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MEASURING COMPANIES' BUSINESS PERFORMANCE IN THE REPUBLIC OF SERBIA USING COMPOSITE INDICES

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Abstract. *The method of measuring business performance has long been a focus of attention for the scientific and professional community. In addition to traditional methods, modern approaches are increasingly being used today. The authors of the paper explore the measurement of company performance in the Republic of Serbia using composite indices as part of multivariate analysis. Composite indices were created based on original financial data, as well as a calculated performance index, with the aim of providing a comprehensive overview of the financial efficiency of companies. The research includes companies listed among the top 100 most successful in Serbia for 2022. The analysis involves the use of statistical methods such as correlation and factor analysis to identify key performance indicators. Based on the obtained indices, companies were ranked, providing insight into their financial positions and market competitiveness. The results show that composite indices are an effective tool for measuring and analyzing business performance, offering management the information needed for strategic decision-making.*

Key words: *index of basic financial positions, liquidity, return on assets, composite indices, company performance assessment, financial statements*

JEL Classification: M41

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1. INTRODUCTION

Measuring the companies' business performance is a key prerequisite of management and decision-making in today's business environment. In the Republic of Serbia, as in many other countries, the performance of enterprises is often measured using various financial and non-financial indicators. In this context, composite indices are becoming an increasingly significant tool that enables integrated evaluation of company performance. Composite indices aggregate individual variables into a single index, thereby providing a more comprehensive picture of business performance. These indices allow the analysis of complex phenomena in a simple and understandable manner, overcoming the limitations of individual indicators that may not provide sufficient information about the examined issue.

The assessment of the companies' business performance in the Republic of Serbia by applying composite indices is important for several reasons. Specifically, companies in the Republic of Serbia operate in a unique market, so understanding the factors that influence business performance can significantly aid managers to improve their business strategy, identify shortcomings in accessing international markets, and achieve a better competitive position.

In this regard, the paper is divided into three parts. The first part presents the theoretical framework of the research and explains the methodology for applying composite indices. The methodology of applying composite indices for the assessment of the companies' business performance in the Republic of Serbia is explained in the second part, while in the final part the results of the conducted empirical research are analyzed. In the last part, the conclusions reached are summarized.

2. THEORETICAL BACKGROUND

Measuring the companies' business performance has become one of the key topics in the context of the rapid development of markets and technologies, especially with the emergence of new methodological approaches in recent years. Traditional methods of assessing business performance, which relied on financial indicators such as profit, liquidity, or leverage, often do not provide a sufficiently comprehensive picture. Performance metrics are long-term tools that should be periodically analyzed, allowing for the elimination of some, the improvement of others, and the addition of new metrics in accordance with changing business conditions and needs (Novićević et al., 2006). Consequently, research increasingly employs the concept of composite indices, which enable the aggregation of multiple different variables into a single indicator, providing a more comprehensive analysis of company performance (Nardo et al., 2008).

Composite indices have proven to be particularly useful in the context of complex, multidimensional phenomena that cannot be adequately captured by a single indicator (Antić et al., 2022). In this way, they facilitate the analysis of various aspects of business, such as competitiveness, sustainability, or innovation. This approach is increasingly present in the assessment of business performance across different industries, allowing for the ranking of companies based on multiple criteria simultaneously (Islami et al., 2020).

Li et al. (2003) demonstrate general method for statistical performance evaluation which incorporates various statistical metrics and automatically selects an appropriate statistical metric according to the problem parameters. They compare the performance of five representative statistical metrics under different conditions through simulation. The

performance of a company can be viewed as the contribution it makes through its operations while striving to achieve defined goals and meet the desires of its customers. In this context, performance can be measured using specific indicators that should align with the calculation of the efficiency and effectiveness of a particular action (Neely et al., 1995), using an appropriate set of specific metrics.

The work of Apostolou et al. (2020) shows how non-financial indicators, such as innovation, social responsibility, and service quality, can be used in conjunction with traditional financial success indicators. This combination allows managers to better understand market trends and opportunities, as well as identify weaknesses in business models.

Hill et al. (1996) explored the relationship between the financial performance of companies traded on the New York Stock Exchange in relation to liquidity, profitability, and debt. According to the results of this study, companies with higher liquidity have better financial performance compared to those with lower financial performance. It was also noted that the debt levels of these companies are high.

The research conducted by Ege and Bayraktaroğlu (2007) examined the relationship between various financial indicators and stock returns. These indicators included liquidity indicators, operational indicators, profitability indicators, and capital structure indicators. According to the results, it was observed that profitability and liquidity indicators are significant in assessing company performance.

In the Republic of Serbia, the application of composite indices in performance evaluation is relatively new but is crucial for monitoring competitiveness in local and international markets. In her dissertation, Marjanović (2022) explored the application of composite indices for evaluating the performance of banks, incorporating the use of Tobin's Q ratio. She emphasized the importance of adapting composite indices as a method for companies to enhance their performance effectively.

Overall, modern approaches to measuring company performance are moving towards the integration of financial and non-financial indicators, utilizing advanced statistical methods for data aggregation and analysis. Composite indices enable a more precise and comprehensive assessment of company performance, facilitating ranking and business decision-making (Nardo,2008). Such tools provide managers with the opportunity to identify key areas for improvement and to create sustainable business strategies based on data, which is particularly significant in a dynamic business environment, as is the case in the Republic of Serbia.

