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THE PHENOMENON OF THE NEGATIVE INTEREST RATES WITH A SPECIAL REVIEW OF THE MACEDONIAN BANKING SECTOR

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Abstract: *The aim of this paper is to examine the phenomenon of the negative interest rates in Switzerland, Sweden, Denmark, the Czech Republic, Germany and Japan and to analyse the efficiency of the Macedonian banking sector. From the analysis it can be stated that the negative interest rates change the way the banks operate, and they can be used only by countries that are developed. In order for the relative efficiency of the Macedonian banking sector to be evaluated, we use the non-parametric methodology DEA. In the analysis, two inputs and two outputs are used, the period is 2016, and the sample comprises 13 banks. According to the results, 7 of the banks are identified as relatively efficient, and the average efficiency of the Macedonian banking sector is 91.56%. For the banks that are identified as inefficient, what is pointed out is how they can improve the efficiency, which presents valuable information for the management and leads to improved efficiency of the banking sector as a whole.*

Key words: *Negative Interest Rates, Commercial Banks, Non-Parametric Approach.*

1. INTRODUCTION

For some time now, in the monetary policies of well-known countries, a phenomenon called negative interest rates has been appearing, yet nobody has still fully defined them. Through defining the economy, as well as its sectors, the Central Bank, being responsible for the monetary policy of a country and representing a fiscal agent in its government, regardless of how independent it is, reaches something only on the surface quite insignificant and small, yet successful enough to turn the whole banking sector around. World countries, which nobody would believe that by being so successful and in the top 10 in the list of highly developed countries, would take the negative interest rates as a measure and comfort that their economies will not be destroyed by themselves, thus completely perplexing theoreticians.

In this paper, the analysis of the phenomenon of negative interest rates comprises the following countries: Switzerland, Sweden, Denmark, the Czech Republic, Germany and Japan. The reasons why these rates are used in each of them is different. For example, Denmark uses them in order to protect its national currency, while Japan tries to deal with the falling prices through them.

In Macedonia, in 2016 both the active and passive interest rates reached the lowest level in its history in the last two decades. On the one hand, the average active interest rate in 2016, compared to the previous year, was reduced by 0.4 percentage points, while the average passive interest rate was reduced by 0.3 percentage points. On the other hand, the interest spread in 2016 noted a minor yet continuous degradation (here the spread in denars with the foreign currency clause is excluded).

In order to examine the efficiency of the Macedonian banking sector in 2016 we use the leading non-parametric methodology data envelopment analysis (DEA). DEA in the literature of the operational research discipline is included by Charnes *et al.* (1978). This methodology measures the relative efficiency of the decision-making units (DMUs), which need to be homogeneous, meaning they need to use the same inputs in order to produce the same outputs. The relatively efficient DMUs have an efficiency score of 1 (100%) and they form the efficiency frontier, while for the relatively inefficient DMUs, this methodology enables the amounts and the sources of inefficiency to be determined. Most of the DEA applications are in banking, education, healthcare and hospital effficiency (Emrouznejad *et al.* 2008).

The paper is structured in the following way: apart from the introduction given in Section 1, the phenomenon of the negative interest rates is explained in Section 2. The Macedonian banking sector is

explained in Section 3, the analysis of its efficiency is given in Section 4, while the conclusion is given in Section 5.

2. THE PHENOMENON OF THE NEGATIVE INTEREST RATES

30 years ago, the negative interest rates were considered to be an irrational solution, or a synonym for failure because nobody then had ever expected that the rates would become zeros, while today they have overcome everybody's expectations, only not in a positive way – in fact, we have the opposite happening with the negative interest rates, i.e. the rates are below zero.

The novelty called negative interest rates is still not defined. The reason for such is precisely the aim that should be achieved with their use, but a key fact about these rates are that the central banks as a vital player in a country's monetary policy use them solely in the monetary policy of individual countries, thus completely changing the ways the banks work – the negative interest rates turn everything that we know about them upside down. Here it must be noted that not every country can use them, which is perceived as a bigger triviality in the efforts for achieving higher economic growth.

