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EFFICIENCY ANALYSIS OF BANKING SECTOR IN REPUBLIC OF SERBIA

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Abstract
Efficiency of the banking sector has, due to its significance, lately been increasingly analysed by individual countries, through the application of modern economic and mathematical methods and models. This is the case with the banking sector in the Republic of Serbia, as well. For this particular reason, the paper deals in a 2016 efficiency analysis of the banking sector of the Republic of Serbia by applying the Data Envelopment Analysis (DEA) analysis. The obtained results of the survey conducted on the sample of thirty (30) banks show that only eight (8) banks were business efficient. With the view of increasing the future business efficiency of the entire banking sector (in particular of the inefficient banks),it is necessary to more efficiently manage the assets and liabilities, human resources, capital, operating income and profit. Moreover, there is a need for a more efficient cost management through the application of modern concepts, such as cost accounting by activities and/or Japanese business philosophy.
Keywords*:* Market share, Factors, Efficiency, DEA analysis

1.INTRODUCTION

The banking sector efficiency analysis is known to be challenging. Therefore, the subject of study in this paper is the efficiency analysis of the banking sector in the Republic of Serbia. The aim and purpose of the study is to examine the business efficiency of banks in the Republic of Serbia, on particular theoretical and methodological grounds, and, consequentially, propose adequate measures for future improvement. This, among other things, represents the scientific and professional contribution of this paper, which also reflects in opening the possibility to compare the efficiency of the banking sector of

the Republic of Serbia with other relevant countries, as another grounds for improvement by implementing appropriate measures in the future.

There is an abundance of literature devoted to the business efficiency analysis of the financial sector - banks and insurance companies (Al-Lagilli et al., 2011; Barros et al. 2011; Biener 2012; Biener 2014; Chen 2014; Chuang 2014; Cummins et al. 2010; Dalkiliç 2014; Djuric 2010; Khailuk 2010; Sufian 2010, Sufian et al. 2010; Sufian 2011; Taboada 2011; Tornjanski 2017; Wise 2017). Likewise, a great deal of literature is dedicated to the business efficiency analysis of the banking and insurance sector in the Republic of Serbia (Knjezevic 2010; Knjezevic 2011; Knjezevic 2015; Lukic 2010; Lukic 2016a, b; Mandic 2017; Mihailovic 2019). All this and other literature (Ludwin 1989; Stojanovic 1990) was used in this paper as theoretical and methodological basis for studying the banking sector efficiency in the Republic of Serbia.

The standard research hypothesis used in this paper is that the efficient performance management of a bank requires the awareness of the current efficiency level and its key driving factors. Such awareness allows us to take appropriate measures to improve the future efficiency. In line with the character of the addressed problems, we applied DEA (Data Envelopment Analysis) analysis as the study methodology in this paper.

In conducting the study, we used the empirical data of the National Bank of Serbia and the Business Registers Agency of the Republic of Serbia. The empirical data used for individual banks are largely comparable, since their "production" relies upon the application of unique statutory relevant norms (international financial reporting standards, fair value concept, Basel standards). In this way, we confined the limitations of the treated problems study contribution of this paper.

2.MARKET POSITION OF BANKS IN REPUBLIC OF SERBIA

The market position of a bank is known to be a significant efficiency determinant of an individual bank and, consequentially, of the overall banking sector. Table 1 and Figure 1 show the market share of individual banks in 2016 total operating income of the banking sector in the Republic of Serbia.

