Determination of Value Drivers for Transport Companies in the Czech Republic

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Summary

Transport is one of the key sectors of the European economy. Effectiveness of transport companies depends mainly on the changes in the given environment. Transport companies differ from other types of companies especially in higher focus on ecology, not storing the services offered or high cost investments. The aim of each business is generally the increase of the value of the company. The objective of this contribution is thus to identify the value drivers of a transport company in the Czech Republic, provided that the value of the company is measured by means of the EVA equity indicator. The data set contains complete financial statements of 1500 transport companies in the Czech Republic for the year 2016. For each company, the EVA equity value is calculated. For the analysis, the Statistica software and the method of artificial neural networks are used. 1000 neural networks are generated, out of which 5 showing the best results are retained. In total, 12 variables are chosen that enter/play a part in the process of the company value creation. Based on the sensitivity analysis, the most important components of the variable are the financial result, consumption of material and energy and the profit on ordinary operations.

KEY WORDS

transport companies
value drivers
artificial neural networks
EVA equity

1. INTRODUCTION

The management of all types of companies resorts to the performance criterion. However, performance is influenced by a number of factors and various objectives set by the companies. One of the main goals and criteria the companies pursue is undoubtedly profit. Profit is the purpose of establishing individual business entities [1]. According to Vítková, Chovancová and Veselý [2], profit can be achieved in two ways: by sales increase or reducing costs. If cost optimization is not necessary, sales increase represents the only way to achieve a positive growth rate of the company value.

Smékalová [3] claims that currently, in economic theory the predominant opinion is that the goal of doing business is the growth of the company value, which depends on the company´s ability to generate future returns. In practice, this means that it depends on the originality and quality of the product offered, position on the market, innovation skills of the employees, effective use of available resources, new investment opportunities etc. Vochozka and Rowland [4] state that for determining the company value, traditional financial analysis is not an adequate tool, which lacks the link among the individual indicators and has only a limited informative capability. For this reason, the concept of value-based management has entailed a need for application and uses new indicators that would measure more accurately the effectiveness of processes and elements (companies) that generate the value. The new approaches and methods are referred to as value drivers [5].

The term value drivers appeared for the first time in scientific literature in the USA, in connection with the concept of shareholder value. According to Firk, Schrapp and Wolff [6], this term represents a set of main commercial indicators that as w hole determine the company value. Vítková, Chovancová and Veselý [2] define value drivers as factors participating in value creation in the market-based valuation of a company. Furthermore, they also claim that knowledge of value drivers is necessary for determining the so-called future and present internal value (real value) of stock. Strnadová, Karas and Režňáková [5] claim that value drivers reflect the environment of the business entities and enable the measuring of the company performance as well as the value of its corporate strategy. For this reason, they should be given close attention to and should be carefully analysed.

According to Mařík [7], value drivers can be divided into two basic groups – internal and external. External drivers are those the business entities cannot influence but still in a way affect their value. These are especially macroeconomic indicators, such as GDP, employment rate, inflation, money supply, real income, etc. In contrast, internal value drivers operate in the company and are controlled by the management. They include free cash flow, return on invested capital, economic profit, return on investment in customer service, etc. Strnadová, Karas and Režňáková [5] mention that when identifying value drivers, dynamic decomposition of the EVA indicator, strategic analysis of a company or benchmarking are applied. According to Copeland [8], identification of basic value drivers is a creative process carried out using trial-error method. This means that value drivers can vary depending on the strategies, structure

and type of company.

In this contribution, value drivers will be assessed in connection with transport companies in the Czech Republic. Each sector of national economy has its own specific features that have to be identified. According to Zbigniew et al. [9], transport is one of the key sectors of the European economy based on knowledge and ecology. Kot [10] states that transport is an inherent component that is associated with all economic and public activities and enables the mobility of people; therefore their functioning and development has a universal character. Furthermore, he claims that transport is one of the subsystems of logistics system.

Transport companies (as a part of infrastructure) provide public services and usually operate under conditions of natural monopoly [11]. Quinet and Vickerman [12], as well as most of other authors, divide transport companies into road transport, water transport, air, sea and rail transport, while those can be both public and non-public companies. Major difference in comparison with other companies operating in a different industry is that transport companies do not store the offered transport services and their investments require significant costs and long construction time, which may affect their performance in the long run. Costs incurred by transport companies include costs of workships, garages and other engineering facilities. The biggest difference between transport and other types of companies is the focus on ecology. As transport companies have much bigger impact on the environment, they are constantly forced to solve these environmental problems [13].