In the European market, the negative rates appeared as far back as 1972, and were kept in monetary policy until 1982. The reason for their use was the unconventionally high exchange rate, but towards the end of the application of such a solution to save its domestic currency, Switzerland was faced with a high inflation rate and a negative result for the use of these interest rates.

The 2008 crisis led the European Central Bank (ECB) to a situation of lowering the rates, which in fact is totally normal if the aim is an economy's expansion. So, according to the statistics of the ECB, in 2008 the rates decreased by 1.25 from the beginning to the end of the year, so that in 2009 they moved closer to zero. ECB started using these negative rates in the middle of 2014, after the interest rate in the period 2012-2013 did not move above zero, with two aims: firstly, to strengthen the economy, facing the countries with assets in the ECB with economic stagnation, which in the long term will reflect on every single country in Europe, regardless of whether they are or aren't a part of the Union or the Eurozone; and secondly, to stabilize the Euro. The ECB does not dictate the policies of the individual countries, but it responds only to the complete economy of the Union.

The first of the European giants to follow in the steps of the ECB, leading the country's rates into negative territory, is Sweden. The illogicality for the usage of such a monetary policy is created immediately afterwards, considering the fact that Sweden takes up the third place in the list of developed countries according to the OECD, but according to Riskbank the necessity for such a policy is the destabilisation of the Swedish currency, influenced by the weakened Euro, the high unemployment rate, and the ever higher deflation since 2012 (Bobkoff and Oyedele, 2016). The reason for this radical measure, to protect the economy from overheating, is also the unusual rate of unemployment because a developed country like Sweden could lower it, yet deflation is stated as a main carrier of such an illogical measure (Sweden Unemployment Rate, 2017). Following Sweden's decision, the second one is Denmark, whose reason for employing such a policy is the attempt to keep up the volume of demands, being frightened that the destabilisation of the Euro will directly affect the trading business, and at the same time, the Danish economy overall. The Danish Central Bank started feeing its commercial banks -0.2%, shortly rising to -0.1%, while today it may move to -0.65%, which in fact crosses those -0.4% of the ECB, which hasn't lowered its interest rates since March 16, 2016.

After the Danish case to protect its currency in order for the volume of demands to remain the same, the Czech Republic, after a long fight of trying to keep its national currency above 27 Koruna per Euro, decided to use the same monetary policy, regardless of the fact that at that time the Koruna was already stable. This monetary policy is used only in the short term by the Czech Central Bank, not expecting any results in regards to the economic growth and development (Gokoluk and Chamonikolas, 2016).

One of the European countries with a big asset contribution in the ECB, i.e. 19%, is Germany. Deutsche Bundesbank, unlike Sweden, Denmark and the Czech Republic, for the long run takes into consideration the economic stagnation of the Union and Europe, hence deciding the negative interest rates be reflected on the country's savings as well, i.e. when applying the monetary policy, it presses the population to move towards purchasing bonds, while trying not to harm small investors, meaning that the decision is that the negative interest rates apply only to deposits of over 100.000 Euros (Black and Hirsch, 2016). This kind of policy has a positive effect because the yield of the bonds grows more than ever before, regardless of the fact that they have by definition the lowest yield, but also the lowest risk.

An exceptional example regarding these negative rates is Japan. A country far from the European market and independent from the influence of the declining Euro, desperate after the lengthy battle with

falling prices, low corporate profit, and with this not being to the advantage of the economy because the Japanese public debt is twice the country's GDP, faced with a low value of its national currency, starts experimenting, thus blindly taking over the policy of the ECB, especially of the bond-buying policy of Germany, since the aim of the Japanese Central Bank is to put pressure on the population to buy bonds, not spend the money, as is the case with the Scandinavian countries and the Czech Republic. The Japanese investors want to save the economy, knowing that they might never see the money from the bonds they have bought, and they start to buy bonds, but that is unfortunately an unsuccessful move because by the end of July 2016, the yield of the bonds approaches -0.18%. This policy in Japan lowers the prices even more, thus making the value of the Yen fall.

