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DETERMINANTS OF BANK PROFITABILITY IN CENTRAL AND EASTERN EUROPEAN COUNTRIES

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ABSTRACT

The aim of this paper is to investigate, which bank-specific and macroeconomic indicators are associated with the bank profitability defined as ROA and ROE in Central and Eastern European (CEE) countries in the time period 2003-2017. In addition, the results are compared with the studies conducted within the area previously to find out whether the results are consistent. The data is studied using linear regression. The results show that the bank-specific indicators that had a significant negative impact on both profitability ratios were bank size, capital adequacy, credit risk, and management quality. Net interest margin was found to have a positive significant effect on both ROA and ROE. From macroeconomic indicators, change in inflation rate was found to have a negative impact on profitability defined as both ROA and ROE. In addition, the amount of total loans and total deposits had a negative impact on ROE. The results imply that during the time period observed, the banks in CEE countries have experienced diseconomies of scale and negative effects on total loans and total deposits caused by the financial crisis. The negative association between change in inflation rate and bank profitability imply that the increasing inflation rate caused the increase in expenses for bank to exceed the increased interest income.

Keywords: Bank profitability, CEE countries, bank-specific indicators, macroeconomic indicators

INTRODUCTION

The functional banking system has a vital role in an economic growth. Traditionally, one of the main tasks of the banks has been transforming household deposits into loans that are used for investments (Duraj, Moci 2015, 483). In order to maintain the economic growth, the stability of banking industry is an interest of not only bank managers and shareholders, but of everybody operating in that economy. The financial crisis in 2008 and failure of some banks also in Europe showed the importance of continuous monitoring of bank performance.

Developing technology, extending selection of the services offered by banks, change in customer behavior, the integration, and changing regulations have defined the European banking industry during the last few decades. All these factors have increased the competition among the banks, and therefore increased the need for understanding and monitoring the bank performance. Bank management boards must be aware of the constantly changing environment in which the banks operate, and be able to recognize if there are any inefficient operations when they purse maximized profitability. In this environment, studying the determinants of bank profitability has become a popular method for understanding the components affecting the performance (Roman, Dănuleţiu 2013, 580).

The determinants of bank profitability vary between different areas and different time periods. There are no universal results that would apply for all the banks. Understanding the determinants for a specified bank or specified area at a specified time period enables to find out which determinants should be monitored. This gives information on how the bank profitability could be improved. Also, macroeconomic indicators give information on how the banks are affected by their economic environment and how efficient they are in responding to the changes in the economic environment.

Despite the fact that there are numerous studies about determinants of bank profitability conducted in Europe, there are not so many studies conducted in CEE area. This current thesis aims to fill this gap by studying banks from ten CEE countries. This paper also fills another gap

by extending the observable time period until 2017, as the recent years have not been studied yet in the CEE area. The combination of the determinants included in this thesis also differs from the ones in the studies conducted previously.

The aim of this paper is to investigate the relationship between independent bank-specific and macroeconomic indicators and bank profitability in CEE countries in the time period between 2003 and 2017. In the current paper the focus is on two research questions:

1. Which of the ten indicators chosen for the study had an impact on the bank profitability in the given time period?

2. Are the results of this thesis consistent with previous studies?

The financial statement data of 47 CEE country banks is collected from Thomas Reuters Eikon database for the 15-year period of 2003 to 2017. The number of banks in the final sample decreased to 38 due to some incomplete and missing data. Quantitative method using regression analysis based on panel data is used to investigate the relationships between the indicators and the profitability ratios. The bank profitability will be measured in terms of both return on assets and return on equity. The ten independent indicators contain two kinds of indicators; bank-specific indicators and macroeconomic indicators. The bank-specific indicators include bank size, capital adequacy, total loans, liquidity, net interest margin, credit risk, management quality and total deposits. Macroeconomic indicators include change in gross domestic product and change in inflation rate. The results will be compared with the results from previous studies to find out whether they are consistent.