TABLE 1. MARKET SHARE OF INDIVIDUAL BANKS IN 2016 TOTAL OPERATING INCOME OF THE BANKING SECTOR IN THE REPUBLIC OF SERBIA

ADDIKO BANKA	2%
AIK BANKA	6%
BANCA INTESA	18%
BANKA POŠTANSKA ŠTEDIONICA	3%
BANK OF CHINA	0%
CREDIT AGRICOLE BANK	3%
DIREKTNA BANKA	0%
EXPOBANKA	1%
ERSTE BANKA	5%
EUROBANKA	5%
HALKBANKA	1%
JUBANKA	3%
JUBMES	0%
JUGOBANKA K.M.	0%
KOMERCIJALNA BANKA	3%
MIRABANKA	0%
MTS BANKA	0%
NLB BANKA	2%
OPPORTUNITY BANKA	1%
OTP BANKA	2%
PIRAEUS BANKA	2%
PROCREDIT BANKA	4%
RAIFFEISEN BANKA	11%
SBERBANKA	3%
SOCIETE GENERALE BANK	9%
SPRSKA BANKA	0%
TELENOR BANKA	0%
UNICREDIT BANKA	10%
VOJVOĐANSKA BANKA	5%
VTB BANKA	0%
Total	100%

Note: Calculations by the Author(s)

Source: National Bank of Serbia and Agency for Business Registers of the Republic of Serbia, Belgrade