It can be concluded that countries capable of using negative interest rates are highly developed, but they are all faced with a destabilisation of their national currencies, deflation or economic stagnation. Countries that are not developed or in the process of development are considered to not be in a position to use such a monetary policy, and it is not expected for their rates to fall lower than zero.

3. THE BANKING SECTOR IN MACEDONIA

The business model in the banks' operations in Macedonia is traditional - banks from the domestic private sector collect deposits and place them in loans to domestic enterprises and households (NBRM, 2017).

Deposits of households, which are the most significant source for financing of banking activities, note an increase in 2016, but at a slower pace, while the highest share (30%) in the banking sector's assets is given to loans of non-financial companies.

In Macedonia, on December 31, 2016, 18 depository institutions operated; 15 of which were banks and 3 savings houses. In the focus of this paper are the banks, as the share of savings houses in the banking sector is not significant.

The group of large banks includes those that had assets of more than 32.1 billion denars on December 31, 2016, as well as the following five banks: Stopanska Banka AD Skopje, Komercijalna Banka AD Skopje, Halk Banka AD Skopje, NLB Tutunska Banka AD Skopje and Ohridska Banka AD Ohrid. In the group of medium-sized banks are those that had assets of between 8.0 and 32.1 billion denars on the same date, and these are the following seven banks: Sparkasse Banka AD Skopje, Centralna Kooperativna Banka AD Skopje, Univerzalna Investiciona Banka AD Skopje, Stopanska Banka AD Bitola, Macedonian Bank for Development Promotion, Eurostandrad Banka AD Skopje, and ProCredit Banka AD Skopje. The group of small banks consists of those that had assets of less than 8.0 billion denars on the same date, and these are the following three banks: Silk Road Banka AD Skopje, Kapital Banka AD Skopje, and TTK Banka AD Skopje.

The banking network consists of 433 business units, and most of them are located in the region of Skopje. The number of employees in the banking sector is 5.985 and in 2016 it increased by 0.3%. Regarding the ownership structure, 11 banks are owned by foreign shareholders.

The indicators of solvency and capitalisation of the banking sector have downward changes. The Capital Adequacy Ratio (CAR) is 15.2% (on December 31, 2015 it was 15.5%). In October 2016, amendments to the Banking Law were adopted, which started in March 2017, and they refer to the introduction of new rules of the Basel Committee and the European Regulation for 4 types of capital buffers and with their fulfillment the solvency of banks in Macedonia will be supported.

The financial result at the end of 2016, compared to 2015, increased by 36.3% and amounted to 6.3 billion denars. Only two banks showed losses in the operation. The indicators of profitability and efficiency of the Macedonian banking sector have improved. In 2016, the net gain was increased, but the net interest margin remained unchanged (4.1%). In the increase of the financial result, the main carrier is the growth in the net interest income. Interest expenses decreased by 14.7% (by 822 million denars), while the interest income increased by 1.1% (by 215 million denars). In addition, the Macedonian banking sector continued to strengthen its operational efficiency in 2016. The average level of risk in the loan portfolio of banks is decreased, and the impairment is also decreased (due to the sale of part of the foreclosed property), which contribute to the increase in the financial result in 2016 by 1/3 (NBRM, 2017, p. 99). Regarding the interest rates in 2016, the active and passive interest rates of the banks continued to decrease, and having been monitored in the last two decades they were the lowest, in particular, the average active interest rate was 6.4%, and the average passive interest rate was 1.8%.

In the following section, the relative efficiency of the banking sector in Macedonia in 2016 was analysed using the non-parametric approach data envelopment analysis.

4. ANALYSIS OF THE RELATIVE EFFICIENCY OF THE MACEDONIAN BANKING SECTOR: DEA APPROACH

For the assessment of the relative efficiency of the commercial banks in Macedonia with the application of DEA, in the literature there are found the following three papers: (Micajkova and Poposka, 2013; Naumovska and Cvetkoska, 2014; and Naumovska and Cvetkoska, 2016).

