FINANCIAL PERFORMANCE MEASUREMENT MODELS IN THE AUTOMOTIVE INDUSTRY IN SLOVAKIA

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Abstract: The article deals with financial performance management in Slovakia's automotive industry. The aim of this article is to design models of financial performance in the automotive industry as a tool to increase the effectiveness of financial performance management with possible application in practice. The researched objects are companies operating in the automotive industry based in Slovakia. Mathematical, statistical, and econometric methods were used to fulfil the aim of the work.

Keywords: financial analysis, financial performance, traditional indicators of financial performance, modern indicators of financial performance

1 Introduction

The entry of the Slovak Republic into global markets brought many economic consequences and significant changes to companies operating on the domestic market, which can be divided into positive and negative changes. A positive change is the number of new business opportunities, which are often very closely linked to constant changes in the economic, financial, and legislative environment within the EU. In addition to many opportunities, this brings small and medium-sized enterprises operating on the Slovak market pitfalls, and if they want to overcome them, they must be flexible, constantly evaluate their financial performance and increase the efficiency and competitiveness of financial management.

Recently, there have been significant changes in approaches to evaluating the financial performance of companies on the global market. Transition from standard financial indicators and models that are based on accounting profit to financial models that consider economic profit, market value and market criteria for small and medium-sized enterprises is not so obvious. Despite the theoretical importance of the issue of financial management analysis, small business owners do not attach sufficient importance to it and pay attention to more standard absolute accounting indicators, such as economic results, costs, revenues, profitability, and indebtedness indicators.

The automotive industry has a strong tradition in Slovakia and became the most important sector and driving force of the Slovak economy. Over the past 20 years it has been an important source of foreign direct investment as well as industrial innovation. Slovakia can be considered as one of the key players of the global automotive industry.

2 Literature Review

In their research, the authors Kiseľaková and Šoltés (2017) devoted themselves to analysis and practical application financial performance management models of 40 small and medium-sized enterprises in the food industry in Slovakia and the Czech Republic, while monitoring the period from 2010 to 2014. Based on the empirical data obtained from the financial statement databases, they tried to perform a financial analysis, while they emphasized data on revenues, costs, ROA, ROE, economic or overall results indebtedness. To fulfill the set goal, they used time series analysis, regression analysis, and correlation analysis. In the trend analysis of some indicators, Kiseľáková and Šoltés focused on median values. Sub-analyses were devoted to trends in basic absolutes (sales, costs), difference (net working capital), as well as ratio indicators (ROS, ROE). The overall analysis of the selected enterprises was carried out on two levels, and at the same time projected into two models:

1. SMFR model: EAT analysis (represented by management result),
2. MMFR model: EVA analysis (represented by a modern indicator of financial performance).

Based on the performed analysis, the authors concluded that it is suitable for the analyzed companies to use the SMFR model, which is based on the management result, as it is with the MMFR model it is necessary to know the value of the EVA indicator, the calculation of which is complicated. SMFR model evaluated as a prediction model, which confirmed that this is a real development trend of the selected indicators with an effort to decrease the absolute cost indicator and maximize net growth of working capital, growth of the sales indicator and return on equity. Monitored so businesses should focus on deeper analysis and monitoring of absolute indicators, in particular: the result of management, sales and costs.

Delen et al. (2013) also focused on measuring the financial performance of Turkish companies listed on the Istanbul Stock Exchange. The authors used decision tree analysis, while in their research used a two-stage analysis:

1. Exploratory Factor Analysis (EFA) through which they identified and verified basic dimensions of financial indicators,
2. Analysis of predictive modeling methods, which revealed potential relationships between company performance and financial indicators.

They used four algorithms to research the impact of financial indicators on the company's financial performance decision tree (CHAID, C5.0, QUEST and C&RT). These algorithms tested return on equity and return on assets using hold out samples. So that the authors can determine how well-run models on real-world data, created a subset of the data for testing purposes and verification. For this reason, the set of obtained data was divided into two parts, with 70% of the data was used to create the model and 30% to test it. They used to analyze the financial performance authors test data sets. The results of the analysis were also examined in two parts:

1. In the first part of the analysis, the coefficient of return on equity was the dependent variable (ROE),
2. In the second part of the analysis, the dependent variable was return on assets (ROA).

The result obtained using ROE as the dependent variable indicated that the most important financial indicators are profit and loss ratio before tax, net profit margin, financial leverage indicator and sales growth ratio. These variables had the greatest impact on predicting ROE. Research results pointed out that the pre-tax profit-loss ratio was the most important factor in each of the four models. Net profit margin emerged as the second most important ratio among the three (CHAID, C5.0 and QUEST) from four models. Evaluations from the second part of the analysis, where it was dependent with the ROA variable, they pointed out that the most important financial indicators include profit before by taxation, the share of net profit, the debt ratio and the ratio of asset turnover, which had the greatest impact on predicting ROA. The result also found that pre-tax profits on equity, net profit margin and debt ratio were the most important indicators in each of the four models. Further in the analysis, the authors tried to find out which financial indicators have the greatest impact on company performance. After the analysis, it was found that the most significant impact on performance companies have two profitability ratios, namely: profit before tax and net profit margin.

