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Application of Financial Modelling in Determining the Financial Performance of Mobile Operators

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Abstract

Establishing the financial performance of one or more business organizations could be defined as the main application of financial modeling. The selection of the financial indicators to be included in a particular model and the choice of a methodology by which the weights of the included financial indicators are determined could be identified as two key factors related to the objectivity of the obtained results from the application of a financial model. In addition, when establishing the financial performance of more than one business organizations, it is necessary to choose a ranking method for the obtained results in order to assess the financial position of each of the business organizations considered. In this research paper, the construction of a specific financial model is presented, the practical application of which is aimed at establishing the financial performance of the three mobile operators, part of the telecommunications market in a particular country – the Republic of Bulgaria. After analyzing the obtained results from the financial modeling, two factors that negatively affect the financial performance of the studied business organizations during a specific time frame are defined.

Keywords: financial modelling; financial performance; telecommunications market

JEL: C51; L25

1. Introduction

The purpose of this research paper is to present a specific financial model that could be applied in establishing the financial performance of mobile operators in different countries. The financial performance of the telecoms that offer mobile services in a particular country – Bulgaria – is the object of this research paper and its subject is the specific financial model, the application of which is aimed at establishing the financial performance of the business organizations under consideration. In order to construct a financial model that could fulfill the purpose of this research paper, in the following section various theoretical aspects related to financial modeling are examined. In this section, also the main factors that influence the objectivity of the obtained results from the application of a financial model are described.

After discussing the theoretical aspects related to financial modelling in the second section of this research paper, in the third

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section the construction of the specific financial model whose purpose is to establish the financial performance of the business organizations under consideration is presented. In this section the financial indicators that are part of the aforementioned model are defined, the specific methodology by which the weights of the individual financial indicators are determined is described and the chosen method for ranking the obtained results is presented. The need for ranking the obtained results arises from the circumstance that the purpose of this research paper pertains to the establishment of the financial performance of more than one business organizations.

In the penultimate fourth section of the paper the results related to the financial performance of the mobile operators in Bulgaria, after the application of the selected ranking method, are presented. Moreover, in this section an analysis of the obtained results is carried out and on this basis two factors that have a negative impact on the financial performance of the considered business organizations in a specific period, namely the years from 2006 to 2021 (inclusive), are defined. The last fifth section of the present research paper contains a conclusion based on the obtained results.

2. Theoretical aspects of the topic

In this section various theoretical aspects related to financial modelling, which is directly related to the preparation of financial analyses, are presented. Financial analyzes could be defined as an important tool for senior management of any business organization, since the information from a financial analysis can be qualified as the basis for research, evaluation, determination and optimization of decisions that are of significant importance for the economic results, achieved by the respective business organization. Given the important role of financial analysis in managerial decision-making, Merkl-Davies, Brennan and McLeay (2011) define the financial performance of business organizations as a reflection of the managerial behavior of their senior management. The application of management control systems could help managers of various companies in order to achieve their goals. Through the implementation of such systems, the financial and non-financial information needed by managers can be gathered as pointed out by Dana et al. (2021).

In view of the close connection between financial modeling and the preparation of various financial analyses, it could be concluded that the main function of financial models is to establish the financial performance of one or more business organizations, and the results of the financial models' application serve as a basis for the preparation of financial analyses. Since it is important that the results of the financial models' application be as objective as possible, it is necessary to determine the key factors, influencing the objectivity of the obtained results. The choice of the financial indicators is essential for the objectivity of the obtained results from the application of financial modelling. Most often, financial indicators are ratios of various positions, part of the balance sheet and the profit and loss statement, which constitute the financial statements prepared by business organizations.

Financial statements are defined by Thalassinos and Liapis (2014) as the most objective and most complete source of information that can be used as a basis for conclusions about the financial performance of a business organization. Arguments for

the veracity of this statement could arise from the fact that the laws in most countries regulate the public disclosure of business organizations' financial statements. For this reason, financial statements are defined by Suryanto and Thalassinos (2017) as an accessible source of information whose content is unified, regardless of which business organization it is prepared by. This unification is due to the national and international accounting standards that are applied by different countries. Rashid (2020) points out the financial statements as a source of information that shows whether a business organization is in good or unsatisfactory financial performance.

By the selection of the financial indicators to be included in a particular financial model, it is necessary to identify the indicators that actually have an impact on the financial performance of the business organizations under consideration. If some of the financial indicators or the independent variables (x_n) in a model are found not to have a statistically significant impact on the dependent variable (y), these indicators have to be removed and other financial indicators in their place should be added. It is important not to add too many indicators to a financial model, as the large number of financial indicators could negatively affect the objectivity of the obtained results. This statement is supported by Graham, Van Horn and Taylor (2012), who consider the large number of indicators or parameters in one model as one of the main problems in constructing different types of models. De la Cámara et al. (2005) describe the inclusion of too many parameters in different models, which is commonly observed in practice, and the lack of statistical significance in the majority of parameters included in different models. Jaqaman and Danuser (2006) point out that only those parameters that are statistically significant for a particular model should be included in it.