The structure of the paper is as following. The first chapter provides theoretical background for the study. The first subchapters conclude the development of European banking industry during the last couple of decades and the importance of monitoring the banking industry. Third subchapter introduces the indicators of bank profitability, and the last subchapter includes the review of the previous studies. The second chapter introduces the data and the methodology used in this study. The empirical study, results, and discussion of the results are presented in the third chapter. The last chapter concludes the most important results.

1. THEORETICAL BACKGROUND

1.1. Overview of European banking industry

During the last couple of decades the European banking industry has gone through radical changes. The deregulation and integration of banking industry within European Union, and the technological advances among many other reasons have increased the competition between banks. To be able to compete with the others, the banks have been forced to find ways to improve their activities.

In 1993, European Union implemented the Single Market Programme (SMP), and since then banking industry in European Union and European Economy Area (EEA) member states has been driven by harmonized regulation that is aiming to create one single market (Casu, Molyneux 2003, 1865). As Berger (2007, 119-120) explains, a single banking license was created in order to enable the banks to operate in any of the member states. One of the most important factors in reducing the barriers of entry among member states of EU has been the implementation of one common currency, Euro.

The integration of banking industry in Europe has brought both advantages and disadvantages to the industry. Banks used to be dependent on the economic cycle of only the country they participate in. However, due to integration and cross-border banking, the stability of banking industry has increased as the risk related to changes in GDP has been spread to more than one country (Goddard *et al.* 2007, 1916). On the other hand, the integration has raised a question about responsibility for supervising the activities of the banks operating in more than one country. As Uhde and Heimeshoff (2009, 1299) explain, the so called "home country principle" takes place, meaning that the responsibility of supervising the activities is on the authorities on the home country. The host country has only limited power on the foreign bank activities. According to the authors, the cooperation between the authorities in different states is non-sufficient with regards to the supervision of banking activities.

Traditionally, the main task of the banks has been resource allocation, meaning the transformation of deposits into loans. In other words banks provide a way to transform the savings into investments. This is the main reason why banking sector has a huge impact on the economic growth (Erina, Lace 2013, 1). To ensure the economic development through productive investments, the performance of the banks should be stable and efficient (Menicucci, Paolucci 2015, 86-87). Another important task of banks, as Alper and Anbar (2011, 139) list in their study, is maintaining a payment mechanism. According to Sheppard (1996), this means creating a system in which a payer can transfer the payment directly from their own account to the payee's account.

As the competition has been increasing, the banks have been forced to extend the selection of the services they offer. Nowadays non-interest income has a significant impact on the banking industry. In addition to traditional banking services, many banks offer services such as insurances, pension funds and asset management (Goddard *et al.* (2007, 1914). According to the study, these non-interest income activities generate on average around 50% of the total profit for banks (*ibid.*, 1918) Moreover, the amount of these off-balance sheet activities is said to be growing continuously. At the same time, the importance of so-called relationship banking has increased. The relationship banking means that the bank gets the provisions from serving same customers repeatedly, and it indicates that the banks must not only compete in terms of profitability, but also in terms of customers. (*ibid.*, 1923)

The advancing information technology has had a significant effect on the banking industry (Fiordelisi *et al.* 2011, 1315). The ways how banks collect, store and process the information have developed, and along with developed systems for handling the information, there have been reductions in the related costs. During the last years, the importance of internet and mobile banking has been increasing. In order to be able to compete with the others, it is vital for banks to have a system to provide such services to their customers (Goddard *et al.* 2007, 1926).

The liberalization and integration of the banking industry has enabled the foundation of multinational financial institutions. Banks from different countries merging into one and bank acquisitions across the borders have become one way of how banks aim to gain advantage in the competition. Growing the bank size enables banks to benefit from economies of scale, as by increasing bank size, they are able to reduce the variable costs and improve their operating efficiency (Goddard *et al.* 2007, 1919). However, it is mentioned in the same study that from

over 1000 bank mergers took place in EEA member states during the period of 1997-2004, only less than half of those included banks from more than one member state. This correlates with the study by Uhde and Heimeshoff (2009), which claims that the amount of mergers among domestic banks is increasing, while the number of cross-border mergers is decreasing.