In this paper, the aim is to analyse the relative efficiency of the Macedonian banking sector in 2016 with the application of DEA. The used inputs, outputs and model are the same as in Naumovska and Cvetkoska (2016), with the difference that in their paper the period from 2007 to 2013 is covered. Deposits and operating costs are inputs, while loans and net interest income are outputs. The model used is the output-oriented Banker-Charnes-Cooper (BCC) DEA model introduced by Banker *et al.* (1984), and this model is explained in Naumovska and Cvetkoska (2016, p. 321). In 2016, there were 15 banks in the Macedonian banking sector, and our sample for analysis consists of 13 banks. From the analysis are excluded the Macedonian Bank for Development Promotion (a state-owned bank that is not involved in deposits collection) and NLB Tutunska Banka AD Skopje (due to an unpublished annual report for 2016 in the period when this analysis was made). To solve the model, the DEA-Solver-LV software was used, and detailed information about this software can be found in Cooper *et al.* (2007, pp. 454-476).

Table 1 shows the statistics (max, min, average and standard deviation) for the inputs and outputs used, and Table 2 gives the correlation analysis.

Table 1: Statistics on Input/Output Data (in national currency)

	Deposits	Operating costs	Loans	Net interest income
Max	87.179.714,00	1.039.492,00	58.854.991,00	3.637.117,00
Min	2.721.245,00	53.363,00	1.872.717,00	122.577,00
Average	21.452.143,00	310.453,00	16.507.338,23	956.856,85
SD	25.151.654,98	265.994,90	16.874.329,39	1.085.919,08

Table 2: Correlation Analysis

	Deposits	Operating costs	Loans	Net interest income
Deposits	1	0.8866	0.9394	0.9655
Operating costs	0.8866	1	0.9720	0.9620
Loans	0.9394	0.9720	1	0.9920
Net interest income	0.9655	0.9620	0.9920	1

Based on the obtained efficiency scores (Table 3, Figure 1), 7 banks were relatively efficient in 2016 and they are: Halk Banka AD Skopje, Kapital Banka AD Skopje, Komercijalna Banka AD Skopje, Ohridska Banka AD Ohrid, Prokredit Bank AD Skopje, Stopanska Bank AD Skopje and Uni Banka AD Skopje, and 6 banks have an efficiency score of less than 1 and they are relatively inefficient. Relatively inefficient banks can improve their efficiency if they make certain changes in the inputs, i.e. in the outputs (Table 4). From Table 4 it can be seen that Silk Road Banka AD Skopje can become relatively efficient if it decreases its operating costs by 48.26% and increases: loans by 24.47%, and net interest income by 23.22%. Eurostandard Bank AD Skopje was relatively the most inefficient bank in 2016, and it can become relatively efficient if it increases: loans by 36.14% and net interest income by 56.65%.

The average efficiency of the Macedonian banking sector is 91.56%, and the group of large banks shows the highest efficiency in its operating.

Table 3: Efficiency scores

No.	DMU	Score
1	Silk Road Banka AD Skopje	0.8115
2	Eurostandard Banka AD Skopje	0.7345
3	Halk Banka AD Skopje	1
4	Kapital Banka AD Skopje	1

5	Komercijalna Banka AD Skopje	1
6	Ohridska Banka AD Ohrid	1
7	Prokredit Banka AD Skopje	1
8	Stopanska Banka AD Bitola	0.8064
9	Stopanska Banka AD Skopje	1
10	Sparkasse Banka AD Skopje	0.8522
11	TTK Banka AD Skopje	0.8652
12	Centralna Kooperativna Banka AD Skopje	0.8326
13	Uni Banka AD Skopje	1

Figure 1: Graphic representation of the efficiency of the commercial banks in Macedonia