At the beginning of the research involving composite indices, criteria for selecting and combining variables are defined, ensuring that they form a clear and meaningful indicator. The aim of this research is to rank companies operating in the Republic of Serbia that are listed in the 'Top 100 Business Entities in 2022,' published by the Business Registers Agency. The Business Registers Agency publishes the Report on the Top 100 Business Entities each year (https://www.apr.gov.rs/registri/finansijski-izvestaji/publikacije/sto-naj-privrednih-drustava.2128.html). The Top 100 lists are compiled based on the values of basic financial positions of business entities as reported in their regular annual financial statements. The report presents lists of business entities from the perspective of business performance, financial capacities, and losses. As indicators of performance, lists of 100 business entities are compiled based on operating revenues and net profit, while lists based on financial capacities are formed according to total assets and equity.

For conducting the analysis, we used available data from financial statements as well as calculated performance metrics obtained from these data. To achieve the defined goal,

we formed two composite indices and, accordingly, selected variables. The first is the index of basic financial positions, and the second is the index of calculated performance. In selecting the variables, we ensured that they have analytical significance, measurability, representativeness for the phenomenon being studied, and interconnectivity (Jovičić, 2006). When creating the index of basic financial positions, the selected variables were: operating revenue, net profit, total assets, and equity. These are also the indicators based on which the Business Registers Agency conducted the ranking. For the index of calculated performance, we considered one indicator each from liquidity, profitability, and leverage.

To enhance the comparability of the indicators, we performed data normalization, i.e., we reduced the variables to comparable values. For this purpose, the min-max transformation was used, allowing the values to be transformed to an identical range. The normalized values range from 1 to 7, following the methodology of the WEF (World Economic Forum).

At the next level of analysis, the indicators were aggregated into a composite index. Based on the results of factor analysis, weighting coefficients (weights) were determined, with the aim of ensuring that the weight reflects the relative importance of each variable.

In selecting the business entities to be ranked, the authors based their choice on two criteria. The first was that the business entity achieved a positive financial result in 2021. and 2022. The second criterion was that the business entity appeared on all four lists for 2022 (operating revenue, net profit, total assets, and equity). For the creation of the integrated composite index in this paper, we used the same variables that APR used for ranking. Therefore, we decided to include only the companies that appear on all four of these lists in our analysis.

The total number of companies that met both criteria was 35, so statistical methods were applied to this sample. For the analysis, data from the last four years were used, totalling 140 observations. Table 1 presents the specific characteristics of the observed sample.

Table 1 Some characteristics of the sample

Variables	Frequency	Valid %	Cumulative %
Type of company			
LLC (Limited Liability Company)	24	68.6 %	68.6
PE (Public Enterprise)	3	8.6 %	77.1
JSC (Joint-Stock Company)	7	20.0 %	97.1
LP (Limited Partnership)	1	2.9 %	100.0
Region			
Vojvodina	10	28.6 %	28.6
Belgrade	16	45.7 %	74.3
Central Serbia	2	5.7 %	80.0
Southern Serbia	3	8.6 %	88.6
Western Serbia	2	5.7 %	94.3
Eastern Serbia	2	5.7 %	100.0
Sector			
Information and Communication	5	14.3 %	14.3
Wholesale and Retail Trade	6	17.1 %	31.4
Agriculture	1	2.9 %	34.3
Construction	2	5.7 %	40.0
Electric Power	3	8.6 %	48.6
Manufacturing Industry	13	37.1 %	85.7
Transport	2	5.7 %	91.4
Mining	3	8.6 %	100.0

Source: Author's calculation

All the business entities analyzed are classified as large companies. In terms of ownership structure, companies with limited liability dominate, accounting for 24 out of 35 entities, or 68.6%. Joint-stock companies make up 20%, while public enterprises represent 8.6% of the observed sample. Only one business entity is organized as a limited partnership.

When analyzing the sample by the region where the company is based, we can see that the highest number of companies comes from the Belgrade region, with 16 entities, or 45.7%. Ten companies in the sample are based in Vojvodina, while two companies each come from the Central, Western, and Eastern Serbia regions. Three companies were analyzed from the Southern Serbia region.

The majority of the business entities analyzed are engaged in manufacturing, with 13 companies (37.1%). Other companies belong to the wholesale and retail trade sector (6 companies, or 17.1%), information and communications (5 companies, or 14.3%), electricity and mining (3 companies each, or 8.6%), construction and transport (2 companies each, or 5.7%), and agriculture (1 company, or 2.9%).

3. RESEARCH METHODOLOGY

At the beginning of the analysis, a ranking of the 35 companies in the sample that met the two criteria set by the authors was conducted. Following this, an index of basic financial positions for 2023 was formed, with the aim of predicting the rank of the companies.

In the second part of the research, the authors calculated certain financial performances of the business entities based on the available financial statements and conducted a ranking based on that. The goal of this ranking was to determine whether the ranking of companies would change if it were based on calculated performances. Additionally, rankings were performed for both 2022 and 2023.

Table 2 shows the ranking of companies based on individual basic financial positions (operating revenue, net profit, total assets, and equity).