Also, as Goddard *et al.* (2007) suggest, by providing additional services such as insurances in addition to traditional banking services and becoming so called universal bank, operating efficiency can be improved. Providing the additional services, and at the same time reducing the dependence on traditional banking activities, is suggested to bring stability to the banks. Anyhow, while non-traditional banking services are suggested to increase the operating efficiency of the banks, the process of choosing the activities and monitoring the profitability of such activities should be carried through carefully. As DeYoung and Torna (2013) conclude in their study, in some circumstances these activities might increase the risk for failure.

Another change taking place within the industry, as Goddard *et al.* (2007, 1914) explain, is related to the customer behavior. Instead of traditional deposits, the number of customers preferring alternative savings and investment possibilities is increasing continuously. This movement is another factor that drives banks to extend the variety of the services they provide.

Starting from 2008-2009, the global financial crisis and the following recession have had an impact on the financial markets also in EU member states. New requirements related to capital and governance of banks have been established by the EU in order to improve the financial markets after the recession and to prevent similar crisis from taking place again (Fiordelisi *et al.* 2011, 1315). As an example, the authors mention that the regulators have published new requirements that give more importance on sufficient capital adequacy. This prevents banks operating mainly on debt, and in case the bank faces financial distress, it would help to reduce the risk of bankruptcy and maintain their level of performance without significant issues.

In many new European Union member states, especially in Eastern Europe, the banking sector grew very rapidly before the financial crises as a response for changes in legislation and financial institutions (Roman, Tomuleasa 2013, 372). Significant structural changes were made in order to fulfill the requirements EU has set for banks operating within its area. As a response for growth in the banking sector, the demand for loans increased extremely fast, and the efficiency and profitability of the banks peaked (*Ibid*., 372). For example in Latvia, the banking sector grew

faster than the overall economic environment (Erina, Lace 2013, 4). During the crisis, the number of loans decreased and the credit portfolio quality of banks deteriorated significantly. At the same time, the risks related to banking increased impacting the performance and profitability of many banks in these new member states (Roman, Tomuleasa 2013, 372).

1.2. Banking performance

Due to continuously growing competition within the industry, the importance of monitoring the performance of banks has increased. The management boards need to understand the policies and activities to be able to find ways to improve the performance of the bank (Adam, 2014). Ideally, any inefficiency in operations or resource allocation should be recognized and improved to enhance the performance and profitability (Paradi, Zhu 2012, 61). As Menicucci and Paolucci (2015) mention, the profitability is a vital precondition for the growth and survival of any business, including banks.

Profitable banks also bring stability to the entire financial system, as those banks have a better ability to response to negative changes in the economy (Menicucci, Paolucci 2015, 87). For this reason, the importance of European Central Bank (ECB) monitoring function is essential. ECB leads the banks to pursue stability in their performance in order to ensure the profitability and stability of the whole the banking sector (*Ibid*., 88)

The bank management boards must be able to predict and understand the changes in the environment so they can adjust their operations accordingly in order to maintain their performance also during and after the crises (Duraj, Moci 2015, 484). The financial crisis in 2008 also showed the importance of understanding the effect of environment and the determinants of bank performance and profitability (Fiordelisi *et al.* 2011, 1315). Therefore, numerous studies related to banking performance have been conducted and published in the EU after the financial crisis.

Many banks are listed in stock exchange, and for those banks monitoring and improving the performance is vital. Similar to the companies in all the other fields, the main objective of the banks is to generate maximum profit for their owners. As Beccalli *et al.* (2006) suggest, there is a correlation between the changes in operating efficiency and stock prices. This encourages the

bank management to find ways to improve the efficiency of their activities. Also, as Fiordelisi *et al.* (2011) suggest, the increased competition only strengthen the need to find ways to enhance the profitability in order to attract new shareholders. At the same time, the correlation between efficiency and stock prices causes some bank managers to take unnecessary risks in order to maximize the profitability. Sometimes, the reason for unnecessary risks might be related to the bonuses or commissions that managers will be rewarded with if the bank is able to generate enough profit (Erina, Lace 2013, 2).