Vochozka, Rowland and Vrbka [14] mention the most important factors that determine the level of competiveness of transport companies. It is especially credibility, reliability of supply, means of transport used, transport route, frequency of transport, size of freight, freight rate, etc. Kliestik [15] states that the European Union constantly increases investment in research and development of various types of transport. Transport company efficiency depends mainly on the changes in the given environment. Bagloee, Sarvi and Ceder [16] even claim that for this reason, transport companies are a particularly important component of national economy in terms of the SME sector, since the whole European economy depends on them. Transport companies are primarily driven by the principle of rationality, ie. they try to minimize costs in order to improve financial results and try to increase the efficiency of the services provided while maintaining the current level of costs [9].

The objective of the contribution is to identify the value drivers of a transport company in the Czech Republic, provided that the company value will be measured using the EVA equity indicator.

2. METHODOLOGY

Data for the analysis will be obtained from the Albertina database of the company Bisnode Czech Republic, Ltd. Those will be specifically the transport companies operating on the Czech market in 2016. The companies were active (i.e. not in liquidation) and were profitable in the given year. The data set will thus include the companies that are classified in the CZ NACE in section H: Transport and storage, division 49 – Land transport and transport via pipelines, division 50 – Water transport and division 51 – Air transport. In total, the data set will contain data of 1569 companies. The companies included in the analysis will be selected at random. The dataset will contain their complete financial statements (except attachments). Therefore, the data from balance sheets, profit and loss statements and cash flow statements will be used. Subsequently, the data will be arranged in an Excel spreadsheet that will be sorted by companies in alphabetical order. The columns will contain the information obtained from the financial statements.

The following step will be to calculate the EVA value for shareholders (owners) of every company in the year of its operating on the market, i.e. the EVA equity parameter.

This assumes calculating the weighted average cost of capital [17]:

$$WACC=r_f+r_{LA}+r_{entrepreneur}+r_{FinStab} \quad (1)$$

where:

$WACC$ = Weighted Average Cost of Capital,
r_f = risk-free yield,
r_{LA} = function of indicators characterizing the company size,
$r_{entrepreneur}$ = function of indicators characterizing creation of productive power,
$r_{FinStab}$ = function of indicators characterizing relations between the company assets and resources to cover them.

Subsequently, the value of opportunity costs on equity will be determined [17]:

$$r_e=\frac{WACC*\frac{UZ}{A}-(1-d)*\frac{U}{BU+O}*(\frac{UZ}{A}*\frac{VK}{A})}{\frac{VK}{A}} \quad (2)$$

where:

r_e = rate of equity,
$WACC$ = Weighted Average Cost of Capital,
UZ = money sources (own capital and interest-bearing share capital),
A = assets,
VK = equity,
BU = bank loans,
O = bonds,
U/BU+O = interest rate, it is possible to use *i* (interest),
d = rate of income tax (it is possible to use t – tax).

Economic value added for shareholders will be calculated as follows [17]:

$$EVA\ Equity=(ROE-r_e)*VK \quad (3)$$

where:

ROE = Return on Equity.

From the data set, excluded companies are those for which the EVA equity could not be calculated due to the unknown or zero values of the items necessary for calculation. The resulting table will be imported into the Statistica software, version 12, which will try to determine the extent to which the EVA equity indicator depends on the individual items in the financial statements.

Firstly, the basic statistic of data will be carried out and a correlation matrix will be created. If a correlation is found between the two variables, it is highly probable there is a mutual dependence between them. Therefore, only the items of the financial statements which are related to each other will be chosen. Next, a tool of automated neural network, regression will be used. A dependent variable will be EVA equity. The variables will be chosen taking into account the commercial theory of production factors [18]. The data set will then be divided into three subsets. Training data set will contain 70 % of the input data, testing and validation data sets will both

contain 15 % of the input data. The training data set is used for generating neural structures, the testing and validation data set is used for verification of the reliability of the neural structure found. In total, 1000 neural networks will be generated, out of which 5 with the best results[1] will be retained. Two types of neural networks - multilayer perceptron neural networks (MLP) and radial basic function neural networks (RBF) – will be used. In the hidden and output layers the following distribution functions will be considered: linear, logistic, a tanh (hyperbolic tangent), exponential, sinus.