By the construction of a financial model, it is necessary to take into account the specifics of the economic sector of which the business organizations, whose financial performance should be established by the respective financial model, are part. This statement is supported by Smorada et al. (2023), who present in their research paper different methods related to the prediction of the future financial position of business organizations. The need to take into account the sectoral specificities by the construction of financial models stems from the desire to maximize the objectivity of the obtained results. One of the main specifics of the telecommunications market is the small number of market players that offer mobile services. For this reason, a conclusion about the presence of the oligopolistic market structure can be made, and the main reason for the small number of business organizations in the presence of this type of market structure is related to the significant barriers to enter or exit the market.

As the provision of mobile services involves the ownership and maintenance of significant infrastructure, the construction and maintenance of such infrastructure requires large investments, and the number of companies able to make such capital investments is not large. From what has been written so far, it could be concluded that the need to build and maintain infrastructure, without which mobile services could not be offered, is an example of a barrier to enter the market, which is why the market for telecommunications services is characterized by the presence of the oligopolistic market structure.

This statement is supported by the fact that the oligopolistic market structure is observed in the telecommunications market in different countries. For instance, in Bulgaria there are only three mobile operators – A1, Yettel and Vivacom. There are also only three mobile operators in Slovakia, where the market was studied by Valaskova et al. (2019). Market concentration in China is even higher due to the presence of only two mobile operators, and the telecommunications market in the Asian country is studied by Ma, Xu and Lou (2018). The given examples can serve as an argument for the need to consider the oligopolistic market structure by the construction of financial models aimed at establishing the financial performance of one or more mobile operators.

Besides the choice of financial indicators, the way in which the coefficients or the weights of each of the financial indicators are determined can be characterized as another key factor related to the objectivity of the obtained results from the application of a financial model. There are two approaches to determining the size of the weights in a financial model – the subjective approach and the objective approach. In the subjective approach, different experts or the author of a specific financial model determine the size of the financial indicators' weights. In the other approach, the objective one, the size of each weight in a financial model is a function of a specific database that is processed using various mathematical and statistical methods.

Kartanaitė et al. (2021) explore the trends in financial modelling in the context of Industry 4.0, a term that is associated with the increasingly efficient use by business organizations of various computer technologies in their production processes. The researchers point out in their paper the increasing use of artificial intelligence (AI) in the construction of various financial models as one of the main features of Industry 4.0, which could be defined as the current industrial revolution. The main advantages of financial models based on artificial intelligence are summarized by Farooq and Qamar (2019) and are related to better accuracy, easier adaptability and the presence of fewer assumptions in this type of financial models.

Precisely because of these advantages, authors such as Sony and Naik (2019) and Melnyk et al. (2019a, 2019b) point out that artificial intelligence instead of human intervention is likely to be used by more and more manufacturing companies in the context of Industry 4.0. For instance, by applying such models, the cost behavior of manufacturing companies could be more accurately predicted. As cost behavior is related to the cost strategic management, the importance of which in today's competitive world is discussed by Rounaghi, Jarrar and Dana (2021), it could be concluded that the use of AI-based models could improve the company's competitiveness.

Since the purpose of this research paper is related to the establishment of the financial performance of more than one business organizations, it is necessary to choose a method for ranking the obtained results. Lu and Lo (2009) point out that there is no universal method for ranking the obtained results from a financial model, and the choice of ranking method depends on the specific goals related to the construction of a certain financial model. A number of methods for ranking the obtained results have been described in the scientific literature, and this statement could be supported by the research paper of Marqués, García and Sánchez (2020), in which several ranking methods that could be

practically applicable in the making of various decisions by the financial management in a business organization are presented.

3. Construction of a specific financial model

After considering various theoretical aspects related to financial modeling in the previous section, in this section the construction of a specific financial model that could be used to identify the financial performance of the companies under consideration will be presented. The selection of the financial indicators that are part of the financial model outlined in this research paper is based on a comparison between the indicators included in three other financial models, those of Dahooie et al. (2019), Safaei Ghadikolaei, Khalili Esbouei and Antucheviciene (2014) and Bulgurcu (2012). These models could be referred as an example of the current trends in financial modelling, since the three aforementioned models date from the last twelve years. Analyzing the indicators in the three already mentioned financial models, an extremely large overlap in the indicators in two of the models – by Dahooie et al. (2019) and Bulgurcu (2012) – is found, with six of the indicators in both models being completely identical:

- Current ratio;
- Quick ratio;
- Debt ratio;
- Net profit margin ratio;
- Return on equity;
- Return on assets.

The presence of such a large number of identical financial indicators in two different financial models is a sign for the importance of the listed indicators in establishing the financial performance of one or more business organizations. Moreover, two of the indicators – return on equity and return on assets – are part of all three financial models already mentioned. From the presence of these two indicators in the three models, a conclusion regarding their essential importance in determining the financial performance of one or more business organizations could be drawn. The conclusion regarding the importance of the six listed indicators is an argument for their inclusion in the financial model, the construction of which is presented in this section of the research paper.

There is also a significant overlap between the indicators current assets turnover ratio and fixed assets turnover ratio, part of Bulgurcu's (2012) financial model, and the indicator total assets turnover ratio in the model of Dahooie et al. (2019). From the presence of these indicators, which are identical in nature, in the two mentioned models, a conclusion regarding their significance could be inferred. In order to track the impact of current and fix assets on the financial performance of the studied business organizations, the two indicators, part of Bulgurcu's (2012) model, are included in the financial model constructed in this research paper.

