

UDK: 3:33 + 336

ISSN 1820-6859

ČASOPIS ZA POSLOVNU EKONOMIJU, PREDUZETNIŠTVO I FINANSIJE
MAGAZINE FOR BUSINESS ECONOMICS, ENTREPRENEURSHIP AND FINANCE

POSLOVNA EKONOMIJA BUSINESS ECONOMICS

Godina XV, broj 2

vol. XXIV

Novi Sad, 2021.

**POSLOVNA EKONOMIJA
BUSINESS ECONOMICS**

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Časopis izlazi dva puta godišnje

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Tiraž: 300 primeraka

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UDK: 336.66

POSLOVNA EKONOMIJA
BUSINESS ECONOMICS

Godina XV

Original Scientific Article

Broj 2

Str 1 – 18

doi: 10.5937/poseko20-34263

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THE IMPACT OF WORKING CAPITAL MANAGEMENT ON PROFITABILITY OF LARGE FIRMS IN SERBIA

ABSTRACT: Short term firms' decisions about working capital influence the firms value and profitability. This study aims to find new empirical evidence of the influence of managing working capital on profitability, measured by ROA, with application to 367 large non-financial firms in Serbia during a four-year period (2016-2019) using panel-corrected standard error model. The results show that after controlling the characteristics of the firm and macroeconomic conditions, working capital management has statistically significant and non linear influence to firm profitability. This suggests the existence of an optimal level of net working capital of analysed firms, while optimal level working capital has positive and above optimal level working capital has negative effects on the firms' profitability.

Key words: working capital, profitability, large firms in Serbia

INTRODUCTION

Management of working capital is important to ensure continuous operating cycle in all firms regardless their type or nature. Working capital management means balancing between level of cash, receivables and inventories on one side and source of financing on the other side with minimized cost and has significant impact on firms' worth. Finding optimal

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level of working capital and source of current liabilities financing is trade-off between profitability and risk (Van Horne & Wachowicz, 2008, p. 216). Lower level of working capital creates risk of default but increases profitability which is basic business goal and a measure of firms' long term performance. Simultaneous maximal profitability and optimal working capital needs to be established.

In yearly Working Capital Report of the largest global listed companies in the last 5 years PWC (2019, p. 2) concludes that there is still plenty of opportunity for creating value through optimising working capital levels (receivables and inventory are mayor sources of opportunity). The Report notes several trends: while net working capital increased by €360bn in 2018 and sales increase by 10% in 2017, operating cash flow (OCF) declined in 2018. Firms are facing operating challenges in converting revenue into cash (PWC, 2019, p. 3). In the same period capital expenditures continued to decline, suggesting that firms are managing cash levels by cutting investments.

Firms can have different strategies about level of working capital (Brigham & Houston, 2015 p. 523). A company should have its own working capital policies on the management of stocks, debtors, cash and short-term investments considering sector activity of the firm, competition and the firm's requirements in order to minimize the possibility of managers making decisions which are not in the best interest of the company (Watson & Head, 2017, p.68). Restrictive working capital strategy implies aggressive approach with lower level of working capital for a given level of activity or sales based on the principle of quick conversion of receivables and inventory into cash and delays of payment to suppliers. An aggressive strategy will increase profitability but will also increase risk for cash shortages or stockouts and missing sales (Brigham & Houston, 2015; Watson & Head, 2017). A conservative working capital strategy is more flexible and the given level of turnover would be associated to higher level of cash and short term securities, approved longer credit terms to customers and higher levels of inventory. Such strategy will decrease default risk and losing sales but will also decrease profitability (Watson & Head, 2017). A moderate working capital strategy is between the aggressive and the conservative strategies.

Any deviation from optimal level of working capital decreases a firm's profitability. Efficient strategy of working capital management is simply an optimal strategy of working capital management (Kornet & Orsag, 2020, p. 49). Firms in real sector in Serbia have low liquidity, both liquidity ratios are below 1 (common and quick ratios), which means that working capital of real sector is constantly below short term liabilities (Serbian Business Registers Agency, 2020, p. 36). Lead by research conducted by Deloof (2003), the aim of this paper is to answer to following questions: what is the impact of working capital management on profitability of large non-financial firms in Serbia and

is there a statistically significant effect of working capital management to profitability of large firms in Serbia? Statistically significant relation of ratio of working capital and sales to profitability of large firms in Serbia is analyzed with panel-corrected standard error according to the methodology of Anton & Nucu (2020). Indicators for managing working capital are ratios of working capital to sales.

The rest of the study is organized as follows. Section 2 describes main theoretical and empirical literature that has approached the relationship between management of working capital and firm profitability. Section 3 presents analysis of large firm profitability in Serbia and relevant market trends as the basis for constructing the hypothesis. Section 4 presents the database and methodological background for analysis, defining variables, and the model estimation approach. Section 5 presents analysis and discussion and Section 6 presents conclusions.

LITERATURE REVIEW

In the last two decades the idea that working capital management influences a firm's profitability and risk is widely accepted and has generated significant interest. Most studies of influence of working capital management on profitability at the beginig show linear effect in which negative effect prevails and these studies support aggressive working capital strategy. Other studies show that working capital management has positive effect to profitability and they support conservative strategy. Summarized review by a chronological order of most recent empirical papers is presented in Table 1.

Table 1. – Literature review

Author/s	Sample	Period	Dependent variable	Conclusion
		Methodology	Independent variable	
Deloof (2003)	Belgium large firms	1991-1996 FE OLS	Gross income ARday APday SalesGr FAR	Negative effect
Marchinez-Solano & Garcia-Teruel (2006)	Spain & SME	1996-2002 FE	ROA ARday APday Salesgr	Negative effect
	Greece	2001-2004	Gross profit	Negative effect

Lazridis & Tryfonidis (2006)	Listed firms	Regression	FixedFA, LNSales, industrial variab	Finandebt, CCC and dummy	
Goncalves, Gaio & Robles (2018)	United Kingdom Non listed firms	2006-2014 Regression	ROA CCC, DR, Sales DDdummy DBdummy		Negative effect
Barjaktarović Rakočević, Latinović & Milosavljević (2014)	Serbia Listed firms	2010 Correlation	ROA CCC, ARday, APday, INVday, Growth, Leverage, CR		CCC doesn't have statistically significant effect APday and ARday negative and INVday positive effect
Muscettola (2014)	Italy production SME	2007-2010 OLS	Ebitda/ Net Sales ARday INVday APday CCC, FAR, CR, IR, ARR		Positive effect
Anton & Nucu (2020)	Poland Listed firms	2007-2016 OLS FE PCSE	ROA OROA WKCR WKCR ² DR CR SalesG Size		Concave relationship – up to optimal level positive and below optimal negative
Botoc & Anton (2017)	13 EE countries Fast growthing firms	2006-2015 OLS FE RE GMM	ROA WKCR WKCR ² SalesG GDP DR CR		Concave relationship – up to optimal level positive and below optimal negative
Bjorkman & Hillergren (2014)	Sweden wholesale SME	2012 OLS	GPM CCC, dSmall, dMedium		Positive effect
Korent & Orsag (2018)	Croatia Software companies	2014-2020 GMM	ROA ROAt-1 wNOCTR wsqNOCTR		Concave relationship – up to optimal level positive and below optimal negative
El-Ansary and Al-Gazzar (2020)	MENA (Africa) Listed firms	2013-2019 GMM	ROA ROE ROA/ROEt-1 NWCR sqNWCR Size SalesGr LEV GDP		Concave relationship – up to optimal level positive and below optimal negative With ROE relationship not confirmed

Source: Authors' work based on the literature review

Most of the studies which focus on quantifying the connection between working capital management and profitability used panel data analysis, with GMM, FE or OLS estimation techniques, but their results are contradictory.

Initial studies find statistically significant, linear and negative relationship between working capital management and profitability of large firms in Belgium (Deloof, 2003), small and medium firms in Spain (Marchinez-Solano & Garcia-Teruel, 2006), listed firms in Greece (Lazridis & Tryfonidis, 2006), non listed firms in the United Kingdom (Goncalves, Gaio & Robles, 2018). The mentioned studies support aggressive working capital strategy.

Some authors did not find negative effect of working capital management on profitability. Barjaktarović Rakočević, Latinović & Milosavljević (2010) researching listed firms in Serbia find that cash conversion cycle (CCC) doesn't have statistically significant effect on profitability while days of sales and days of payables have outstanding negative and days inventory outstanding positive effect.

Positive and linear effects of working capital management on profitability are found in small and medium production firms in Italy (Muscatella, 2014), as well as small and medium wholesale firms in Sweden (Bjorkman & Hillergren, 2014).

Some recent studies (Gomes, 2013; Botoc & Anton 2017; Anton & Nucu, 2020; Korent & Orsag 2020; El-Ansary & Al-Gazzar, 2020) find non linear relationship between working capital management and profitability. Results of these studies imply the existence of an optimal level of working capital which maximizes a firm's profitability.

PROFITABILITY OF LARGE FIRMS IN SERBIA

In 2019 profitability of real sector in Serbia, measured by Return on Asset (ROA) was slightly disturbed compared to previous year and amounted 3,12%. According to the Statistical Office of the Republic of Serbia (2020, p. 40) the positive trend from 2014 to 2018 was interrupted in 2019. ROA was 1.56%, 2.17%, 3.43%, 3.64% and 3.12% in the period from 2015 to 2019 respectively.

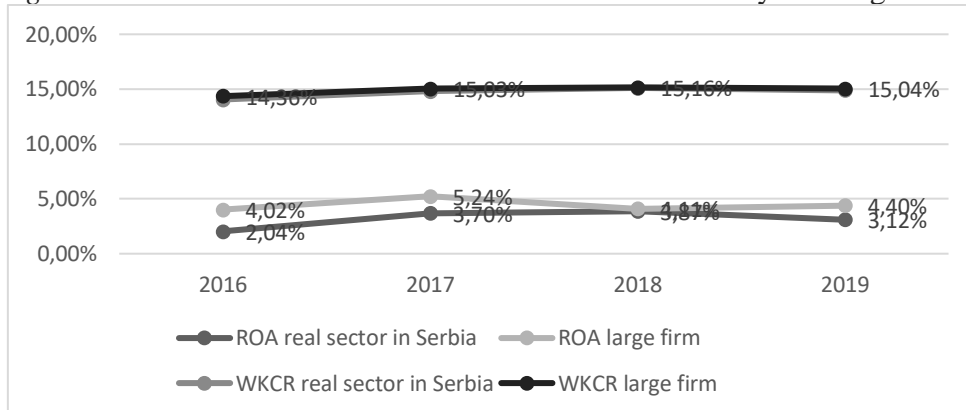
Decrease in business profitability was the main cause of decreased profitability. Similar trends are present in US economy and economies in Western Europe (Jugović, Ribić & Živanović, 2020, p. 57).

According to the Serbian Business Registers Agency [hereinafter SBRA] (2020, p. 24) large firms participate with 42.1% in total revenues in Serbian economy in 2019. Profitability of 367 large firm in Serbia, measured by ROA varies in the observed period and are higher than average ROA of

real sector (SBRA, 2020) which can indicate that size can influence a firm's profitability.

Working capital in Serbian economy amounts to 6.3 billion dinars in 2019, majority of current assets are invested in inventory (34%) and account for receivables (33%) which record increase comparing to the previous years of 10.2% and 11.8% respectively (SBRA, 2020, p13). Business activity is mostly financed from borrowed short term sources (69% of total assets), majority of short-term borrowings account for payable obligations (SBRA, 2020, p. 14).

Figure 1. – ROA and WKCR indicators in Serbian economy and large firms



Source: Authors' calculation based on SBRA data

Figure 1 presents comparable relationship of return on assets (ROA) and working capital ratio (WKCR) of Serbian economy and 367 large firms for the period from 2016 to 2019. Working capital ratio, analyzed as percentage of working capital (account receivables + inventory – account payables) and sales, on economy level is 14.72% on average, while the same ratio for large firms in Serbia is very similar and is 14.90% on average. In 2019 Serbian economy had low profitability (average ROA 3.12%) and demanded high level of working capital ratio (average WKCR was 14.91% from sales), while large firms with similar level of working capital (15.04% from sales) achieved higher profitability of 4.40%.

DATA AND METHODOLOGY

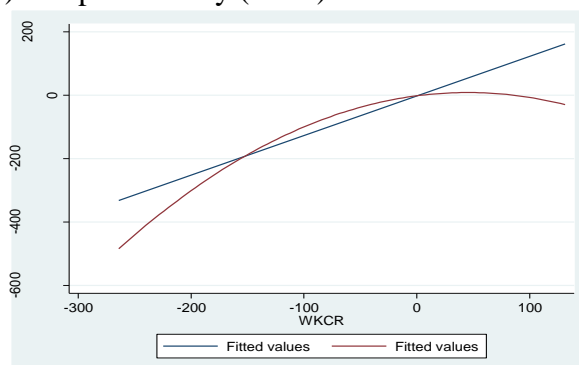
The subject of the paper is the analysis of the impact of working capital management on profitability of large firms in Serbia in a four-year period (2016-2019). The goal is to determine if the ratio of working capital to sales influences profitability of the observed firms in the presented period. The

research sample consists of active, non-financial firms with the existing financials during the period from 2016 to 2019 which are classified as large firms in 2019 according to article 6 of Accounting Law (Accounting Law, Sluzbeni glasnik RS, 2019, article 6). Large firms are firms which meet two of the following three criteria: average employee number 250, Revenue 40,000,000 euros in rsd counter value and Total Asset value on Balance date 20,000,000 euros in rsd counter value. According to Serbian Business Registers Agency data there were 415 large firms in 2019 in Serbia, but listed criteria was met by 367 firms, so the sample in this paper consists of 367 large firms. This group of companies was selected because of its importance for Serbian economy. Large firms participated in 42.1% of total real economy revenues in 2019 (SBRA, 2020, p. 24).

The data collection was done using the database SBRA. However, the final database was put together manually, computed, and constructed by the author, including manual calculation of ratios. The sample consists of 367 firms ($N=367$) which are studied over a four-year period ($T=4$) which resulted in total of maximum 1,468 observations for the basis of the study.

The selection of dependent and independent variables was based on literature analysis. Profitability is a dependent variable in this research and is usually measured by Return on Equity (abbreviated ROE) and Return on Assets (abbreviated ROA). In this research ROA is chosen. It is simple measurement of firm profitability and determines the firm's ability to generate profit based on asset management. This study will use a common and well-known measure of ROA: $\text{Return on Assets (ROA)} = \text{Net profit} / \text{Total Asset}$. The study is based on working capital ratio (WKCR) as an independent variable of primary interest and is defined as $(\text{Inventory} + \text{Account Receivables} - \text{Account Payables}) / \text{Sales}$ in line with referenced studies (Botoc & Anton, 2017; Korent & Orsag, 2018; El-Ansary & Al-Gazzar, 2020). The study analyzes a variable which reflects the amount of money necessary in operating cycle, i.e. working capital ratio (Anton & Nucu 2020; Botoc & Anton, 2017), and not variable which reflects a length of time like (CCC) cash conversion cycle (Marchinez-Solano & Garcia-Teruel, 2006, Bjorkman & Hillergren, 2014; Zariyawati et al., 2010).

Figure 2. – Curve estimation regression model between the level of working capital (WKCR) and profitability (ROA).



Source: Authors' calculation in STATA Statistics v.12.0

According to previous studies (Banos-Caballero, Garcia-Teruel & Marchinez-Solano, 2015; Anton and Nucu, 2020) quadratic model is analyzed. Figure 2 displays the Curve estimation regression model and shows the relationship between the level of working capital (WKCR) and profitability (ROA). We notice a non-linear (inverted U-shape) relationship, suggesting that inclusion of WKCR square in the model is necessary. This motivates the inclusion of WKCR square in the model (WKCRsq).

Based on previous studies of this model, control variables are included to improve the model and to help explaining the profitability of large firms in Serbia that are not captured by working capital. The indicator of growth potential is a one-year growth of a firm (SalesGr) which is defined as follows $((\text{Sales}_{n+1} - \text{Sales}_n) / \text{Sales}_n)$, debt ratio (DR) which is defined as ratio of total debt and total assets, cash ratio (CR) which is defined as percentage of cash and cash equivalents to total assets. Firm size (Size) is logarithm of assets and indicates influence of Assets size to firm profitability. Growth of real gross domestic product (GDPGr) is used as external control variable and the data are taken from World Bank (World Bank data, 2021).

Results in many studies find that relationships between firm size (Size) and profitability (Anton & Nucu, 2020; Afrifa & Padachi, 2016; Mansoor & Muhammad, 2012), relationships between real growth of gross domestic product (GDPGr) and profitability (Mansoori & Muhammad, 2012; Marchinez-Solano & Garcia-Teruel, 2006; Nazir & Afza, 2009) and relationships between cash ratio (CR) and profitability (Muscatolla, 2015; Anton & Nucu, 2020; Nazir & Afza, 2009) are positive.

Debt ratio (DR) also represents a variable used in many studies to find relationships between working capital management and profitability. The results are mostly consistent - authors (Botoc and Anton, 2017; Charitou, Elfani & Lois, 2010; Marchinez-Solano & Garcia-Teruel, 2006, Gomes, 2013)

find negative relationships. Some authors (Zariyawati, Annuar, Taugiq & Sazali 2010) find that debt does not have statistically significant influence on profitability of listed firms in Malaysia.

Relationship of Sales growth (SalesGr) and profitability is negative (Gomes, 2013; Pais & Gama, 2015) showing that Sales increase led to decrease in profitability when firms invest in inventory to support expected sales growth. While some authors (Mansoori & Muhammad, 2012; Charitou et al., 2010) show that the relationship between sales growth and profitability is statistically significant and positive.