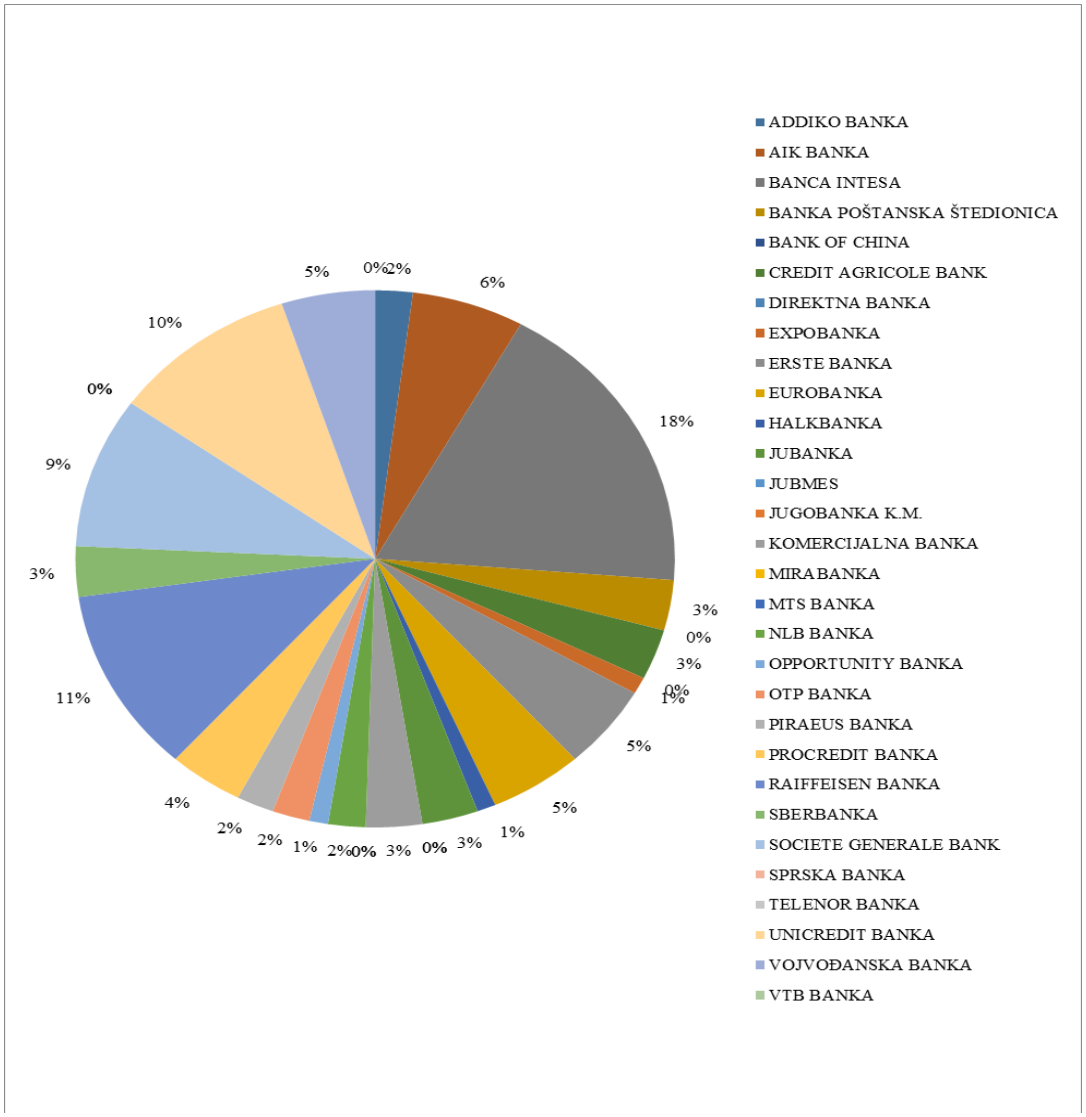

FIGURE 1. MARKET SHARE OF INDIVIDUAL BANKS IN 2016 TOTAL OPERATING INCOME OF THE BANKING SECTOR IN THE REPUBLIC OF SERBIA

Note: Figure by the Author(s)

Source: National Bank of Serbia and Agency for Business Registers of the Republic of Serbia, Belgrade

In the Republic of Serbia, five banks (AIK BANKA, BANCA INTESA, RAIFFEISEN BANKA, SOCIETE GENERALE BANK, UNICREDIT BANKA) control more than fifty per cent (precisely, 54%) of the banking market. In other words, this means that their way of conducting business mostly affects the efficiency of the entire banking sector of the Republic of Serbia.

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3.MATHEMATICAL DEA MODELS

In literature, several mathematical models of the DEA (Data Envelopment Analysis) are formulated (Ludwig, 1989). They are shown below as:

Model 1

The General Mathematical DEA model is:

$$\max h_0 = \frac{\sum_{r=1}^{s} u_r y_{rj}}{\sum_{i=1}^{m} v_1 x_{ij}}$$

At the limit of:

$$\frac{\sum_{r=1}^{s} u_r y_{rj}}{\sum_{i=m}^{m} v_i x_{ij}} \leq 1 \quad (j = 1, \ldots, n)$$

where : u_r , $v_i > 0$, u_r= weight coefficient of output r, v_i = weight coefficient of input and $y_{r,}$ = output r for DMU j,x_{ij} = input i amount for DMU j,n = number DMU in the given series, DMU = *relative efficiency* of *decision-making units* (*DMU*).

General DEA model expressed in the form of linear programming is:

Model 2

$$\max \sum_{r=1}^{s} u_r y_{rj}$$ (note: max = 1)

At the limit of:

$$\sum_{r=1}^{s} u_r y_{rj} - \sum_{i=1}^{m} v_i x_{ij} \leq 0 \quad (j = 1, \ldots, n)$$

$$\sum_{i=1}^{m} v_i x_{ij} = 1$$

Where $u_r, v_i > 0$

Dual problem of DEA model expressed in the form of linear programming is:

Model 3

min z_0

At the limit of:

$$\sum_{j=1}^{n} d_j x_{ij} - z_0 x_{ij} \leq 0 \ (i = 1, \ldots, m)$$

$$\sum_{j=1}^{n} d_j y_{rj} \geq y_{rj} \quad (r = 1, \ldots, s)$$

Where dj≥ 0; z_0 are real variables

4.EFFICIENCY OF BANKING SECTOR IN REPUBLIC OF SERBIA

The Republic of Serbia banking sector efficiency is affected by numerous factors, such as: gross domestic product growth rate, effective interest rate, inflation, unemployment, exchange rate, trends in import and export, financial market development level, presence of foreign banks in the banking market, political stability, risks, normative regulations etc. Through the adequate control of such factors, the Republic of Serbia banking sector efficiency can be significantly increased.