In their study, Wu and Shen (2013) focus on the relationship between the financial performance of a company and its social responsibility (CSR) in the banking sector. The motifs suggested that the relationship between these it is positive in two areas, namely that financial performance is influenced by social performance responsibility. The research sample covered the years 2003-2009 and consists of data from 162 banks in 22 countries. The authors then divided the banks into four categories based on their degree of involvement into social responsibility. To avoid data distortion, the study suggests using of the extended version of Heckman's two-stage regression:

- Step1: logit model,
- Step 2: estimates the performance equation with the inverse Mills ratio generated in the first step.

In Benková et al (2020), empirical results show that social responsibility is positively associated with financial performance in terms of return on assets, return on equity, net interest income and non-interest income. Conversely, social performance is negatively associated with non-performing loans, so it is strategic choice as the primary motive of banks to engage in social responsibility. If it is a matter of measures for making a profit, banks that carry out more activities in the field of corporate social responsibility outperform those that do not participate in social responsibility.

By linking CSR and financial performance in the banking sector, they also covered in their research Simpson and Kohers (2002). The aim of the work was to extend previous research on the relationship between CSR and financial performance of the company. A significant contribution of the study is the empirical analysis of the sample companies from the banking industry and the use of the rating. Empirical analysis strongly supports the hypothesis that the connection between social and financial performance is positive. Research sample they comprised all national banks that were reviewed for compliance in 1993 and 1994 with rating agencies. All banks that were assigned ratings were included in the sample necessary improvement. Banks that received satisfactory ratings were omitted for clarity division of banks with high social performance and low social performance. Finally, the total sample consisted of 385 banks. In monitoring financial performance, two measures were used, which the authors considered to be important measurement dimensions, namely the ROA indicator and the loss from loans to total loans. The authors used regression analysis where the null hypothesis of a negative relationship, or its non-existence between the rating and the return on assets was rejected on a probabilistic basis level 0.016, i.e., it is a positive regression coefficient for the rating variable. Regression equation with dependent variable (loan losses) and independent variable (rating) revealed that the null hypothesis could be rejected. Research results clearly indicate that there is a positive relationship between social and financial performance, which indicates better financial performance for banks with high social performance, i.e., banks with high social performance had lower loan losses.

The research of the Czech author Dluhošová (2004) deals with the analysis of financial performance based on of the modern EVA method. The research sample consists of 2,009 industrial enterprises in the Czech Republic in the observed period of 1997-2001. Based on the conducted study, it can be argued that decisive the positive development of the indicator is influenced by a decrease in the cost of equity capital, as well as growth of the EAT/EBIT indicator. On the other hand, the most significant negative impact was the increase of the own capital in relation to the negative value of EVA. The author further devoted herself to the decomposition of the EVA parameter, while using the logarithmic decomposition method. Research has shown that increasing the competitiveness of enterprises in the Czech industry will lead to the fact that the EVA indicator will gradually moves from negative to positive values. The author does not recommend using logarithmic analysis, but rather functional, or pyramid decomposition. Companies that achieved positive the value of EVA also increases with market capitalization, based on which Dluhošová comes to the conclusion that the EVA method should be one of the key measures in managing the financial performance of the company as it is connected with the orientation of the company towards increasing the value for the owners.

In his research, Watson (2007) focuses on modeling the interaction between financial performance and building a network. Network theory comes with the view that a successful business can depend on the ability of owners to gain access to resources that are not under their control, and thus in a way that which is cost effective. Networks provide value to members by giving them access to social resources that are embedded in the network and thus the network can provide resources, with which owners of small and medium-sized enterprises can use the necessary resources (ie o resources acquired externally). However, there is currently little empirical support for this proposition, especially for established companies, while the results of the study are based on an extensive long-term database and indicate a significant positive relationship between networking and financial performance. Several studies have been conducted to examine the relationship between network connectivity and performance companies, but each of them had at least one of the following limitations:

- Only cross-sectional data were used.
- Only a limited number of networks were examined.
- Potential variables (age, industry, and company size) were not mentioned.

The aim of most studies was the research of emerging or newly established enterprises. Watson therefore in his study sought to explore and model the connection between networking and financial performance of companies (survival, growth, and ROE). 5,027 economic operators were included in the survey businesses from Australia and data collection was done through questionnaires over a period of years 1994-1998. This study tracks the performance of firms through three important measures:

- survival of the company,
- growth of total revenues (sales plus other revenues),
- return on capital (ROE).