Based on the results of these studies, the research hypothesis is formulated: ***Hypothesis 1:** There is non linear and statistically significant relationship between working capital and profitability with optimal level of working capital which maximizes profitability.*

Research approach intends to assess the relationship between working capital and profitability of the firm, taking in consideration large firms in Serbia. In statistical notation, the regression model can be described as follows:

$$\text{ROA}_{i,t} = \beta_0 + \beta_1 \text{WKCR}_{i,t} + \beta_2 \text{WKCRsq}_{i,t} + \beta_3 \text{SalesGr}_{i,t} + \beta_4 \text{DR}_{i,t} + \beta_5 \text{CR}_{i,t} + \beta_6 \text{Size}_{i,t} + \beta_7 \text{GDPGr}_{i,t} + \varepsilon_{i,t} \quad (1)$$

where: ROA – dependent variable, WKCR and WKCRsq – independent variables SalesGr, DR, CR, Size, GDPGr – control independent variables, β – regression coefficient with independent variables, ε – error term and i number of observed large companies in Serbia ($i=1, \dots, 367$) and t time from 2016 to 2019 ($t=1, \dots, 4$).

RESULT AND DISCUSSION

The research considered the period from 2016 to 2019. The source of data are Financial Statements collected from database SBRA. However, the final database was put together manually, computed, and constructed by the author, including manual calculation of ratios.

Descriptive statistics for the sample are showed in Table 2. The table describes means, standard deviation, minimum values, and maximum values for the included variables. These variables comprise data from 1,468 observations. ROA acts as the dependent and is a central variable for answering the research question. Most theories consider that good level profitability is above 10%. Statistics show that the mean of ROA for firms included in this study is approximately 0.0444 or 4.44% which can be consider as low profitability. The mean ROA is partly reduced by the negative ratios of some observations, including lowest ROA at -0.1558 as seen in the minimum

column. The mean ROA is positively affected by the limit set on the most negative observations after adjusting for outliers in the 5th percentile. It is further reduced as an effect of limiting the max ROA value at 0.2223 after adjusting the outliers in the 95th percentile. The value for ROA is comparable with those reported for listed consumer goods firms in the MENA region 4% (El-Ansary & Al-Gazzar (2020), 5.0% for Czech, 5.1% for Slovak and 5.1% for Polish fast-growing firms (Botoc & Anton, 2017).

Average value of working capital ratio for large Serbian firms is 14.89% with standard deviation of 0.1933. Mean values of WKCR are reduced as effect of limiting maximum values to 0.5665 after adjusting outliers in the 95th percentile and are similarly positively adjusted for limiting negative outliers in the 5th percentile to -0.1942. The sales of the observed firms were in average growth by 14.26% per year, indebtedness was on the level of 62.01% and cash was on the level of 6.67% from total assets. Mean value for SalesGr is also adjusted for outliers using the Winsorize method in STATA. The pre-adjusted values can be found in Appendix 1.

Table 2. – Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA_wi	1468	.044164	.081478	-.1558831	.2223371
WKCR_wi	1468	.1489746	.1933456	-.1942392	.5665348
DR	1468	.6201953	.5471871	.0293719	8.609257
CR	1468	.0667062	.1016032	0	.9313446
Size	1468	15.54126	1.237213	10.76855	20.72844
GDPGr	1468	.0354585	.0093906	.0210116	.0449512
SalesGr_wi	1468	.142667	.2625175	-.207758	.886844

Source: Authors' calculation in STATA Statistics v.12.0

The correlation analysis reveals the trend and levels of interrelatedness between the two variables.

The Pearson correlation matrix for the variables is presented in Table 3. Analyzing the correlation matrix, all the statistically significant correlations are with low intensity. In relation to ROA, there is statistically significant, positive and low correlation with working capital ratio (WKCR) and statistically significant, negative and low correlation with squared working capital ratio (WKCRsq), which is in line with the author's assumption about the negative influence of WKCR on firm profitability above optimal level. There is statistically significant, negative and moderate correlation to debt ratio (DR); significant, positive and low correlation to cash ratio (CR) and firm size (Size), positive and weak correlation to sales growth (SalesGr) while growth of gross domestic product (GDPGr) has negative impact on profitability.

Table 3. – Correlation matrix – Pearson correlation coefficient

	ROA_ wi	WKCR_ wi	WKCRs q	DR	CR	Size	GDP Gr	SalesG r_wi
ROA_ wi	1.0000							
WKCR_ wi	0.1459*	1.0000						
WKCR	-0.1118*	-0.0379	1.0000					
sq	0.0000	0.1466	0.1466					
DR	-0.3813*	-0.2089*	-0.0344	1.0000				
	0.0000	0.0000	0.1883					
CR	0.1730*	-0.1729*	0.0269	-0.0404	1.0000			
	0.0000	0.0000	0.0304	0.1221				
Size	-0.0791*	0.1154*	0.0364	-0.0639*	-0.2821*	1.0000		
	0.0024	0.0000	0.1632	0.0144	0.0000			
GDPGr	-0.0460	0.0038	-0.0460	-0.0098	-0.001	0.0557*	1.0000	
	0.0782	0.8858	0.0780	0.7973	0.9654	0.0330		
SalesGr_ wi	0.0261	-0.0712*	0.0574*	0.0495	0.1424*	-0.1927*	-0.0484	1.0000
	0.3167	0.0063	0.0279	0.70581	0.0000	0.0000	0.0638	

Source: Authors' calculation in STATA Statistics v.12.0 Note: * Statistical significance on level of 5%.

Precondition for the usage regression model is the absence of multicollinearity between the independent variables. Although it is shown in Pearson correlation matrix, in order to test multicollinearity the author chose to construct a correlation matrix and to conduct VIF test in STATA. As there are no correlations between two variables that exceed 10 and $1/VIF$ is not below 0.2 (Menard, 1995) it can be concluded that there is no multicollinearity in the model.

Table 4. – VIF test of multicollinearity

Variable	VIF	1 / VIF
CR	1.15	0.872962
Size	1.13	0.888531
WKCR_wi	1.09	0.918547
DR	1.06	0.934558
SalesGr_wi	1.07	0.942994
WKCRsq	1.01	0.988394
GDPGr	1.01	0.992798
Mean VIF	1.07	

Source: Authors' calculation in STATA Statistics v.12.0

There is a problem of serial correlation ($DW=1,047274$), heteroskedasticity ($BP\ Prob > F= 0,000$ and $F(7, 1460) = 6,95$) and cross section dependence (Pasaran test = 13.959, $Pr = 0.000$) in the model. In line with Beck & Katz (1995) model panel-corrected standard error (PCSE) is used

to correct the level of heteroskedasticity and cross section dependence in firms.

The results of regression coefficients conducted by PCSE are presented in table 5. Dependent variable is ROA. In line with defined hypothesis, the results show non linear relationship between firm profitability and working capital. The coefficient of WKCR is positive ($\beta_1 > 0$) and indicates positive working capital – profitability relationship. Coefficient of its square WKCRsq is negative ($\beta_2 < 0$) and indicates negative working capital – profitability relationship.

Positive and negative trends, as well as optimal level of working capital which has inverted U-shape prove the research hypothesis. The results are statistically significant and consistent with the results of listed firms in Poland (Anton & Nucu, 2020), software firms in Croatia (Kornet & Orsag, 2018), fast growing firms in 13 countries from Central, East and Southeast Europe (Botoc & Anton, 2017) SME firms in the United Kingdom (Afrifa & Padachi, 2016) and listed firms for consumer goods in MENA region (El-Ansary & Al-Gazzar, 2020). Above the optimal level, working capital has negative effect and harms firm profitability because of opportunity and financing costs.

The results of regression analysis show that the above optimal level working capital has negative effects on profitability of the observed firms in Serbia and are consistent with recent results in other countries.

The results for the control variables show that the debt ratio (DR) has statistically significant and negative effect to profitability and are in line with Pecking Order Theory of capital structure and the results of listed firms in Poland (Anton & Nucu, 2020), listed firms in Cyprus (Charitou et al., 2010), non listed firms in the United Kingdom (Goncalves et al., 2018), SME in Portugal (Pais & Gama, 2015) and fast growing firms in 13 countries from Central, East and Southeast Europe (Botoc & Anton, 2017). Pecking Order Theory (Myers & Majluf 1984) indicates that internal financing leads to decreasing indebtedness and negative relationship between debt and profitability.

Growth of gross domestic product (GDPGr) has statistically significant and negative effect on profitability. While studies from Kornet & Orsag (2018) and Banos-Caballero et al. (2010) show negative but not statistically significant relationship.

Cash ratio (Muscatella, 2015; Anton & Nucu, 2020) is an important factor allowing firms to improve profitability as it has positive and statistically significant effect to profitability. Sales growth (SaleGr) and firm size (Size) have positive but not statistically significant impact (Mansoori & Muhammad, 2012; Charitou et al., 2010).

Table 5. – Results PCSE model

ROA_wi	Model PCSE		
Independent variable	Coef.	Panel-corrected Std. Err.	P> z
WKCR_wi	.0349731	(0.0108433)	0.001**
WKCRsq	-4.57e-06	(1.39e-06)	0.001**
DR	-.0578688	(.0100515)	0.000***
CR	.1209495	(.0293455)	0.000***
Size	.0027195	(.0019981)	0.173
GDPGr	-.5333699	(.1048582)	0.000***
SalesGr_wi	.0013999	(.0069595)	0.841
Constant	.0430995	(.0252795)	0.088
No of observations	1468	Wals chi2 (7)	199.64
R-squared	0.3077	Prob > chi 2	0.0000

Source: Authors' calculation in STATA Statistics v.12.0

Note: WKCR and WKCRsq measures working capital. Control variables are DR, CR, Size, GDPGr and SalesGr. * $p < .05$; ** $p < .01$; *** $p < .001$. Panel corrected standard errors are reported in brackets.

CONCLUSION

In empirical studies, conclusions for optimal relationship of working capital and profitability are not consistent. However, most recent studies confirm optimal level of working capital and nonlinear relationship. The main purpose of this study was to investigate the relationship between working capital and profitability of large non-financial firms operating in Serbia in the period of 4 years (2016-2019). The results show that managing working capital, measured by ratio of working capital in sales has statistically significant and nonlinear impact on profitability. That is implied by the fact that the relationship proved to be inverted U-shaped. The empirical results highlight that at low level working capital there is a significantly positive influence on corporate profitability. However, a further increase in working capital above its optimum level has significantly negative influence on corporate profitability trend. Managers should avoid high net investment in working capital and prevent negative effects on profitability. Generated funds should be oriented towards profitable investment opportunities. As a result of decreasing unnecessary surpluses of working capital, financial flexibility of firms will increase.

Statistically significant and positive relation has been found between cash ratio and profitability and statistically significant but negative relation

between debt ratio and GDP growth and profitability. There is no relationship between Sales growth and profitability and size and profitability. Many internal factors influence a firm's business performance and their recognitions can significantly improve the firm's performance.

Large firms in Serbia are important as they participated with 42% of total revenues in Serbian economy in 2019 and engaged 31% of employees (SBRA, 2020, p. 10). Large firms in the observed period of 4 years had an average ROA of 0.041, which means that da 4.41% of Assets is retained as net profit of the firms.

Further research might take into consideration more determinations of profitability since the value of R^2 is 0.3077, which implies that there are more important variables which have not been included in this model. Also, future research can take into consideration sectorial analysis and a longer period. As economy is influenced by Covid-19 (Corona virus), future researchers can examine the speed of adjustment and/or recovery managing working capital during financial crisis or the period of pandemic.

REZIME

UTICAJ UPRAVLJANJA OBRTNIM KAPITALOM NA PROFITABILNOST VELIKIH PREDUZEĆA U SRBIJI

Kratkoročne odluke preduzeća o obrtnom kapitalu utiču na profitabilnost i vrednost preduzeća. Cilj rada je analiza odnosa pokazatelja upravljanja obrtnim kapitalom na profitabilnost. Istraživanje je sprovedeno za period od 2016. do 2019. godine, na uzorku 367 velikih nefinansijskih preduzeća iz Srbije. Primenom metoda panel korigovane standardne greške (PCSE) ispitan je uticaj obrtnog kapitala na profitabilnost preduzeća izražene kroz ROA pokazatelj. Rezultati pokazuju da postoji statistički značajna nelinearna korelacija kod velikih firmi u Srbiji. Do optimalnog nivoa obrtni kapital ima pozitivan uticaj na profitabilnost, nakon optimalnog nivoa obrtni kapital ima negativan uticaj na profitabilnost.

Ključne reči: obrtni kapital, profitabilnost, velika preduzeća u Srbiji

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Appendix 1. – Minimum and maximum values before and after Winsorized adjustment

	All observations		Extreme values excluded	
	Min	Max	Min	Max
ROA	-2368.35	4.62747	-.155883	.222337
WKCR	-264.054	131.291	-.194239	.566535
DR	.029372	8.60926	.029372	8.60926
CR	0	.931345	0	.931345
Size	10.7685	20.7184	10.7685	20.7284
GDPGr	.021012	.044951	.021012	.044951
SalesGr	-.999479	2652.95	-.207758	.886844

Ovaj rad je primljen **04.10.2021.**, a na sastanku redakcije časopisa prihvaćen za štampu **23.12.2021.** godine.

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VALORIZATION OF THE QUALITY OF THE PRODUCTS MADE BY ENTERPRISES ON THE MARKET WHERE THEY DO BUSINESS

ABSTRACT: The need of different enterprises for exploring the level of the quality of their products/services is growing with the expansion of their business operations in the global environment and with the growth of their competition. The subject matter of this research study is the valorization of certain characteristics of the products with which enterprises appear on a target market, which on their part especially relate to their quality. The purpose of the exploration and valorization of the product quality level is connected with numerous business arrangements of the enterprises competing on selected markets in a particular period of time so as to achieve an expected financial result. The starting premise implies that the installed concept of the quality of a product made by an enterprise should encompass all those quality elements pertaining to the consumer/user, i.e. to achieving their satisfaction. That is even more so given the fact that all the relevant analyses and experiences of global enterprises indicate that buyer/consumer satisfaction with a quality product ultimately decides on their financial success. In the research study, the comparative statistics, hypothetical-deductive, analytical-deductive and

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comparative, historical and statistical-descriptive methods are used.

Key words: enterprise, quality valorization, product, competitiveness, business results

INTRODUCTION

The complex market conditions of earning a profit impose a continuous care for the improvement of the quality of products/services on enterprises as an integral part of their behavior in the currently prevailing business environment (Kamenković, Lazarević-Moravčević, 2018). A quality product is the basic precondition for bringing a strategy based upon the market perception to reality in a sense that a product like that, with its performances of a positive benefit for the consumer, will also bring a benefit for the enterprise in the form of its strategic positioning on the market. An enterprise's lagging behind in its product quality improvement process (Antić, Stevanović, 2013) leads to the formation of a long-term barrier to the international market. Essentially, a quality means comparing a product with the products made by the competition based upon the familiar and recognized quality, optimality, useful value, standardization, and usefulness check methods, as well as the other pieces of knowledge useful for the verification of the quality of a product or service (Miletić, Ćurčić, Aničić, 2017). The quality itself is identified as a level up to which a set of the characteristics typical of products/services meet users' demands (Oakland, et. al. 2021).

A quality product should be characterized by appropriate distinctive features that classify it into a special place when speaking about the useful benefits for the buyer, for the reason of which fact it is necessary that both the quality level and the performances of and attitudes expressed by the user should continuously be checked and valorized [Jelić, 2016, pp. 7-8]. In the concept of satisfying consumers' needs and expectations (Miletić, Ćurčić, Miletić, 2019) for a quality living, the quality of a product is its backbone. The factors that provoke buyer special satisfaction are the characteristics – quality of products/services or the process that are not expected, nor are they specified, and the product buyer/service user positively treats them when they come across them. In the final outcome, the experiences of successful global enterprises show that buyer/consumer satisfaction with a quality product is crucial when their financial success is in question (Kostić, 2009).

The inadequate quality of products, small-scope series, an unattractive design and packaging, the obsolete technology of and high prices for

products are but some of the reasons for which numerous domestic products cannot be competitive against the products made by the numerous foreign value-oriented (Rakita, Mlađan, Marković, 2019) market leaders, as well as the companies coming from the newly industrialized countries of the world.

In order for any domestic enterprise to become a manufacturer of the world-class goods as per the WCM model, it must achieve as good results as possible in the quality, price, speed, delivery reliability, flexibility and innovation [p. 57]. That means the need of a national enterprise for meeting the expectations of different buyers/consumers for goods requires the application of a quality concept without which no business success is possible. Managers in national enterprises are aware of the fact that it is necessary for their employees to improve their knowledge and skills, especially so being necessary for operational heads, and to contemporary management methods and techniques, especially so the quality management system (TQM), which signifies the process of the transformation of all inputs into the enterprise to a quality product that satisfies the buyer. Each process has several inputs, including the human potential, the material, methods, measurements, equipment, the external environment, and so on, but the most important input of all includes the buyer's wishes, needs, expectations and requests (Jovović, Femić, 2018). A satisfied buyer is the output of that process. By implementing the given agenda, the management of the enterprise are obliged to create such strategic options which will enable them to make efficient business decisions based on the quality of their products/services (Domanović, Janjić, 2018). Such decisions should ensure that the existing buyers are retained and that new buyers are attracted both on the domestic market and on the international market, all with the aim of achieving top business results.

The quality of every enterprise's concrete product and service is only one of the segments of the market concept of quality, which represents the key initial and final stage of the overall business operations quality improvement cycle. Essentially, the goods manufacturer and the service provider are interested in a more specific product or service quality assessment so that, based on the same, a necessary improvement can be made if required by the market. Ensuring a consistent quality (Miletić, Ćurčić, Simonović, 2020), enterprises conquer new and retain the existing markets. Yet, end users expect that the product they buy will correspond in quality with their respective demands and needs. In order for an enterprise to ensure a quality offer in real time for their consumers, an important role is also played by the artificial intelligence-based systems that collect data on and useful pieces of information about the demanded quality of such product(s) and enable the sending of an offer in real time (12).

It is, therefore, obvious that only those enterprises (Cvjetković, Ilić, 2015) adhering to quality, thus also adhering to their clients, can be considered competitive and successful. Therefore, in the preparation of products for and their delivery to markets, domestic enterprises should observe contemporary procedures with the aim of constantly improving their quality, which is implicative of cautiousness and a strong support in the endeavors made by all organizational members of the enterprise to become trained in performing their obligations.