The 2016 banking sector efficiency analysis in the Republic of Serbia by applying the DEA analysis was based on the following elements:

DEA model = DEA-Solver LV8.0/ CCR(CCR-I)

Problem = DUM

No. of DMUs = 30

Returns to Scale = Constant (0 =< Sum of Lambda < Infinity)

No. of Input items = 3

Input(1) = TOTAL ASSETS

Input(2) = NUMBER OF EMPLOYEES

Input(3) = CAPITAL

No. of Output items = 2

Output(1) = OPERATING INCOME

Output(2) = NET PROFIT

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In 2016, 30 banks operated in the Republic of Serbia and they were treated as DUM units. Three input elements for DEA analysis were: total assets (1), number of employees (2) and capital (3). Two output elements for DEA analysis were: operating income (1) and net profit (2). Consequently, table 2 shows the input and output variables of the Republic of Serbia banking sector efficiency in the 2016 DEA analysis.

TABLE 2. INPUT AND OUTPUT VARIABLES OF THE REPUBLIC OF SERBIA BANKING SECTOR EFFICIENCY IN THE 2016 DEA ANALYSIS (IN MILLION RSD)

DUM	(I) TOTAL ASSETS	(I) NUMBER OF EMPLOYEES	(I) CAPITAL	(O) OPERATING INCOME	(O) NET PROFIT
ADDIKO BANKA	97,355	625	20,713	3,254	-1,279
AIK BANKA	183,736	595	52,936	8,775	4,338
BANCA INTESA	551,416	2,956	124,141	24,676	9,924
BANKA POŠTANSKA ŠTEDIONICA	138,032	1,970	18,509	4,298	272
BANK OF CHINA	1,804	18	1,804	0,382	39
CREDIT AGRICOLE BANK	77,531	921	8,753	4,018	201
DIREKTNA BANKA	11,044	444	1,402	665	-279
EXPOBANKA	19,696	175	2,002	971	-957
ERSTE BANKA	142,916	1,043	18,128	7,312	2,065
EUROBANKA	150,633	1,460	48,966	7,626	2,061
HALKBANKA	34,986	429	5,884	1,565	136
JUBANKA	74,344	506	11,686	4,530	678
JUBMES	9,328	125	3,422	592	64
JUGOBANKA K.M.	1,417	110	995	55	-102
KOMERCIJALNA BANKA	400,017	2,779	55,424	4,081	-8,063
MIRABANKA	7,698	42	2,933	128	-443
MTS BANKA	5,815	177	1,576	269	-271
NLB BANKA	34,238	428	5,713	2,745	261
OPPORTUNITY BANKA	13,005	324	2,383	1,487	335
OTP BANKA	47,856	677	12,730	3,125	205
PIRAEUS BANKA	52,243	441	12,331	2,282	25
PROCREDIT BANKA	89,334	485	14,654	5,113	1,606
RAIFFEISEN BANKA	254,025	1,557	56,138	14,723	5,411
SBERBANKA	108,158	689	23,347	3,914	436
SOCIETE GENERALE BANK	235,783	1,364	40,348	12,344	3,685
SPRSKA BANKA	11,402	66	2,939	681	253
TELENOR BANKA	11,120	185	1,615	359	-1,318
UNICREDIT BANKA	332,232	1,224	64,204	13,527	6,227
VOJVOĐANSKA BANKA	125,898	1,487	19,976	6,459	301
VTB BANKA	13,793	65	1,866	87	-250

Source: National Bank of Serbia and Agency for Business Registers of the Republic of Serbia, Belgrade

Table 3 shows the descriptive statistics of the Republic of Serbia banking sector efficiency elements in the 2016 DEA analysis.