The company NIS A.D. NOVI SAD ranks first on all four lists: operating revenue, net profit, total assets, and equity. This company belongs to the mining sector from the Vojvodina region. The public enterprise SRBIJAGAS NOVI SAD ranks second on the list based on operating revenue, while the mining company from the Eastern Serbia region, SERBIA ZIJIN MINING, holds the second position on the net profit list. The company TELEKOM SRBIJA, as a joint-stock company, is second on the lists based on total assets and equity.

The collected data from the published financial statements of business entities were analyzed using the IBM SPSS Statistics 20.0 software (Statistical Package for Social Sciences - SPSS, Version 20.0). To determine the degree of agreement between variables, correlation analysis was used, while the validity of applying factor analysis was assessed using the Kaiser-Meyer-Olkin measure and Bartlett's test. In order to investigate, we defined the following hypotheses:

H1: The ranking of companies operating in the Republic of Serbia will change if they are ranked according to the index of basic financial positions compared to their rank for each position separately;

H2: The ranking of companies based on the index of calculated performances is different from the ranking obtained based on the index of basic financial positions;

H3: The ranking of companies based on both indices will differ in 2023 compared to 2022.

Table 2 Ranking of companies based on basic financial positions for 2022

	Operating revenue	Rang 2022	Net profit	Rang 2022	Total Assets	Rang 2022	Equity	Rang 2022
A1 SRBIJA D.O.O.	42,543,065	15	5,348,404	18	66,376,035	12	15,692,854	24
AGROMARKET DO	30,283,710	21	6,902,978	11	44,034,640	19	30,973,142	14
ALMEX Pancevo	19,512,695	33	2,606,029	28	28,283,045	25	17,842,861	21
BALL PAKOVANJE	23,910,293	30	1,905,569	32	26,278,464	28	14,490,938	26
BECHTEL ENKA UK LIMI	42,269,124	16	8,947,878	5	56,288,298	17	12,327,856	30
Beograd na vodi	31,640,403	20	6,971,265	10	68,120,870	11	15,895,679	23
Beogradske elektrane	29,624,891	23	1,870,112	33	65,061,624	13	41,409,241	11
COCA-COLA HBC - SERBIA	44,401,348	13	7,799,324	9	57,393,128	16	43,753,227	10
COOPER TIRE & RUBBER	18,969,197	34	3,101,158	24	23,321,012	30	11,375,731	32
DELHAIZE SERBIA DOO	134,491,427	3	6,747,855	12	91,578,147	8	45,771,648	9
Dijamant	28,405,322	25	1,445,803	34	21,407,809	34	10,554,245	33
ELIXIR PRAHOVO DOO	34,471,512	19	6,442,134	14	31,039,398	24	13,703,674	27
ELIXIR ZORKA - MINER	40,042,250	18	6,535,340	13	26,512,573	27	12,457,334	29
EMS AD BGD	58,607,193	10	8,145,638	8	112,046,535	6	78,194,924	6
GASTRANS D.O.O. NOVI	19,691,398	31	4,766,560	19	191,748,454	5	69,084,918	7
HEMOFARM AD VRŠAC	51,370,519	12	4,412,921	20	63,755,332	14	48,144,002	8
HENKEL SRBIJA DOO BE	67,441,151	9	2,679,144	27	42,708,969	20	21,036,563	19
Imlek	27,982,130	26	2,516,837	29	45,252,509	18	14,674,370	25
INTERNATIONAL AD SEN	26,155,283	28	5,514,806	16	23,051,649	31	12,026,512	31
JP SRBIJAGAS NOVI SAD	219,593,640	2	5,488,727	17	435,955,725	3	127,933,187	3
LIDL SRBIJA KD	93,328,905	8	2,042,241	31	73,534,183	9	34,980,491	12
Lukoil Doo	43,686,164	14	454,295	35	10,173,236	35	5,283,659	35
MATIJEVIC	24,370,416	29	2,427,464	30	27,840,240	26	20,057,506	20
METALFER STEEL MILL	40,530,504	17	3,939,535	23	22,663,893	33	9,741,025	34
NIS A.D. NOVI SAD	499,132,440	1	93,456,931	1	522,968,976	1	359,816,117	1
PEŠTAN DOO BUKOVIK	19,674,979	32	4,073,187	22	24,987,414	29	21,820,653	17
PHILIP MORRIS OPERAT	28,897,912	24	6,221,231	15	31,827,257	23	17,729,716	22
Pošte Srbije	27,466,098	27	2,967,425	25	33,645,824	22	25,622,037	16
SBB	29,635,125	22	4,097,941	21	73,130,287	10	32,177,946	13
SERBIA ZIJIN COPPER	102,536,456	7	35,163,600	3	286,705,843	4	118,709,489	4
SERBIA ZIJIN MINING	119,388,145	5	75,025,684	2	94,583,564	7	79,955,631	5
SPORT VISION DOO BEO	17,451,867	35	2,837,814	26	22,912,699	32	12,746,680	28
TELEKOM SRBIJA A.D.	115,440,514	6	13,336,844	4	489,700,404	2	175,124,367	2
TIGAR TYRES DOO	134,132,152	4	8,845,714	6	61,521,740	15	21,143,381	18
YETTEL D.O.O.	56,388,370	11	8,461,038	7	37,451,802	21	25,674,322	15

Source: Authors' creation based on collected data

4. EMPIRICAL RESULTS AND DISCUSSION

4.1. Ranking of companies based on the index of basic financial positions

After normalizing the data, we conducted a correlation analysis of the selected variables. Through correlation, we aimed to examine whether there is a relationship, as well as the strength and direction of that relationship between the variables. For our analysis, we used Pearson's correlation coefficient. The matrix of correlation coefficients is presented in the following table.