METHODOLOGICAL APPROACH

The research study was carried out in a form of an online questionnaire. The subject matter of the research study conducted herein is the valorization of the quality of the products made by the domestic enterprises doing business on a selected market, the enterprises being of a different size and performing a different activity. The research study was conducted on a sample of 26 micro-enterprises (19%), 38 small enterprises (28%), 39 medium-sized enterprises (29%) and 33 big enterprises (24%), all having been selected from within the database kept by the Business Registers Agency (BRA) of the Republic of Serbia. The decisive factor for the selection of the enterprises for the sample was the successfulness of the business operations carried out by those enterprises in the national profit earning frameworks. A non-random (i.e. non-probability) sample was used for the needs of this research study. Essentially, the questionnaire was intended to collect pieces of information and valorize the quality of the products made by the national enterprises in the context of the other selected characteristics in function of the effectiveness of their business operations. The survey procedure was conducted anonymously and only referred to the enterprises doing business on the national market. The survey questions were answered by the owners or the top managers of a higher level.

While creating the methodological framework of the paper, the bibliographical-speculative method was used apart from the explorative method, and in the case of the results processing and interpretation, the multiple comparison and statistical test methods were used.

RESULT AND DISCUSSION

Accepted as the need to meet the expectations of different buyers/consumers, and a constant challenge to perform better than the competition, the quality of products of each single enterprise and its more

concrete valorization are again singled out in the national milieu of doing business as a precondition for the implementation of a strategy based on market perception in a sense that such a product, inclusive of all its performances of a positive benefit for the consumer, will bring a benefit for the enterprise in a form of its strategic positioning on the market.

Table 1 shows the share of the enterprises in relation to the business operation sector. According to the table, it can be seen that there is the largest number of the organizations doing business in the field of traffic, the textile industry, construction, other services, the food industry, hospitality and tourism.

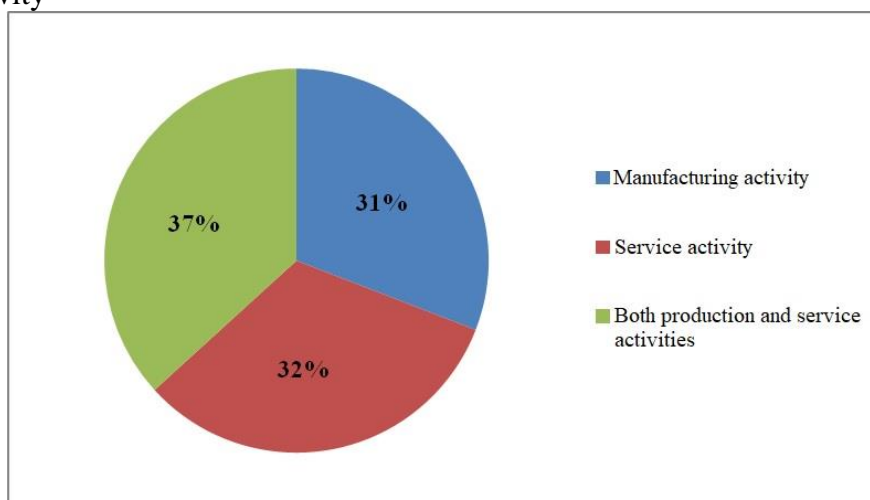
Table 1. – The share of the enterprises in relation to the business operation sector

Business operation sector	Absolute frequencies	Relative frequencies
Textile industry	12	8.8
Power generation, transmission and distribution industry	9	6.6
Traffic	14	10.3
Timber industry	7	5.1
IT	4	2.9
Rubber processing industry	3	2.2
Construction	14	10.3
Tobacco industry	3	2.2
Other services	13	9.6
Telecommunications	2	1.5
Graphic design industry	5	3.7
Chemical industry	5	3.7
Energy sector	2	1.5
Machine construction	2	1.5
Trade	7	5.1
Food industry	11	8.1
Agriculture	2	1.5
Insurance	4	2.9
Medicine	2	1.5
Hospitality and tourism	10	7.4
Banking	2	1.5
Forestry	3	2.2

Source: Authors

A total of the 42 enterprises included in the perceived sample perform the manufacturing activity, 44 perform the service activity, whereas 50 enterprises perform both the manufacturing and service activities. The percentage share of the enterprises in relation to the activity performed is given in Graph 1.

Graph 1. – The share of the enterprises in the sample in relation to the activity



Source: Authors

The valorization of the level of the quality of products made by the enterprises on the market where they do business as one of the key elements for the success of their financial business operations began by analyzing certain coopted factors. The focus was placed on the validity of the rating of the product quality level in correlation with the level of the competitive capability of the enterprises, the qualitative business operations performed by the enterprises in relation to the comparable rivals, the level of the competition on the market where the enterprise does business, the level of the extent to which the quality concept is implemented on the market in compliance with the requirements of international standards for doing business and to the extent to which the enterprise performs its business operations with fewer resources in relation to the resources which are assumed to be needed as the necessary conditions and for competitive international business operations.

It is assumed that the enterprises striving for becoming the manufacturers of goods as per the WCM model should meet certain conditions and satisfy certain criteria. For that reason, the enterprises were asked to valorize certain characteristics in the framework of their business

operations by assigning them the marks from 1 to 5, where 1 was the lowest and 5 was the highest mark. The results as per individual characteristics are presented in Table 2.

Table 2. – The marks for the characteristics in the enterprises

Characteristics	M a r k s									
	1		2		3		4		5	
	Af	Rf	Af	Rf	Af	Rf	Af	Rf	Af	Rf
The level of the product on the market where the enterprise does business	2	1.5	11	8.1	49	36.0	40	29.4	34	25.0
The level of the competitive capability of the enterprise	4	2.9	8	5.9	30	22.1	57	41.9	37	27.2
The qualitative business operations of the enterprise in relation to the comparable rivals	0	0	2	1.5	22	16.2	57	41.9	55	40.4
The level of the competition on the market where the enterprise does business	7	5.1	12	8.8	42	30.9	29	21.3	46	33.8
To which extent is the product quality concept being implemented in the enterprise	13	9.6	17	12.5	9	6.6	41	30.1	56	41.2
To which extent the enterprise does business with fewer resources in relation to the resources which are assumed as needed	2	1.5	16	11.8	39	28.7	47	34.6	32	23.5

Af-Absolute frequencies; Rf-Relative frequencies (percentages); S.vr. – Mean values

Source: Authors

Table 3 below shows the ranking of the characteristics based upon average marks (mean values) for each particular performance.

Table 3. – The performance ranking

Characteristics	Mean values	Performance ranking
The quality of the products on the market where the enterprise does business	3.68	15
The qualitative business operations performed by the enterprise in relation to the comparable competitors	4.21	1
The level of the competitive capability of the enterprise	3.85	10
The level of the competition on the market where the enterprises do business	3.70	14
The level of the extent to which the product quality concept is being implemented following the international standards	3.81	12
To which extent the enterprise does business with fewer resources in relation to the resources which are assumed as needed	3.67	16

Source: Authors

Based on the obtained results, it can be concluded that the respondents who took part in the survey and who came from the domestic enterprises included in the sample valorized with the marks slightly ranging from 4.21 to 3.67 the quality of the products made by the enterprise, the qualitative business operations in relation to the comparable rivals, the level of the competitive capability of the enterprise, the level of the competition on the market where the enterprise does business, the level of the extent to which the quality concept is being implemented in the enterprise in compliance with the requirements imposed by the international standards and the extent to which the enterprise does business with fewer resources in relation to the resources which are assumed to be needed in order to achieve a top financial result. The mentioned comparison is indicative of a high interdependence between the mentioned characteristics.

Further below, a two-factor analysis was used to analyze how the level and activity of the business operations performed by the enterprise influence the quality of the products on the market where they are present as a precondition for sustainable survival on the market. The value 0.05 was taken for the difference significance level (for all the values $\text{Sig} \leq 0.05$ there is a statistically significant difference). The subsequent Tukey test determined between which enterprises (depending on the activity of the business performed by them) there was a difference in the product quality. Table 4

accounts for the fact that there is a difference between the enterprises engaged in the manufacturing and service activities, as well as between the enterprises engaged in the manufacturing activity and in the manufacturing and service activities.

Table 4. – The marks for the quality of the products on the market for the enterprises of different activities

<i>The quality of the products on the market where the enterprise does business</i>		Difference mean value (I-J)	Standard error	Error significance (Sig)	95% Trust interval	
(I) The activity performed by the enterprise	(J) The activity performed by the enterprise				Lower limit	Upper limit
Manufacturing activity	Service activity	.640(*)	.206	.007	.15	1.13
	Both manufacturing and service activities	.491(*)	.200	.041	.02	.97
Service activity	Manufacturing activity	-.640(*)	.206	.007	-1.13	-.15
	Both manufacturing and service activities	-.148	.198	.735	-.62	.32
Both manufacturing and service activities	Manufacturing activity	-.491(*)	.200	.041	-.97	-.02
	Service activity	.148	.198	.735	-.32	.62

Source: Authors

CONCLUSION

The research study carried out herein had a sample including the enterprises of a different size, simultaneously reflecting a proportional share according to the size. The largest number of the enterprises in the sample were engaged in both the manufacturing and the service activities, of which the largest number of the enterprises were from the fields of the textile industry, traffic, construction, food industry, and the other sectors of doing business.

The results indicated the existence of a positive relationship between the mentioned characteristics, the level of the product quality in the domestic enterprises simultaneously being valued as one of the key business operations improvement factors. The best ranked characteristic of the enterprise in relation to the comparable competitors in the observed sample was valorized with the mark 4.21 and it was qualitative business operations, which also ties to itself the quality of products, which was assigned a similar mark 3.68. As far as the individual influences are concerned, the level of the competitive capability of the enterprises was singled out, which was also determined by the quality of their products. The business activity of the enterprise (manufacturing, service, both manufacturing and service) exerts a significant influence on the differences in the level of the quality of the products the enterprise appears on the market, and also the extent to which the enterprise which had been subjected to the rating was performing with fewer engaged resources in relation to the resources which were assumed to be needed.

Ultimately, domestic enterprises cannot be competitive if deprived of the quality products that meet the requirements of the contemporary market. This is all the more so given the fact that the competitiveness of a product and a financial success essentially contain its quality and the other implied aspects – the price, the technological and ecological levels, the needed aspect of their safety, and so forth.

REZIME

VALORIZOVANJE KVALITETA PROIZVODA PREDUZEĆA NA TRŽIŠTU NA KOME POSLUJU

Potreba različitih preduzeća za istraživanjem nivoa kvaliteta proizvoda/ usluga raste sa širenjem njihovog poslovanja u globalnom okruženju i narastanjem konkurencije. Predmet istraživanja ovog rada je vrednovanje određenih karakteristika proizvoda sa kojim preduzeća nastupaju na ciljnom tržištu, a koje se posebno odnose na njihov kvalitet. Svrha istraživanja i vrednovanja nivoa kvaliteta proizvoda povezana je sa brojnim poslovnim aranžmanima preduzeća koja se takmiče na odabranim tržištima u određenom periodu kako bi ostvarila očekivani finansijski rezultat. Polazi se od premise da instalirani koncept kvaliteta proizvoda preduzeća treba da obuhvati sve one elemente kvaliteta koji se odnose na potrošača/ korisnika, odnosno na postizanje njihovog zadovoljstva. Tim pre, jer sve relevantne analize i iskustvo globalnih preduzeća pokazuju da zadovoljstvo kupaca/ potrošača kvalitetnim proizvodom u krajnjem odlučuje o njihovom finansijskom uspehu. U istraživanju su korišćene metode komparativne statistike, hipotetsko -

deduktivne metode, analitičko - deduktivne i komparativne metode, istorijske i statističko - deskriptivne metode.

Ključne reči: preduzeće, vrednovanje kvaliteta, proizvod, konkurentnost, poslovni rezultat.

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Ovaj rad je primljen **10.12.2021.**, a na sastanku redakcije časopisa prihvaćen za štampu **23.12.2021.** godine.

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ANALYSIS OF EFFICIENCY OF PHARMACEUTICAL COMPANIES IN SERBIA BASED ON THE CODAS METHOD

ABSTRACT: Recently, as it is known, the performance (efficiency) of pharmaceutical companies is increasingly measured on the basis of multi-criteria analysis. With this in mind, this paper analyzes the efficiency of pharmaceutical companies (engaged in the production and distribution or only distribution of pharmaceutical products) in Serbia on the basis of the CODAS method. In this context, adequate measures have been proposed to improve the efficiency of pharmaceutical companies in Serbia in the future. The obtained results of the analysis of the efficiency of the observed pharmaceutical companies in Serbia on the basis of the CODAS method show that the most efficient pharmaceutical company is Hemofarm. It is followed by: Novo Nordisk, Roshe, Phoenix Pharma, Pfizer, Krka, Galenika, Velefarm, Vega, Zdravlje, Pharmanova, Pharma Swiss, and Farmalogist. This positioning of pharmaceutical companies in terms of efficiency in Serbia has been influenced by numerous macro and micro factors, such as: economic climate, living standards, research and development expenditures, political stability, digitalization of business, and others.

Key words: efficiency, pharmaceutical company, Serbia, determinants, CODAS method

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INTRODUCTION

The issue of measuring the efficiency of pharmaceutical companies based on multi-criteria analysis is very current, complex, and significant (Mohammadi, 2013; Díaz, 2020; Shin, 2018; Gascón, 2017; Namdej, 2019; Shahin, 2019; Moktadir, 2018). This paper investigates the efficiency of pharmaceutical companies in Serbia using the CODAS method in order for the companies to improve in the future by taking adequate measures (Saaty, 2008; Velasquez, 2013; Cagri, 2013; Ersoy, 2017; Gaur, 2020; Lukic, XIII, XIV, 2019, 2020a, b, c, 2021a, b, c, d, e, f, g; Sarsour, 2020; Urbonavičiūtė, 2019). Compared to the ratio analysis, the CODAS method gives more realistic results. For these reasons, the author decided to implement it in this paper.

In addition to the CODAS method, the AHP method (Saaty, 2008) is used to determine the weighting coefficients of the selected criteria. For the purpose of the most complex methodological analysis, statistical analysis is used to some extent.

In the relevant literature of Serbia, as far as we know, there is not a single comprehensive work dedicated to evaluating the efficiency of pharmaceutical companies using the CODAS method. Given that, this gap should be somewhat filled by this paper, and this, among other things, reflects its scientific and professional contribution.

Continuous research using an adequate methodology, in our case the CODAS method, a factor of efficiency of pharmaceutical companies in Serbia is a fundamental prerequisite for improvement in the future by taking adequate measures. This reflects the basic research hypothesis in this paper.

The research in this paper has shown that in relation to the ratio analysis, the application of the CODAS method gives more precise results in terms of efficiency and financial performance of pharmaceutical companies in Serbia. For these reasons, it was implemented in this paper to analyze the efficiency of pharmaceutical companies in Serbia.

This paper specifically investigates the impact of the following factors on the efficiency of pharmaceutical companies in Serbia: number of employees, assets, capital, operating income and net profit. This is due to the fact that these factors adequately determine the efficiency and financial performance of pharmaceutical companies in Serbia. In addition, empirical data from official financial reports are available, which are regularly submitted to the Agency for Business Registers of the Republic of Serbia. Adequate control of these factors can significantly influence the realization of the target profit of pharmaceutical companies in Serbia.

Empirical analysis of the efficiency of pharmaceutical companies in Serbia using this methodology is based on data collected from the Business

Registers Agency of the Republic of Serbia that are "produced" in accordance with relevant international standards, so there are no restrictions on international comparability.

CODAS METHOD

The CODAS (*Combinative Distance-Based Assessment*) method is a new method of Multi-Attribute Decision Making (MCDM) developed based on the Euclidean and Hamming distance measures, in order to choose the best alternative from the available options. The basic principle of the CODAS method is that the best alternative should have the greatest distance from the negative ideal solution (Seker, 2020). In the case where the Euclidean distances of two alternatives have the same value, then Hamming distances are compared in order to choose the best alternative (Ghorabae, 2016).

The stages of the CODAS method process are as follows (Badi, 2018; Panchal, 2017; Ghorabae, 2016, 2017; Mathew, 2018; Seker, 2020):

Step 1. Defining the decision matrix.

Decision makers evaluate alternatives according to each attribute (criterion).

$$[x_{ij}]_{n \times m} = \begin{bmatrix} \tilde{x}_{11} & \tilde{x}_{12} & \cdots & \tilde{x}_{1m} \\ \vdots & \vdots & \ddots & \vdots \\ \tilde{x}_{n1} & \tilde{x}_{n2} & \cdots & \tilde{x}_{nm} \end{bmatrix} \quad (1)$$

where x_{ij} shows the rating of the value of the i -th alternative in relation to the j -th attribute.

Step 2. Calculating a normalized decision matrix.

The decision matrix is linearly normalized using the following equation:

$$\tilde{n}_{ij} = \begin{cases} \tilde{x}_{ij} / \max_i \tilde{x}_{ij} & \text{if } j \in N_b \\ \min_i \tilde{x}_{ij} / \tilde{x}_{ij} & \text{if } j \in N_c \end{cases} \quad (2)$$

N_b sets of useful, i.e. revenue (higher value is preferred), and N_c useless (cost) attributes (lower value is preferred).

Step 3. Calculation of weight-normalized decision matrix.

The weight-normalized decision matrix is determined using the following equation:

$$s_{ij} = w_j \tilde{n}_{ij} \quad (3)$$

where $w_j \in [0,1]$ represents the weighting factor assigned by the decision maker for the different attributes and $\sum_{j=1}^m w_j = 1$.

Step 4. Identifying negative ideal solutions.

Negative ideal solutions (*NI*) are obtained by applying the following equation:

$$NI = [n_{tj}]_{1 \times m} \quad (4)$$

$$n_{tj} = \min s_{ij}$$

Step 5. Calculating the Euclidean (*ED*) and Hamming (*HD*) distances of alternatives from the negative ideal solution.

The Euclidean and Hamming distance of alternatives from the negative ideal solution are calculated using the following equations:

$$ED_i = \sqrt{\sum_{j=1}^m (s_{ij} - n_{tj})^2} \quad (5)$$

$$HD_i = \sum_{j=1}^m |s_{ij} - n_{tj}| \quad (6)$$

Step 6. Constructing a relative estimation matrix.