One of the specifics in the financial model of Dahooie et al. (2019) is the classification of the included indicators into benefit and cost indicators. This classification is essential to the way in which the size or the weight of each financial indicator is determined. The weights' determination in the mentioned financial model is related to data normalization. The benefit indicators are normalized using one formula and the cost indicators – using another formula, an approach borrowed from the model of Dahooie et al. (2019) and applied to the determination of the weights' size of the

financial indicators in the model constructed in this section of the research paper.

Only one of the eight indicators listed so far could be classified as a cost one – the debt ratio. In order to achieve a better balance between the number of benefit and cost indicators, in the model constructed for the purposes of this research paper, one more indicator, which could be classified as cost one, is included – the debt equity ratio, part of the model of Bulgurcu's (2012) model. Table 1 presents the nine financial indicators included in the proposed financial model, the formulas used to find the value of each indicator, and their classification into benefit and cost indicators.

Table 1. Financial indicators, part of the proposed model

№	Financial indicator	Formula	Classification
1	Current ratio	$CR = \frac{Current\ assets}{Current\ liabilities}$	Benefit
2	Quick ratio	$QR = \frac{Current\ assets - Inventories}{Current\ liabilities}$	Benefit
3	Debt equity ratio	$DER = \frac{Total\ debt}{Shareholder's\ equity}$	Cost
4	Debt ratio	$DR = \frac{Total\ debt}{Total\ assets}$	Cost
5	Current assets turnover ratio	$CATR = \frac{Net\ sales}{Current\ assets}$	Benefit
6	Fixed assets turnover ratio	$FATR = \frac{Net\ sales}{Fixed\ assets}$	Benefit
7	Net profit margin ratio	$NPM = \frac{Net\ income}{Net\ sales}$	Benefit
8	Return on equity	$ROE = \frac{Net\ income}{Shareholder's\ equity}$	Benefit
9	Return on assets	$ROA = \frac{Net\ income}{Total\ assets}$	Benefit

Source: Dahooie et al. (2019) / Safaei Ghadikolaei, Khalili Esbouei and Antucheviciene (2014) / Bulgurcu (2012)

After the determination of the nine financial indicators, with the help of which an attempt to establish the financial performance of the mobile operators that carry out their economic activity in Bulgaria will be made, follows a description of the specific methodology that has been applied in determining the weights of the financial indicators included in the constructed model. The indicators' weights have been determined using the objective approach, thus aiming to avoid subjectivity related to the judgment of different experts or the author of the particular model. The specific methodology used to determine the weights of the nine financial indicators in the current model is described in detail in the research paper of Radkov (2023).

In the mentioned research paper, a methodology for determining the weights' size of the financial indicators is presented.

This methodology could be applied in establishing the financial performance of business organizations, part of sectors with oligopolistic characteristics, such as the telecommunications market. It could be assumed that the methodology described by Radkov (2023) is applicable in establishing the financial performance of oligopolistic companies, due to the consideration of the market share of each of the oligopolists through a specific mathematical model in determining the weights' size of individual financial indicators.

Since the methodology described by Radkov (2023) is related to the implementation of the objective approach in determining the weights of financial indicators, part of a specific financial model, for its application the use of a specific database is required. The weights' size of the nine indicators, included in the proposed financial model, is dependent on the value of the individual financial indicators for each of the three telecoms offering mobile services in Bulgaria in the period from 2006 to 2021 (inclusive). The size of the financial indicators for each of these years is calculated using some of the positions from the balance sheets and the profit and loss statements, part of the financial statements of A1, Yettel and Vivacom, which are published in the Commercial Register of the Republic of Bulgaria.

The reflection of the oligopolistic market structure in the methodology described by Radkov (2023) for determining the weights of the financial indicators is achieved by calculating the cumulative values for the individual financial indicators, part of a specific financial model, for the entire market of which the business organizations whose financial performance is to be ascertained are a part. For the purposes of this research paper, the cumulative value for each of the nine financial indicators already listed in Table 1 in each of the years that are part of the period between 2006 and 2021 (inclusive) has to be calculated. It is necessary to multiply the size of the specific financial indicator for each of the three mobile operators in a particular year by the ratio of the market share of each of the mobile operators to the total market share of all mobile operators, thereby taking into account the existence of the oligopolistic market structure. Equation (1) presents the mathematical expression of the way in which the oligopolistic market structure is reflected in the methodology for determining the weights' size of the financial indicators in the methodology developed by Radkov (2023):

$$\mathrm{KPI} = \sum_{j=1}^{m} \frac{\mathrm{MS_j}}{\sum_{j=1}^{m} \mathrm{MS_j}} * \mathrm{KPI_j}, \text{ where} \qquad (1)$$

KPI – specific financial indicator;

MS – market share;

n – number of firms.

After a numerical matrix with the cumulative values for each of the nine financial indicators over the specified sixteen years is constructed, the data in this matrix has to be normalized. As already mentioned in the present section, the data normalization is borrowed from the existing financial model of Dahooie et al. (2019), in which the data for the benefit and the cost indicators is normalized using two different formulas. The data for the benefit indicators is normalized using the following formula:

$$z_{ij} = \frac{x_{ij} - x_j^{min}}{x_j^{max} - x_j^{min}}, \text{ where} \quad (2)$$

z_{ij} – normalized value of x_{ij};

x_j^{min} – minimum value of x_{ij};

x_j^{max} – maxim value of x_{ij}.