TABLE 3. DESCRIPTIVE STATISTICS OF THE REPUBLIC OF SERBIA BANKING SECTOR EFFICIENCY ELEMENTS IN THE 2016 DEA ANALYSIS

Statistics on Input/Output Data					
	TOTAL ASSETS	NUMBER OF EMPLOYEES	CAPITAL	OPERATING INCOME	NET PROFIT
Max	551416	2956	124141	24676	9924
Min	1417	18	995	0.382	-8063
Average	107895	778.9	21250.6	4655.38	852.033
SD	129940	760.926	27045.5	5460.86	2939.03

Note: Calculations by the Author(s), assisted by the statistics software programme DEA model = DEA-Solver LV8.0/ CCR (CCR-I)

Source: National Bank of Serbia and Agency for Business Registers of the Republic of Serbia, Belgrade

The average key indices of the 2016 banking sector in the Republic of Serbia were: total assets 107,895 million dinars, number of employees 778, capital 21,250 million dinars, operating income 4,655 million dinars and net profit 852 million dinars. Observed by individual banks, many were below the average of these performance elements, which adversely affected the overall 2016 banking sector efficiency in the Republic of Serbia.

For the purpose of a more comprehensive analysis, Table 4 shows a correlation between the banking sector efficiency variables in the Republic of Serbia in the 2016 DEA analysis.

TABLE 4. CORRELATION BETWEEN THE INPUT AND OUTPUT COMPONENTS OF THE BANKING SECTOR BUSINESS EFFICIENCY IN THE REPUBLIC OF SERBIA IN THE 2016 DEA ANALYSIS

Correlation					
	TOTAL ASSETS	NUMBER OF EMPLOYEES	CAPITAL	OPERATING INCOME	NET PROFIT
TOTAL ASSETS	1	0.9013	0.95791	0.88583	0.47124
NUMBER OF EMPLOYEES	0.9013	1	0.81955	0.74796	0.26012
CAPITAL	0.95791	0.81955	1	0.92995	0.625
OPERATING INCOME	0.88583	0.74796	0.92995	1	0.79875
NET PROFIT	0.47124	0.26012	0.625	0.79875	1

Note: Calculations by the Author(s), assisted by the statistics software programme - DEA model = DEA-Solver LV8.0/ CCR (CCR-I)

Source: National Bank of Serbia and Agency for Business Registers of the Republic of Serbia, Belgrade

The data in Table 4 show that the Republic of Serbia banking sector net profit was significantly affected by the asset, capital and operating income management efficiency (there is a statistical significance of

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p<0,05; Correlation is significant at the 0.01 level (2-tailed)).The impact of employees on the Republic of Serbia banking sector net profit is negligible (weak positive correlation of 0.26012 and there is no statistical significance - p> 0.05). Average 2016 net profit per employee in the banking sector of the Republic of Serbia was slightly above one million dinars. This indicator is theoretically and practically considered very important, since it allows to examine not only physical but also creative and particularly the "invisible" traits of the employees and the way they affect efficiency of a bank. All this leads to a conclusion that increasing the efficiency of the banking sector in the Republic of Serbia calls for a more efficient future management of human resources through the implementation of appropriate training programs.

Table 5 and Figure 2 show the 2016 relative efficiency of individual banks in the Republic of Serbia.

