements were audited during 2005-2011. In order to achieve the stratification condition specific to this sampling method, the statistical population (audited entities) has been divided in two categories (population groups): audited entities with foreign management, respectively audited entities with local management.

In Cluj County there have been identified a number of 304 entities which had their financial statement audited during 2005-2011. The extracted financial data derive from the financial statements drawn for the financial years 2008-2011. Out of the total of audited entities, 127 entities were eliminated as they were not relevant in the present study for various reasons, such as not publishing their financial statements for each of the four mentioned financial years. Therefore, from the total number of entities in Cluj County whose financial statements were audited during 2005-2011, for 58% of them there were calculated performance indicators for the period 2008-2011. The financial data extracted from the last four financial years can confer credibility to the study's results in the situation of confirming or refuting the hypotheses.

In order to quantify performance one extracted from the financial statements of these audited entities necessary information for calculating certain relevant economic and financial indicators whose method of calculation and significance are presented below (table 2).

The indicators were calculated for all entities taken into consideration for each of the four financial years. Later, one made a simple arithmetic average of the values for the two categories of audited entities: with foreign and local management. These data revealed if the performances of these two categories of audited entities comply, in evolutionary terms, with a particular mathematical model. This model would be useful to carry out some predictions about the development of the audited entities' performance at national level, and particularly some predictions concerning the performance of a certain type of management within these audited entities: foreign and local.

Table 2. Indicators of performance measurement for which the inclusion within the linear regression model is verified

No	Indicator denomination	Indicator symbol	Calculation formula	Indicator significance	Significance of used terms
1	Rotation speed of total assets	K_{TA}	$\frac{NT}{TA}$	Management effectiveness in using assets to achieve turnover	NT=Net Turnover NR=Net Result TA=Total Assets TD=Total Debts E=Equity
2	Rotation speed of total debts	K_{TD}	$\frac{NT}{TD}$	The rhythm of total debts reimbursement	
3	Net Profit Margin	N_{PM}	$\frac{NR}{NT}$	Revenue contribution to strengthening the entity's self-financing capacity	
4	Return on Common Equity	R_{CE}	$\frac{NR}{E}$	The efficiency of using the shareholder's capitals	
5	Return on Total Assets	R_{TA}	$\frac{NR}{TA}$	The profitability of the entire capital invested in the entity	

Source: Processing performed by authors

Therefore, these values were processed using the method of least squares in order to create a mathematical model to forecast the economic entities' performances. The association between financial years and performance can be mathematically represented by a straight line called the line of linear regression.

The calculations made within this method are based on the logic of a first-degree equation (formula 1):

$$y = ax + b \quad (1)$$

Where,

x=determinant variable, independent (financial years);

y=determinat variable, dependent (performance indicators of the audited entities);

a=regression coefficient (the degree of variability);

b=free term of the regression line (constant element).

Identifying a mathematical model representative for the audited entities' performance based on linear regression involves discovering the value of two coefficients. In mathematical terms, it was proven that (formula 2):

$$a = \frac{\sum_{i=1}^{n} X_i Y_i}{\sum_{i=1}^{n} X_i^2} = \frac{\sum_{i=1}^{n}(x_i-\bar{x})(y_i-\bar{y})}{\sum_{i=1}^{n}(x_i-\bar{x})^2}$$

$$b = \bar{y} - a\bar{x}$$

Where,
$\bar{x}$=average value of the determinant variable (financial years);
$\bar{y}$=average value of the determinat variable (performance indicators of the audited entities). (2)

Although, in general, the linear regression model is appropriate for determining the development of economic performance, its implementation is not always opportune. In this respect, the method of the least squares and, implicitly, its component – the linear regression – is justified (relevant) only when noticing a conditioning, a certain association between the two variables taken into consideration in order to establish the regression model: financial years and performance registered by the audited entities during that certain period.