It was used to evaluate the relationship between networking and these measures of firm performance binary logistic analysis. A strength of this study is the use of a large longitudinal database which allows several variables to be included in the analysis. The results suggest that networking and financial performance have a positive interaction. In terms of survival and growth, she could in this area there is some optimal level of resources that the owner should invest in networking. On the based on the study, it can be argued that while its results provide some support for network activities (mainly in the field of survival and growth of the company), it is not recommended that everyone's networks be developed and promoted species. The author further argues that the extensive involvement of owners in multiple networks will be Although the results suggest that the support of networks could be very beneficial if the goal is to maximize business growth and survival but support for networks is unlikely to be beneficial to the company's profitability (ROE).

Brazilian authors Viglioni et al. (2018) conducted research to identify the main economic and financial performance indicators of companies, or of mergers and acquisitions in technological industry in Brazil. The quantitative model was logistic regression, the research sample consisted of 28 enterprises of the industrial sector, the necessary data of which were collected and distributed quarterly between 2009 and 2017. While conducting the study, the authors found that studies related to this topic were extensively discussed, especially in the field of industrial economy, finance, and accounting. The created logistic regression model showed that the key economic and financial indicators that determine mergers and acquisitions in the technological industry depend on foreign capital, and the size of the company. Foreign capital is one of the alternatives through which the company finances its business activity. In turn, company size can bring many advantages, for example, increase in assets, geographical expansion, economies of scale, greater bargaining power and other. One of the results of this survey points out that the company's profits can be increased compensated by an increase in the size of the company, i.e., a larger volume of own resources. Contradictory ROE, ROA, L3 and EVA recorded the result as they showed negative statistical significance and hey generated value for shareholders. The authors made a proposal for future research, in more detail analyze the EVA, deepen, and expand the time frame of the research.

The aim of the research of the Czech author Pokorná (2012) was to find out whether the financial performance of Czech of companies with foreign capital shows higher financial performance than companies with domestic capital. The author had available data from 6,152 companies, while financial performance was measured on a five-year period from 2005-2009 based on significance profitability and asset growth. The financing of these enterprises was as follows:

- 32% of companies with foreign capital,
- 45% of companies' domestic capital,
- 23% of companies did not have this information available.

The difference between the financial performance of Czech companies with foreign and domestic capital was performed through the Mann-Whitney U test and the financial performance of the companies was measured through return on assets ROA and asset growth ratio. Research has found that in businesses with foreign capital, the average growth of assets was equal to 7.76% and the return on assets was 6.61%. The results for companies owned by the Czech Republic were 9.48% and 7.74%. The conclusions are statistically significant, and it can therefore be concluded that foreign-owned enterprises are not more efficient than domestic companies.

In research conducted by Hertenstein et al. (2005) investigated the question of whether there is a connection between industrial design and financial performance of the company, while the goal was to find out how it affects design for financial performance. 93 publicly traded companies were included in the examined sample companies, and the research covered the period from 1995 to 2001. The authors used traditional financial performance indicators (especially return on sales and return on assets), while expecting that businesses that place great emphasis on design have higher return on sales, ROA as well as rate sales growth. Furthermore, they assumed higher returns on the stock market and cash flow. On the other side also higher expenses that are associated with design (salaries of industrial designers, fees design consultants, industrially supported industries), but also material expenses and production. The authors performed this analysis using the Student's statistical method t-distribution where they tested the null hypothesis which assumes that there is a relationship between industrial design and financial performance. The results indicate that there is a positive the relationship between these two areas, however, surprisingly revealed that companies rated as companies with "good" design they were stronger in all indicators except growth rate. These results provide evidence that good industrial design is related to financial performance.

The aim of the study by the author Závarská (2011) was to identify the relationships of financial indicators performance and subsequent selection of key identifiers. The research sample consisted of 344 cooperatives of enterprises that account in the double-entry bookkeeping system, while the data is from 2008. The author focused on the following 14 indicators:

- production power (EBIT/A),
- return on assets (EAT/A and EBT/A),
- return on equity (ROE),
- profitability of sales (EBIT/T and EAT/T),
- asset turnover (T/A),
- share of added value in sales (VA/T),
- share of added value on assets (VA/A),
- share of economic added value on net operating assets (EVA/NOA),
- total liquidity (L3),
- current liquidity (L2),
- ready liquidity (L1),
- insolvency.

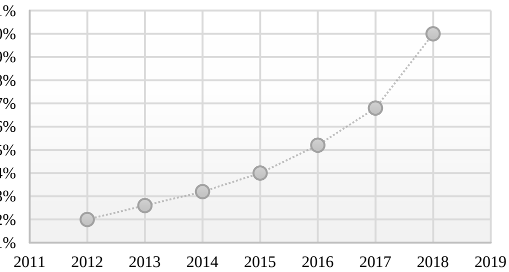
Statistical and logistic methods were used in the research. Individual financial indicators performance was calculated by the author using descriptive statistics, correlation analysis was used for the calculation The Kolmogorov-Smirnov test, which pointed out that for all 13 indicators (except of the T/A indicator) the null hypothesis of a normal distribution of the variable can be rejected. Executed the research produced the following result: Among the indicators that were examined, the author recommends leave the following:

- profitability indicators: EBIT/A, EBIT/T, VA/T, ROE,
- activity indicators: T/A,
- liquidity indicators: L3, insolvency,
- modern indicators: EVA/NOA.