This will result in obtaining neural structures that will predict EVA equity on the basis of the input data, from which it will be possible to derive the probably EVA equity value. The model will take into consideration only the variables that will be of real influence on the resulting value of the EVA equity indicator. A neural network that can express the relation as accurately as possible (that is, the network with the best performance in training, testing and validation data set and minimum error in each data set and a clear economic interpretation) will be selected. A sensitivity analysis will also be carried out to help determine which variables are in the calculation and at the same time significantly influence the result. The result will be value drivers of a transport company.

3. RESULTS

After excluding the companies for which the EVA equity could not be calculated, the data set contains exactly 1500 transport companies operating in the Czech Republic. On the basis of the methodology used, the independent variables included in the calculation were determined (on the basis of the identified correlation and economic interpretation). These include intangible fixed assets, tangible fixed assets, financial fixed assets, sales of goods, consumption of material and energy, trading margin, performance, personnel costs, other operating income, interest receivable, economic result, economic result from ordinary activities.

It results from the table that all retained networks are multilayer perceptron networks. They show the best characteristics. In all cases, Quasi-Newton was used as a training algorithm, always a different variant. As an error function, for each retained network the method of the least squares was used. The hidden layer of neurons is in four cases activated by exponential function, in one case it is the function of hyperbolic tangent. The output activation functions are quite different. In two cases, it is the identity function, in other two cases it is the sinus function and in the remaining case it is the exponential function. Interesting finding is that the number of neurons in the first layer is 12 in all five cases. If all of them will be represented by the same variables, it is possible to identify with a relatively high precision value drivers for transport companies.

Relevance of the generated networks is showed in Table 2.

Table 2 Relevance of the generated networks

Neural network	Training	Testing	Validation
MLP 12-15-1	0.933324	0.935308	0.374470
MLP 12-16-1	0.909745	0.864635	0.349241
MLP 12-27-1	0.932583	0.885182	0.350835
MLP 12-29-1	-0.160945	0.900793	0.417865
MLP 12-12-1	0.931085	0.701774	0.341565

Source: authors

The table shows the performance of individual networks in three data sets – training, testing and validation. In the optimal case, we look for the highest value of performance (i.e. correlation coefficient) and at the same time, the same value for all data sets. It is obvious that the highest value of performance in training and testing data sets shows the first retained network MLP 12-15-1. It is also worth mentioning that the MLP 12-29-1 network, which has a negative correlation coefficient in the training data set, but based on training 1000 artificial neural networks, is still among the five networks with the best results. However, very poor results (low value of performance, different value compared to training and testing data set) were achieved for the validation data set.

For a better estimate, Table 3 shows the parameters of predictions carried out by means of individual networks.

Table 1 Shows five best generated and retained neural networks

	Network	Training perform.	Testing perform.	Validat. perform.	Training error	Testing error	Validat. error	Training algorithm	Error function	Activation of hidden layer	Output act. function
1	MLP 12-15-1	0.93332	0.93531	0.37447	4.803651E+10	6.819367E+09	7.662206E+11	BFGS (Quasi-Newton) 31	Sum quart.	Exponent.	Identity
2	MLP 12-16-1	0.90975	0.86464	0.34924	6.854571E+10	1.578513E+10	7.610380E+11	BFGS (Quasi-Newton) 44	Sum quart.	Tanh	Sinus
3	MLP 12-27-1	0.93258	0.88518	0.35084	4.842035E+10	1.353885E+10	7.710443E+11	BFGS (Quasi-Newton) 38	Sum quart.	Exponent.	Sinus
4	MLP 12-29-1	-0.16095	0.90079	0.41787	3.738617E+11	4.004679E+10	7.802513E+11	BFGS (Quasi-Newton) 1	Sum quart.	Exponent.	Identity
5	MLP 12-12-1	0.93109	0.70177	0.34157	4.968989E+10	3.660524E+10	7.564859E+11	BFGS (Quasi-Newton) 24	Sum quart.	Exponent.	Exponent.

Source: authors

[1] Orientation will be performed using the least squares method and entropy. Generation of networks will be finished if there is no improvement, i.e. there is no decrease in the sum of the squares or disorder.