The normalization of cost indicators has the following mathematical expression:

$$z_{ij} = \frac{x_j^{max} - x_{ij}}{x_j^{max} - x_j^{min}}, \text{ where} \quad (3)$$

z_{ij} – normalized value of x_{ij};

x_j^{min} – minimum value of x_{ij};

x_j^{max} – maxim value of x_{ij}.

After the data from the numerical matrix with the cumulative values is normalized, it is necessary to calculate the percentage dimension of each of the nine financial indicators for a certain year compared to the total value of all financial indicators for the respective year. This could be defined as the first step in the Radkov's (2023) methodology, related to the determination of the weights' size of the financial indicators and is applied to each of the years, part of the numerical matrix with the cumulative values. The mathematical expression of the method by which this first step related to the determination of the weights' size is carried out is as follows:

$$w_j = \frac{KPI_j}{\sum_{j=1}^{m} KPI_j}, \text{ where} \quad (4)$$

w_j – weight of the financial indicator j;

KPI – financial indicator;

m – number of financial indicators.

Having established the weight of each of the nine financial indicators for each of the years in the period between 2006 and 2021 (inclusive), it is necessary to determine the final weight of each of the nine indicators part of the constructed model. This could be characterized as the second step in the methodology presented by Radkov (2023) for determining the weights' size of financial indicators. The calculation of the final size of the weights of the financial indicators is related to the application of the statistical method for calculating the arithmetic mean value, described by Goggeshall (1886). The formula used to calculate the size of the arithmetic mean value is presented in the following equation:

$$\overline{X} = \frac{\sum_{i=1}^{n} Xi}{n}, \text{ where} \quad (5)$$

$\overline{X}$ – arithmetic mean value;

$\sum_{i=1}^{n} Xi$ – the sum of all values of X;

n – number of considered values.

The calculation of the arithmetic mean value, based on the already calculated weights of each of the financial indicators, depends on the weights in the different years for the respective indicator:

$$w_j^* = \frac{\sum_{i=1}^{n} w_{ij}}{n}, \text{ where} \quad (6)$$

w_j^* – final weight of financial indicator j;

w_{ij} – weight of financial indicator j in year i;

n– number of years.

Table 2 presents the weights of the nine indicators, part of the proposed financial model, after applying the methodology described by Radkov (2023). The two cost indicators, debt equity ratio and debt ratio, are highlighted in yellow, as the two weights have a minus sign in front. This is to reflect the negative impact of the two cost indicators, part of the model, on the financial performance of the business organizations under consideration.

Table 2. Weights of financial indicators

Current ratio	0.1271
Quick ratio	0.1183
Debt equity ratio	-0.0784
Debt ratio	-0.0704
Current assets turnover ratio	0.0829
Fixed assets turnover ratio	0.1143
Net profit margin ratio	0.1374
Return on equity	0.1312
Return on assets	0.1401

Source: Own calculations based on data from the Commercial Register of the Republic of Bulgaria

It is a common practice to analyze the significance of the indicators, part of a financial model, after establishing the weights or the sizes of the coefficients of the individual indicators in a model, and if necessary, to reduce their number. A good example of indicator analysis in a particular model is that of Martyniuk, Wołowiec and Mieszajkina (2021). After examining the size of the coefficients in their initial model, the authors concluded that only six of the original ten indicators have a significant impact on customs revenue in Ukraine. The analysis related to the significance of indicators in the current model is based on the statistical five percent rule. In statistical science, it is accepted that a certain percentage value is significant only if its size is greater than 5% (0.05). Given the fact that the weights of all indicators, part of the presented model, have a value greater than 5% (0.05), it could be assumed that each of the nine included indicators is significant for the establishment of the financial performance of the mobile operators in Bulgaria.

The difference of slightly more than three percentage points between the weight of the fix assets turnover ratio (11.43%) and the weight of the current assets turnover ratio (8.29%) is a sign for a more objective determination of the financial performance of the business organizations under consideration by including both indicators in the presented financial model. Based on the presented numbers it could be concluded that the inclusion of both indicators related to the assets is a better decision than the use of only one financial indicator – the total assets turnover ratio. Despite the likelihood of biasing the obtained results by including one more indicator, the weights' size of the two indicators, which is greater than 5% (0.05), and the difference of slightly more than three percentage points between the weights' size of the two indicators are two arguments that support this statement.

Looking at the three financial indicators with the largest weights – return on assets (14.01%), net profit margin ratio (13.74%) and return on equity (13.11%), a conclusion regarding the objective determination of the weights in the current model can be drawn. One of the arguments for this conclusion is the fact that the two indicators that are part of all three existing financial models mentioned at the beginning of this section – return on assets and return on equity – are also two of the indicators with the highest weights

in the proposed model. It is no coincidence that both indicators have been described in a number of research papers. Cheng, Chen and Huang (2012), Dong, Chen and Wan (2018) and Karimi and Barati (2018), write about the return on equity in their research papers, while Lee, Lin and Shin (2012) and Moghimi and Anvari (2014) describe the return on assets in their publications. The third indicator with the greatest weight – net profit margin ratio – could also be defined as one of the most frequently used indicators in the preparation of financial analyses. The indicator is described by Akguc (2010) and Shaverdi et al. (2016) in their research papers. From the arguments presented so far, a conclusion regarding the correct choice of financial indicators included in the current model, as well as regarding the objectivity of the methodology by which the weights of the financial indicators were determined, could be inferred.