3 Automotive industry in Slovakia

An analysis of the automobile industry was carried out, as it is a decisive industrial sector of the economy in Slovakia. Figure 1 shows how the share of the automotive industry in the total industrial production of Slovakia developed in the selected period 2012 to 2018. This share is increasing from year to year.

Figure 1 The share of the automotive industry in the total industrial production of Slovakia (2012 to 2018)



Source: own processing, Sario Agency

Based on available data from the Sario agency, we can claim that Slovakia is one of the countries that has held a leading position in the automotive industry in Central Europe since the 1990s. Over the past 20 years it has been an important source of foreign direct investment as well as industrial innovation. For this leading position we can thank the presence of four global car companies - Volkswagen Slovakia (Bratislava), Kia Slovakia (Žilina), Stellantis Slovakia (Trnava) and Jaguar Land Rover Slovakia (Nitra).

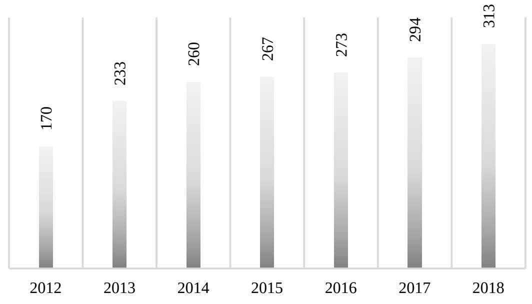
According to Trebuna et al. (2022), Slovakia is also a key player in the global automotive industry. As already mentioned, the automotive industry has a long tradition in Slovakia, and we can say that it is the driving force of the Slovak economy. Based on a survey by the Sario agency, the biggest advantages of Slovakia in the field of investment by automotive companies in this country include:

- strategic position within Europe,
- a wide network of suppliers,
- economic stability of the country,
- well-developed infrastructure,
- stable and favorable business environment,
- skilled and educated workforce,
- cost effectiveness,
- currency euro.

Every year, Slovakia improves its position on a global scale, as evidenced by the latest survey by the Sario agency, according to which Slovakia is among the 20 largest producers of the automotive industry in the world with a production of more than 1 million. cars per year. In 2021, this sector participates in the total industrial production of the country in the amount of 48%, while its share of the total GDP of the country represents 12%. People employed directly by the 4 car producers present 164,000 people and 245,000 people employed directly and indirectly by the automotive industry.

On the graph below (Figure 2) we can see the number of companies that were registered in Slovakia and belong to the automotive industry. Looking at the graph, we note that we recorded the largest number of companies in 2018, up to 313 companies.

Figure 2 Number of automobile industry enterprises in Slovakia (2012 to 2018)



Source: own processing, Finstat Database

4 Materials and Methodology

This section is devoted to the proposal of a financial performance model in the automotive industry as a tool leading to an increase in the effectiveness of financial performance management and its possible application in practice. The goal is to design a regression model, its subsequent estimation and interpretation.

The analytical and design part of the thesis is based on the financial data of automotive companies industry in Slovakia and for its needs we have chosen a statistical classification of economic activities SK NACE Rev. 2, sector C- production, division 29, which deals with the production of motor vehicles, trailers and semi-trailers, namely subgroups 29.10 (manufacture of motor vehicles), 29.20 (manufacture of bodies (coachwork) for motor vehicles and manufacture of semi-trailers and trailers) and 29.30 (manufacture of parts and accessories for motor vehicles). Financial data of companies in the automotive industry were obtained from Finstat database, as it provides financial data for many companies. The key period for our analysis was the years from 2012 to 2018, because available financial data were reported by companies in this period.

A trend analysis of traditional and modern financial was carried out indicators of 118 enterprises of the automotive industry in the period from 2012 to 2018. These enterprises they paid attention to most financial indicators, especially absolute financial ones an indicator of sales and costs, as well as a ratio indicator of profitability, liquidity, indebtedness, and activities. It should be emphasized that the financial statements did not contain the values of the EVA indicator, which it belongs to modern indicators of financial performance, which is why we quantified this indicator.

For this article, it was necessary to determine the variables which will enter our calculations as dependent, or independent. Since we are targeting the research on two models of financial performance for 2018, for each of them we they chose a different dependent variable that enters our model. We selected the explanatory variables as follow:

- traditional indicator of financial performance of EAT,
- modern EVA indicator.

The selection of independent variables was based on the results of the authors who dealt with the given issue in his previous studies. Most authors paid attention mainly to indicators return on equity (ROE), total liquidity (L3), indebtedness and sales. To us created and researched model, in addition to the above, we also included an absolute financial one cost indicator.