The relative estimation matrix (*Ra*) is obtained using the following formula:

$$Ra = [p_{il}]_{n \times n}$$

$$p_{il} = (ED_i - ED_l) + (\delta(ED_i - ED_l))x((HD_i - HD_l))$$

where $l \in \{1, 2, \dots, n\}$ and δ the function of the threshold used in the following way:

$$\delta(x) = \begin{cases} 1 & \text{if } |x| \geq \rho \\ 0 & \text{if } |x| < \rho \end{cases} \quad (7)$$

The value of the threshold parameter is between 0.01 and 0.05. It can also be determined by the decision maker (Ghorabae, 2016). If the difference

between the Euclidean distances of the two alternatives is less than the defined threshold value, then they are compared according to the Hamming distance.

Step 7. Assigning a grade (AS) to each alternative.

The AS value of each alternative is calculated as follows:

$$AS_i = \sum_{l=1}^n p_{il} \quad (8)$$

According to the higher grade, the most suitable alternative is chosen.

Step 8. Ranking alternatives by AS value.

Alternatives are ranked according to the value of AS in descending order. The alternative with the highest AS value is the best option among the alternatives.

EVALUATION OF EFFICIENCY OF PHARMACEUTICAL COMPANIES IN SERBIA ON THE BASIS OF CODAS METHOD

When measuring the efficiency of pharmaceutical companies in Serbia using the CODAS method, the criteria were: C1 - number of employees, C2 - assets, C3 - capital, C4 - operating income and C5 - net profit. Alternatives were observed pharmaceutical companies: A1 – Hemofarm, A2 – Galenika, A3 – Krka, A4 – Pharmanova, A5 – Farmalogist, A6 – Velexfarm, A7 – Pfizer, A8 – Zdravlje, A9 – Phoenix Pharma, A10 – Pharma Swiss, A11 – Roche, A12 – Novo Nordisk, and A13 – Vega. (Calculation of the efficiency of pharmaceutical companies in Serbia was performed using CODAS Software-Excel). The obtained results are shown in the attached tables below, as well as graphically. The weighting coefficients of the criteria were determined using the AHP method (The calculation was performed using AHPS Software-Excel).

Initial data for measuring the efficiency of pharmaceutical companies in Serbia using the given methodology are shown in Table 1.

Table 1. – Initial data for measuring the efficiency of pharmaceutical companies in Serbia, 2019

(employment in whole numbers)

(in millions of dinars)

	Number of employees	Assets	Capital	Operating income	Net profit
Hemofarm	2666	48841	34906	32013	3978
Galenika	875	11002	8197	35898	2388
Krka	78	1395	305	3544	94
Pharmanova	143	1034	252	959	27
Farmalogist	432	7748	1786	17473	6
Velexfarm	128	4446	28	8485	68
Pfizer	75	6329	1289	4946	180
Zdravlje	362	7595	6609	5670	1520
Phoenix Pharma	497	22563	4993	52264	568
Pharma Swiss	325	10077	8362	6559	702
Roche	60	4347	1869	4838	30
Novo Nordisk	55	1008	401	5888	185
Vega	247	9061	2567	23110	310

Source: Agency for Business Registers of the Republic of Serbia

Table 2 shows descriptive statistics.

Table 2. – Descriptive statistics

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
1 Number of employees	13	55.00	2666.00	457.1538	703.72779
2 Assets	13	1008.00	48841.00	10418.9231	12872.73860
3 Capital	13	28.00	34906.00	5504.9231	9333.85141
4 Operating income	13	959.00	52264.00	15511.3077	15810.79632
5 Net profit	13	6.00	3978.00	773.5385	1192.05716
Valid N (listwise)	13				

Note: Author's calculation using the SPSS software program

The data in the given table show that, for example, the net profit above the average was realized by the pharmaceutical companies Hemofarm,

Galenika and Zdravlje (which are engaged in the production and distribution of pharmaceutical products), whereas the net profit of other companies was below the average. Their financial performance is at an enviable level.

Table 3 shows the correlation matrix.

Table 3. – Correlations

Correlations						
		1	2	3	4	5
1 Number of employees	Pearson Correlation	1	.942 **	.974 **	.528	.922 **
	Sig. (2-tailed)		.000	.000	.064	.000
	N	13	13	13	13	13
2 Assets	Pearson Correlation	.942 **	1	.937 **	.652 *	.825 **
	Sig. (2-tailed)	.000		.000	.016	.001
	N	13	13	13	13	13
3 Capital	Pearson Correlation	.974 **	.937 **	1	.432	.921 **
	Sig. (2-tailed)	.000	.000		.141	.000
	N	13	13	13	13	13
4 Operating income	Pearson Correlation	.528	.652 *	.432	1	.488
	Sig. (2-tailed)	.064	.016	.141		.091
	N	13	13	13	13	13
5 Net profit	Pearson Correlation	.922 **	.825 **	.921 **	.488	1
	Sig. (2-tailed)	.000	.001	.000	.091	
	N	13	13	13	13	13
**. Correlation is significant at the 0.01 level (2-tailed).						
*. Correlation is significant at the 0.05 level (2-tailed).						

Note: Author's calculation using the SPSS software program

The correlation matrix shows that there is a strong correlation between the observed variables, and to the significant statistical level, except for the operating income. This indicates that the application of modern methods (for example, customer management, product categories, digital marketing) should more efficiently manage the operating income of pharmaceutical companies in Serbia.

In order to deal as comprehensively as possible with the treated issues and to arrive to the correct conclusion about the performance (efficiency) of the analyzed pharmaceutical companies in Serbia, the ratio analysis is briefly presented in Table 4.

Table 4. – Ratio analysis

	Operating income per employee (operating income / number of employees) (in thousands of dinars)	Net profit per employee (net profit / number of employees) (in dinars)	Assets per employee (assets / number of employees) (in thousands of dinars)	Capital per employee (capital / number of employees) (in thousands of dinars)	Asset turnover ratio (operating income / assets)	Return on assets (net profit / assets) (%)	Return on equity (net profit / equity) (%)	Return on sales (net profit / operating income) (%)	Financial indebtedness (assets / capital)
Hemofarm	12007.88	1492.123	18319.95	13093.02	0.655453	8.14	11.40	12.43	1.399215
Galenika	41026.29	2729.143	12573.71	9368	3.262861	21.71	29.13	6.65	1.342198
Krka	45435.9	1205.128	17884.62	3910.256	2.540502	6.74	30.82	2.65	4.57377
Pharmanova	6706.294	188.8112	7230.769	1762.238	0.927466	2.61	10.71	2.82	4.103175
Pharmalogist	40446.76	13.88889	17935.19	4134.259	2.255163	0.08	0.34	0.03	4.338186
Velexfarm	66289.06	531.25	34734.38	218.75	1.908457	1.53	242.86	0.80	158.7857
Pfizer	65946.67	2400	84386.67	17186.67	0.781482	2.84	13.96	3.64	4.910008
Health	15662.98	4198.895	20980.66	18256.91	0.746544	20.01	23.00	26.81	1.14919
Phoenix Pharma	105159	1142.857	45398.39	10046.28	2.316359	2.52	11.38	1.09	4.518926
Pharma Swiss	20181.54	2160	31006.15	25729.23	0.650888	6.97	8.40	10.70	1.205094
Roche	80633.33	500	72450	31150	1.112951	0.69	1.61	0.62	2.325843
Novo Nordisk	107054.5	3363.636	18327.27	7290.909	5.84127	18.35	46.13	3.14	2.513716
Vega	93562.75	1255.061	36684.21	10392.71	2.550491	3.42	12.08	1.34	3.529801
Median	45435.9000	1255.0610	20980.6600	10046.2800	1.9085	3.4200	12.0800	2.8200	3.5298

Note: Author's calculation

The data in the given table show that the best performances in 2019 was achieved by Hemofarm, Galenika and Zdravlje. The performance of other pharmaceutical companies is above or below average.

The initial decision matrix is shown in Table 5.

Table 5. – Initial Matrix

Initial Matrix					
weights of criteria	0.3365	0.229	0.0978	0.1674	0.1693
kind of criteria	-1	1	1	1	1
	C1	C2	C3	C4	C5
A1	2666	48841	34906	32013	3978
A2	875	11002	8197	35898	2388
A3	78	1395	305	3544	94
A4	143	1034	252	959	27
A5	432	7748	1786	17473	6
A6	128	4446	28	8485	68
A7	75	6329	1289	4946	180
A8	362	7595	6609	5670	1520
A9	497	22563	4993	52264	568
A10	325	10077	8362	6559	702
A11	60	4347	1869	4838	30
A12	55	1008	401	5888	185
A13	247	9061	2567	23110	310

MAX	2666	48841	34906	52264	3978
MIN	55	1008	28	959	6

Note: Author's calculation

Table 6 shows the normalized decision matrix.

Table 6. – Normalized Matrix

NormalizedMatrix					
weights of criteria	0.3365	0.229	0.0978	0.1674	0.1693
kind of criteria	-1	1	1	1	1
	C1	C2	C3	C4	C5
A1	0.0206	1.0000	1.0000	0.6125	1.0000
A2	0.0629	0.2253	0.2348	0.6869	0.6003
A3	0.7051	0.0286	0.0087	0.0678	0.0236
A4	0.3846	0.0212	0.0072	0.0183	0.0068
A5	0.1273	0.1586	0.0512	0.3343	0.0015
A6	0.4297	0.0910	0.0008	0.1623	0.0171
A7	0.7333	0.1296	0.0369	0.0946	0.0452
A8	0.1519	0.1555	0.1893	0.1085	0.3821
A9	0.1107	0.4620	0.1430	1.0000	0.1428
A10	0.1692	0.2063	0.2396	0.1255	0.1765
A11	0.9167	0.0890	0.0535	0.0926	0.0075
A12	1.0000	0.0206	0.0115	0.1127	0.0465
A13	0.2227	0.1855	0.0735	0.4422	0.0779

Note: Author's calculation

Table 7 shows the weight-normalized decision matrix.

Table 7. – Weighted Normalized Matrix

Weighted NormalizedMatrix					
	C1	C2	C3	C4	C5
A1	0.0069	0.2290	0.0978	0.1025	0.1693
A2	0.0212	0.0516	0.0230	0.1150	0.1016
A3	0.2373	0.0065	0.0009	0.0114	0.0040
A4	0.1294	0.0048	0.0007	0.0031	0.0011
A5	0.0428	0.0363	0.0050	0.0560	0.0003
A6	0.1446	0.0208	0.0001	0.0272	0.0029
A7	0.2468	0.0297	0.0036	0.0158	0.0077
A8	0.0511	0.0356	0.0185	0.0182	0.0647
A9	0.0372	0.1058	0.0140	0.1674	0.0242
A10	0.0569	0.0472	0.0234	0.0210	0.0299
A11	0.3085	0.0204	0.0052	0.0155	0.0013
A12	0.3365	0.0047	0.0011	0.0189	0.0079
A13	0.0749	0.0425	0.0072	0.0740	0.0132

A-	0.0069	0.0047	0.0001	0.0031	0.0003
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Note: Author's calculation

Table 8 shows the relative assessment matrix.

Table 8. – Relative Assessment Matrix

RAM													
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13
A1	0.0000	0.4464	0.4286	0.6575	0.7073	0.5829	0.3740	0.6437	0.3733	0.6628	0.0113	-0.0165	0.6010
A2	-0.4464	0.0000	-0.0178	0.2110	0.2608	0.0197	-0.0725	0.1973	-0.0731	0.2164	-0.1804	-0.2264	0.1546
A3	-0.4286	0.0178	0.0000	0.2289	0.2787	0.1543	-0.0111	0.2151	-0.0553	0.2342	-0.1625	-0.2086	0.1724
A4	-0.6575	-0.2110	-0.2289	0.0000	0.0498	-0.0182	-0.2835	-0.0137	-0.2841	0.0054	-0.3914	-0.4374	0.0162
A5	-0.7073	-0.2608	-0.2787	-0.0498	0.0000	-0.1244	-0.3333	-0.0158	-0.3340	-0.0063	-0.4412	-0.4872	-0.1062
A6	-0.5829	-0.0197	-0.1543	0.0182	0.1244	0.0000	-0.2089	0.0609	-0.2095	0.0800	-0.3168	-0.3628	0.0182
A7	-0.3740	0.0725	0.0111	0.2835	0.3333	0.2089	0.0000	0.2697	-0.0007	0.2888	-0.1079	-0.1540	0.2270
A8	-0.6437	-0.1973	-0.2151	0.0137	0.0158	-0.0609	-0.2697	0.0000	-0.2704	0.0095	-0.3776	-0.4237	-0.0190
A9	-0.3733	0.0731	0.0553	0.2841	0.3340	0.2095	0.0007	0.2704	0.0000	0.2895	-0.1072	-0.1533	0.2277
A10	-0.6628	-0.2164	-0.2342	-0.0054	0.0063	-0.0800	-0.2888	-0.0095	-0.2895	0.0000	-0.3968	-0.4428	-0.0618
A11	-0.0113	0.1804	0.1625	0.3914	0.4412	0.3168	0.1079	0.3776	0.1072	0.3968	0.0000	-0.0460	0.3350
A12	0.0165	0.2264	0.2086	0.4374	0.4872	0.3628	0.1540	0.4237	0.1533	0.4428	0.0460	0.0000	0.3810
A13	-0.6010	-0.1546	-0.1724	-0.0162	0.1062	-0.0182	-0.2270	0.0190	-0.2277	0.0618	-0.3350	-0.3810	0.0000

Note: Author's calculation

Table 9 shows the Euclidean (E_i) and Taxicab (T_i) (Ghorabae, 2016) distance of alternatives from the negative ideal solution.

Table 9. – Euclidean and Taxicab's distance of alternatives from the negative ideal solution

Alternatives	E_i	T_i	threshold parameter	
			τ	0.02
A1	0.3136	0.5905		
A2	0.1604	0.2972		
A3	0.2305	0.2449		
A4	0.1225	0.1241		
A5	0.0715	0.1253		
A6	0.1407	0.1805		
A7	0.2416	0.2885		
A8	0.0873	0.1730		
A9	0.1972	0.3335		
A10	0.0778	0.1634		
A11	0.3022	0.3358		
A12	0.3300	0.3540		
A13	0.1063	0.1967		

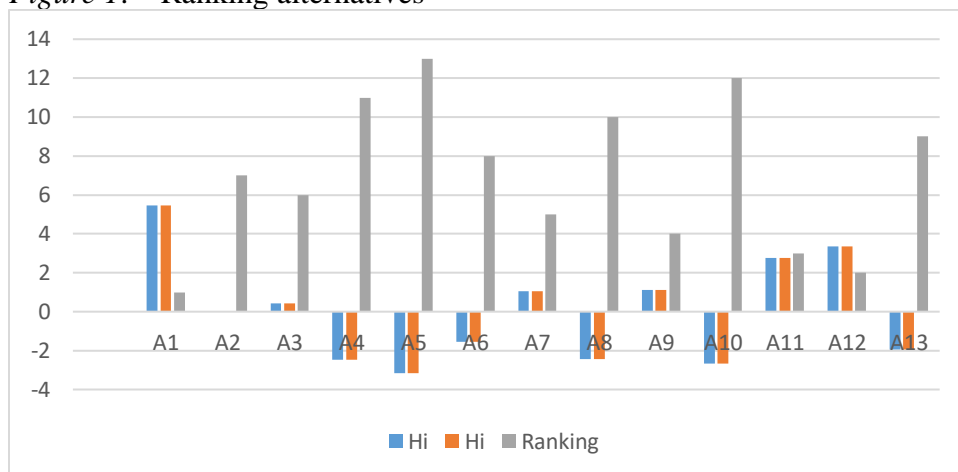
Note: Author's calculation

Table 10 and Figure 1 show the ranking of alternatives.

Table 10. – Ranking of alternatives

	Alternatives	H_i	H_i	Ranking
Hemofarm	A1	5.472	5.472	1
Galenika	A2	0.043	0.043	7
Krka	A3	0.435	0.435	6
Pharmanova	A4	-2.454	-2.454	11
Farmalogist	A5	-3.145	-3.145	13
Velexfarm	A6	-1.553	-1.553	8
Pfizer	A7	1.058	1.058	5
Zdravlje	A8	-2.438	-2.438	10
Phoenix Pharma	A9	1.111	1.111	4
Pharma Swiss	A10	-2.682	-2.682	12
Roche	A11	2.759	2.759	3
Novo Nordisk	A12	3.340	3.340	2
Vega	A13	-1.946	-1.946	9

Note: Author's calculation

Figure 1. – Ranking alternatives

Source: Author

The obtained results of the analysis of the efficiency of the observed pharmaceutical companies in Serbia on the basis of the CODAS method show that the most efficient pharmaceutical company is Hemofarm. It is followed by: Novo Nordisk, Roshe, Phoenix Pharma, Pfizer, Krka, Galenika, Velexfarm, Vega, Zdravlje, Pharmanova, Pharma Swiss, and Farmalogist. Numerous factors have influenced the efficiency of pharmaceutical companies in Serbia. These are: economic climate, living standards, research and development expenditures, political stability, digitalization of business, and others. Their adequate control can affect the achievement of the target efficiency of pharmaceutical companies in Serbia.

CONCLUSION

The obtained results of the analysis of the efficiency of the observed pharmaceutical companies in Serbia on the basis of the CODAS method show that the most efficient pharmaceutical company is Hemofarm. It is followed by: Novo Nordisk, Roshe, Phoenix Pharma, Pfizer, Krka, Galenika, Velexfarm, Vega, Zdravlje, Pharmanova, Pharma Swiss, and Farmalogist. This positioning of the analyzed pharmaceutical companies in terms of efficiency in Serbia was influenced by numerous macro and microfactors, such as: economic climate, living standards, research and development expenditures, political stability, business digitalization, and others.

In order to increase the efficiency of pharmaceutical companies in Serbia in the future, it is necessary to manage human capital, assets, capital, sales and profits as efficiently as possible. This is achieved by applying new

business models (modern concepts of cost management, kaizen concept, customer management, and others).