As already stated in the previous section, since the purpose for this research paper is related to the establishment of the financial performance of more than one business organizations, it is necessary to choose a ranking method for the obtained financial modeling results. The ranking of the obtained results from the application of the financial model constructed in this research paper was performed using the mathematical model presented by Velev (2004). This mathematical model has two varieties; by the using the first of them, it is possible to compare the values of different indicators between two business organizations, while using the other variety of the mathematical model it is possible to compare the size of different indicators of more than two companies. Since the object of this paper is related to the financial performance of all mobile operators in a particular country – Bulgaria, which are three in number, the second variety of the model described by Velev (2004), which has the following mathematical expression, is used for the ranking of the results obtained from the financial modelling:

$$SC_{ik} = 6 * \frac{(VAL_{ik} - VAL_{imin})}{(VAL_{imax} - VAL_{imin})} + 1, \quad (7)$$

where:

SC_{ik} – score (weight) of the i-th indicator for the k-th company;

VAL_{ik} – value of the i-th indicator for the k-th firm;

VAL_{imax} – the corresponding maximum value of the i-th indicator for the whole set of analyzed companies;

VAL_{imin} – the corresponding minimum value of the i-th indicator for the whole set of analyzed companies.

In the application of the above mathematical model, the value of the mobile operator with the best financial performance in each of the sixteen years considered has a value equal to the number seven, while the financial performance of the company with the most unsatisfactory financial performance is always equal to the number one. The financial performance of the third business organization has a value between the numbers one and seven. The specific value varies from year to year and depends on the obtained results relating to the financial performance of the business organizations considered before the chosen ranking method is applied.

4. Presentation of the obtained results

Having described in the previous section the construction of the specific financial model, with the help of which the financial performance of the mobile could be established, in this section the data on

Table 3. Ranking of the obtained results

Year	A1	Yettel	Vivacom
2006	1.5	1.0	7.0
2007	4.2	1.0	7.0
2008	7.0	5.7	1.0
2009	7.0	4.5	1.0
2010	7.0	4.7	1.0
2011	6.9	7.0	1.0
2012	5.7	7.0	1.0
2013	6.0	7.0	1.0
2014	6.0	1.0	7.0
2015	7.0	3.7	1.0
2016	3.0	7.0	1.0
2017	5.0	7.0	1.0
2018	1.2	7.0	1.0
2019	1.9	7.0	1.0
2020	3.3	7.0	1.0
2021	2.2	7.0	1.0
	4.7	5.3	2.1

Source: Own calculations based on data from the Commercial Register of the Republic of Bulgaria

the financial performance of the business organizations considered in this research publication – A1, Yettel and Vivacom – is presented. The results after applying the formula for their ranking, given in equation (7), are illustrated in Table 3. For each of the years, part of the period between 2006 and 2021 (inclusive), the mobile operator with the best financial performance in a given year is marked in green, the mobile operator with the most unsatisfactory financial performance is marked in red and the mobile operator, whose financial performance is in the middle is marked in yellow.

In the first two years of the period under review – 2006 and 2007 – there is no change in the ranking of the obtained results. Vivacom is the mobile operator with the best financial performance, Yettel is the telecom with the most unsatisfactory financial performance and A1's financial performance is in the middle. In 2008, there is a radical change in the positions of the three mobile operators. A1 is the mobile operator with the best financial performance, Vivacom is the telecom with the most unsatisfactory financial performance and Yettel's financial performance is in the middle. The displaced positions of the three telecoms are preserved in the following two years – 2009 and 2010.

In 2011, there is again a shift in the ranking of results, with Yettel displacing A1 from the leadership position. The exchanged positions of A1 and Yettel can be observed in the following two years, during which Yettel is again the mobile operator with the best financial performance. As in the previous three years, Vivacom is the mobile operator with the most unsatisfactory financial performance in 2011, 2012 and 2013. The data presented in

Table 3 shows that in 2014 there is again a shift between two of the mobile operators – Yettel loses its leadership position and is the telecom with the most unsatisfactory financial performance. On the other hand, Vivacom is the mobile operator with the best financial perofrmance in 2014. While for Yettel and Vivacom there is a change in the financial performance in the year 2014, there is no such change for A1 compared to the previous year 2013.

In 2015, a complete reshuffling of the positions in the ranking of the results is again observed. A1 is the mobile operator with the best financial performance, Vivacom is the telecom with the most unsatisfactory financial performance and Yettel is the market player with a financial performance in the middle. In 2016, Yettel displaces A1 from the leading position related to the financial performance of mobile operators in Bulgaria. As in 2016, in the remaining five years until the end of the period under review Yettel is the mobile operator with the best financial performance, Vivacom is the telecom with the most unsatisfactory financial performance and A1 is the market player with a financial performance in the middle.

The last row in Table 3 contains the highlighted in grey arithmetic mean values, calculated using equation (5), of the three mobile operators. From the values presented, it can be seen that Yettel's value is the highest, Vivacom's is the lowest and A1's is in the middle. From these values, a conclusion about the financial performance of the mobile operators could be drawn, since the arithmetic mean value takes into account the sustainable trends related to the financial performance of the three mobile operators. The size of the arithmetic means shows that Yettel is the telecom with the best financial performance, Vivacom is the mobile operator with the most unsatisfactory financial performance, and A1's financial performance is in the middle.