Table 1, it captures the variables that are used in our proposed and investigated models of financial performance of the company. The financial indicators representing the explanatory variables are therefore as follows:

Table 1 Dependent and Independent variables

Variables			Unit of measure
y_1	EAT	Net profit	EUR
y_2	EVA	Economic Value Added	EUR
x_1	S	Sales	EUR
x_2	C	Costs	EUR
x_3	L3	Total Liquidity	coef.
x_4	I_d	Degree of indebitedness	%
x_5	ROE	Return On Equity	%

Source: own processing

The first step in the design of the model was to examine the influence of independent, i.e., explanatory variables (x) to the dependent, or explained variable (y) and for this purpose it was necessary create sub-models where the dependent variable always depended on only one independent variable, i.e., that we created as many sub-models as the variables were included in analysis.

To make estimates, it was necessary to analyze whether the model chosen by us is suitable and meets the assumptions of linear regression. We therefore tested the following assumptions:

- normality of the residuals,
- the presence of heteroscedasticity,
- the presence of autocorrelation,
- the presence of multicollinearity.

A significance level of 0.05 was compared with the p-values of all tests. Based on of the previous relationship were subsequently rejected or accepted null hypotheses.

Normality of residuals
Residues represent model errors, i.e., differences between the actual value of yt and the model by the estimated value of y. According to the assumptions of linear regression, the residuals should come from a normal distribution. In our case, we used Jarques- Bera test of normality, while we tested the following hypotheses:

H0: The residuals come from a normal distribution.
H1: The residuals do not come from a normal distribution.
If the p-value of the test >0.05, H0 is not rejected.

Presence of heteroskedasticity
Homoscedasticity appears in the model if the assumption of linear regression is met about constant variance. On the contrary, if this assumption is not met, it means a problem heteroskedasticity. To verify the presence of heteroscedasticity in the model, we applied Breusch-Pagan test, where we tested the following hypotheses:

H0: There is no heteroskedasticity in the model.
H1: Heteroskedasticity is present in the model.
If the p-value of the test > 0.05, H0 is not rejected.

Presence of autocorrelation
The random components in a linear model should not be correlated. If this condition is not met, there is an autocorrelation problem in the model. The correlation is monitored by the correlation coefficient ρ, which can take on values from the

interval -1 to 1. Durbin–Watson test was used to test autocorrelation the test and hypotheses were formulated as follows:

H0: Autocorrelation is not present in the model (ρ = 0).
H1: Autocorrelation is present in the model (ρ ≠ 0).

Acceptance, or the rejection of the hypotheses depended on the test statistic, which is calculated as twice the difference 1 – ρ.

In case of:
P = -1, then the test statistic is 4, this represents negative autocorrelation,
P = 1, then the test statistic is 0, this represents positive autocorrelation,
P = 0, then the test statistic is 2, meaning no autocorrelation is present,
-1 > P > 1 and at the same time ₽ 0, then decisions are made based on critical values.

Presence of multicollinearity
Multicollinearity occurs in a model when there is a dependency between the dependent variables. In our case, the presence of multicollinearity in the model was detected using the inflation factor VIF test, where its values come from the interval 1 to infinity. Values greater than and equal to 5 indicate the presence of strong multicollinearity (Ringle et al., 2015). We tested the hypotheses:

H0: There is no dependence between the explanatory variables.
H1: There is a dependency between the explanatory variables.

5 Results and discussion

The first tested model was the standard model (SM), in which EAT appeared as the dependent variable.

The output from the R program in the form of the resulting values of all variables in the model is presented in Table 2, where statistically significant variables are also marked, through significance codes. Testing the assumptions of this standard linear regression model was performed subsequently.

Table 2 Linear regression model (SM) variable values

Independent variables	Estimation	Standard deviation	p-value
S	-0,01315	0,00245	1,06e-07***
C	-0,01076	0,00275	0,0001***
L3	-0,20271	0,02338	0,3861
Id	0,15501	0,01348	0,7209
ROE	0,48173	0,01325	0,9069
Significance codes	0 *** 0.001 ** 0.01 * 0.05 * 0.1		

Source: own processing, The Output of R program

The evaluation of the performed tests is summarized for the standard model in the following table (Table 3). Based on the performed testing, we interpret the results as follows:

1. Testing the normality of the residuals - the model meets the assumptions of the normality of the residuals, because p > 0.05. We do not reject the hypothesis H0, that the residuals come from a normal distribution.
2. Testing the presence of heteroskedasticity - there is no heteroscedasticity in the model since p > 0.05 applies. We do not reject the H0 hypothesis, which states that there is no heteroskedasticity in the model.
3. Testing the presence of autocorrelation - there is no autocorrelation in the model, p > 0.05 applies. We do not reject the hypothesis H0: There is no autocorrelation (ρ = 0) in the model.
4. Testing the presence of multicollinearity - the model meets the assumptions of independence of all independent variables because p > 0.05. We do not reject the H0 hypothesis about the absence of dependence between the explanatory variables.