From the correlation matrix based on the correlation coefficients and the corresponding significance level (Sig<0.01), it is evident that there is a statistically significant relationship between the observed variables. A positive correlation is observed for all variables, indicating that an increase in one variable leads to an increase in another variable and vice versa. The highest degree of agreement among the observed variables exists between Total Assets and Equity (r= 0.919. p<0.01), followed by the relationship between Equity and Operating Revenue (r= 0.853. p<0.01), and third is the agreement between Total Assets and Operating Revenue (r= 0.747. p<0.01). The lowest degree of direct agreement was observed between the variables Total Assets and Net Profit (r= 0.486, p<0.01).

Table 3 Correlation Matrix

Variables		Total Assets	Equity	Operating revenue	Net profit
Total Assets	Pearson Correlation	1	.919	.747	.486
	Sig (1-tailed)		.000	.000	.000
Equity	Pearson Correlation		1	.853	.584
	Sig (1-tailed)			.000	.000
Operating	Pearson Correlation			1	.664
revenue	Sig (1-tailed)				.000
Net profit	Pearson Correlation				1
	Sig (1-tailed)				

Correlation is significant at the 0.01 level (2-tailed).**

Source: Independent calculations by the authors

The application of factor analysis involves checking the fulfilment of the conditions for using this multivariate analysis technique (Tabachnick & Fidell, 2013; Igić, 2014). We will verify whether the conditions are met by applying the Kaiser-Meyer-Olkin measure and Bartlett's test. These tests are conducted on the normalized values of the variables. During the normalization of the variables, a transformation model was applied to reduce the values of the variables to a scale from 1 to 7, so it should be expected that the values of the composite index will fall within this range. Data normalization is a procedure that must precede any method of data aggregation as individual indicators are most often expressed in different measurement units. The values of the KMO and Bartlett's test are presented in Table 4.

Table 4 KMO and Bartlet test

Kaiser-Meyer-Olkin Measure of Sampling Adeguacy		0.734
Bartlett's Test of Sphericity	Approx. Chi-Square	518.531
	Df	6
	Sig.	0.000

Source: Independent calculations by the authors

If the value of the Kaiser-Meyer-Olkin measure is greater than 0.5, the application of factor analysis for the selected set of variables is statistically justified and the sample is adequate. In our case, the value of this measure is 0.734, which allows us to conclude that we have executed an adequate set of variables and that it is justified to perform factor analysis on them. If the KMO value is not greater than 0.5, then the correlation matrix is not suitable for factor analysis. The achieved significance level in our case for Bartlett's test of sphericity ($p < 0.05$) indicates that the correlation matrix has significant correlations among the indicators.

In addition to the KMO statistic value for the entire sample, it is necessary to pay attention to the value of this indicator for each variable individually as it shows the suitability of each indicator for analysis. The KMO statistic values for each variable are given on the diagonal of the Anti-image matrix, which is presented in Table 5.

Table 5 Anti-image Matrices

		Total Assets	Equity	Operating revenue	Net profit
Anti-image Covariance	Total Assets	.149	-.095	.024	.027
	Equity	-.095	.092	-.079	-.023
	Operating revenue	.024	-.079	.226	-.133
	Net profit	.027	-.023	-.133	.552
Anti-image Correlation	Total Assets	.704[a]	-.815	.131	.095
	Equity	-.815	.663[a]	-.548	-.102
	Operating revenue	.131	-.548	.790[a]	-.376
	Net profit	.095	-.102	-.376	.864[a]

a. Measures of Sampling Adequacy (MSA)
Source: Independent calculations by the authors

Based on the previous table, we can see that all variables have a KMO statistic value greater than 0.5, so it is possible to continue with further analysis. If the KMO coefficient value for any variable were lower than 0.5, the possibility of excluding that variable from further research should be examined. Additionally, based on the data calculations in SPSS, we can say that the total variance is 78.691%, indicating that this percentage of variation in the variables is explained by the newly formed factor.

After verifying and meeting the initial assumptions of the model, we obtained the component matrix which shows the factor loadings that form the basis for assigning weights to each observed variable. It is important that the sum of the weights equals 1. The squares of these factor loadings represent the proportions of variance of certain indicators attributed to the effect of the given factor (Table 6).

Table 6 Weights

	Indicator of Basic Financial Positions
Total Assets	.255
Equity	.271
Operating revenue	.262
Net profit	.212

Source: Independent calculations by the authors

The weights obtained in this way have approximately equal values indicating that the observed variables have a roughly equal impact on the value of the composite index. Based on the weights, it is possible to define a formula for calculating the indicator of basic financial positions:

$$IBFP = 0.255 \times \text{Total Assets} + 0.271 \times \text{Capital} + 0.262 \times \text{Operating Income} + 0.212 \times \text{Net Profit} \quad (1)$$

where IBFP – index of basic financial positions.

By combining the values of the weights with the normalized values of the variables, a composite index was formed and subsequently, the ranking of companies for the years 2022 and 2023 was conducted. An overview of the rankings for 2022 is provided in Table 7.