The analysis of the data in Table 3 shows that over the period 2011 to 2021 (inclusive), with the exception of 2014 and 2015, the ordering of the three mobile operators corresponds to the ordering of the arithmetic mean values presented in the last row of the table. The decline in the financial performance of Yettel in 2014 compared to the previous year 2013 and its categorization from the most satisfactory to the most unsatisfactory coincides with two significant events related to the development of the mobile operator. In 2013, 100% of the telecom's assets were acquired by a new owner – the Norwegian company Telenor Group, and the brand name was changed from Globul to Telenor in 2014.

In a large number of cases, there is a tendency to replace senior and middle managers in a company when its ownership changes, which leads to certain organizational changes that could have an impact on the functioning of a business organization, if these replacements are not carried smoothly enough in order to ensure continuity between new and old management. Furthermore, the rebranding of a company that has been recognizable in the market with its old brand name for the previous thirteen years – from the company's establishment in 2001 until 2014 – brings negative effects related to confusion among consumers.

The importance of the brand name is discussed by Katrandjiev (2023). His research paper points out that the roots of brand naming date back to the Beginning of Antiquity. A common practice in such large-scale rebranding is to announce aggressive price reductions on the goods or services offered, aimed at retaining current and attracting new

customers. In addition, large-scale rebranding is associated with a significant increase in spending on advertising and other marketing activities aimed at faster and more effective establishment of the new brand. Since price reductions are associated with a decline in revenue and increased spending on advertising and other marketing activities leads to an increase in costs, a negative impact of rebranding on the financial performance of business organizations could be inferred. The described rebranding's impact on the financial performance is a sign for the need of a good marketing management, which is described by Ivanov (2016) as a modern form of strategic management and planning.

The combination of the ownership's change and the rebranding may explain the sharp decline associated with Yettel's financial performance in 2014. Despite the combination of these two factors, this decline was quickly overcome and the telecom's financial performance was again the most satisfactory from 2016 to the end of the period under review. The rapid recovery of Yettel's financial performance is an indicator of high professionalism of the company's financial management, which has been able to deal with the factors negatively affecting the company's financial performance within just two years.

An interesting fact is that in 2018 this company again went through a change of ownership. In the mentioned year the Norwegian company Telenor Group sold 100% of its shares to the Czech company PPF Group. Unlike the previous change of ownership, the mobile operator was not rebranded until 2022, when the brand name was changed from Telenor to Yettel. This late rebranding is an indicator of the smoother implementation of organizational changes within the company by the new owners, and thanks to these actions, the company remains with the best financial performance even after the change of ownership. Unfortunately, at the time of preparation of this research paper, the financial statements of the three business organizations under consideration for 2022 and 2023 have not been published in the Commercial Register of the Republic of Bulgaria, therefore it is not possible to evaluate the rebranding of the mobile operator carried out in 2022.

The statement made about the negative impact of rebranding on the financial performance of business organizations could be confirmed by the development of the financial performance of another mobile operator – A1. The telecom is a pioneer in the telecommunication services market in Bulgaria, entering the market in 1999 with the brand name Mobiltel, which was shortened to Mtel in 2001. In 2018, the owner of the mobile operator – the Austrian company A1 Group, which owns 100% of the telecom's assets since 2005, decided to change the brand name from Mtel to A1, as this significant change was part of the concept of a common corporate identity of all companies owned by the parent company. As can be seen from the data in Table 3, after the rebranding in 2018, A1's financial performance is trending negatively compared to relatively stable levels from 2008 to 2017 (inclusive).

The negative impact on the financial performance of business organizations under large-scale rebranding caused by the increased expenditure on advertising and other marketing activities combined with reduced revenue due to aggressive price reductions has already been mentioned. The combination of these two factors could be pointed out as one of the reasons for

the negative trend related to the financial performance of A1 after 2018. It could be assumed that this change of the brand name was based on insufficient in-depth analysis related to the effects of the rebranding of a company that was in the market under its old brand name for almost twenty years. The fact that this rebranding occurred thirteen years after the acquisition of the telecom' assets by the A1 Group could be interpreted as a marketing activity, which was undertaken without a proven need of a new logic governing the economic relations between consumers and a company. Namely, this need is described by Ivanov (2013) as a prerequisite for the implementation of marketing activities.

Since the values related to the financial performance of A1 in the last four years of the period under consideration are significantly smaller compared to the years from 2008 to 2017 (inclusive), it is fair to note that this trend is most likely not solely due to the rebranding carried out in 2018. Given the significant deterioration of A1's financial performance in 2016 compared to the previous eight years, an assumption that part of the company's financial management was replaced in the following years could be made, and it is possible that such a potential change instead of a positive effect had a negative impact on the company's financial performance. Arguments for such an assumption can be found in the policy of large international companies such as A1 Group, where making personnel changes after unsatisfactory results in a certain reporting period is a common practice. This statement is confirmed by the fact that A1's 2016 financial statement was signed on 30 January 2017 by a new CFO, different from the one who had signed the company's previous four financial statements. The implementation of such a policy by the owner of the mobile operator could be cited as another reason for the observed lower financial performance's values of A1 in the years 2018 to 2021 (inclusive).