Table 3 Results of SM linear regression model testing

Testing	Test	p-value	Test result
the normality of the residuals	Jarques – Bera test	0,7706	H0 do not reject
the presence of heteroskedasticity	Breusch – Pagan test	0,3695	H0 do not reject
the presence of autocorrelation	Durbin – Watson test	0,0568	H0 do not reject
the presence of multicollinearity	VIF test	1,3112	H0 do not reject
		1,3181	
		3,8519	
		1,1031	
		1,7671	

Source: own processing, The Output of R program

The second model tested was the modern model (MM), in which EVA appeared as a dependent variable.

The table below (Table 4) shows all the variables that enter the modern linear regression model - MM. Variables that demonstrate statistical significance are marked with the respective significance codes. Subsequently, testing was carried out to see if this model also meets the conditions of a linear model.

Table 4 Linear regression model (MM) variable values

Independent vabriables	Estimation	Standard deviation	p-value
ROE	0,406707	0,049093	0,0007***
S	-0,171592	0,032756	0,0016**
C	-0,181012	0,055447	0,0035**
L3	0,003746	0,021291	0,1768
Id	0,005229	0,024563	0,1972
Significance codes	0 *** 0.001 ** 0.01 * 0.05 * 0.1		

Source: own processing, The Output of R program

The evaluation of the tests that were carried out for the modern model is summarized in the following (Table 5). Based on the performed testing, we state the following:

1. Testing the normality of the residuals - the model meets the assumptions of the normality of the residuals, p > 0.05 applies. We do not reject the hypothesis H0: the residuals come from a normal distribution.

Table 5 Results of MM linear regression model testing

Testing	test	p-value	Test result
the normality of the residuals	Jarques – Bera test	0,6577	H0 do not reject
the presence of heteroskedasticity	Breusch – Pagan test	0,3681	H0 do not reject
the presence of autocorrelation	Durbin – Watson test	0,0524	H0 do not reject
the presence of multicollinearity	VIF test	2,3208	H0 do not reject
		2,5121	
		1,0819	
		1,1232	
		1,0235	

Source: own processing, The Output of R program

2. Testing the presence of heteroskedasticity - there is no heteroskedasticity in the model, because p > 0.05. We do not reject the H0 hypothesis about the absence of heteroscedasticity in the model.
3. Testing the presence of autocorrelation - there is no autocorrelation in the model, p > 0.05 applies. We do not reject the hypothesis H0: that there is no autocorrelation (ρ = 0) in the model.
4. Testing the presence of multicollinearity - assumptions about the independence of all independent variables are also met in the model because p > 0.05. We do not reject the H0 hypothesis, which assumes the absence of dependence between the explanatory variables.

Dependencies of financial indicators
The tested set contains 118 companies (n=118) and the significance level is set at 0.05 (p=0.05).

The evaluation of the statistical dependence between the selected indicators in 2018 is captured in the table (Table 6). After performing the significant significance test, statistical dependence was found between modern EVA indicators and ROE indicators, also between EVA and absolute financial indicators of costs and sales. The P-values of these variables were less than 0.05, i.e., we reject the null hypothesis of the absence of statistical significance between the indicators. In the case of the degree of indebtedness and total liquidity, we accept the hypothesis H0 of the absence of dependence, because their p-value exceeds the significance level of 0.05.

Table 6 Evaluation of the statistical dependence between selected standard financial indicators and the EVA indicator in 2018

Spearman's correlation coefficient				
variables	r	t(n-2)	p-value	Testing result
EVA & ROE	0.17321199	1.8941815	0.0000041	+
EVA & Id	-0.1872096	-2.0525995	0.7027906	-
EVA & L3	-0.1622567	-1.7710272	0.5495236	-
EVA & C	-0.0804366	-0.8691449	0.0004881	+
EVA & S	-0.0750193	-0.8102656	0.0006731	+

Source: own processing, The Output of R program

Table 7 shows the results of the H0 hypothesis testing about the non-existence of statistics among the selected financial indicators in 2017. As we can see, this year too there is a statistically significant dependence between the indicators EVAROE and ROE, EVAROE and costs, but also EVA and sales, as their p-values did not exceed 0.05. We accept the null hypothesis only in the case of the relationship EVA and L3, as well as EVA and Id.

Table 7 Evaluation of the statistical dependence between selected standard financial indicators and the EVA indicator in 2017

Spearman's correlation coefficient				
variables	r	t(n-2)	p-value	Testing result
EVA & ROE	0.16797717	1.835246671	0.0000049	+
EVA & Id	0.01875402	0.201987304	0.7250151	-
EVA & L3	-0.1583752	1.727556746	0.7030032	-
EVA & C	-0.0899127	-0.97232801	0.0004446	+
EVA & S	-0.0896273	-0.96921629	0.0004512	+

Source: own processing

By verifying the H0 hypothesis by correlation analysis in 2016 (Table 8), it was found that a statistically significant dependence between variables was recorded for the following pairs: EVA & ROE, EVA & costs and EVA & sales, whose p-values were lower than the significance level of 0.05. On the contrary, we accept the null hypothesis, which assumes the absence of dependence between the selected financial indicators, again for the pairs: EVA & L3 and EVA and Id, as their p-values exceeded the statutory significance level of 0.05.