Table 7 Company Rankings for 2022.

Rang	Company name	The composite index
1.	**NIS A.D. NOVI SAD**	**6.64**
2.	**TELEKOM SRBIJA A.D.**	**3.54**
3.	**JP SRBIJAGAS NOVI SAD**	**3.43**
4.	SERBIA ZIJIN COPPER	3.04
5.	SERBIA ZIJIN MINING	2.97
6.	DELHAIZE SERBIA DOO	1.99
7.	EMS AD BGD	1.96
8.	GASTRANS D.O.O. NOVI	1.95
9.	TIGAR TYRES DOO	1.84
10.	LIDL SRBIJA KD	1.71
11.	HEMOFARM AD VRŠAC	1.64
12.	COCA-COLA HBC - SRBI	1.63
13.	YETTEL D.O.O.	1.55
14.	SBB	1.52
15.	Beogradske elektrane	1.51
16.	HENKEL SRBIJA DOO BE	1.50
17.	BECHTEL ENKA UK LIMI	1.50
18.	A1 SRBIJA D.O.O. BEO	1.49
19.	AGROMARKET DO	1.48
20.	Beograd na vodi	1.48
21.	ELIXIR ZORKA - MINER	1.39
22.	ELIXIR PRAHOVO DOO	1.39
23.	PHILIP MORRIS OPERAT	1.38
24.	Pošte Srbije	1.38
25.	Imlek	1.35
26.	METALFER STEEL MILL	1.34
27.	PEŠTAN DOO BUKOVIK	1.33
28.	MATIJEVIC	1.32
29.	INTERNATIONAL AD SEN	1.32
30.	ALMEX Pancevo	1.30
31.	BALL PAKOVANJE	1.29
32.	Dijamant	1.27
33.	COOPER TIRE & RUBBER	1.27
34.	SPORT VISION DOO BEO	1.26
35.	**Lukoil Doo**	**1.25**

Source: Authors' calculations

Based on the data presented in Table 7, it can be noted that the maximum index value for 2022 is 6.64, held by the company NIS A.D. NOVI SAD, while the minimum value of 1.25 belongs to the company Lukoil Doo. If we look at the ranking list we compiled for the companies in the sample (Table 2), we can observe that the company NIS A.D. NOVI SAD is in the top position on the list of companies based on business revenues, net profit, total assets and capital. TELEKOM SRBIJA A.D. has an index value of 3.54 and is in second place. On the individual indicator lists, this company is also second in terms of business revenues and net profit, while it ranks sixth on the list based on total assets and fourth based on capital. Among the top five companies ranked according to the index of basic financial positions, three are from the mining sector. This is understandable as 2022 saw the engagement of new production capacities and significant growth in this

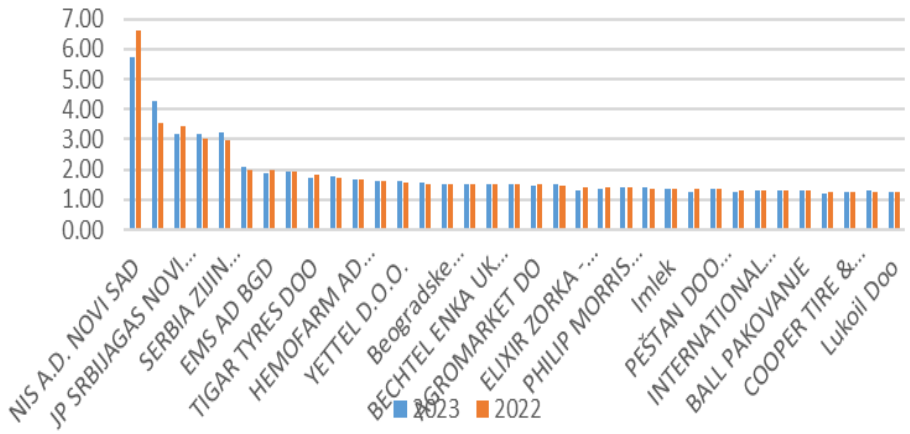
sector. Additionally, the increased production activity was accompanied by rising prices of mining products on the global market.

The company Lukoil Doo, which is last on the list according to the composite index of basic financial positions, is also at the bottom of the individual original data lists (in terms of net profit, total assets, and capital), while it ranks fourteenth in terms of business revenues.

Through a comparative analysis of the company rankings based on basic financial positions and the established index of basic financial positions, we can conclude that the ranks of companies with the highest and lowest values of financial positions are similar which is understandable, but the ranks of other companies differ.

The first hypothesis posed in the paper is "H1: The ranking of companies operating in the territory of the Republic of Serbia will change if they are ranked according to the index of basic financial positions compared to their ranking for each individual position." Based on the above analysis, we can say that this hypothesis is partially accepted. Companies with very high amounts in individual positions are also at the top of our list; however, the ranking of other companies has changed.

In addition to ranking companies in 2022 according to the index of basic financial positions, the authors aimed to predict the ranking of companies for 2023 based on the same index for that year. The ranking of companies determined using the composite index of basic financial positions for 2023 is graphically presented below. For easier comparison, we have also provided the values of this index for 2022.