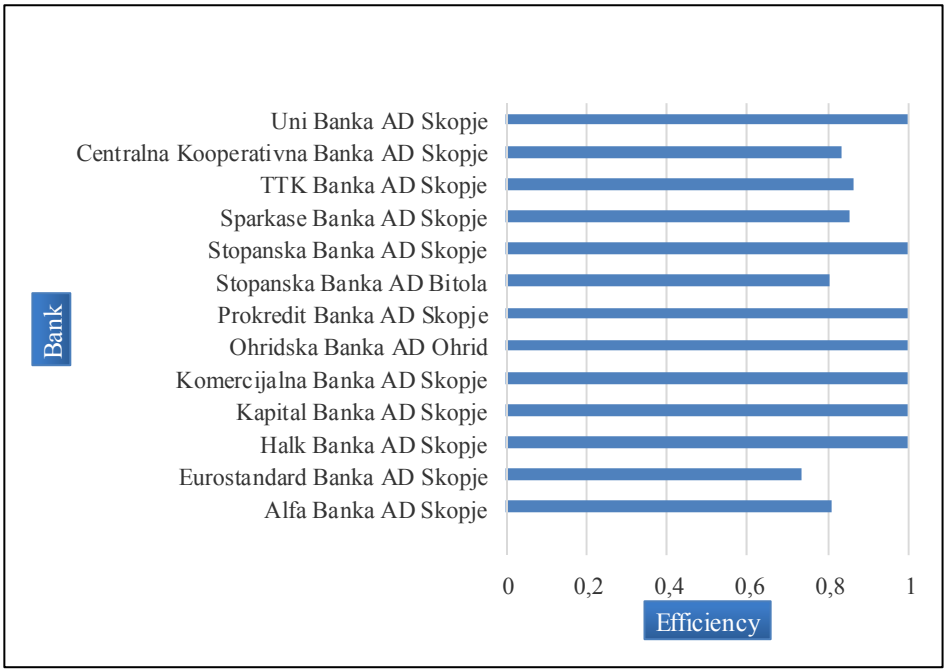

Table 4: Projection (BCC model)

	Deposits	Operating costs	Loans	Net interest income
Silk Road Banka AD Skopje	0.00%	-48.26%	24.47%	23.22%
Eurostandard Banka AD Skopje	0.00%	0.00%	36.14%	56.65%
Stopanska Banka AD Bitola	0.00%	0.00%	24.01%	35.20%
Sparkasse Banka AD Skopje	0.00%	-5.80%	17.34%	17.34%
TTK Banka AD Skopje	0.00%	-28.76%	46.77%	15.58%
Centralna Kooperativna Banka AD Skopje	0.00%	-1.70%	20.10%	37.79%

5. CONCLUSION

The sea of data and information regarding the negative interest rates is very shallow and there is not yet enough analysis that fully involves them. The emphasis of this paper is on six worldwide known countries (Switzerland, Sweden, Denmark, the Czech Republic, Germany and Japan), reviewing the fact that each of them uses these rates from different points and for different aims. Switzerland has been using them long before everyone else, for trying to protect their currency. In a not very different vein, Denmark and the

Czech Republic have also been trying to protect their own currencies, while Sweden as the first country that jumped in negative territory right after ECB, is aiming at lowering the unemployment rate. Germany is worried about the economic stagnation, and Japan follows the same policy as Germany, yet only trying to stop the falling prices. A limitation to making general conclusions about the phenomenon of the negative interest rates is that in this paper the United States of America are not included, but the States will be a subject of our further research.

The historically lowest active and passive interest rates in Macedonia were achieved in 2016 - the average active interest rate was 6.4% and the average passive interest rate was 1.8%. In order to investigate the efficiency of the Macedonian banking sector in 2016, this paper used the specially designed technique for linear programming – data envelopment analysis (DEA). The result is that 54% of the banks (7 of the analysed 13 commercial banks in Macedonia) are relatively efficient. The average efficiency of the Macedonian banking sector is 91.56%. Especially valuable information for the management of the banks is that with DEA, what can be identified is: which banks are relatively efficient and which are not, what are the amounts of inefficiency and how can the inefficient banks improve their efficiency, which further leads to gaining higher efficiency results of the banking sector of Macedonia as a whole.

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