Menicucci and Paolucci (2015, 88) mention that the presence of banks has reduced in terms of financial activities during the last few years. According to the authors the banking sector might be facing challenges and disintegration, as different member states may choose different approach for ensuring their own profitability. This might cause difficulties for the banks operating in more than one state. As Goddard *et al.* (2007) list, economic conditions, different cultures and the differences in legislation and financial institutions are the factors that might create barriers for cross-border banking in the European Union.

The main determinants of bank performance in EU, according to the study by Menicucci and Paolucci (2015), seem to be related to the already mentioned bank size, and capital strength of the banks. Capital strength is shown to lead to reduction in the cost of external financing which leads to higher profitability.

1.3. Determinants of bank profitability

The increased need for analyzing bank profitability has caused a movement from traditional ratio analysis to more complex measures of performance (Adam, 2014). Currently, most of studies focus on the relationships between the profitability and different indicators that may affect the profitability.

Bank profitability is in most cases investigated in terms of profitability ratios, with the main focus on return on assets (ROA) and return on equity (ROE) (Alper, Anbar 2011, 143-144). ROA is calculated by dividing net profit by total assets, and the ratio reflects how efficient the bank management is in using their assets (Athanasoglou *et al*. 2006, 4). The result can be interpreted as how much profit the bank has been able to generate per one unit of the currency

invested in the bank's assets. ROE is the ratio of net profit to total equity, and a measure of how efficiently the bank is using its equity. The result can be interpreted as how much profit the bank is able to generate per one unit of currency invested in equity.

Bank profitability is usually studied by investigating how the mentioned profitability ratios are affected by different indicators. The ultimate aim of these studies is to find out, which of these indicators have a significant impact on the profitability, and therefore can be classified as determinants of the bank profitability. Most of the studies divide the determinants of bank profitability into two different categories: internal indicators and external indicators. Internal indicators, also called bank-specific factors, are the factors that can be affected by the decisions of the bank's management. As Athanasoglou *et al.* (2006) mention in their paper, bank-specific factors are related to operating efficiency, risk and the size of the bank. On the other hand, the bank management is not able to have a direct effect on the external factors. These include industry-specific factors, such as banking concentration, and macroeconomic factors such as GDP and inflation rate (Athanasoglou *et al.* 2006).

Bank size in most of studies is measured by the natural logarithm of total assets. It is believed that with increasing size, banks would be able to benefit from economies of scale. For this reason, positive relationship between bank size and bank profitability can be expected (Roman, Tomuleasa 2013). However, it is argued that increasing the bank size past a certain limit would lead to decreasing profits, as the increasing bureaucracy and agency costs would begin to have a negative effect on the profitability (Athanasoglou *et al.* 2006, 5).

Capital adequacy reflects how well the bank is prepared to cover possible losses. This ratio is calculated by dividing equity with total assets. The higher the ratio, the less the bank need external financing and therefore the cost of capital is lower. Based on this, positive relationship is expected between capital adequacy and bank profitability (Alper, Anbar 2011, 144).

Credit risk is defined as the risk that the borrower is not able to fulfill their obligations to pay back the loans, which would cause financial loss for the bank. The credit risk can be measured by the ratio of provisions for loan losses to total loans. As Alexiou and Sofoklis (2009, 105) explain, the exposure for credit risk increases along with the increasing ratio. According to Athanasoglou *et al.* (2006, 11), increasing ratio indicates decreasing bank profitability.