REZIME

ANALIZA EFIKASNOSTI FARMACEUTSKIH KOMPANIJA U SRBIJI NA BAZI CODAS METODE

U poslednje vreme, kao što je poznato, sve se više vrši merenje performansi (efikasnosti) farmaceutskih kompanija na bazi višekriterijumske analize. Imajući to u vidu, u ovom radu se analizira efikasnost farmaceutskih kompanija (koja se bave proizvodnjom i distribucijom ili samo distribucijom farmaceutskih proizvoda) u Srbiji na bazi CODAS metode. U kontekstu toga predložene su adekvatne mere za unapređenje efikasnosti farmaceutskih kompanija u Srbiji u budućnosti. Dobijeni rezultati analize efikasnosti posmatranih farmaceutskih kompanija u Srbiji na bazi CODAS metode pokazuju da je naefikasnija farmaceutska kompanija Hemofar. Zatim po redosledu slede: Novo Nordisk, Roshe, Phoenix Pharma, Pfizer, Krka, Galenika, Velexfarm, Vega, Zdravlje, Pharmanova, Pharma Swiss, i Farmalogist. Determinante efikasnosti farmaceutskih kompanija u Srbiji su: ekonomska klima, životni standard, izdaci za istraživanje i razvoja, politička stabilnost, digitalizacija poslovanja, i drugi. Njihovom adekvatnom kontrolom može se uticati na ostvarenje ciljne efikasnosti farmaceutskih kompanija u Srbiji.

Ključne reči: efikasnost, farmaceutska kompanija, Srbija, determinante, CODAS metoda

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Ovaj rad je primljen **18.10.2021.**, a na sastanku redakcije časopisa prihvaćen za štampu **23.12.2021.** godine.

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THE USE OF DRONE TECHNOLOGY IN THE AUDITING PROFESSION

ABSTRACT: The use of drone technology has significant potential for wider and mass application in the auditing profession, primarily in the implementation of audit engagement in the domain of the auditor's obligation to attend the inventory if they are material from the point of view of audited financial statements. The audit of inventories aims to examine and confirm the accuracy of the statements of the responsible persons in the entity that is the subject of the audit of the financial statements of the stated inventories. The aim of this paper is to research the attitudes of persons engaged in auditing towards the use of drone technology in the auditing profession with an emphasis on the use of drones in order to conduct stock audits. The research was conducted through a questionnaire that was advertised through publicly available mechanisms that include social networks and business contacts. The main conclusion of the paper is that there is an interest of persons engaged in auditing for the use of drone technology in the auditing profession, with concerns about the costs of its use and its legal regulation for use in auditing as evidence of management's assertions on inventories in financial statements. There is a greater interest in the use of drone technology among auditors employed by large international audit firms than by auditors working in smaller local audit firms or self-employed auditors.

Key words: drone; audit; inventory;

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INTRODUCTION

The audit of inventories aims to examine and confirm the accuracy of the statements of the responsible persons in the entity that is the subject of the audit of the financial statements of the stated inventories, in order to provide conditions for expressing the audit opinion and ensure the integrity of the entity's financial statements. (Protić M, 2020). Inventories are a very risky category in the financial statements from the point of view of persons engaged in auditing. The state of inventories is usually determined at the end of each year by inventorying and reducing the bookkeeping to the final state. The list of assets and liabilities must be clear and provide the most reliable assurance that it shows the actual state of assets and liabilities (Jakovljević N, 2021). International Standards on Auditing (ISA) 501 relating to inventories suggest that auditors who audit financial statements are required to attend an audit of inventories when they are material amounts relative to the total amounts in the financial statements or if they have any specific risk. If the inventories are material significant from the point of view of the financial statements that are the subject of the audit, then the persons engaged in the audit should collect sufficient auditing evidence relating to the existence and condition of inventories and they include (Protić M, 2020):

1. monitoring the implementation of the inventory by persons employed in the audited entity who have the obligation and obligation to conduct the inventory within the prescribed deadlines;
2. examination of the physical condition of stocks and assurance of their condition;
3. evaluation of procedures and documents prepared by the audited entity, relating to the annual inventory of assets and liabilities;
4. determining the sample of stocks that will be subject to the revision of the inventory;
5. counting of sampled stocks and
6. performing analytical procedures on inventory records.

Drones are unmanned aerial vehicles of various dimensions and functionalities that are controlled from the ground and that can be used for various purposes. Drones can be equipped with cameras and infrared rays that can scan large areas and determine their objects and contents. They have one-point control technology on the ground where video image and drone movement can be enabled. One of the areas in which drones find their application is auditing, primarily in the field of inventory auditing. Auditors who engage in drone technology when auditing inventories and other assets may not have to spend as much time confirming the existence and completeness of inventories and other assets to the extent that they would if

they did not use drone technology. The key contribution of the application of drone technology in auditing is certainly the reduction of time required to count stocks and reduction of error rate (Margaret H. C, and others, 2021). Achieving a significant reduction in the time required to count inventories can affect the overall reduction in the time required to conduct an audit engagement, leading to increased audit efficiency and eventual reduction of actual audit costs, which in turn opens up space for generating higher profits for each individual engagement. The problem may be that not all audited entities in an audit firm's portfolio are eligible for the use of drone technology, so it is highly debatable how much the overall reduction in drone audit costs would affect the audit firm's profits. However, the study (Cooper L. A, and others, 2019) focusing on the application of robotic automation software in public accounting showed that there are concerns that client may want to reduce fees due to the reduced number of hours of persons engaged in the jobs in question.

The paper aims to research the attitudes of persons engaged in auditing towards the use of drone technology in the auditing profession with an emphasis on the use of drones in order to conduct stock audits. The research was conducted through a questionnaire that was advertised through publicly available mechanisms that include social networks and business contacts. The initial hypothesis of the research states that there is an interest among persons engaged in auditing in the application of drone technology in the audit of inventories and other parts of assets. The research was conducted through a questionnaire that was advertised through publicly available mechanisms that include social networks and business contacts, and its results were analysed and presented below.

LITERATURE REVIEW

Authors (Passails N, Tefas A, 2020) claim that drones can be used to help with various tasks performed from the air. The study they conducted (Margaret H. C, and others, 2021) shows that auditors can perform inventory counting much faster if they use drone technology than when they count inventory mechanically. The use of drones in inventory counting reduces the average time required for counting from 681 hours to 19 hours and reduces error rates from 0.15% to 0.03% while providing better and more reliable audit evidence. The study they conducted (Appelbaum D, Nehmer R. A, 2017) proposes the creation and use of a new specific technological architecture that includes the use of drones. Another study (Gross A. and others 2020) says that using software based on the use of drone technology in conducting audit engagements can improve counting accuracy, increase reporting timeliness,

reduce travel costs, increase fieldwork efficiency, and provide more documentation and audit evidence. Authors (Irizarry J, 2012) outline the necessary characteristics that every drone used for inspection purposes should have, such as autonomous navigation, high-resolution cameras, vocal interaction and a friendly user environment, and a simple and secure user interface. Authors (Appelbaum D, Nehmer R. A, 2017) also discussed the possible consequences of automation in the accounting profession.

The researchers (Polimeni R. S, Burke J. A, 2021) prepared a case study documenting their experiences regarding the integration of current and emerging technologies into the existing accounting curriculum, which, among other things, analysed the use of drone technology in accounting as a profession, which is related to auditing. The authors (Sanjab A. and others, 2020) propose new algorithms for reaching the equilibrium point under different studied safety regimes when using drone technology. Another group of authors (Pickard M. D. and others, 2020) analysed the use of automated virtual interviewers and compared them with human examiners during the collection of answers to questions from the questionnaire and interviews, which is one of the techniques for collecting audit evidence. They believe that the use of automated virtual interviewers can increase the scope, i.e. coverage of interviews as audit techniques for gathering evidence, without reducing the quality of interviews. The authors (Leitner-Hanetseder S. and others, 2021) believe that tasks and skills for existing professional occupations in the broader context of accounting and auditing will be subject to major changes in the next 10 years due to the expansion of digital technologies based on artificial intelligence. They will exist in the future, but some will not be performed by humans but by technology based on artificial intelligence. For other new jobs and roles, people will need to use digital technologies in an informed way and, to some extent, collaborate with technology based on artificial intelligence. Using drone technology, members of the audit team can take photographs and videos of the inventory, thus creating strong non-traditional audit evidence to confirm the claims being tested on fixed assets (Appelbaum D. and others, 2020). Drone applications are becoming more common in the field of forest management and analysis of forest and orchard inventories (Kotivuori E, 2019). Drones are widely used in the analysis of forest and orchard structures by generating high-resolution RGB images (Araujo R. F, 2020). An agricultural inventory system integrated into drone technology can help facilitate the collection of plant inventory information (Jannette Q, 2021) which can assist the auditor in auditing farms. The authors (Alice R. J, 2020) investigated the potential of wood biomass prediction using measurements performed on unmanned aerial vehicles and concluded that drones can be significantly used to predict wood biomass, which can be useful when revising the list of wood, materials, forests and orchards.

The authors (Budi R. and others, 2020) proposed a framework for ensuring adequate distance between the drone and the object of observation in order to generate adequate quality photographs that could be potential audit evidence. They believe that measuring adequate distance is essential when using drones to record stockpiles. Authors (Margaret H. C. and others, 2021) express concern that regulators and professional organizations establishing international standards of professional practice in auditing will not be able to respond in a timely manner by amending existing standards or adopting new ones to enable greater and more extensive application of new technologies in conducting audits, including drone technology. They argue that stock audit using advanced drone technologies can increase audit quality, but a key factor in this is the regulatory guidance that needs to be adopted in order for drone technology to be widely used and widely used in auditing. Researchers (Munoko I. and others, 2020) considered the ethical implications for the accounting and auditing professions as a consequence of the use of artificial intelligence. Authors (Alves da Silva C. and others, 2019) point out that drone tools are capable of generating highly accurate scanning products with great potential for application in controlling air pollution levels and environmental impact.

CONCEPT OF ANALYSIS

The research was conducted by creating a questionnaire on the topic of examining and determining the degree of interest of persons engaged in auditing for the application of drones in the auditing profession, primarily in the field of auditing inventories and other parts of assets. The questionnaire contained ten simple questions, the first of which was created with the aim of collecting information on the age structure of the respondents, and the second was created with the aim of collecting information on the employment of the respondents, i.e. whether they are employed by a large international audit company, whether they are employed by a smaller local audit company or are self-employed. The remaining eight questions were created in order to determine the respondents' interest in the application of drones in the auditing profession. The questions were pre-defined and distributed to the respondents through publicly available social networks and business contacts. The questionnaire was available for completion during April 2021, i.e. from April 1st to April 30th 2021. A total of 712 responses were received, 38 of which were incomplete and therefore eliminated from the analysis, and 674 responses were taken for analysis. The questionnaire was open to respondents from all countries, but the paper will not analyse the structure of respondents based on the country they come from. The answers to the questionnaire as a

result of the conducted research were analysed using descriptive analysis in the SPSS program, after which they were explained in detail in the continuation of the paper and presented in the form of graphical and tabular representations.

The research conducted as part of this paper contains limitations that have partially influenced the reduction of its scope and the quantitative and qualitative scope of its results, which have nevertheless maintained a satisfactory level of innovation and qualitative perception of knowledge. The first limitation is due to the fact that the respondents may not have been completely honest when answering the questions from the distributed survey, which can create a distorted picture of the final results and affect the level of interest whose calculation is based on the research results. The second limitation is a consequence of the appearance of a limited number of answers in the form of feedback to the questions from the questionnaire distributed to the selected respondents via social networks. A larger number of answers would provide greater support and certainty to the presented conclusions and findings, but despite this limitation, the presented conclusions have satisfactory and appropriate support in the results of the questionnaire. The third limitation concerns the representativeness of the sample. Due to all the above mentioned, it is necessary to take the presented data with a great deal of caution during interpretation and during official use.

However, despite these limitations, the research conducted as a result presented significant findings and conclusions regarding interest of persons engaged in auditing for the use of drones in their profession, primarily in the field of inventory and other assets. External audit firms and internal audit departments can use the results of this research as a guide and concept for the application of drones in the auditing profession in order to increase overall work performance and accumulate knowledge and practical skills to perform daily work tasks.

EMPIRICAL DATA AND ANALYSIS

The aim of the research that is the subject of this paper is to examine and determine the degree of interest of persons engaged in auditing in the Republic of Serbia for the application of drones in the auditing profession, primarily in the field of auditing inventories and other assets. The questionnaire contained ten simple questions, the first of which was created with the aim of collecting information on the age structure of the respondents, and the second was created with the aim of collecting information on the employment of the respondents, i.e. whether they are employed by a large international audit company, whether they are employed by a smaller local audit company or are

self-employed. The remaining eight questions were created in order to determine the respondents' interest in the application of drones in the auditing profession. The questions are presented below in the form of a matrix of research questions.

Table I. – Matrix of research questions

Number of the question	Full text of the question	Purpose of the question
Question 1	How old are you?	Determine whether respondents believe that digital games and business simulations would be a purposeful training.
Question 2	Where are you employed?	Determine whether the persons engaged in audit work are employed in large international audit companies and in smaller local audit companies or work independently.
Question 3	Have you ever used drones?	Determine if respondents have ever used drones.
Question 4	Would you use drones for inventory audit purposes?	Determine whether respondents would use drones for inventory audit purposes.
Question 5	Do you think drones would help you conduct inventory audits more efficiently and effectively?	Determine whether respondents believe that drones would help them conduct inventory audits more efficiently and effectively.
Question 6	Do you think you could operate a drone on your own or do you think you would need the help of another person?	Determine if respondents think they could operate the drone on their own or think they would need the help of another person.
Question 7	Have you ever been in a situation where your audit client uses drones when inventorying?	Determine if respondents were in a situation where their audit client was using drones when inventorying.
Question 8	Do you expect that regulatory bodies could	To determine whether respondents expect that

	regulate the application of drones in the auditing profession in the near future?	regulatory bodies could regulate the application of drones in the auditing profession in the near future.
Question 9	On a scale of 1 to 5, how would you rate the possibility of using a drone in an audit at the company you currently work for?	Determine on a scale of 1 to 5 how respondents would rate the possibility of using a drone in an audit at the company in which they currently work.
Question 10	On a scale of 1 to 5, how you think drones could provide quality and reliable audit evidence?	Determine on a scale of 1 to 5 how respondents felt drones could provide quality and reliable audit evidence.

Source: Author

The initial hypothesis on which the research is based is that persons engaged in auditing in the Republic of Serbia are interested in the application of drones in the auditing profession, primarily in the field of auditing inventories and other parts of assets. A total of 712 responses were received to the distributed questionnaire, 38 of which responses were incomplete and therefore eliminated from the analysis, and 674 responses were taken for analysis. The questionnaire was open to respondents from all countries, but the paper will not analyse the structure of respondents based on the country they come from. In the first question, the respondents had the opportunity to enter their age in the blank field. In the second question, which asked about employment, the respondents had the opportunity to choose one of the three offered options. The first was that they were employed by a large international audit company, the second option was that they were employed by a smaller local audit company, and the third option was that they were self-employed. In the third question, which was whether they ever used drones, the respondents had the opportunity to choose one of the two offered options. The first option was yes, and the second option was no. In the fourth question, which was whether they would use drones for inventory audit purposes, respondents had the option to choose one of the two options offered. The first option was yes, and the second option was no. In the fifth question, which was whether they thought drones would help to conduct inventory audits more efficiently and effectively, respondents had the opportunity to choose one of the two options offered. The first option was yes, and the second option was no. In the sixth question, which was whether they thought they could operate the drones on their own or they thought they would need the help of another person, the respondents had the opportunity to choose one of the two options offered. The first option was yes, and the second option was no. In the seventh

question, which was whether they were in a situation where their audit client used drones when inventorying, respondents had the option to choose one of the two options offered. The first option was yes, and the second option was no. In the eighth question, which was whether they expected regulatory bodies to be able to regulate the application of drones in the auditing profession in the near future, respondents had the opportunity to choose one of the two options offered. The first option was yes, and the second option was no. In the ninth question, which was to rate on a scale from 1 to 5 the possibility to apply the drone in the audit in the company where they currently worked, the respondents had the opportunity to choose one of the five offered options. The first option was very unrealistic; the second option was unrealistic; the third option was I don't know; the fourth option was realistic and the fifth option was very realistic. In the tenth question, which was to rate on a scale from 1 to 5 how they thought drones could provide quality and reliable audit evidence, respondents had the opportunity to choose one of the five options offered. The first option was very unreliable; the second option was unreliable; the third option was I don't know; the fourth option was reliable and the fifth option was very reliable.

RESULTS AND DISCUSSION

A total of 712 responses were received to the distributed questionnaire, 38 of which were incomplete and therefore eliminated from the analysis, and 674 responses were taken for analysis. The questionnaire was open to respondents from all countries, but the paper will not analyse the structure of respondents based on the country they come from. A descriptive analysis of the answers to the first and second questions is given in the table below.

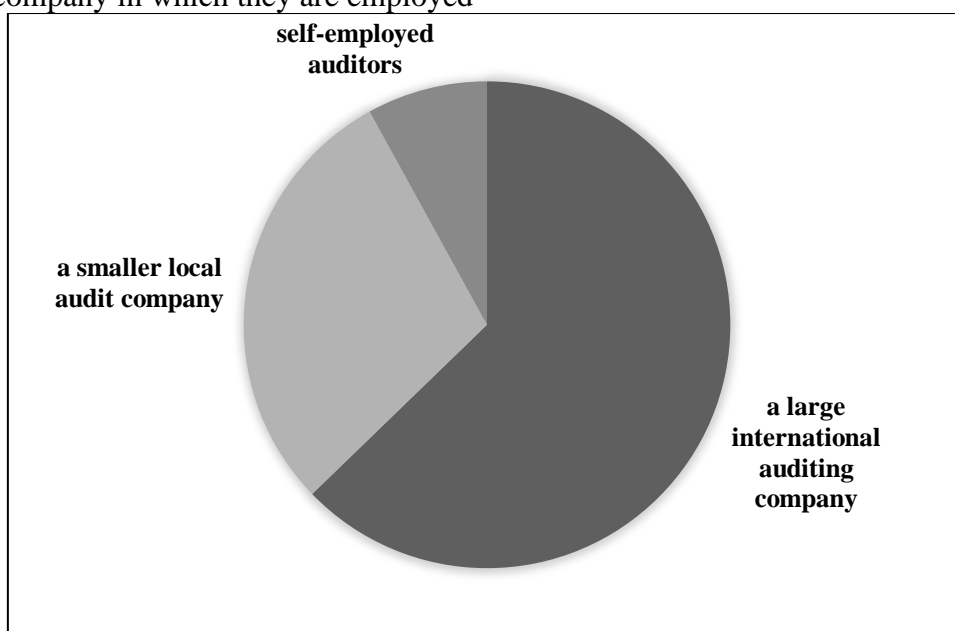
Table 2. – Frequencies and descriptive statistics of the answers to the first and second questions

Statistics	q1	q2
Valid	674	674
Missing	0	0
Mean	32,73	1,45
Std. Error of Mean	0,455	0,025
Median	28,21 ^a	1,40 ^a
Mode	27	1
Std. Deviation	11,816	0,639
Variance	139,628	0,409
Skewness	1,281	1,103

Std. Error of Skewness	0,094	0,094
Kurtosis	0,465	0,086
Std. Error of Kurtosis	0,188	0,188

Source: Author, based on analysis of results using SPSS

Graph I. – The structure of the respondents based on the size of the audit company in which they are employed



Source: Author, based on analysis of results using EXCEL

The average age of the respondents is 32.73 years. Out of the total number of respondents, 423 are employed in a large international audit company, i.e. 62.8%, 197 respondents are employed in a smaller local audit company, i.e. 29.2% of the total number and the remaining 54 respondents are self-employed, i.e. 8 % of the total number. A descriptive analysis of the answers to the third, fourth, fifth and sixth questions is given in the table below.