The degree of association between the two categories of variables is provided by the regression correlation coefficient (r) calculated below (formula 3):

$$r = \frac{\sum_{i=1}^{n} X_i Y_i}{\sqrt{\sum_{i=1}^{n} X_i^2 \sum_{i=1}^{n} Y_i^2}} = \frac{\sum_{i=1}^{n}(x_i-\bar{x})(y_i-\bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i-\bar{x})^2 \sum_{i=1}^{n}(y_i-\bar{y})^2}}$$

Significance:
$r \to 1$ indicates a perfectly positive (direct) association (correlation) between the financial years and the performance of audited entities from the perspective of linear regression;
$r = 0$ indicates the lack of association between the two set categories of variables;
$r \to -1$ indicates a perfectly negative (indirect) association (correlation) between the financial years and the performance of the audited entities from the perspective of the linear regression (3)

3. Results and Discussions

In order to verify the hypothesis of this study one will primarily assess if, for the two categories of audited entities, there is a degree of correlation between the financial years and the values achieved by the five indicators taken into consideration. This degree of correlation will be identified by calculating the regression correlation coefficient. If, after mathematical calculation, this coefficient registers appropriate values, then the linear regression model shall be considered representative for the performance development of the audited entities' management. Secondly, one will create a first-degree function considered to be useful and relevant for forecasting the audited entities' performance starting from the two categories of management.

The number of assets rotation performed in order to achieve a certain level of turnover is the expression of the efficiency of asset usage. To assess the opportunity of using the method of the least squares and the linear regression model for forecasting the evolution of this indicator for the audited entities, the regression correlation coefficient was calculated (r) based on the information shown below (table 3):

Table 3. Setting the regression correlation coefficient for the rotation speed of total assets

Type of management	Rotation speed of total assets (K_{TA}) – linear correlation Calculation elements - coefficient of linear correlation							Coefficient
	Year	x_{iN} Year	y_{iN} (K_{TA})	$x_i - \bar{x}$	$y_i - \bar{y}$	$(x_i - x)(y_i - y)$	$(x_i - x)^2$	$(y_i - y)^2$	
Foreign management	2011	1	0.30	-1.50	-0.48	1.62	2.25	1.1718	0.764
	2010	2	0.94	-0.50	0.16	-0.08	0.25	0.0248	
	2009	3	0.90	0.50	0.12	0.06	0.25	0.0138	
	2008	4	0.99	1.50	0.21	0.31	2.25	0.0431	
	Cumulated values	*Average*	*2.5*	*0.783*	-	-	*1.915*	*Total(Σ) 5*	*1.2535*	
Local management	2011	1	0.40	-1.50	-0.02	0.03	2.25	0.0004	-0.304
	2010	2	0.46	-0.50	0.04	-0.02	0.25	0.0016	
	2009	3	0.45	0.50	0.03	0.02	0.25	0.0009	
	2008	4	0.37	1.50	-0.05	-0.08	2.25	0.0025	
	Cumulated values	*Average*	*2.5*	*0.42*	-	-	*-0.05*	*Total(Σ) 5*	*0.0054*	

Source: Processing performed by authors

After applying the method of calculation, for the audited entities with foreign participation, we obtained a coefficient value of 0.764, quite close to the maximum possible value 1. This indicates a strong level of positive association (correlation) between the variables used: financial years and the medium level of the rotation speed of total assets. Consequently, for the audited entities with foreign management, linear regression can be used to forecast the evolution of the efficiency of using the assets. In what concerns the audited entities with local management, the correlation coefficient value is of – 0.304. In this case, the coefficient value signifies a negative association of medium intensity, at the maximum limit of this interval.

The collection rhythm of total debt for the audited entities with foreign and local management is highlighted by the rotation speed of total debt. The level of regression correlation coefficient obtained after the processing of statistics is highlighted below (table 4).