Liquidity reflects the ability of the bank to finance their short-term obligations, and it can be considered as a measure of operational performance. Liquidity is usually measured by the ratio of liquid assets to total assets. As Adam (2014) mentions, usually the higher the ratio, the higher is the margin of safety for the bank. It is vital for the bank to have a possession of enough liquid assets, as without they would not be able to meet their obligations for providing liquidities (Roman, Dănuleţiu 2013, 583). The liquidity is expected to have a negative relationship with the profitability, as liquid assets do not provide very high returns.

Management quality measures the effect of how well the management board is aware of and how well they are controlling the performance of the bank. One way to calculate the management quality is to calculate the ratio of non-interest expense to total assets (Roman, Dănuleţiu 2013, 582). As Athanasoglou *et al*. (2008) explain, the impact on profitability is expected to be negative, as increasing ratio would mean that the amount on non-interest expenses relative to total assets is increasing, and that will cause a decrease in profitability.

Net interest margin, as Alper and Anbar (2011, 145) define, measures the difference between interest income and interest expenses, and it is calculated as a ratio of net interest income to total assets. Net interest margin is considered as an important measure of efficiency.

As Roman and Tomuleasa (2013, 375) mention, the ratio of total loans to total assets measures the exposure to credit risk. On the one hand, this ratio measures the income the bank gains from loans, and therefore a positive relationship with profitability might be expected. From bank's point of view there is always a risk related to the loans. For that reason, too many loans might lead to higher risk, which would deteriorate the asset quality. As the risk increases along with the ratio of total loans to total assets, a negative relationship with bank profitability might be expected (Alper, Anbar 2011, 144).

Total deposits is defined as a ratio of deposits to total assets. This is expected to have a positive relationship with bank profitability, as the more deposits the bank has and is able to transform into loans, the more profit is expected to be gained (Alper and Anbar 2011, 144). Deposits are the cheapest way to finance bank's assets, and for that reason it is the main source of financing of banks (Roman, Tomuleasa 2013, 375).

Annual GDP growth is used as a measure of economic activity. A positive impact on profitability is expected as increasing GDP indicates that the amount of loan requests increases along, causing an increase in profits for banks. Also, when the economy is growing, the credit risk for banks tend to decrease, meaning there will be less customers who are not able to fulfill their obligations related to loan paybacks (Alexiou, Sofoklis 2009, 104). On the other hand, when GDP decreases, the banks might face credit risk, and the profit might be decreasing along with the decreasing amount of loan requests (Roman, Tomuleasa 2013, 376).

For measuring annual inflation rate, the customer price index (CPI) is used (Alper, Anbar 2011, 145). Whether inflation is expected to have a positive or negative impact on bank profitability is a bit controversial. In many studies it is suggested that the expected impact is related to whether the changes in inflation are expected or not. In case the change is expected, banks have time to adjust their interest rates into the right level, and the increase in inflation stays below the increase in the bank revenues. In case the change is not expected and banks do not have time to adjust their interest rates, they might have a loss in their profits as the increase in inflation increases the expenses. (Athanasoglou *et al*. 2006, 6)

1.4. Review of previous studies

Erins and Erina (2013) study banks' profitability indicators in Central and Eastern European countries during the years 2006 to 2012. The study employs return on average assets (ROAA) and return on average equity (ROAE) as bank profitability indicators, capital, credit risk, total loans, net interest margin, and size as internal factors, and gross domestic product and annual inflation as external indicators. The results indicated that there are interconnections between profitability and the variables listed above, and that most of the indicators might not have a direct effect on the profitability, but an indirect effect. Only the indicators that affect ROAE, mainly credit risk and bank size, were found to have a direct effect on the profitability.

A study by Roman and Tomuleasa (2013) analyze the profitability determinants in new EU member states based on the data of 86 commercial banks from seven countries. The period chosen for the study covers the years from 2003 to 2011. The study covers the evaluation of both internal and external factors of the bank profitability. The results indicate the determinants that had the greatest effect in most of the countries are ratio of non-performing loans, cost-to-income

ratio, bank size, annual GDP growth and inflation. It is also found that the impact of the variables varies from country to another, and for some ratios the sign of the coefficient varies depending on the country.