Table 8 Evaluation of the statistical dependence between selected standard financial indicators and the EVA indicator in 2016

Spearman's correlation coefficient				
variables	r	t(n-2)	p-value	Testing result
EVA & ROE	0.15987713	1.7443673	0.0000068	+
EVA & Id	-0.0490467	-0.528886	0.7155107	-
EVA & L3	-0.0285251	-0.307350	0.3091502	-
EVA & C	-0.0523127	-0.564197	0.0007736	+
EVA & S	-0.0478132	-0.515554	0.0008932	+

Source: own processing

Statistical dependence testing in 2015 is shown in Table 9. We reject the H0 hypothesis about the absence of significant dependence between the variables in the case of pairs EVA & ROE, EVA & costs, as well as EVA & sales. The P-values of these pairs were very low and did not exceed the limit of 0.05, which indicates the existence of statistical significance between these indicators. On the contrary, the p-values of the pairs of variables EVA & Id, EVA & L3 were higher than the established significance level of 0.05, which indicates the absence of statistically significant dependence between the variables.

Table 9 Evaluation of the statistical dependence between selected standard financial indicators and the EVA indicator in 2015

Spearman's correlation coefficient				
variables	r	t(n-2)	p-value	Testing result
EVA & ROE	0.16087713	1.75556695	0.0000067	+
EVA & Id	0.08594147	0.92905525	0.8825264	-
EVA & L3	-0.0536204	-0.5783409	0.4386942	-
EVA & C	-0.0461229	-0.4972885	0.0006718	+
EVA & S	-0.0387241	-0.4173844	0.0007863	+

Source: own processing

In 2014, the statistical dependence between the selected indicators was tested again (Table 10). A significant statistical dependence was found between the pairs of indicators EVA & sales, EVA & costs and EVA & ROE. In these cases, we reject the H0 hypothesis since the significance level of 0.05 was not exceeded. In the case of the relations EVA and Id and EVA & L3, the p-values were higher, which indicates acceptance of the null hypothesis, which assumes the absence of dependence between the selected financial indicators.

Table 10 Evaluation of the statistical dependence between selected standard financial indicators and the EVA indicator in 2014

Spearman's correlation coefficient				
variables	r	t(n-2)	p-hodnota	Testing result
EVA & ROE	0.17144578	1.874279017	0.0000044	+
EVA & Id	-0.0455447	-0.49053643	0.7229416	-
EVA & L3	-0.0704425	-0.76057799	0.5223487	-
EVA & C	-0.0821602	-0.88789427	0.0004913	+
EVA & S	-0.0768941	-0.83063408	0.0005401	+

Source: own processing

The verification of hypotheses in 2013 is shown in Table 11, from which it follows that the p-values of the pairs EVA & L3, as well as EVA & Id were higher than the chosen significance level of 0.05, and thus we accept the null hypothesis, which assumes that there is no statistically significant dependence between the tested variables. In the other cases, the p-values did not exceed the significance level of 0.05, and therefore we reject the H0 hypothesis. Thus, we claim that a statistically significant dependence exists for pairs of financial indicators EVA & ROE, EVA & sales, and EVA & costs.

Table 11 Evaluation of the statistical dependence between selected standard financial indicators and the EVA indicator in 2013

Spearman's correlation coefficient				
variables	r	t(n-2)	p-hodnota	Testing result
EVA & ROE	0.177524335	1.94285511	0.0000021	+
EVA & Id	-0.03306782	-0.3563461	0.6815288	-
EVA & L3	0.09240012	0.99945546	0.7906354	-
EVA & C	-0.08300235	-0.8970581	0.0002147	+
EVA & S	-0.07885601	-0.8519582	0.0003429	+

Source: own processing

Hypothesis H0, which assumes the absence of significant statistical dependence between selected financial indicators, was also tested in 2012 (Table 12). Correlation analysis found the dependence between the modern EVA indicator and the traditional ROE indicator, as well as the absolute indicators of sales and costs. For these pairs of variables, the p-values did not exceed the 0.05 threshold, and therefore we reject the H0 hypothesis, claiming that there is a statistically significant dependence between the selected financial indicators. On the other hand, we do not reject the H0 hypothesis for the remaining two pairs of variables.

Table 12 Evaluation of the statistical dependence between selected standard financial indicators and the EVA indicator in 2012

Spearman's correlation coefficient				
variables	r	t(n-2)	p-hodnota	Testing result
EVA & ROE	0.17530188	1.91775603	0.0000034	+
EVA & Id	0.08207355	0.88695154	0.8438169	-
EVA & L3	0.0773701	0.83580683	0.6360071	-
EVA & C	-0.0731297	-0.7897456	0.0003491	+
EVA & S	-0.0688742	-0.7435635	0.0004218	+

Source: own processing

We interpret the results of the performed regression analysis as follows: we accepted the H0 hypothesis, which assumes the absence of a significant statistical dependence between the modern EVA indicator and selected standard financial performance indicators, for the pairs listed below:

- EVA & degree of indebitedness,
- EVA & total liquidity.