Table 4. Establishing the regression correlation for the rotation speed of total debts

Type of management	Rotation speed of total debts (K_{TD}) – linear correlation								Coefficient
	Calculation elements - coefficient of linear correlation								
	Year	x_{iN} Year	y_{iN} (K_{TD})	$x_i - \bar{x}$	$y_i - \bar{y}$	$(x_i - x)(y_i - y)$	$(x_i - x)^2$	$(y_i - y)^2$	
Foreign management	2011	1	0.34	-1.50	-1.37	2.06	2.25	1.8769	0.782
	2010	2	2.24	-0.50	0.53	-0.27	0.25	0.2809	
	2009	3	1.96	0.50	0.25	0.13	0.25	0.0625	
	2008	4	2.30	1.50	0.59	0.89	2.25	0.3481	
	Cumulated values	*Average*		-	-		*Total*(∑)		
		2.5	*1.71*			*2.8*	*5*	*2.5684*	
Local management	2011	1	0.68	-1.50	-0.03	0.04	2.25	0.0008	-0.488
	2010	2	0.83	-0.50	0.12	-0.06	0.25	0.0150	
	2009	3	0.77	0.50	0.06	0.03	0.25	0.0039	
	2008	4	0.55	1.50	-0.16	-0.24	2.25	0.0248	
	Cumulated values	*Average*		-	-		*Total*(∑)		
		2.5	*0.71*			*-0.23*	*5*	*0.0445*	

Source: Processing performed by authors

For the audited entities with foreign management, the high level of the coefficient of regression correlation of 0.782 indicates a strong positive association. Therefore, in the case of this category of audited entities the linear regression for the forecast of the reimbursement rhythm of debt during the future financial years can be used. The negative value of this coefficient of -0.488, in the case of audited entities with local management means a negative association of medium intensity, an indirect correlation between the financial years and the value of the rotation speed of debts. Therefore, it is legitimate to use the linear regression in the case of these audited entities in order to forecast the evolution of the reimbursement rhythm of total debt.

The results of the statistics' processing for the Net Profit Margin indicator are the following:

Table 5. Establishing the regression correlation coefficient for the Net Profit Margin

Type of management	Net Profit Margin (N_{PM}) – linear correlation Calculation elements - coefficient of linear correlation								Coefficient
	Year	x_{iN} Year	y_{iN} (N_{PM})	$x_i - \bar{x}$	$y_i - \bar{y}$	$(x_i - x)(y_i - y)$	$(x_i - x)^2$	$(y_i - y)^2$	
Foreign management	2011	1	3.21	-1.50	-0.30	0.45	2.25	0.0900	0.659
	2010	2	1.68	-0.50	-1.83	0.92	0.25	3.3489	
	2009	3	2.51	0.50	-1.00	-0.50	0.25	1.0000	
	2008	4	6.64	1.50	3.13	4.70	2.25	9.7969	
	Cumulated values	*Average*		-	-		*Total*(Σ)		
		2.5	*3.51*			*5.56*	*5*	*14.236*	
Local management	2011	1	9.56	-1.50	6.67	-10.01	2.25	44.489	-0.913
	2010	2	2.23	-0.50	-0.66	0.33	0.25	0.4356	
	2009	3	0.52	0.50	-2.37	-1.19	0.25	5.6169	
	2008	4	-0.75	1.50	-3.64	-5.46	2.25	13.250	
	Cumulated values	*Average*		-	-		*Total*(Σ)		
		2.5	*2.89*			*-16.32*	*5*	*63.791*	

Source: Processing performed by authors

The evolution of net profit obtained above (table 5) per one unit of turnover ratio shows after the processing a positive value of coefficient (0.659) for the audited entities with foreign management. This denotes a direct association (correlation) of medium intensity between the financial years and the evolution of net profit in what concerns the use of linear regression model for the forecast of the Net Profit Margin in the future financial years for this category of audited entities. The evolution of this performance indicator shows different results in the case of audited entities with local management, in the case of which there were registered values towards the inferior limit of the interval, namely -0.913. The value of the correlation coefficient varying close to the minimum indicates a strong negative association (correlation) between the determinant variable (financial years) and the determinat variable (the analyzed performance indicator). The fact that such a level was registered can be explained by the fact that the audited entities with local management showed medium values that were very high, of 9.56%, a lot more as compared with the average perceived as reasonable, of 5% (Achim, 2009). Consequently, it is legitimate to use the model of linear regression for the forecast of the evolution of Net Profit Margin for the audited entities with local management.