Table 3 The parameters of predictions carried out by means of individual networks

Parameters of prediction	1.MLP 12-15-1	2.MLP 12-16-1	3.MLP 12-27-1	4.MLP 12-29-1	5.MLP 12-12-1
Minimum prediction (Training)	-22105726	-18397346	-22247584	-394070	-21621781
Maximum prediction (Training)	1732437	1360031	1649889	76820	1558633
Minimum prediction (Testing)	-4731708	-4879242	-3017596	-784475	-4229349
Maximum prediction (Testing)	150381	1608515	1194009	-57148	551037
Minimum prediction (Validation)	-280160	-365782	-227260	-99483	-488905
Maximum prediction (Validation)	258645	482046	81053	-55666	490375
Minimum residuals (Training)	-5663399	-5688797	-5654872	-22360986	-5610360
Maximum residuals (Training)	1247534	3232267	1666944	1728327	1586582
Minimum residuals (Testing)	-729807	-1299404	-1454095	-3687216	-621586
Maximum residuals (Testing)	679358	407552	382439	435149	3638489
Minimum residuals (Validation)	-15551250	-15380410	-15563988	-15652934	-15411255
Maximum residuals (Validation)	297719	219810	224560	163178	533849
Minimum standard residuals (Training)	-26	-22	-26	-37	-25
Maximum standard residuals (Training)	6	12	8	3	7
Minimum standard residuals (Testing)	-9	-10	-12	-18	-3
Maximum standard residuals (Testing)	8	3	3	2	19
Minimum standard residuals (Validation)	-18	-18	-18	-18	-18
Maximum standard residuals (Validation)	0	0	0	0	1

Source: authors

It results from the table that prediction distinctions are rather different. It is demonstrated by the extreme values of residuals. In particular, MLP 12-29-1 significantly differs from other retained networks. This does not render impossible to pass to the results. Thus, the sensitivity analysis was carried out. The results are showed in Table 4.

It follows from the table that in all cases, the same variables have been included in the calculation. Although the order of importance is different for the individual networks, the difference is not significant (except for one value of the MLP 12-12-1 network and the item Economic result). The imaginary first position is occupied by economic result, then there is the consumption of material and energy, logically also economic result from ordinary activities, interest receivables or financial fixed assets. On the next positions, there are performance, personnel costs, sales of goods, trading margin, tangible fixed assets, intangible fixed assets and other operating revenues. These variables affect the creation of transport company value, but their influence is not significant. According to MLP 12-15-1 and MLP 12-12-1, the main value driver was economic result. The network with the best prediction power (the first retained network MLP 12-15-1) has identified the economic result as the most significant value driver. According to MLP 12-16-1, the most significant value driver are interest receivables. According to MLP 12-27-1 it was the economic result from ordinary activities and according to MLP 12-29-1 it was the consumption of material and energy.

4. CONCLUSION

The objective of the contribution was to identify the value drivers of the transport companies operating in the Czech Republic in 2016. Adequate methodology has been developed and the value drivers have been identified. 12 variables have been selected that PLAY A PART in the process of company value creation measured by the EVA equity indicator. The most important items (variables) have been identified as follows:

Table 4 The results of sensitivity analysis

Indicator	1.MLP 12-15-1	2.MLP 12-16-1	3.MLP 12-27-1	4.MLP 12-29-1	5.MLP 12-12-1	Average
Economic result	3.15972	1.26365	2.25751	0.99538	15.15201	4.56565
Consumption of material and energy	1.987724	1.240389	2.018584	1.004375	1.803531	1.610921
Economic result from ordinary activities	1.087327	1.113293	2.723862	0.998482	1.087332	1.402059
Interest receivable	1.678252	1.266504	1.710994	0.999356	1.281801	1.387381
Financial fixed assets	1.342441	1.124419	1.565165	0.998350	1.182689	1.242613
Performance	1.433020	1.049181	1.367892	1.000426	1.217566	1.213617
Personnel costs	1.402464	1.021132	1.263793	1.003065	1.091295	1.156350
Sales of goods	1.227317	1.020790	1.010552	0.999477	1.346566	1.120940
Trading margin	1.133801	1.012138	0.999012	1.000073	1.177695	1.064544
Tangible fixed assets	1.002976	1.008184	1.006811	1.002661	1.066856	1.017498
Intangible fixed assets	1.000215	1.054485	1.009251	1.000049	0.991942	1.011189
Other operating revenues	1.009582	1.007357	1.000053	0.999450	1.002905	1.003870

Source: authors

economic result, consumption of material and energy and economic result from ordinary activities. A transport company operating in the Czech Republic should focus especially on these three items of financial statements, while other items participate in the creation of the company value. It can therefore be stated that the objective of the contribution was achieved.

What is important is the potential of the results, which can be followed by further research. It is now appropriate to identify the impact of individual variables on EVA equity and at the same time to determine the relation of these variables to EVA equity. The following step would be to decompose the appropriate individual indicators and integrate them into the tactical and strategic goals of the company. The strategic goal is known – it is a growth of the value for shareholders.

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