Graph 1 Ranking of Companies According to the Index of Basic Financial Positions for 2022 and 2023
Source: Authors

The authors predict that the top company in the composite index of basic financial positions for 2023 will be NIS A.D. Novi Sad, which also ranked first in 2022. Following closely is TELEKOM SRBIJA A.D., maintaining its position from the previous year. The third spot for 2023 is expected to go to SERBIA ZIJIN MINING, which was fifth in 2022. The companies JP SRBIJAGAS NOVI SAD, SERBIA ZIJIN COPPER and DELHAIZE SERBIA DOO will also be among the top six, as they were the previous year.

HEMOFARM AD VRŠAC, COCA-COLA HBC, YETTEL D.O.O. and SBB are anticipated to retain their ranks in 2023. Conversely, the company Dijamant is expected to be at the bottom of the original data list, while Lukoil Doo is projected to climb to the 31st position.

The ranking of companies in 2023 will partially change compared to their ranking in 2022. There will be no drastic changes in positions, so companies with the best performance will remain at the top of the list. Therefore, we reject the third hypothesis.

4.2. Ranking of companies based on the index of calculated performance

In the second part of the research, the authors aim to rank companies based on specific calculated financial performances derived from available financial reports. The question the authors sought to answer is whether the ranking of companies would remain the same as with the original financial positions. For the ranking three variables were selected: Liquidity, Return on Assets, and Leverage. These are the most commonly used indicators for assessing a company's performance, and for this reason and practicality, we used them in our research.

Table 8 Selected Variables for Creating the Composite Index

Variables	Measurement	Acronym
Liquidity	Current assets / Current liabilities (Farooq, O. & Bouaich, Z. 2012.; Bogdan et al. 2012)	Lik
Return on Assets	Operating revenue/ Total assets (Didar 2019; Sudiyatno, B. & Suwarti, T. 2022)	ROA
Leverage	Total liabilities / Total assets (Wahba, H. 2013; Kijkasiwat, P. et al. 2022)	Zad

Source: Authors based on selected variables

We performed data normalization here as well using the min-max transformation, which allows for the conversion of values to a consistent range. The normalized values will range from 1 to 7, following the methodology of the World Economic Forum (WEF) Data normalization is one way to enhance the comparability of indicators.

For positive variables, or variables whose increase leads to an increase in the index, the following relation is applied during the transformation (WEF, 2016., p. 241):

$$TI_{ji} = 6 * \frac{I_{ji} - I_j^{min}}{I_j^{max} - I_j^{min}} + 1 \quad (2)$$

For so-called negative variables, i.e., those variables where a higher value leads to a lower result or a decrease in the index value and vice versa, the following formula is applied:

$$TI_{ji} = -6 * \frac{I_{ji} - I_j^{min}}{I_j^{max} - I_j^{min}} + 7 \quad (3)$$

where:

TI_{ji}- The transformed value of the j-th indicators in the index; I_{ji}- The value of the j-th indicator in the i-th company; I_j^{min}- The minimum value of the j-th indicator among the companies; I_j^{max}- The maximum value of the j-th indicator among the companies.

For the liquidity and return on assets variables Formula 1 was used for normalization, as an increase in these variables positively affects performance. For the leverage variable, Formula 2 was applied because an increase in this variable would negatively impact the companies' performance. By applying correlation analysis, we determined that there is a high degree of agreement between the variables. The highest degree of agreement was observed between the liquidity and return on assets variables. Their research concluded that there is a significant positive correlation between liquidity and return on assets, suggesting that companies with higher liquidity typically demonstrate better financial performance.

In the IBM SPSS Statistics 20.0 software (Statistical Package for Social Sciences - SPSS Version 20.0) we applied factor analysis and utilized the Kaiser-Meyer-Olkin measure and Bartlett's test, which provided us with data on the weighting coefficients.

Table 9 KMO and Bartlet test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.558
Bartlett's Test of Sphericity	Approx. Chi-Square	37.324
	Df	3
	Sig.	0.000

Source: Authors' calculations

Since the value of the Kaiser-Meyer-Olkin measure is 0.558, the correlation matrix is suitable for factor analysis. Additionally, Bartlett's test indicates that the sampling adequacy is appropriate for each variable in the model as well as for the overall model. The significance level is $p < 0.05$, which justifies the use of factor analysis.

Table 10 Anti-image Matrices

		Liquidity	ROA	Leverage
Anti-image Covariance	Liquidity	.796	-.070	-.337
	ROA	-.070	.951	-.131
	Leverage	-.337	-.131	.782
Anti-image Correlation	Liquidity	.544[a]	-.080	-.428
	ROA	-.080	.701[a]	-.152
	Leverage	-.428	-.152	.540[a]

a. Measures of Sampling Adequacy(MSA)

Source: Authors' calculations

The value of the anti-image matrix, which shows partial correlation coefficients along the diagonal, is greater than 0.5 in our case allowing us to proceed to the next level of analysis. Additionally, based on the calculations in SPSS, we can state that the total variance amounts to 52.217%, indicating that this percentage of variability in the variables is explained by the newly formed factor.

Once we obtained the weights in the program, we aggregated the data to derive the value of the composite index of calculated variables. In our case, the formula would be as follows:

$$ICP = 0.372 \times LIK + 0.246 \times ROA + 0.382 \times ZAD \quad (4)$$

where ICP – index of calculated performance.

The obtained index is applied to companies in 2022 and 2023 to determine their ranking during the observed period. An overview of the companies' performance in 2022 and 2023 according to the index of calculated performance is presented in Table 11.