The audited entities with foreign management show quite low values of the correlation coefficient, but positive ones in what concerns the evolution of the Return on Common Equity (table 6). This is explained by the fact that in the financial year 2008 there were registered higher medium values of performance, of 11.54% given the fact that the specialized literature (Bringham, 1999) mentions a medium level of this indicator, around 15%. This detail can diminish, from a mathematical point of view, the coefficient of regression correlation at 0.411. given the fact that the value is quite close to the middle of the interval that guarantees the relevance of the linear regression, namely 0.5, we believe that the value shows a direct relation of medium intensity and thus suitable for the use of linear regression for the forecast of the evolution of the efficiency in the use of shareholders' capital in the future

financial years. The audited entities with local management register, as shown in table 6 negative values of the correlation coefficient, very close to the minimum, indirect, of low intensity, namely -0.921. This shows an almost perfectly indirect correlation between the financial years and the evolution of the Return on Common Equity indicator. This is explained by the fact that in the case of local management we noticed a reverse evolution trend as compared to the foreign management for the Return on Common Equity. The financial year 2011 shows the higher values of this indicator, meaning 9.58% that leads to this value of the correlation coefficient. Given the strong intensity of the relation, the linear regression is recommended for the forecast of this type of audited entities.

Table 6. The coefficient of regression correlation on the Return on Common Equity

Type of management	Return on Common Equity (R_{CE})- linear correlation								
	Calculation elements - coefficient of linear correlation								Coefficient
	Year	x_{iN} Year	y_{iN} (R_{CE})	$x_i - \bar{x}$	$y_i - \bar{y}$	$(x_i - x)(y_i - y)$	$(x_i - x)^2$	$(y_i - y)^2$	
Foreign management	2011	1	7.82	-1.50	1.26	-1.89	2.25	1.5876	0.411
	2010	2	2.73	-0.50	-3.83	1.92	0.25	14.669	
	2009	3	4.15	0.50	-2.41	-1.21	0.25	5.8081	
	2008	4	11.54	1.50	4.98	7.47	2.25	24.800	
	Cumulated values	*Average*		-	-		*Total*($\sum$)		
		2.5	*6.56*			*6.29*	*5*	*46.865*	
Local management	2011	1	9.58	-1.50	6.69	-10.03	2.25	44.723	-0.921
	2010	2	2.32	-0.50	-0.57	0.29	0.25	0.3278	
	2009	3	0.55	0.50	-2.34	-1.17	0.25	5.4873	
	2008	4	-0.88	1.50	-3.77	-5.66	2.25	14.232	
	Cumulated values	*Average*		-	-		*Total*($\sum$)		
		2.5	*2.89*			*-16.58*	*5*	*64.769*	

Source: Processing performed by authors

The Return on Total Assets for the audited entities is presented in the light of the extent of association and of the opportunity to use the linear regression model of forecast (table 7):

Table 7. The coefficient of regression correlation on the Return on Total Assets

Type of management	Return on Total Assets (R_{TA})- linear correlation Calculation elements - coefficient of linear correlation							Coefficient
	Year	x_{iN} Year	y_{iN} (R_{TA})	$x_i - \bar{x}$	$y_i - \bar{y}$	$(x_i - x)(y_i - y)$	$(x_i - x)^2$	$(y_i - y)^2$	
Foreign management	2011	1	0.95	-1.50	-1.89	2.83	2.25	3.5627	0.889
	2010	2	1.58	-0.50	-1.26	0.63	0.25	1.581	
	2009	3	2.25	0.50	-0.59	-0.29	0.25	0.3452	
	2008	4	6.57	1.50	3.73	5.60	2.25	13.932	
	Cumulated values	*Average* 2.5	*2.838*	-	-	*8.765*	*Total(Σ)* 5	*19.421*	
Local management	2011	1	3.87	-1.50	2.66	-3.99	2.25	7.0623	-0.924
	2010	2	1.03	-0.50	-0.18	0.09	0.25	0.0333	
	2009	3	0.23	0.50	-0.98	-0.49	0.25	0.9653	
	2008	4	-0.28	1.50	-1.49	-2.24	2.25	2.2276	
	Cumulated values	*Average* 2.5	*1.21*	-	-	*-6.63*	*Total(Σ)* 5	*10.29*	