TABLE 5. RELATIVE EFFICIENCY OF INDIVIDUAL BANKS IN THE REPUBLIC OF SERBIA, 2016

Model = CCR-I			
No.	DMU	Score	Rank
2	AIK BANKA	1	1
12	JUBANKA	1	1
18	NLB BANKA	1	1
19	OPPORTUNITY BANKA	1	1
22	PROCREDIT BANKA	1	1
23	RAIFFEISEN BANKA	1	1
26	SPRSKA BANKA	1	1
28	UNICREDIT BANKA	1	1
9	ERSTE BANKA	0.974	9
8	EXPOBANKA	0.9513	10
25	SOCIETE GENERALE BANK	0.8951	11
5	BANK OF CHINA	0.8905	12
3	BANCA INTESA	0.8494	13
6	CREDIT AGRICOLE BANK	0.832	14
20	OTP BANKA	0.7709	15
13	JUBMES	0.7679	16
7	DIREKTNA BANKA	0.7601	17
10	EUROBANKA	0.7113	18
29	VOJVOĐANSKA BANKA	0.6749	19
21	PIRAEUS BANKA	0.6442	20
24	SBERBANKA	0.5931	21
11	HALKBANKA	0.5632	22
1	ADDIKO BANKA	0.5467	23
4	BANKA POŠTANSKA ŠTEDIONICA	0.4187	24
17	MTS BANKA	0.4046	25
27	TELENOR BANKA	0.3875	26
14	JUGOBANKA K.M.	0.3395	27
16	MIRABANKA	0.2859	28
15	KOMERCIJALNA BANKA	0.1806	29
30	VTB BANKA	0.1311	30

Note: Calculations by the Author(s), assisted by the statistics software programme - DEA model = DEA-Solver LV8.0/ CCR (CCR-I)