Table 3. - Frequencies and descriptive statistics of the answers to the third, fourth, fifth and sixth questions

Statistics	q3	q4	q5	q6
Valid	674	674	674	674
Missing	0	0	0	0
Mean	1,26	1,35	1,55	1,41
Std. Error of Mean	0,017	0,018	0,019	0,019

Median	1,26 ^a	1,35 ^a	1,55 ^a	1,41 ^a
Mode	1	1	2	1
Std. Deviation	0,439	0,476	0,498	0,493
Variance	0,193	0,227	0,248	0,243
Skewness	1,099	0,643	-0,191	0,350
Std. Error of Skewness	0,094	0,094	0,094	0,094
Kurtosis	-0,795	-1,591	-1,969	-1,883
Std. Error of Kurtosis	0,188	0,188	0,188	0,188

Source: Author, based on analysis of results using SPSS

To the third question, which was whether they ever used drones, 499 respondents or 74% of the total, answered yes, and the remaining 175 respondents or 26% of the total, answered no. To the fourth question, which is whether they would use drones for stock audit purposes, 440 respondents answered that they would use them, i.e. 65.3% of the total number, and the remaining 234 respondents answered that they would not use them, i.e. 34.7% of the total number. To the fifth question, whether they thought that drones would help them conduct the audit more efficiently and effectively, 305 respondents answered that they think it would help them, i.e. 45.3% of the total number, and the remaining 369 respondents answered that it would not help, or 54.7% of the total number. To the sixth question, whether they thought that they could operate a drone independently or they thought that they would need the help of another person, 395 respondents answered that they thought that they could operate a drone independently, i.e. 58.6% of the total number, while the remaining 279 respondents answered that they thought they would need help, or 41.4% of the total number. A significant part of the total number of respondents used drones, but according to the results of the collected answers, it seems that some of them, although they used drones (probably for entertainment purposes) are not ready to take responsibility to use drones for audit purposes and inventory audits. The positive finding of the research is that the majority of respondents are interested in using drones in the audit of stocks, although their opinion on the efficiency and effectiveness of the usage of drones in the audit is quite divided. A descriptive analysis of the answers to the seventh, eighth, ninth and tenth questions is given in the table below.

Table 4. – Frequencies and descriptive statistics of the answers to the seventh, eighth, ninth and tenth questions

Statistics	q7	q8	q9	q10
Valid	674	674	674	674
Missing	0	0	0	0
Mean	1,86	1,92	3,45	3,44
Std. Error of Mean	0,013	0,011	0,036	0,043
Median	1,86 ^a	1,92 ^a	3,55 ^a	3,50 ^a
Mode	2	2	4	3
Std. Deviation	0,342	0,274	0,940	1,129
Variance	0,117	0,075	0,884	1,275
Skewness	-2,141	-3,064	-0,883	-0,399
Std. Error of Skewness	0,094	0,094	0,094	0,094
Kurtosis	2,591	7,407	0,474	-0,374
Std. Error of Kurtosis	0,188	0,188	0,188	0,188

Source: Author, based on analysis of results using SPSS

To the seventh question, which is whether they had been in a situation where their audit client used drones when inventory, 91 respondents answered yes, i.e. 13.5% of the total number, and the remaining 583 respondents answered no, i.e. 86, 5% of the total. To the eighth question, which was whether they expected regulatory bodies to be able to regulate the application of drones in the auditing profession in the near future, 55 respondents answered yes, i.e. 8.2% of the total number, and the remaining 619 respondents answered no, i.e. 91.8% of the total number. To the ninth question, which was to rate on a scale from 1 to 5 the possibility of using a drone in the audit of the company where they currently worked, 34 respondents, or 5% of them, answered it was very unrealistic, 67 respondents, i.e. 9.9%, answered it was unrealistic, 181 respondents (26.9%) answered they did not know, 347 (51.5%) respondents answered it was realistic, and the remaining 45 respondents (6.7%) answered it was very realistic. To the tenth question, which was to rate on a scale of 1 to 5 how they thought drones could provide quality and reliable audit evidence, 50 respondents (7.4%) said they thought the evidence would be very unreliable, 61 respondents (9.1%) answered that they thought that this evidence would be unreliable, 240 respondents (35.6%) answered that they did not know, 188 respondents (27.9%) answered that they thought that this evidence would be reliable, and

the remaining 135 (20%) respondents answered that they considered that the evidence would be very reliable. Most of the respondents were not in a situation where their audit client used drones. Respondents' noticeable attitude towards regulatory bodies and their ability to quickly and adequately follow new trends in the application of new tools for conducting audit engagement was negative. Most of the respondents believe that the audit firm in which they worked could use drones when conducting an audit of inventories, and that means great trust in the management of audit firms and confirmation of their inclination to improve audit practice. The results of the research show that a significant part of the respondents tend to show a certain degree of confidence in the reliability and relevance of the evidence in the audit of stocks created by the application of drones. However, there is an interest of persons engaged in auditing in the usage of drone technology in the auditing profession, with concerns about the costs of its usage and legal regulation for application in auditing as evidence for management's assertions about inventories stated in financial statements. Auditors employed by large international audit firms have a greater interest in using drone technology than auditors working in smaller local audit firms and self-employed auditors.

CONCLUSION

Drone technology still cannot be characterized as simple and affordable to use. It is likely that smaller audit firms and auditors operating as sole proprietors will have a problem with the provision of financial resources and human resources for the application of drone technology in auditing. Therefore, it may be necessary to find a way to make this technology globally more accessible for audit purposes. One example where the application of drone technology for audit purposes is possible is the audit of asset positions that includes materially significant positions of orchards and vineyards. This situation is possible with large companies engaged in agricultural production or wine production that are subject to audit. International Standard on Auditing (ISA) 501 relating to inventories suggests that auditors who audit financial statements have an obligation to attend an audit of inventories when they are material amounts to the total amounts in the financial statements or if they have a specific risk. Therefore, in the case in question, the auditor must go to the field and physically verify the condition of orchards and vineyards and check their condition with a physical census on the selected sample. Orchards and vineyards usually cover large areas and it would take the auditor quite a bit of time to list one tree at a time from the sample and to make sure of its physical condition. But if a person engaged in audit work takes a drone with him/her when leaving the field and activates the drone upon arrival to the field,

he/she will have the opportunity to film aerial sampled orchards and vineyards from a single point with little time and effort and to apply advanced technologies and in just a few minutes perform a machine tree count. If the drone is connected to other software solutions used in conducting the audit and if the process of its usage is automated, then it probably has the ability to generate a report on the performed inventory audit, in this case it would be a report on the counted samples of fruit trees or vineyards. Such a report may include high-resolution photographs and aerial photographs and calculation reports on the position and number of trees that have been counted. When a comparison with the book balance is made later, it is very easy to obtain high-quality and reliable evidence of differences between the book and the actual situation, which is the data needed when conducting an audit of asset positions.

Another example where the application of drone technology for audit purposes is possible is the audit of asset positions that includes materially significant positions of cereals stored in grain tanks. This situation is possible with large companies engaged in agricultural production which are subject to audit. Therefore, in the present case, the auditor must go to the field and physically verify the condition of the cereals in the silos and to do a check of their condition by a physical census on a selected sample. Cereals are measured in kilograms and include a large set of very small individual items, and it would take the auditor quite a long time to list them and make sure of their physical condition. Since they are in large grain tanks, the person engaged in audit work would have to calculate the total volume of the tank and then calculate the fullness of the tank and thus get the data on the amount of grain in the tank. This kind of work usually involves excellent knowledge of mathematical formulas, climbing the tank, calculating its dimensions and other things that are very hard and complicated work that can easily lead the auditor to the wrong conclusion if a mistake is made, while relying on responsible persons from the entity which is subject to audit in terms of downloading a certain part of the data needed for calculation in this case may pose a risk. But if a person engaged in audit work takes a drone with him/her when leaving the field and activates the drone upon arrival to the field, he/she will be able to record aurally sampled cereals in the tank from a single point with little time and effort and apply advanced technologies for just a few minutes to do their machine counting. If the drone is connected to other software solutions used in conducting audits and if the process of its usage is automated, then it probably has the ability to generate a report on the performed inventory audit, in this case it would be a report on the number of sampled cereals in the tank. Such a report may include high-resolution photographs and aerial photographs and calculation reports on the cereals that were the subject of the count. When a comparison with the book balance is made later, it is very easy to obtain high-quality and reliable evidence of

differences between the book and the actual situation, which is the data needed when conducting an audit of asset positions.

A third example where the use of drone technology for audit purposes is possible is an audit of asset items that include materially significant animal positions in the financial statements. Research (Margaret H. C, and others, 2021) showed that animals can show confusing and panicky behaviour if the drone approaches them at a distance of less than 3 meters. If the animals are in a herd, this situation may cause material damage to the audited entity and may pose a danger to the persons conducting and attending the audit of livestock positions by controlling their census. There are also application solutions that are based on Android phones, and which have the ability to use the camera on phones to count certain uniform items in the space that covers the camera's field of vision. Usually, with higher resolution cameras, the quality and accuracy of counting is higher, but these technologies have not shown a sufficient degree of accuracy to be used more widely in the audit process. Information security in the use of drone technology in auditing is a very important issue. Since the use of drones in the audit mainly implies the use of the Internet, remote access and cloud technology. The use of drone technology mainly involves connecting with other software tools used in auditing and their integration into the technologically and IT-complete audit process, where information security is a very important issue.

The important question on this topic is the question of the turning point, i.e. the question of how many companies suitable for the use of drone technology should have one audit company in order for the use of drone technology to be profitable. Here it is important to consider the fixed and variable costs of purchasing, putting into use and using drone technology. These costs may include the purchase and transportation of drones from remote locations to the audit firm's headquarters, their installation and training, and possibly the lease of certain licenses for the usage of applications and supporting drone management tools. Further, they may include the cost of connecting drones to existing software solutions used in conducting audits, which may include additional work by developers on customization in improving existing solutions in order to connect them to drone technology. After commissioning, there will probably be costs for updating and maintaining the drones and their adequate storage. The storage space in which they are stored should be tidy and adequately secured from unauthorized access. Sometimes drone parts can be rarely available and have a long time to produce and deliver, and it may be necessary to have certain quantities in stock at all times for uninterrupted drone operation and constant readiness for use, which can incur additional costs. There may also be costs for training. This is necessary because handling drones is a very sensitive job that requires concentration and attention in order to avoid temporary or permanent damage

and loss of the drone or loss of some of its functionalities. It is desirable to train as many employees as possible to handle drones, which should be the choice of audit companies and the result of their internal assessment. The authors (Budi R. and others, 2020) proposed a framework for ensuring adequate distance between the drone and the object of observation in order to generate adequate quality photographs that could be potential audit evidence. They believe that measuring adequate distance is essential when using drones to record stockpiles.

A significant part of the total number of respondents used drones, but according to the results of the collected answers, it seems that some of them, although they used drones (probably for entertainment purposes) are not ready to take responsibility to use drones for audit purposes and inventory audits. The positive finding of the research is that the majority of respondents are interested in using drones in the audit of stocks, although their opinion on the efficiency and effectiveness of the use of drones in the audit is quite divided. A descriptive analysis of the answers to the seventh, eighth, ninth and tenth questions is given in the table below. Most of the respondents were not in a situation where their audit client used drones. Respondents' noticeable attitude towards regulatory bodies and their ability to quickly and adequately follow new trends in the application of new tools for conducting audit engagement is negative. Most of the respondents believe that the audit firm in which they work could use drones when conducting an audit of inventories, and that means great trust in the management of audit firms and confirmation of their inclination to improve audit practice. The results of the research show that a significant part of the respondents tend to show a certain degree of confidence in the reliability and relevance of the evidence in the audit of stocks created by the usage of drones. However, there is an interest of persons engaged in auditing in the use of drone technology in the auditing profession, with concerns about the costs of its application and its legal regulation in auditing as evidence for management's assertions about inventories stated in financial statements. There is a greater interest in the application of drone technology among auditors employed by large international audit firms than by auditors working in smaller local audit firms and self-employed auditors.

REZIME

UPOTREBA TEHNOLOGIJE DRONOVA U REVIZORSKOJ PROFESIJI

Upotreba tehnologije dronova ima značajne potencijale za širu i masovniju primenu u revizorskoj profesiji, pre svega na poslovima sprovođenja revizorskog angažmana u domenu obaveze revizora da prisustvuje popisu

zaliha ukoliko su one materijalno značajne sa stanovišta finansijskih izveštaja koji su predmet revizije. Revizija zaliha ima za cilj da ispita i potvrdi tačnost tvrdnji odgovornih lica u entitetu koji je predmet revizije finansijskih izveštaja o iskazanim zalihama. Predmet istraživanja u radu su stavovi lica angažovanih na poslovima revizije o upotrebi tehnologije dronova u revizorskoj profesiji sa akcentom na upotrebu dronova u cilju sprovođenja revizije zaliha. Istraživanje je sprovedeno putem upitnika koji je oglašen putem javno dostupnih mehanizama koji obuhvataju društvene mreže i poslovne kontakte. Glavni zaključak u radu je da postoji zainteresovanost lica angažovanih na poslovima revizije za upotrebu tehnologije dronova u revizorskoj profesiji, uz iskazivanje zabrinutosti za troškove njene upotrebe i njeno zakonsko regulisanje za upotrebu u reviziji kao dokaz za iskazane tvrdnje menadžmenta o zalihama iskazanim u finansijskim izveštajima. Veća zainteresovanost za upotrebu tehnologije dronova postoji kod lica angažovanih na poslovima revizije koja su zaposlena u velikim međunarodnim revizorskim kompanijama, nego kod lica angažovanih na poslovima revizije koja rade u manjim lokalnim revizorskim kompanijama i lica angažovanih na poslovima revizije koja posluju samostalno.

Ključne reči: dron; revizija; popis;

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Ovaj rad je primljen **22.09.2021.**, a na sastanku redakcije časopisa prihvaćen za štampu **23.12.2021.** godine.

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GROWING PUBLIC DEBT AS A RESULT OF THE COVID-19 PANDEMIC IN THE WESTERN BALKANS REGION: THE CASE OF NORTH MACEDONIA AND SERBIA

ABSTRACT: Just before the start of the pandemic, the public debt of the Western Balkan countries averaged over 50% of GDP, with large fluctuations between countries, which narrowed the fiscal space for resolving the consequences of the COVID-19 crisis. Despite that, although partially stable to pandemic turbulence, the needs for borrowing in the countries of the Western Balkans are growing sharply, as a result of which future interest payments are increasing in the conditions of increased public debt. It is estimated that all countries in the region will record an increase in public debt, while Montenegro will have the highest level of growth. That is why the countries of the Western Balkans need to implement successful fiscal consolidation and more prudent fiscal management at the national level, but also to pay attention to higher government borrowing and increased public investment in pandemic conditions. The aim of this paper

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is to analyze the movement of public debt of the countries in the region in the crisis caused by the COVID-19 pandemic, with special emphasis on the case of North Macedonia and the Republic of Serbia. The paper consists of three parts. After the introduction, the first part of the paper presents an analysis of public debt in the Western Balkans region. The second part analyzes the public debt in the case of the Republic of Serbia, while the third part deals with the analysis of the public debt in the case of North Macedonia. Finally, concluding remarks are given.

Key words: public debt, growth, pandemic COVID-19, Western Balkans, North Macedonia, Republic of Serbia.

INTRODUCTION

Following the great global economic and financial crisis of 2008, public debt has emerged as a global problem. There was an upward trend of public debt, expressed as a percentage of GDP, both in developed and developing countries. Consequently, many EU countries, as well as the United States and Japan, have faced increased public debt and the need for adequate financing. Such circumstances have contributed to the global economic crisis of 2008 plunging the world into a new debt crisis. A concerning factor regarding the public debt is the problem of its servicing. Debt, as a key problem that arises from the inability of a country to meet its due liabilities, is determined by the amount and structure of public debt, economic capacity, as well as the fiscal policy of the country (Економски институт, 2017).

The crisis caused by the COVID-19 virus pandemic has severely affected the public finances of most countries in the world (Kisin, Ignjatović, 2020) including the countries of the Western Balkans. Therefore, in order to mitigate the economic consequences of the pandemic, the countries of this region provided the state with extraordinary expenditures by borrowing, which led to an increase in public debt. However, overemphasizing public debt for development policy can potentially be very damaging and can lead to major strategic failures, especially continuous and intensive borrowing (Madžar, 2019). Bearing in mind that the economies of the Western Balkans, as well as the global economy, currently have record levels of public debt, which has been constantly growing over the years, it can be concluded that the economies are "in immediate danger". The obligation of countries is responsible management of public debt, which includes economically justified use of these funds, but also care about how to use public debt (Grgić, 2010., pp. 6).