In addition, from the data in Table 3 it is evident that the financial performance of Vivacom can be defined as the most unsatisfactory during a total of thirteen out of the sixteen years under review. From this trend, a conclusion about the neglect of the company's financial performance by its owners could be drawn, a behavior, which could be qualified as illogical in view of the fact that Vivacom is a public limited company. It could be concluded that such an unsatisfactory financial performance over so many years could contribute to the exit of a business organization from the market under conditions of perfect or monopolistic competition, since these two market structures are characterized by a significantly larger number of direct competitors than the oligopolistic market structure observed in the telecommunications market.

5. Conclusion

In this research paper, a specific financial model has been presented, through the application of which the financial performance of the mobile operators in different countries could be established. Given the fact that the size of all nine indicators, part of the presented financial model is greater than 5% (0.05), a conclusion about the good selection of financial indicators included in the model, each of which has a statistically significant impact on the financial performance of mobile operators under consideration can be inferred. Moreover, the chosen methodology for determining the financial indicators' weights takes into account the presence of the oligopolistic market structure, which could

be defined as one of the main specificities of the economic sector of which the business organizations whose financial performance is to be established are a part. In addition, by including a method for ranking the obtained results, the assessment of the financial performance of all observed companies is enabled.

After analyzing the presented results, it was concluded that Yettel is the mobile operator in Bulgaria with the most satisfactory financial performance over the period 2006 to 2021 (inclusive) and Vivacom is the telecom with the most unsatisfactory financial performance over the period under review. The financial performance of the third mobile operator, part of the telecommunication services market in Bulgaria – A1 is in the middle, with a tendency to low financial performance's values of this telecom from 2018 until the end of the period under review in 2021. Furthermore, in the previous section two main reasons that have a negative impact on the financial performance of the business organizations under consideration were defined, the first of which is related to the rebranding of a company that is already clearly recognizable among consumers with its existing brand name. As large-scale rebranding is in most cases associated with increased marketing and advertising costs and reduced revenues due to the announcement of aggressive price reductions on the goods or services offered. The combination of these two activities is expected to have a negative impact on the financial performance of a business organization.

Another reason that negatively affects the financial performance of the companies under consideration is related to the way in which personnel changes are made within business organizations. As already stated in the previous section, when a company changes its ownership, in most cases a large number of former top and middle managers are replaced. Carrying out such changes in an insufficiently smooth manner does not provide an opportunity for continuity between the new and old management, which affects the functioning of a business organization. For example, a change in financial management could have a negative impact on a company's financial performance. Since large international companies often experience personnel changes when underperformance occurs during a particular reporting period, even without a change in ownership, it is also possible that such changes could have a negative rather than a positive impact on the functioning of business organizations and more specifically on their financial performance.

The presentation of the practical application of a specific financial model, which contains only statistically significant financial indicators, in combination with the consideration of the main specificity of a particular economic sector in determining the financial indicators' weights could be qualified as the main scientific contribution of this research paper. The analysis of the obtained results after the application of the selected ranking method has outlined two main reasons that negatively affect the financial performance of the studied business organizations during the considered time frame. The conclusions inferred in this research paper regarding the financial performance of mobile operators in Bulgaria could be taken into account by both the top management of the business organizations under consideration and the senior management of companies from other economic sectors in different countries before making strategically significant decisions such

as changing the brand name or undertaking personnel changes.

References

Akguc, O., 2010. Financial Statement Analysis. 13th ed. Istanbul: Arayis Publication.

Bulgurcu, B. K., 2012. Application of TOPSIS Technique for Financial Performance Evaluation of Technology Firms in Istanbul Stock Exchange Market. *Procedia – Social and Behavioral Sciences*, 62, pp. 1033-1040.

Cheng, C. H., Chen, C. T. and Huang, S. F., 2012. Combining fuzzy integral with order weight average (OWA) method for evaluating financial performance in the semiconductor industry. *African Journal of Business Management*, 6(21), pp. 6358-6368.

Dahooie, J. H. et al., 2019. A new evaluation model for corporate financial performance using integrated CCSD and FCM-ARAS approach. *Economic Research-Ekonomska Istrazivanja*, 32(1), pp. 1088-1113.

Dana, L. P. et al., 2021. Increasing productivity and sustainability of corporate performance by using management control systems and intellectual capital accounting approach. *Green Finance*, 3(1), pp. 1-14.

De la Cámara, A. G. et al., 2005. Heterogeneity of Prognostic Profiles in Non-small Cell Lung Cancer: Too Many Variables but a Few Relevant. *Eur J Epidemiol*, 20, pp. 907-914.

Dong, J. Y., Chen, Y. and Wan, S. P., 2018. A cosine similarity based QUALIFLEX approach with hesitant fuzzy linguistic term sets for financial performance evaluation. *Applied Soft Computing*, 69, pp. 316-329.

Farooq, U. and Qamar, M. A. J., 2019. Predicting multistage financial distress: Reflections on sampling, feature and model selection criteria. *Journal of Forecasting*, 38(7), pp. 632-648.

Goggeshall, F., 1886. The Arithmetic, Geometric, and Harmonic Means. *The Quarterly Journal of Economics*, 1(1), pp. 83-86.

Graham J. W., Van Horn, M. L. and Taylor, B. J., 2012. Dealing with the Problem of Having Too Many Variables in the Imputation Model. Chapter book in Statistics for Social and Behavioral Sciences. New York: Springer.