Roman and Dănuleţiu (2013) study the determinants of bank profitability in Romania between the years 2003 and 2011. The results indicate that from the internal indicators studied only non-performing loans, management quality measured by non-interest expense divided by total assets, and liquid assets have an effect on the bank profitability. From macroeconomic indicators included in the study only bank concentration and GDP are found to have an impact on the profitability.

Erina and Lace (2013) investigate the impact of internal and external indicators on the bank profitability indicators in Latvian commercial banks between the years 2006 and 2011. As a result the authors suggest that there are interconnections between bank-specific and macroeconomic indicators. They also suggest that operational efficiency, portfolio composition and asset management have a positive impact on ROAA, while credit risk and capital may have a negative impact. When using ROAE as a profitability indicator, the results indicated that only portfolio composition has a positive impact, while credit risk and operational efficiency have a negative impact. From the external factors, the results show that the GDP might have a positive impact on the profitability measured by both ROAA and ROAE.

Titko *et al.* (2016) examine the drivers of bank profitability in Latvia and Lithuania in years 2008-2014 using both financial and non-financial measures. The results suggest that in Lithuanian banking industry, there is a positive relationship between profitability measured as ROE and the amount of total deposits. Based on Latvian data, the same relationship was not found.

Jílková and Stránská (2017) examine the impact of the economic situation on the profitability of banks in Czech Republic during the period of 2004-2015 based on selected internal and external variables. The results show that the financial crisis on 2008/2009 had a negative impact on macroeconomic indicators in Czech Republic. From all the variables included in the study, ROA is found to be affected only by capital adequacy. The return on equity is found to be affected positively by ROA and balance sheet total, and negatively by interest rate.

Athanasoglou *et al.* (2006) conduct a study of bank-specific, industry-specific and macroeconomic determinants in Greek banking industry in 1985-2001. The results show a positive impact of capital, labor productivity growth and expected inflation on the profitability, while credit risk and operating expenses are shown to have a negative impact on profitability. Industry-specific determinants are not found to have an impact on the profitability.

Another paper by Athanasoglou *et al.* (2008) study of bank-specific, industry-specific and macroeconomic determinants in seven Southern European region (SEE) countries based on the data from 1998-2002. The results suggest a negative impact of credit risk and operating expenses, while inflation has a positive impact on profitability when measured using both ROA and ROE and bank size and capital have an impact on ROA.

Greek banking industry is studied also in the paper written by Alexiou and Sofoklis (2009). The data of six major Greek banks from 2000 to 2007 is collected and analyzed. The results seem to be consistent with the two studies as Alexiou and Sofoklis also find a positive impact of inflation, bank size and capital, and a negative impact of credit risk. In addition, the study shows the negative effect of cost to income ratio and bank liquidity on the profitability.

Duraj and Moci (2015) investigate the determinants of bank profitability in Albania. The sample consists of 16 banks, and the data analyzed covers the period 1999-2014. ROE is chosen as dependent variable, and the results show that has a positive relationship with deposit/loans ratio and GDP level, and negative relationship with inflation rate and total loan level.

As a conclusion, based on the previous studies conducted in Europe, the main determinants of profitability are bank size, capital adequacy, credit risk, and changes in GDP and inflation rate. The impact of bank size, changes in GDP and changes in inflation rate has been found to be positive in most cases, while the impact of credit risk has been found to be negative. For capital adequacy, both positive and negative impacts have been found in the previous studies.

2. DATA AND METHODOLOGY

2.1. Data

As OECD defines, Central and Eastern European countries (CEE) include 12 countries; Albania, Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic, and Slovenia. Due to lack of relevant data provided for Albania and Latvia, these countries were excluded from the current study. As Roman and Tomuleasa (2013) define, these are the new EU member states, as most of the countries joined the EU in 2004, except for Bulgaria and Romania who joined in 2007 and Croatia joining only in 2013.