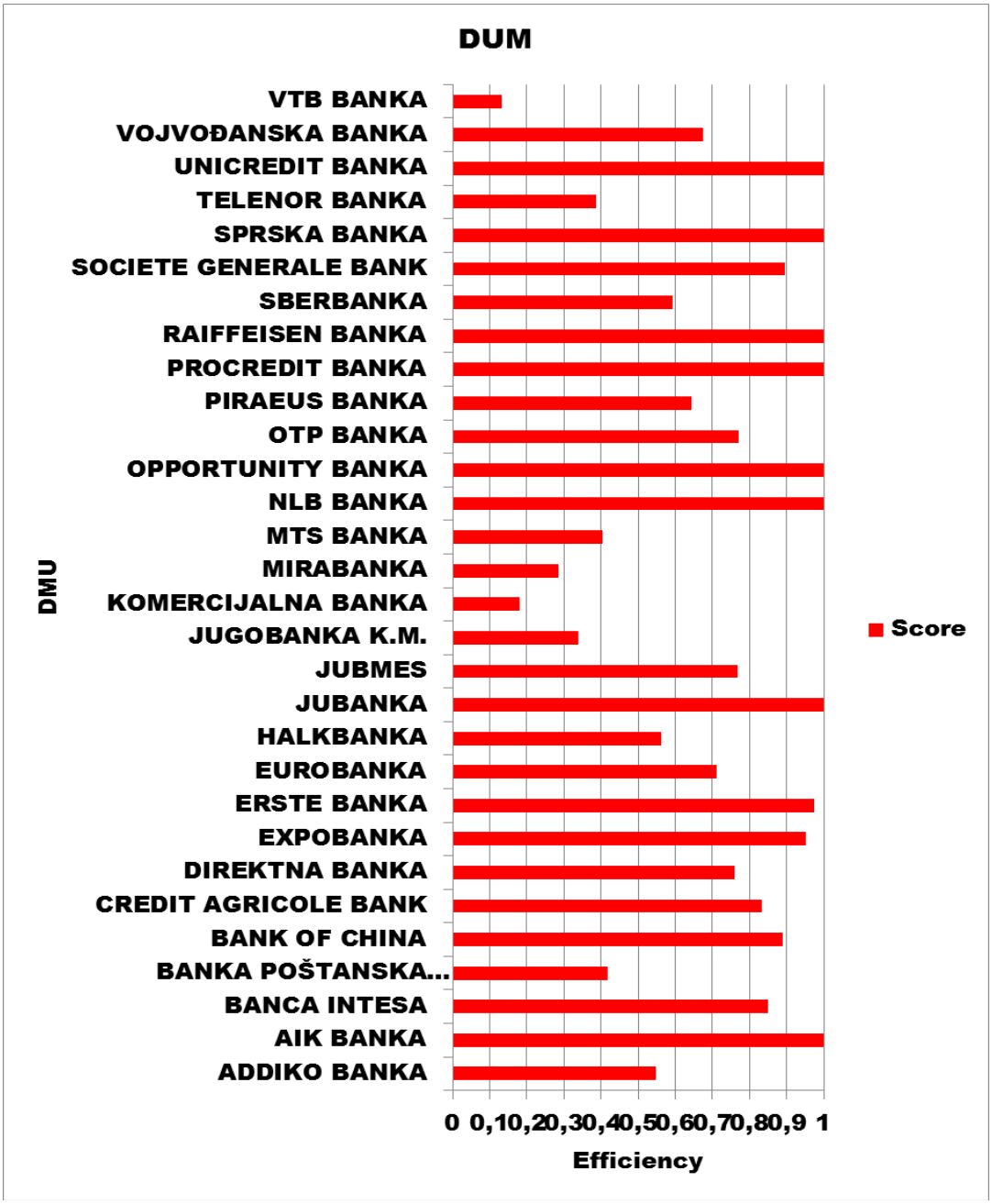

FIGURE 2. RELATIVE EFFICIENCY OF BANKS' OPERATIONS IN THE REPUBLIC OF SERBIA ACCORDING TO THE DEA ANALYSIS, 2016

Note: Figure developed by the Author(s), assisted by the statistics software programme - DEA model = DEA-Solver LV8.0/ CCR (CCR-I)

Data in Table 5 and Figure 2 show that in 2016, out of total 30 banks, only 8 were business efficient (AIK BANKA, JUBANKA, NLB BANKA, OPPORTUNITY BANKA, PROCREDIT BANKA, RAIFFEISEN BANKA, SPRSKA BANKA, UNICREDIT BANKA) while 22 banks were inefficient. In order to increase the business efficiency of the entire banking sector (especially of the inefficient banks), it is necessary to

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more efficiently manage the assets, human resources, capital, operating income and profit, in the future. Also, the implementation of new cost management concepts (cost accounting by activities) and Japanese business concepts (kaizen and lean) can significantly spur the Republic of Serbia banking sector efficiency in the years to come.

5.CONCLUSION

In the Republic of Serbia in 2016, five banks controlled over fifty percent (precisely 54%) of the banking market, observed by their actual operating income. By the way they transact business, these banks have mostly affected the efficiency of the entire banking sector. The key banking sector indices have shown the following average values: total assets- 107,895 million dinars, number of employees - 778, capital - 21,250 million dinars, operating income - 4,655 million dinars and net profit 852 million dinars. Many commercial banks were below the average of these elements, which adversely affected the efficiency of the entire banking sector in the Republic of Serbia. The 2016 correlation analysis shows a significant impact of the efficiency of asset, capital and operating income management on net profit of the Republic of Serbia banking sector(there is a statistical significance - $p < 0,05$; Correlation is significant at the 0.01 level (2-tailed)).Nevertheless, the impact of the employees on the net profit of the Republic of Serbia banking sector was negligible (there is a weak positive correlation of 0.26012 and no statistical significance - $p > 0.05$) .The average profit (net profit) per employee was slightly above one million; this indicator is generally considered as very important, since it allows to examine not only physical but also creative and particularly "invisible" traits of the employees and the way they affect efficiency of a bank. All this leads to a conclusion that increasing efficiency of the banking sector in the Republic of Serbia calls for a more efficient future management of human resources through the implementation of appropriate training programs.

The DEA analysis results show that out of the total of 30 banks that have been issued an operating license, only 8 were efficient, whereas the remaining 22 operated inefficiently. In order to increase the business efficiency of the entire banking sector (especially of the inefficient banks), it is necessary to more efficiently manage the assets, human resources, capital, operating income and profit, in the future. Likewise, the implementation of new cost management concepts (cost accounting by activities) and Japanese business concepts (kaizen and lean) can significantly spur the efficiency of the Republic of Serbia banking sector in the forthcoming period.

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