As the most developed country in the region (Ignjatović et al., 2020, pp. 21), Serbia has gone through a period of dramatic changes, managing the political and economic environment. At the beginning of 2020, the focus of the Serbian Government was on supporting the economic recovery from the consequences of the pandemic (Ignjatović, et al., 2021), when a stimulus program of about 13% of GDP was approved, which affected a mild recession in the amount of - 1% (World Bank, 2021a). Nevertheless, the program had significant fiscal costs, given the growth of the fiscal deficit to 8.0% GDP and the significant growth of public debt 56.5% of GDP approaching the high indebtedness threshold (NBS, 2021, pp. 2-13). Galloping the growth of public debt in this way ranks Serbia among the highly indebted countries (Jotić and Lovre, 2013, pp. 112; Obradović-Matijašević, Ilić, 2018, pp. 93). However, although the Serbian economy began to show signs of recovery in the first half of 2021, even in the second year of the pandemic, the future remains uncertain. It is certain that another "wave" of public debt growth in the coming period would not be sustainable. Also, since borrowing policy is an integral part of macroeconomic policy, it cannot be successful if general macroeconomic policy is ineffective (Kovačević, Stevović, 2019, pp. 4).

In the case of North Macedonia at the end of 2019, the overall fiscal deficit was expected to remain below 2% of GDP, keeping public debt stable (IMF, 2020a). However, there were estimates that public debt in 2020 would continue its upward trajectory and reach a level of as much as 52% of GDP due to the high gross need for financing but also potential future shocks that would make negative differences. However, as North Macedonia began to record economic growth after a major slowdown, a debt increase of 60.2% of GDP in 2020 was recorded (Ministry of Finance, 2021, pp. 21), mainly due to higher government borrowing, but also due to increased public investment. This year, a growth trend of 41.4% is expected, while the return of public finances to a sustainable path will be necessary in the upcoming period (World Bank, 2021).

The question inevitably arises, what will be the further consequences of the COVID-19 pandemic (Kisin, et al., 2021) in the Western Balkans region, known for public debt crises (Jeremić et al. 2019, pp. 2). Therefore, the aim of this paper is to analyze the movement of public debt as a macroeconomic aggregate in the conditions of the COVID-19 pandemic on the example of the Western Balkans in the case of North Macedonia and the Republic of Serbia. The first part of the paper presents an analysis of public debt in the Western Balkans region. The second part of the paper analyzes the public debt in the case of the Republic of Serbia, and the third part deals with the analysis of the public debt in the case of North Macedonia. Finally, concluding remarks are given. Certainly, the topic for some future research may be the analysis of the

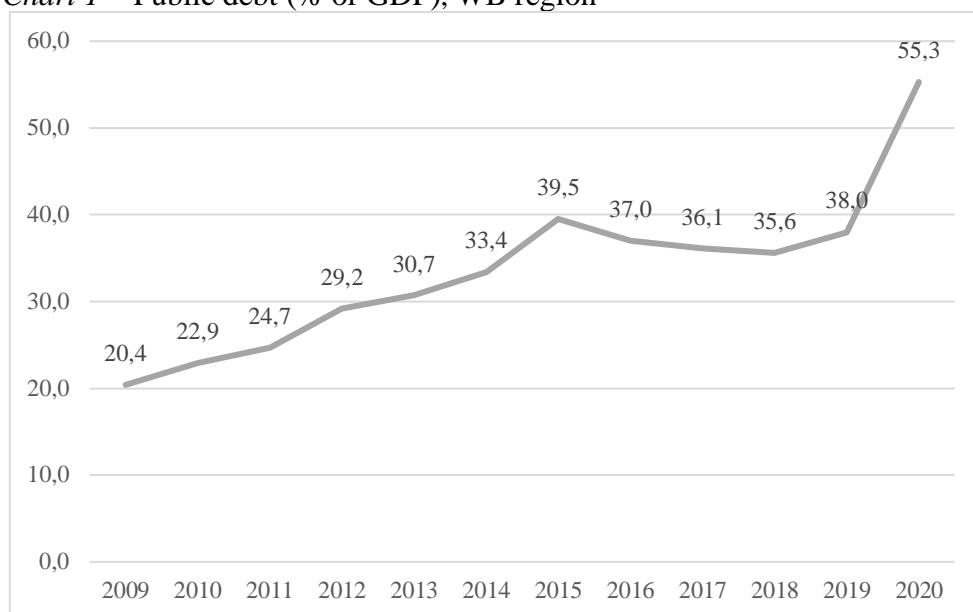
individual contribution of each individual alimony for each budget item affected by the pandemic.

PUBLIC DEBT ANALYSIS OF THE WESTERN BALKANS REGION

The countries of the Western Balkans, after a period of suppressing the impact of the economic crisis, sought to strike a balance between fiscal policy measures and support for economic recovery and ensuring fiscal sustainability. Some countries in the region have improved their fiscal position in recent years, thus creating space for fiscal action and financing of public assistance programs, which became indispensable with the entry into the COVID-19 crisis.

With the onset of the pandemic, all countries in the region have increased their public debt, much more than was the case during the global economic crisis. In response to the pandemic, as fiscal policy is crucial, all Western Balkan countries have introduced the necessary measures to mitigate the impact of the crisis. Nevertheless, their effectiveness depends on the extent to which they are tailored to the specific case in each of the countries in the region. However, as the need for borrowing grows, later interest payments will increase in the Western Balkans, given the increased fiscal deficit and public debt and reduced availability of funds in the financial markets (World bank, 2021).

Despite the fact that the regional economy is predicted to grow in the period 2020-2021, it will still remain slightly below the ten-year maximum achieved in 2018 (Trivić, 2019). Also, the high public debts of some countries in the region, together with fiscal risks, make these countries vulnerable to growing uncertainty. According to data (World Bank, 2021a) in the period 2009-2019 the average public debt in the Western Balkans was 31.6% of GDP. The highest level was achieved in 2009 in the amount of 20.4%, after which a constant increase in debt was recorded. If we look at 2020, the public debt of the Western Balkan countries amounted to over 55% of GDP, with large differences between individual countries, as a result of which the fiscal space for resolving the consequences of the crisis was narrowed (Chart 1).

Chart 1 – Public debt (% of GDP), WB region

Source: Authors, based on data by World Bank (2021a, b, c).

Today, all Western Balkan countries have higher debts than before the global financial crisis, while their risk premiums are higher. If we compare the increase in public debt between countries in the period 2008-2019 it is concluded that Albania and BiH recorded a moderate increase of between 13-17% of GDP, North Macedonia and Serbia an increase of about 25% of GDP, and Montenegro an increase in debt of close to 50% of GDP.

Albania, BiH and Serbia entered the pandemic crisis in the period of improving the fiscal position, where they previously in 2018-2019 reduced public debt between 1 and 1.7% of GDP, with strong economic growth. North Macedonia kept its debt at a level slightly higher than in 2018, with a growth of 0.3% of GDP. Montenegro faced a public debt crisis of over 81% of GDP. Although net debt decreased in 2019 after the sale of Eurobond issues in the amount of EUR 500 million (10% of GDP), these funds were deposited and used to service debt maturing in 2020 (including 320 million on the basis of repurchased Eurobonds).

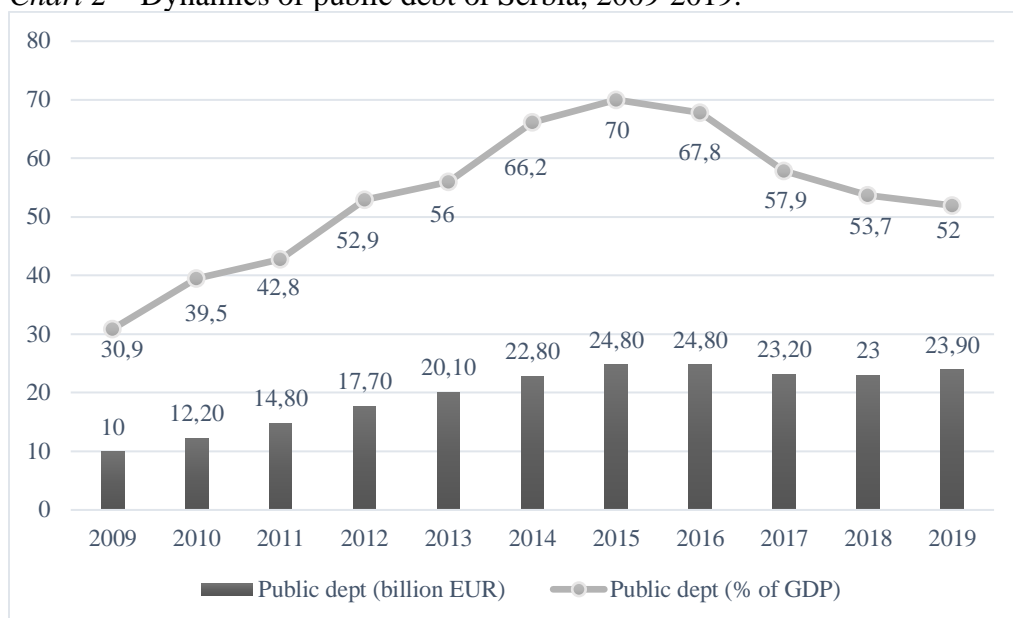
According to the IMF (2020b, Bakić, 2020, pp.74) in the case of Albania, successful fiscal consolidation and more prudent fiscal management have made it possible to reduce the share of public debt to 32.9% of GDP this year, compared to 34% in 2020. Although Albania's public debt is on a downward trajectory, its contingent liabilities on the basis of public-private partnerships are growing. In Bosnia and Herzegovina, public debt is stable at 38%, while debt reduction is expected to fall to 35.3% this year. It is estimated

that public debt will remain low and sustainable in pandemic conditions, and that it will be reduced to 26% of GDP by 2025. International financial institutions will continue to finance projects, and the Government is expected to return fiscal positions after the crisis subsidies, which will stabilize the public debt to the level of 2019.

On the other hand, the economy of Montenegro is very specific, in the sense that it is often vulnerable, but it often recovers quickly, with borrowing to the limits of liquidity, in order to repay incomes. Montenegro used to have large oscillations of public debt, which amounted to 80% at the beginning of this century, but in the period before the beginning of the world economic crisis in 2007-2008 decreased to 28% (Vukićević, 2020). However, according to estimates by World Bank (2021b), public debt in Montenegro in 2020 reached 92% of GDP, while this year it will amount to 79.5%. However, the question arises as to whether another rebalance will be made, through additional borrowing, which would enable the payment of salaries, social benefits and basic maintenance of investments. In addition, one of the main topics in Montenegro is debt restructuring with a Chinese investor to build a highway. The reason is that Montenegro, like other countries in the Western Balkans, has a limited access to European funds and a great need for investment in infrastructure, so they see Chinese projects as a developmental opportunity (Filipović, Ignjatović, 2021. pp. 83). In the following text, we will analyze in detail the public debt in North Macedonia and the Republic of Serbia.

THE IMPACT OF THE COVID-19 PANDEMIC ON PUBLIC DEBT OF THE REPUBLIC OF SERBIA

Since 2000 and the beginning of the transition process, in terms of public debt, Serbia has achieved a long-term trend of reduction, due to good economic results and debt write-offs to individual creditors. At the beginning of the global economic crisis, in 2008 public debt was at a decades-long low level, with public debt-to-GDP ratio of 26.8% (Ministry of Finance of the Republic of Serbia, 2021c). After good macroeconomic results, improvement of the fiscal position and reduction of indebtedness of Serbia, as a consequence of the economic crisis, since 2009, a new period of public debt growth trend has followed. According to official reports, Serbia's public debt has doubled in just four years between 2009 and 2013, to increase to almost 15 billion euros by 2016. (Chart 2).

Chart 2 – Dynamics of public debt of Serbia, 2009-2019.

Source: Authors based on data Ministry of Finance of the Republic of Serbia (2021c).

The share of public debt in the GDP of Serbia, as the second relevant indicator of indebtedness, during the observed period recorded constant and progressive growth, which at the end of 2015 amounted to as much as 70% of GDP. After that, positive results were recorded, when there was a decrease in indebtedness. Nominally, public debt was reduced by about a billion euros in the period 2015-2019, while a significantly better result was achieved in the ratio of public debt and GDP, according to which the share of public debt in GDP decreased by about 18% during the same period. Although according to the official projections at the time, it was expected that the tendency of public debt reduction would continue (Kisin, Mihić, 2021), the end of 2019 brought the appearance of the COVID-19 pandemic, which will become a global phenomenon in early 2020. Officially, the beginning of the pandemic in Serbia was in March 2020, when epidemiological restrictions began, which strongly affected the decline in economic activity and public finances. At the same time, such a crisis requires great fiscal support, for the payment of extraordinary expenses and for the implementation of a package of mitigation measures to help the economy and the population (Kisin, Ignjatovic, 2020).

Due to the expansive fiscal policy as a result of extraordinary circumstances, the dynamics of Serbia's public debt since the beginning of 2020 has a strong growing trend. Total public debt of Serbia on December 31st 2020 amounted to 26.67 billion euros, which is an increase of 2.7 billion EUR

compared to the end of 2019. The change in the share of public debt in GDP, as one of the most important criteria of sustainability, also had an increase, which is a consequence of the growth of public debt and falling GDP, due to the COVID-19 pandemic. At the end of 2019, the share of public debt in GDP was about 52%, but growth was recorded during 2020, so at the end of the first year of the pandemic in Serbia, the share of public debt to GDP was 57.4% (Table 1).

Table 1. – Public debt of Serbia, amount and structure, 2019 and 2020.

	2019.		2020.	
	EUR	% GDP	EUR	% GDP
1. Direct obligations				
Internal public debt	9.814.869.889	21,3%	11.217.692.874	24,1%
External public debt	12.640.912.641	27,5%	14.028.483.523	30,2%
Total direct obligations	22.455.782.530	48,8%	25.246.176.397	54,3%
2. Indirect obligations				
Internal public debt	177.949.979	0,4%	216.175.173	0,5%
External public debt	1.310.274.912	2,8%	1.206.978.379	2,6%
Total indirect obligations	1.488.224.891	3,2%	1.423.153.551	3,1%
3. Local government, state sector				
Local government public debt and non-guaranteed other government public debt	620.677.207	1,3%	582.005.693	1,3%
In total				
Public debt of the central level of government (1+2)	23.944.007.421	52,0%	26.669.329.948	57,4%
General government debt total (1+2+3)	24.354.852.572	52,9%	27.055.797.547	58,2%

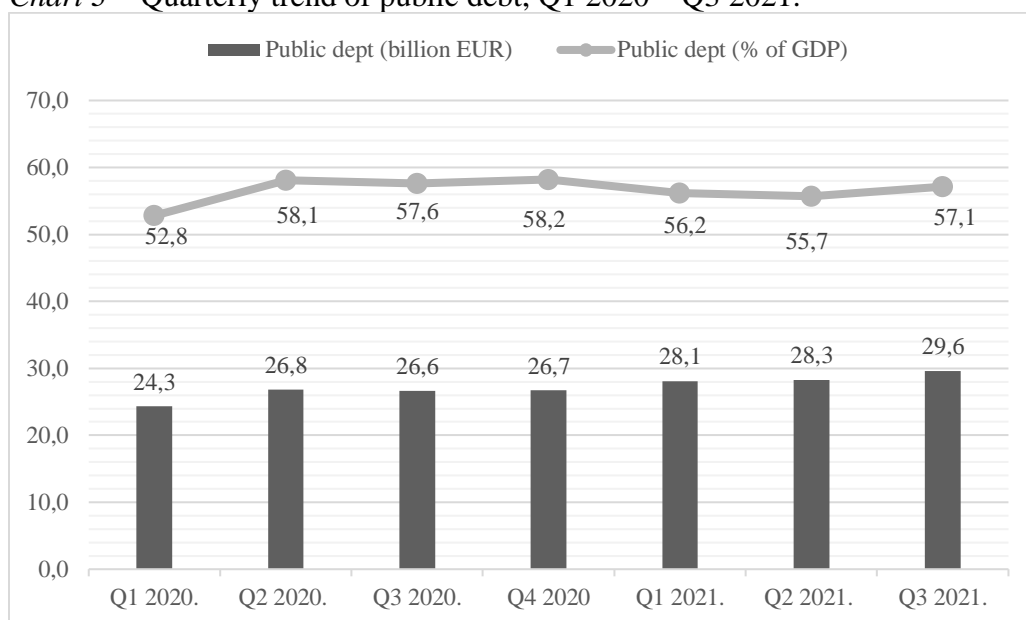
Source: Authors based on data by Ministry of Finance of the Republic of Serbia (2021b)

The structure of public debt is based on the loan issuance system and according to the territorial principle, i.e. depending on whether the creditors are domestic or foreign entities. These criteria provide a basic division into direct and indirect obligations in public debt, which includes internal and external debt. For decades, Serbia has been borrowing predominantly from foreign creditors, creating higher external indebtedness. This trend continued during 2020 as well. According to the data presented in Table 1, indebtedness with foreign creditors dominates the structure of Serbia's public debt. At the end of 2020, the external public debt amounted to 15.2 billion euros, and the internal public debt to around 11.4 billion euros. Compared to 2019, the structure of public debt has changed in the direction of increasing external debt, which amounted to 1.3 billion euros, which is a total increase of about 2.5% share in GDP, from 30.3% at the end of 2019 to 32.8% at the end of 2020. Also, the total direct obligations make up almost the entire public debt of the Republic of Serbia. According to the data of the Ministry of Finance of the Republic of Serbia (2021b), the percentage of public debt in foreign

currency at the end of December 2020 was 69.5%, where the euro dominates in relation to all other foreign currencies. In terms of the structure of interest rates, Serbia's public debt is dominated by fixed interest rates with over 80% of the contracted share, while the other 20% is contracted at variable interest rates.

The growth of Serbia's public debt continued during the second year of the pandemic. In 2021 Serbia practically eliminated any epidemiological measures, especially those related to the interruption or reduction of economic activity, which has a positive impact on GDP growth. The real growth of GDP in the third quarter of 2021, compared to the same period a year before, amounted to 7.7%, which is also the average GDP growth in 2021 (Statistical Office of the Republic of Serbia, 2021). At the same time, government borrowing had a new wave of growth. From the last quarter of 2020, the total public debt increased by about 3 billion euros until the end of the third quarter of 2021, which is in only 9 months (Chart 3).