Ivanov, P., 2013. Marketing as Management Concept. *Economic Alternatives*, (3), pp. 64-73.

Ivanov, P., 2016. Economic Interests – the Argument of Marketing Management. *Economic Alternatives*, (1), pp. 119-125.

Jaqaman, K and Danuser, G., 2006. Linking data to models: data regression. *Nature Reviews Molecular Cell Biology*, 7, pp. 813-819.

Karimi, A. and Barati, M., 2018. Financial performance evaluation of companies listed in Tehran Stock Exchange. *International Journal of Law and Management*, 60(3), pp. 885-900.

Kartanaitė, I. et al., 2021. Financial modeling trends for production companies in the context of Industry 4.0. *Investment Management and Financial Innovations*, 18(1), pp. 270-284.

Katrandjiev, H. I., 2023. Genesis of Branding: Methodological Framework for Studying Ancient Egyptian Cylinder Seals (3000 BC-2150 BC). *Economic Alternatives*, (2), pp. 235-255.

Lee, P. T. W., Lin, C. W. and Shin, S. H., 2012. A comparative study on financial positions of shipping companies in Taiwan and Korea using entropy and grey relation analysis.

Expert Systems with Applications, 39(5), pp. 5649-5657.

Lu, W. M. and Lo, S. F., 2009. An interactive benchmark model ranking performers – Application to financial holding companies. *Mathematical and Computer Modelling*, 49, pp. 172-179.

Ma, J., Xu, T. and Lou, W., 2018. Research on a triopoly dynamic game with free market and bundling market in the Chinese telecom industry. *Discrete Dynamics in Nature and Society*, 2018 (Article ID 5720392), pp. 1-11.

Marqués, A. I., García, V. and Sánchez, J. S., 2020. Ranking-based MCDM models in financial management applications: analysis and emerging challenges. *Progress in Artificial Intelligence*, 9, pp. 171-193.

Martyniuk, V., Wołowiec, T. and Mieszajkina, E., 2021. Planning and Forecasting Customs Revenues to the State Budget: A Case Study of Ukraine. *European Research Studies Journal*, XXIV(2), pp. 648-665.

Melnyk, L. et al. (2019a). Disruptive technologies for the transition of digital economies towards sustainability. *Economic Annals-XXI*, 179(9-10), pp. 22-30.

Melnyk, L. et al. (2019b). The effect of industrial revolutions on the transformation of social and economic systems. *Problems and Perspectives in Management*, 17(4), pp. 381-391.

Merkl-Davies, D. M., Brennan, N. M. and McLeay, S. J., 201. Impression management and retrospective sense-making in corporate narratives: A social psychology perspective. Accounting, *Auditing & Accountability Journal*, 24(3), pp. 315-344.

Moghimi, R. and Anvari, A., 2014. An integrated fuzzy MCDM approach and analysis to evaluate the financial performance of Iranian cement companies. *The International Journal of Advanced Manufacturing Technology*, 71(1-4), pp. 685-698.

Radkov, B., 2023. Reflection of the Oligopolistic Market Structure in the Construction of a Financial Model. *Research Papers of UNWE*, (5), pp. 167-179 (in Bulgarian).

Rashid, C. A., 2020. Balanced Score Card and Benchmarking as an Accounting Tool to Evaluate Morrison's Performance. *Journal of Global Economics and Business*, 1(3), pp. 59-72.

Rounaghi, M. M., Jarrar, H., and Dana, L. P., 2021. Implementation of strategic cost management in manufacturing companies: overcoming costs stickiness and increasing corporate sustainability. *Future Business Journal*, 7, pp. 1-8.

Safaei Ghadikolaei, A., Khalili Esbouei, S. and Antucheviciene, J., 2014. Applying fuzzy MCDM for financial performance evaluation of Iranian companies. *Technological and Economic Development of Economy*, 20(2), pp. 274-291.

Shaverdi, M. et al., 2016. Combining fuzzy AHP and fuzzy TOPSIS with financial ratios to design a novel performance evaluation model. *International Journal of Fuzzy Systems*, 18(2), pp. 248-262.

Smorada, M. et al., 2023. Business Management and Methods of Predictive Financial Analysis of Companies' Activity. *Economic Alternatives*, (1), pp. 155-168.

Sony, M. and Naik, S., 2019. Key ingredients for evaluating Industry 4.0 readiness for organizations: a literature review. *Benchmarking: An International Journal*, 27(7), pp. 2213-2232.

Suryanto, T. and Thalassinos, I. E., 2017. Cultural ethics and consequences in whistle-

blowing among professional accountants: An empirical analysis. *Journal of Applied Economic Sciences*, 12(6), pp. 1725-1731.

Thalassinos, I. E. and Liapis, K., 2014. Segmental financial reporting and the internationalization of the banking sector. Chapter book in Risk Management: Strategies for Economic Development and Challenges in the Financial System, Hauppauge: D. Milos Sprcic, Nova Publishers.

Valaskova, K. et al., 2019. Oligopolistic competition among providers in the telecommunication industry: the case of Slovakia. *Administrative Sciences*, 9(3), pp. 49(1-15).

Velev, M., 2004. Assessment and analysis of company competitiveness, Sofia: Softtrade (in Bulgarian).