Table 11 Ranking of Companies by Calculated Performance Index

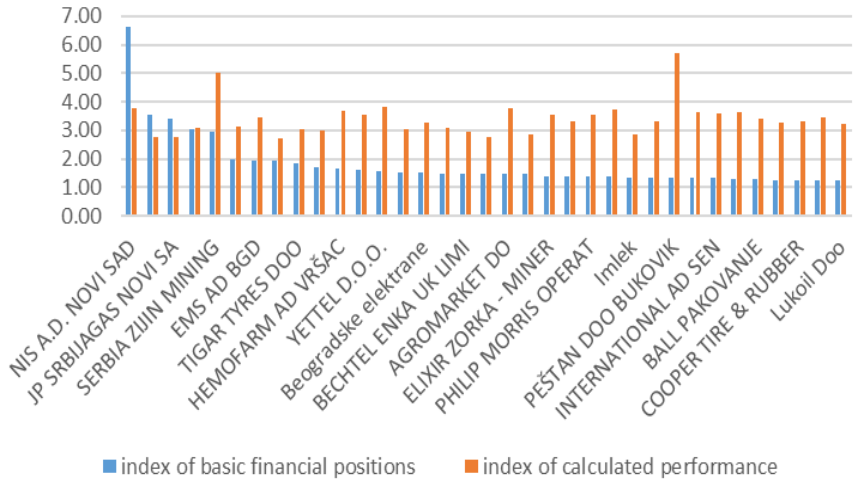
Company name	The composite index 2022	Rang 2022	The composite index 2023	Rang 2023
PEŠTAN DOO BUKOVIK	**5.719**	**1**	**5.797**	**1**
SERBIA ZIJIN MINING	**5.027**	**2**	**4.575**	**2**
YETTEL D.O.O.	**3.813**	**3**	**3.980**	**3**
AGROMARKET DO	3.780	4	3.624	10
NIS A.D. NOVI SAD	3.773	5	3.778	4
Pošte Srbije	3.710	6	3.655	7
HEMOFARM AD VRŠAC	3.699	7	3.639	9
MATIJEVIC	3.662	8	3.503	12
ALMEX Pancevo	3.634	9	3.641	8
INTERNATIONAL AD SEN	3.596	10	3.497	13
PHILIP MORRIS OPERAT	3.565	11	3.493	14
COCA-COLA HBC - SRBI	3.562	12	3.423	15
ELIXIR ZORKA - MINER	3.554	13	3.143	21
EMS AD BGD	3.476	14	3.348	17
SPORT VISION DOO BEO	3.471	15	3.684	6
BALL PAKOVANJE	3.431	16	3.596	11
METALFER STEEL MILL	3.330	17	**2.779**	**33**
COOPER TIRE & RUBBER	3.306	18	3.717	5
ELIXIR PRAHOVO DOO	3.300	19	3.068	23
Beogradske elektrane	3.292	20	3.165	19
Dijamant	3.267	21	3.162	20
Lukoil Doo	3.229	22	3.393	16
DELHAIZE SERBIA DOO	3.130	23	3.107	22
SERBIA ZIJIN COPPER	3.098	24	2.932	27
HENKEL SRBIJA DOO BE	3.085	25	3.196	18
SBB	3.054	26	3.040	24
TIGAR TYRES DOO	3.020	27	2.784	32
LIDL SRBIJA KD	2.996	28	3.018	25
BECHTEL ENKA UK LIMI	2.955	29	**2.698**	**35**
Beograd na vodi	2.852	30	**2.765**	**34**
Imlek	2.847	31	2.956	26
TELEKOM SRBIJA A.D..	2.778	32	2.832	30
JP SRBIJAGAS NOVI SAD	2.767	33	2.895	29
A1 SRBIJA D.O.O. BEOGRAD	2.745	34	2.787	31
GASTRANS D.O.O. NOVI SAD	**2.702**	**35**	2.902	28

Based on the list formed according to the calculated performance index for 2022 the top-ranked company is PEŠTAN DOO BUKOVIK. Following it are companies SERBIA ZIJIN MINING and YETTEL D.O.O. The last-ranked companies in 2022 are JP SRBIJAGAS NOVI SAD, A1 SRBIJA D.O.O. BEOGRAD and GASTRANS D.O.O. NOVI SAD. These companies improved their performance in 2023 resulting in a better ranking than the previous year.

When looking at the last three positions on the ranking list for 2023, we find METALFER STEEL MILL. Beograd na vodi, and BECHTEL ENKA UK LIMI. The ranking of these companies is significantly worse compared to 2022, particularly for METALFER STEEL

MILL, which dropped from seventeenth to thirty-third place. Aside from the top three companies, no other company maintained the same ranking in 2023.

Since the goal of the work was to see if the ranking of companies would change based on positions from financial statements or calculated performances, we now present a comparison of rankings for 2022 according to both indices. We chose to compare rankings for 2022 because that list has already been published, while the list for 2023 is still in preparation and may undergo changes.



Graph 2 Overview of company rankings by both indices for the year 2022
Source: Authors

As previously mentioned, the first company on the list based on basic financial data is NIS A.D. NOVI SAD. However, when examining the list of companies based on the index of calculated performance, this company ranks fifth. The second (TELEKOM SRBIJA A.D.) and third (JP SRBIJAGAS NOVI SAD) companies on the basic financial indicators list are among the lowest on the list formed based on the index of calculated performance. The last three companies on the basic financial data list for 2022 are in the middle of the list according to the index of calculated performance.