Chart 3 – Quarterly trend of public debt, Q1 2020 – Q3 2021.



Source: Authors based on data by Ministry of Finance of the Republic of Serbia (2021c)

Although nominally public debt continued the growing trend, the mentioned strong economic growth in 2021 caused a slight downward trend in the share of public debt in Serbia's GDP by about 1% compared to the end of 2020. According to the latest available data, as of October 31st 2021, the total public debt of Serbia amounts to almost 30 billion euros, with the public

debt-to-GDP ratio 57.2% (Ministry of Finance of the Republic of Serbia, 2021b). Summarizing the trend of public debt, we come to the conclusion that from the beginning of the pandemic to the latest available data, the state of Serbia has borrowed an additional 5.6 billion euros. The reasons for government borrowing are numerous and varied, especially due to extraordinary circumstances. In this context, the growth of public debt due to the pandemic was expected. However, questions arise as to whether the additional debt of 5.6 billion euros is too high for an economy like Serbia, as well as the question of the economic justification of so much borrowing (Kisin, Mihić, 2021).

It is also important to point out that from the beginning of the debt growth due to the crisis caused by the COVID-19 pandemic until the latest available data, the share of public debt in GDP did not exceed 60%, which would classify Serbia as a highly indebted country according to EU methodology and Maastricht criteria.⁴ Two years after the start of COVID-19, due to significant GDP growth during 2021, Serbia has a good chance of returning to the pre-pandemic period. According to the Fiscal Strategy for 2022 with projections for 2023-2024. (Table 2) and the planned medium-term GDP growth of around 4%, the projections of Serbia's indebtedness should have a declining trend (Ministry of Finance of the Republic of Serbia, 2021a).

Table 2. – Public debt forecast, 2021-2024.

	2021.	2022.	2023.	2024.
Public debt, in billions of RSD	3.505,8	3.698,8	3.842,8	3.934,8
Public debt, in% of GDP	59,0	58,3	56,5	54,4

Source: Authors based on data Ministry of Finance of the Republic of Serbia (2021a).

According to the data of the Ministry of Finance of the Republic of Serbia (2021a), in the medium term, a gradual balancing of public finances and a reduction in indebtedness is envisaged. Public debt would nominally have a slight growing trend until 2024, but due to the planned GDP growth rates, the share of public debt in GDP would begin to decline to around 55% by the end of 2024. Serbia's public debt management strategy until 2024 envisages various financial and fiscal risks, which can lead to an increase in

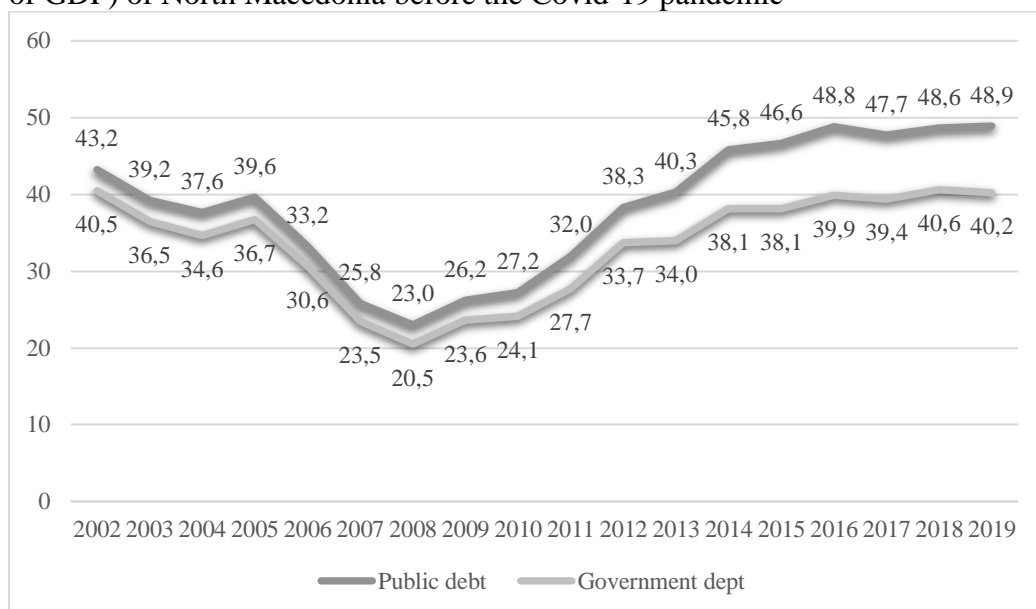
⁴ In Serbia, data are available according to three different methodologies for public debt monitoring: 1. National methodology according to the Law on Public Debt; 2. EU methodology - Maastricht criterion, which monitors the gross public debt of the general government sector; 3. According to the Law on Budget System, which observes the general government debt.

indebtedness and public debt service costs. Potential risks include: refinancing risk, foreign exchange risk, market risk (interest rate risk, inflation risk), liquidity risk, credit and operational risks and risks related to the distribution of servicing costs (debt structure, concentration of liabilities). In the medium term, achievable macroeconomic projections and fiscal policy goals are set, and recommendation is to increase the credibility of the strategy through decisive and consistent implementation, without frequent changes in public policies (Fiscal Council of the Republic of Serbia, 2021).

THE IMPACT OF THE COVID-19 PANDEMIC ON PUBLIC DEBT OF THE NORTH MACEDONIA

During pandemic period, in terms of global and regional trends, North Macedonia was characterized as a moderately indebted country. Despite all challenges, before the outbreak of the COVID-19 pandemic, during 2019 in a condition of a stable domestic environment and significantly reduced inflationary pressure, North Macedonia provided better economic growth compared to previous years. Financial stability was supported by satisfactory stability of public finance and a sustainable level of public debt (Ignjatovic et al, 2021).

Chart 4 – The trend of the Public debt (% of GDP) and Government debt (% of GDP) of North Macedonia before the Covid-19 pandemic



Source: Authors based on data Open economy (2021)

In the 2002-2008 period, North Macedonia was characterized by a continuous decline of public debt from 43.2% of GDP in 2002 to 23.0% of GDP in 2008, while the government debt was 20.5% of GDP (Hristovska and Spasovska, 2016). From 2008 to 2016, the public debt of North Macedonia was continuously increasing, reaching its maximum of 48.8% of GDP in 2016, marking the largest increase since the country's independence (Chart 4). In contrast to the upward trend that was recorded in the period from 2008 to 2016, the public debt in the period after 2016 was slightly stabilized. Prudent management of public finances resulted in stabilizing the level of public debt and government debt. Consequently, just before the outbreak of the Covid-19 crisis, public debt amounted to 5,540.9 million euros, i.e. 49.4% of GDP, while government debt amounted to 4,556.8 million euros, i.e. 40.7% of GDP (Government of the Republic of North Macedonia, 2021).

With the outbreak of the COVID-19 crisis, the government of North Macedonia has taken a series of measures to support companies and households in order to mitigate the economic and social impact of the crisis, which resulted in an increase in public debt. As a result, a fiscal consolidation policy has been implemented in order to stabilize the debt level.

Table 3. – Public Debt Stock, mil. EUR

	2019	2020
General government debt	4.556,8	5.516,0
Guaranteed public debt	942,2	929,5
Non-guaranteed public debt	41,9	37,8
Total public debt (general)	5.540,9	6.483,3
External public debt	3.709,3	4.323,7
Domestic public debt	1.831,6	2.159,6
Public debt as % of GDP	48,9%	60,2%

Source: Authors based on data by Ministry of Finance of the Republic of North Macedonia (2021: 21)

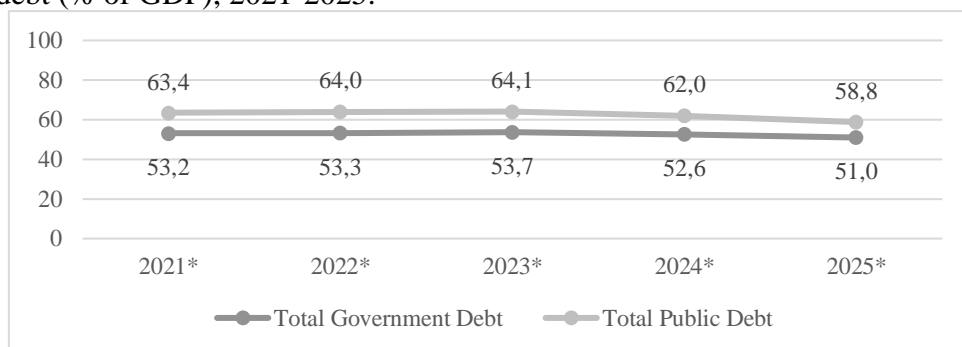
In conditions of the higher budget deficit and increased needs for its financing, the government debt of North Macedonia at the end of 2020 amounted to 5,516 million euros, i.e. 51.2% of GDP, which is an increase of 10.5 p.p. compared to 2019. The annual growth of central government debt is a result of the increase in external debt (from 24.6% to 31.4% of GDP), with the simultaneous growth of domestic debt (from 15.9% to 19.7% of GDP). However, even with this level of government debt, North Macedonia remains a moderately indebted country with government debt lower than the average debt level of EU27 countries, which at the end of 2020 was accounting for 90.7% (National Bank of the Republic North Macedonia, 2020: 31). On the other hand, the public debt of the Republic of North Macedonia at the end of

2020 amounted to 6,483.3 million euros, i.e. 60.2% of GDP, which is an increase of 10.8 p.p. compared to the end of 2019 (Table 3). This is the largest increase in public debt since the independence of North Macedonia. External public debt in 2020 increased by 614.4 million euros, while internal public debt increased by 328 million euros compared to 2019 (Ministry of Finance, 2020., pp. 10-11).

The increase in public debt stems from the increase in external public debt (from 33.1% to 40.2% of GDP), as well as from the growth of domestic public debt (from 16.3% to 20.1% of GDP). Within the public debt, the total government debt (debt of the central government, public funds, and municipalities) in 2020 increased from 40.7% to 51.2% of GDP, while the debt of public enterprises (guaranteed and non-guaranteed) was 8.6% of GDP. At the end of 2020, the share of the government debt in the total public debt was 85.1% (82.2% in 2019), while the share of the debt of the public enterprises (guaranteed and non-guaranteed) in the total public debt was 14.3% (17% in 2019) (National Bank of the Republic North Macedonia, 2020: 32).

In order to keep the public debt level within a sustainable framework, without disrupting the fiscal sustainability, the limit of total public debt in the medium and long term is determined and should not exceed the level of 60% of GDP. As a result of the economic crisis caused by the Covid-19 crisis, a significant part of the EU countries, as well as countries in the region, were forced to expand their budget deficits in order to provide funds to deal with the current pandemic, resulting in an increase in the level of public debt by more than 10 percentage points. The trend of growing the level of public debt was also noticed by North Macedonia by about 10 p.p. and approached the maximum grant determined by the national 2021-2023 Public Debt Management Strategy.

Chart 5 - Projections on total Public debt (% of GDP) and total Government debt (% of GDP), 2021-2025.



Source: Authors based on data by Government of the Republic of North Macedonia (2021: 9).

At the beginning of 2021, the impact of the COVID-19 pandemic was still present in the Macedonian economy. In order to easily finance the budget needs, in March 2021 the Republic of North Macedonia issued the eighth Eurobond in the amount of 700 mil. EUR. The government debt at the end of Q1 2021 was 6,207.8 mil. EUR, i.e. 54.1% of the projected GDP. The total public debt, which includes the state debt and the debt of the public enterprises established by the state or the municipalities, the municipalities in the city of Skopje and the city of Skopje, at the end of Q1 2021 was at the level of 7,173.6 million EUR, which represents 62.5% of projected GDP. With the Law on Modification and Amendments to the Law on Public Debt, the national definition of public debt was expanded, and starting from Q2 2019, the unsecured debt of public enterprises is included in the public debt balance (Ministry of Finance, 2020a., pp. 4). Regarding the public debt projections, medium-term analyses show that public debt will exceed the maximum limit of 60% in the period 2021-2023, primarily as a result of fiscal consolidation measures (Chart 5). In the 2024 period, the stabilization of the public debt is expected and its return to the specified limits in 2025, i.e. below 60% of GDP (Government of the Republic of North Macedonia, 2021a: 9).

CONCLUSION

Following the great global economic and financial crisis of 2008, public debt has emerged as a global problem. There was an upward trend of public debt, expressed as a percentage of GDP, both in developed and developing countries. In the years before the COVID-19 pandemic, the reduction of Serbia's public debt was achieved, which created fiscal space for additional borrowing for extraordinary expenditures and measures to support the economy could be supported in potential crisis conditions. However, the COVID-19 pandemic caused an economic downturn, an increase in expenditures and new borrowing, which resulted in negative consequences for Serbia's public finances. Quantitative data show that due to the expansive fiscal policy as a result of COVID-19 crisis, the dynamics of Serbia's public debt since March 2020 has had a strong growing trend. Borrowing of the Republic of Serbia, to finance the budget deficit, was the dominant way of providing funds for the implementation of a package of mitigation measures to help the economy and the population, which has had major changes in the amount of public debt in the last two years. The budget for 2021 foresaw large capital investments and raising the quality of life of citizens through increased pensions and salaries in the public sector, higher health expenditures and increased investment in attracting foreign investment, road and railway infrastructure. However, the great uncertainty brought by 2021 shows that

such economic growth can easily not be realized, because the deficit could be significantly higher than planned. The implemented policy of full openness of the Serbian economy, regardless of the epidemiological and health risk, especially during 2021, had positive effects in terms of economic growth, but the growth of the increase in public debt continued. Summarizing the analysis of Serbia's public debt structure, direct obligations dominate, as well as high external indebtedness, which has become one of the features of Serbia's fiscal policy for a long time. According to projections, in the coming years it is planned to reduce the fiscal deficit and public debt of Serbia, which would bring stronger fiscal stability. It is expected that the Serbian economy will return to the level of growth in the medium term before the start of the COVID-19 pandemic. Despite this, there are still challenges that limit short-term and long-term economic growth, indicating that all bottlenecks need to be removed. Any exit strategy from the COVID-19 crisis in the economic part should include reducing public debt in the upcoming years, as one of the most important goals.

During this period, in terms of global and regional trends, North Macedonia was characterized as a moderately indebted country. At the end of 2019, just before the outbreak of the COVID-19 crisis, the public debt of North Macedonia amounted to 5,540.9 million euros, i.e. 49.4% of GDP, while government debt amounted to 4,556.8 million euros, i.e. 40.7% of GDP. With the outbreak of the COVID-19 crisis, the government of North Macedonia has taken a series of measures to support companies and households in order to mitigate the economic and social impact of the crisis, which resulted in an increase in public debt. As a result, a fiscal consolidation policy has been implemented in order to stabilize the debt level. The government debt of North Macedonia at the end of 2020 amounted to 5,516 million euros, namely 51.2% of GDP, which is an increase of 10.5% compared to 2019. Consequently, with this level of government debt, the Republic of North Macedonia remains a moderately indebted country with government debt lower than the average debt level of EU27 countries, which at the end of 2020 was accounting for 90.7%. On the other hand, the public debt of the Republic of North Macedonia at the end of 2020. amounted to 6,483.3 million euros, i.e. 60.2% of GDP, which is an increase of 10.8% compared to the end of 2019. This is the largest increase in public debt since the independence of the Republic of North Macedonia. Regarding the public debt projections, medium-term analyses show that public debt will exceed the maximum limit of 60% in the period 2021-2023, primarily as a result of fiscal consolidation measures. In the 2024 period, the stabilization of the public debt is expected and its return to the specified limits in 2025, i.e. below 60% of GDP.

REZIME

RAST JAVNOG DUGA KAO POSLEDICA PANDEMIJE COVID-19 U ZEMLJAMA ZAPADNOG BALKANA: SLUČAJ SEVERNE MAKEDONIJE I REPUBLIKE SRBIJE

Neposredno pred početak pandemije javni dug država Zapadnog Balkana iznosio je u proseku preko pedeset odsto BDP-a, uz velike oscilacije među zemljama, što je suzilo fiskalni prostor za rešavanje posledica krize COVID-19. Uprkos tome, iako delimično stabilne na pandemijske turbulencije, u zemljama Zapadnog Balkana potrebe za zaduživanjem naglo rastu, usled čega se povećavaju i buduće otplate kamata u uslovima uvećanog fiskalnog deficita, javnog duga i smanjene dostupnosti sredstava na finansijskim tržištima. Procenjuje se da će sve zemlje regiona beležiti rast javnog duga, dok će najveći nivo rasta imati Crna Gora. Zato države Zapadnog Balkana treba na nacionalnom nivou da sprovedu uspešnu fiskalnu konsolidaciju i opreznije fiskalno upravljanje, ali i da obrate pažnju na veća zaduživanja države, i povećanja javnih ulaganja u pandemijskim uslovima. Cilj ovog rada je da analizira trend kretanja javnog duga u uslovima pandemije COVID-19 u zemljama Zapadnog Balkana, sa posebnim osvrtom na slučaj Severne Makedonije i Republike Srbije. Rad se sastoji iz tri dela. Nakon uvoda, prvi deo rada predstavlja analizu javnog duga u region Zapadnog Balkana. Drugi deo rada analizira javni dug u slučaju Republike Srbije, dok se treći deo rada bavi analizom javnog duga u slučaju Severne Makedonije. Na kraju je dat zaključak po mišljenju autora.

Ključne reči: javni dug, pandemija, COVID-19, Zapadni Balkan, Severna Makedonija, Republika Srbija

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Ovaj rad je primljen **08.12.2021.**, a na sastanku redakcije časopisa prihvaćen za štampu **23.12.2021.** godine.

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CIP -Каталогизација у публикацији
Народна библиотека Србије, Београд
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ПОСЛОВНА економија: часопис за пословну
економију, предузетништво и финансије=
Business economics: Magazine for business
Economics, entrepreneurship and finance/
Главни и одговорни уредник Марко Маловић.-
Год.1, бр. 1 (2007)-. - Сремска Каменица
(Војводе Путника 87) : Универзитет Едуконс, Факултет
Пословне економије,
2007.-.24 цм. –
Полугодишње

ISSN 1820/6859 = Пословна економија
COBISS.SR-ID 146187532