By means of the verification of the H0 hypothesis, a significant statistical dependence was found in each of the monitored years between the following pairs of variables by correlation analysis:

- EVA & ROE,
- EVA & sales,
- EVA & costs.

Based on the performed testing, we also found that there is a positive relationship between the modern EVA financial performance indicator and the return on equity ROE indicator, in each analyzed year, which also results from the above-mentioned tables (Table 7 to Table 12). It also follows from the mentioned tables that there is a significant dependence between the EVA indicator and the absolute indicators of sales and costs, but in these cases this dependence is negative, while it was confirmed in every monitored year.

The verification of the H0 hypothesis was subsequently also carried out for the entire period from 2012 to 2018 (Table 13). Also during this testing, a positive statistical dependence between the EVA & ROE indicators was demonstrated, a negative dependence was recorded for the pairs EVA & sales, EVA & costs. On the other hand, a statistically significant dependence was not confirmed between the indicators EVA & L3 and EVA & I_d.

Table 13 Evaluation of the statistical dependence between selected standard financial indicators and the EVA indicator throughout the period

Spearman's correlation coefficient				
variables	r	t(n-2)	p-hodnota	Testing result
EVA & ROE	0.40760173	4.80747787	0.0000001	+
EVA & I_d	-0.0723138	-0.7808789	0.5790183	-
EVA & L3	0.03518408	0.37917891	0.6019781	-
EVA & C	-0.2189302	-2.4165753	0.0000011	+
EVA & S	-0.1790234	-1.9597975	0.0000014	+

Source: own processing

Two linear regression models were proposed: the standard model and the modern model, which were subsequently estimated and interpreted results.

The first model was a standard SM linear regression model based on EAT analysis, which represented the dependent variable in this model of financial performance. This net indicator companies paid sufficient attention to profit and reported it in their financial statements in each observed period. After testing the assumptions of linear regression, confirmed the suitability of our chosen model. As statistically significant variables in this model they showed mainly sales and costs. In the case of sales, it is a positive relationship, and therefore with an increase in sales there is also an increase in EAT. Conversely, when costs increase, EAT decreases, which means negative addiction.

Second, the modern MM model was based on the analysis of the modern EVA indicator, which was chosen as the dependent variable. It should be emphasized that not a single enterprise showed the values of this modern indicator, and therefore it was necessary to quantify it. The values had to be calculated for everyone one company separately. As mentioned above, the calculation of the EVA indicator is considerable complicated and its calculation requires the calculation of other variables, such as cost of equity capital. This is also most likely one of the reasons why him companies do not pay attention and do not show it in their financial statements. The suitability of this of the model was also confirmed based on testing the assumptions of linear regression. Statistically significant variables in this model can be ROE, sales, and costs.

After conducting the tests of dependencies, a significant statistical dependence was found in each year between the dependent EVA and the independent variables ROE, costs, and sales.

The research that we studied before conducting our testing was devoted to companies' different industries, but we can say that the trend development of the EVA indicator was like the case of the automobile industry companies we examined.

Study of the food industry in the Czech Republic and Slovakia by Kiseľáková and Šoltés (2017) as well demonstrated a negative relationship between sales and the modern EVA indicator.

The relationship of the variables was investigated through the correlation coefficient. Dluhošová (2004) addressed in her research analysis of the financial performance of industrial enterprises in the Czech Republic based on modern EVA methods, while the decisive influence on the positive development of the indicator has a decrease in costs for equity, as well as the growth of the EAT/EBIT indicator.

On the other hand, the most significant negative impact had an increase in equity due to a negative EVA value. Viglioni et al. (2018) performed research of the technological sector in Brazil, while recording the opposite result of ROE, ROA, L3 and EVA because they showed negative statistical significance and generated shareholder values.

6 Conclusion

The article presents an analysis of the automotive industry in Slovakia in the years 2012 to 2018, capturing its development and basic characteristics. We worked with relevant data belonging to the statistical classification of economic activities SK NACE Rev. 2, sector C- production, section 29, which deals with the production of motor vehicles, trailers, and semi-trailers. The key period for our analysis was the years 2012 to 2018, and since not all companies falling into our selected category provided the required financial indicators in their financial statements and annual reports, our resulting database contained 118 companies.

It was devoted to the design of the financial performance model in the automotive industry. The starting point for the models and their variables was, on the one hand, a trend analysis of the financial indicators of automobile industry companies, and on the other hand, the results of the authors who addressed the issue in their previous studies. The proposed regression models were subsequently estimated and interpreted, while an extensive mathematical and statistical apparatus was used. Econometric models were compiled using the R program and hypotheses were tested to see if there was a statistically significant dependence between the selected standard indicators and the modern indicator in each year.

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