The top-ranked company for 2022 according to the index of calculated performance is PEŠTAN DOO BUKOVIK. This company ranks twenty-seventh on the list based on basic financial positions. The performance of PEŠTAN DOO BUKOVIK is significantly better when specific indicators are calculated than when raw data from financial statements are used. The same applies to the companies in second (SERBIA ZIJIN MINING) and third place (YETTEL D.O.O.) according to calculated performance, while they are ranked fifth and thirteenth respectively, based on basic financial positions for 2022. GASTRANS D.O.O. NOVI SAD is last on the list according to the index of calculated performance, but occupies eighth place on the list of basic financial positions.

When comparing these two rankings, we can observe a significant difference in the rankings of the companies. The only exception is COCA-COLA HBC, which holds the same (twelfth) position on both lists. We can conclude that companies with higher amounts of financial positions, and thus better positions on the basic financial data ranking tend to have

poorer calculated performance and are ranked lower. Conversely, companies with better calculated performance often have lower financial figures in their balance sheets.

The above analysis confirms the hypothesis posed in the paper, "H2: The ranking of companies based on the index of calculated performance is different from the ranking obtained based on the index of basic financial positions."

The quality of a composite index depends not only on the methodology used to construct it, but primarily on the quality of the data used in the analysis. This is because composite indices can send misleading messages if they are poorly constructed or misinterpreted. In this regard, it is possible to identify both the strengths and weaknesses of a composite index. Despite some observed shortcomings in the application of composite indices, their use allows for a holistic approach to performance analysis. Research findings indicate that companies with higher indices have better market positions and growth (Pavláková Dočekalová, & Kocmanová, 2016).

5. CONCLUSION

Measuring the performance of companies in the Republic of Serbia poses a significant challenge in the modern business environment and this paper focuses on the use of composite indices as a means for analyzing and ranking companies. The application of composite indices allows for integrated performance assessment. Through the analysis of available financial data, we identified variables relevant to evaluating performance and created two composite indices: the index of basic financial positions and the index of calculated performance. The variables considered for the calculated performance index included one indicator each from liquidity, profitability, and leverage.

The data collection base was the list "Top 100... companies in 2022." This list ranked companies in the Republic of Serbia according to four criteria: business revenue, net profit, total assets and equity. In our empirical research, we used data only for companies that appeared on all four lists. At the beginning of the analysis, data normalization was performed. After that, a correlation analysis was conducted, which showed a high degree of agreement between all the variables used in the research.

Factor analysis indicated that the sample is adequate and that there is statistical justification for the study. Weights obtained in SPSS were applied to the normalized data to determine the ranking of the companies. The ranking of companies based on the index of basic financial positions showed that the top three companies with the highest amounts of individual variables were also closely ranked when evaluated using the newly formed index. For other companies, significant variation in positions was noticeable.

The second index we calculated, the index of calculated performance, ranked companies in a completely different way. Specifically, when the selected performance indicators were calculated, the rankings of the companies significantly differed from those based on the index of basic financial positions. Except for COCA COLA BBC, which maintained the same rank, all other companies had different positions.

In our research, we focused on companies that achieved positive financial results in the previous two years and that appeared on all four APR lists, which implies stability and significant potential for further development. Rankings were conducted for 2022 and 2023. However, the APR list for 2023 has not yet been published, so we attempted to predict the ranking of companies based on available data. The authors are interested in

verifying the results of the research after the publication of the APR list, and in the case of significant fluctuations, conducting a deeper analysis of the market conditions and trends that led to the changes in the companies' rankings.

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MERENJE USPEŠNOSTI POSLOVANJA KOMPANIJA U REPUBLICI SRBIJI KORIŠĆENJEM KOMPOZITNIH INDEKSA

Novi pristup merenja uspešnosti poslovanja preduzeća dugo je predmet pažnje naučne i stručne zajednice. Pored tradicionalnih. danas se sve više koriste savremeni pristupi. Autori ovog rada istražuju merenje uspešnosti kompanija u Republici Srbiji korišćenjem kompozitnih indeksa kao dela multivarijacione analize. Kreirani su kompozitni indeksi na osnovu originalnih finansijskih podataka. kao i indeks izračunatih performansi. sa ciljem da se pruži sveobuhvatan pregled finansijske efikasnosti preduzeća. Istraživanje obuhvata kompanije koje su na listi 100 najuspešnijih u Srbiji za 2022. godinu. Analiza uključuje korišćenje statističkih metoda korelacije i faktorske analize radi identifikacije ključnih indikatora uspešnosti. Na osnovu dobijenih indeksa. kompanije su rangirane, što omogućava uvid u njihove finansijske pozicije i konkurentnost na tržištu. Rezultati pokazuju da kompozitni indeksi predstavljaju efikasan alat za merenje i analizu uspešnosti poslovanja, pružajući menadžmentu informacije potrebne za donošenje strateških odluka.

Ključne reči: *indeks osnovnih finansijskih pozicija, likvidnost, stopa prinosa na poslovna sredstva, kompozitni indeksi, ocena performansi preduzeća, fianansijski izveštaji*.