Source: Processing performed by authors

The rate of return of assets for the audited entities that already have foreign participation show the highest value of the correlation coefficient as compared to the other analyzed indicators, namely 0.889. Therefore, the correlation is direct, of very strong intensity. The level of correlation coefficient for the audited entities with local management is the opposite, showing after the mathematical calculations values that are close to the minimum, that is to say - 0.924. In this respect, the correlation is indirect, of strong intensity. This is explained by the significant increase in the financial year 2011 for this type of audited entities, of the medium value of the assets' return at 3.87%. Therefore, the linear regression is relevant in what concerns the use for the forecasts in the case of this indicator.

Considering the fact that the audited entities with foreign management showed positive values (direct relation) of the correlation coefficient corresponding to the evolution of the 5 indicators analyzed in the financial years 2008-2011, situated in the interval [0.411,0.889] we

believe that the use of linear regression is justified for the forecast of their performance in the future financial years. In this case of this type of entities the first hypothesis that is the object of the present study is confirmed. In what concerns the audited entities with local management, only negative results of the correlation coefficient were registered (indirect relations). These were situated between the [-0.924, -0.304] interval. In this case, we believe that the linear regression is reliable for the forecasts concerning future financial years. Therefore, for the audited entities with local management the first hypothesis of the present study is confirmed in order to verify it.

In order to confirm the second hypothesis of the study, for the audited entities with foreign management, as well as local, because the linear regression coefficient means the existence of a satisfying level of association (medium intensity and very strong intensity) between the financial years and the performance of entities we calculated the regression coefficient (degree of variability) a and the free term of the regression line (constant element) b in order to establish the linear regression model (table 8):

Table 8. Forecasting functions- the evolution of indicators audited entities on the basis of the method of least squares (linear regression)

Type of management		Indicator denomination	Indicator symbol	Forecasting function
1	Foreign management	Rotation Speed of Total Assets	K_{TA}	$y = 0.383x - 0.175$
2		Rotation Speed of Total Debts	K_{TD}	$y = 0.560x + 0.310$
3		Net Profit Margin	N_{PM}	$y = 1.112x + 0.730$
4		Return on Common Equity	R_{CE}	$y = 1.258x + 3.415$
5		Return on Total Assets	R_{TA}	$y = 1.753x - 1.545$
6	Local management	Rotation Speed of Total Assets	K_{TA}	$y = -0.010x + 0.670$
7		Rotation Speed of Total Debts	K_{TD}	$y = -0.046x + 0.825$
8		Net Profit Margin	N_{PM}	$y = -3.264x + 11.050$
9		Return on Common Equity	R_{CE}	$y = -3.316x + 11.180$
10		Return on Total Assets	R_{TA}	$y = -1.326x + 4.525$

Source: Processing performed by author

4. Conclusions

By verifying the first hypothesis on the whole, the study shows the existence of a positive, linear correlation, of a conditioning extent between the performance of audited entities from Cluj County regardless of the type of management and the financial years. The conclusions of the study at the Cluj County level can be applied at national level taking into account the stratified sampling methodology. This allows the generalization of conclusions given the fact that the Cluj County can be considered to be representative at the national level from the point of view of the economic activity. This was revealed by the statistics offered by the Trade Register Office for the interval 1990-2012. The study is finalized by the constitution of 10 regression models that allow reliable forecasting for the evolution of the foreign and local management performance in the case of audited entities based on the data extracted from financial statements. With the help of these functions we can guarantee the reliable forecasting of the economic and financial indicators used, as well as the rotation speed of total assets, rotation speed of total debts, Net profit Margin, Return on Common Equity, and Return on Total Assets.

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