The sample includes 47 banks from CEE countries, and the data from the period between 2003 and 2017 is analyzed. The distribution of the banks between the countries is following; Bulgaria 5 banks, Croatia 11 banks, Czech Republic 2 banks, Estonia 1 bank, Hungary 2 banks, Lithuania 1 bank, Poland 16 banks, Romania 3 banks, Slovakia 4 banks, and Slovenia 2 banks.

From the data set, some extremely high or low values were excluded to avoid biases in the regression analysis. In the final data set, all the values for ROA set between -50 and 50, and for ROE the values are between -100 and 100. The excluded values were mainly from Croatia in the year 2013, when the country joined the EU. That year, some of the Croatian banks had extremely low values for ROE. However, the regression analysis was also run using the whole data set, including the deleted values, and it was noticed that the main results were not significantly affected.

Table 1. Indicators, abbreviations, formulas and expected signs

Indicator	Abbreviation	Formula	Expected association
Profitability			
Return on assets	ROA	Pretax net profit / total assets	
Return on equity	ROE	Pretax net profit / total equity	
Bank-specific indicators			
Bank size	S	Natural logarithm of total assets	+
Capital adequacy	CA	Total equity / total assets	+
Total loans	TL	Total loans / total assets	-
Liquidity	LIQ	Liquid assets / total assets	-
Net interest margin	NIM	Net interest income / total assets	+
Credit risk	CR	Provisions for loan losses / total loans	-
Management quality	QUA	Non-interest expense / total assets	-
Total deposits	D	Total deposits / total assets	+
Macroeconomic variables			
Change in gross domestic product	CGDP	Annual growth of GDP	+
Change in customer price index	CCPI	Annual growth in CPI	+/-

Notes: "+": positive association is expected, "-": negative association is expected

The financial statement data and most of the ratios are gathered from Thomson Reuters Eikon database. The macroeconomic data for changes in GDP and CPI was collected from International Monetary Fund (IMF) database. The remaining ratios, total loans to total assets, credit risk and management quality, were calculated by the author.

The final results are based on 319 observations for both ROA and ROE. 38 cross-sectional units, in other words banks, were included in the regression analysis. Some banks were excluded while running the models using Gretl due to the lack of information provided.

To measure the profitability, return on assets (ROA) and return on equity (ROE) were chosen as dependent indicators. In order to exclude the differences caused by differences in tax rates between the countries, pre-tax net profit was chosen for calculations.

Eight different bank-specific indicators are included in this study as explanatory variables. These indicators are used to measure the asset quality (total loans, TL), bank size (S), capital adequacy (CA), credit risk (CR), deposits (D), liquidity (LIQ), income-expenditure structure (Net Interest Margin, NIM), and management quality (QUA). Two indicators are used to study the effect of macroeconomic environment: the annual GDP growth rate (CGPD) and the annual inflation growth rate (CCPI). The detailed explanations of the indicators can be found in the chapter 1.3. The indicators, the abbreviations used in the tables, the formulas, and the expected signs of the indicators are concluded in the Table 1.

Table 2 provides the descriptive statistics of the main features of the sample data. The table includes the mean value of each variable, the maximum and minimum values, and the standard deviation.

Table 2. Descriptive statistics of the variables used in the study

	mean	max.	min.	std.dev.
Pretax ROA	0.815	34.098	-32.039	3.505
Pretax ROE	8.875	78.606	-98.935	19.035
Bank size (S)	14.672	18.080	8.278	2.025
Capital adequacy (CA)	10.863	98.736	-209.798	12.911
Total loans (TL)	63.690	96.899	2.829	15.246
Liquidity (LIQ)	13.750	66.590	0.012	10.864
Net interest margin (NIM)	3.066	11.620	-0.731	1.369
Credit risk (CR)	1.047	8.494	-16.492	1.594
Management quality (QUA)	3.793	32.605	0.374	2.424
Total deposits (D)	74.972	93.224	1.940	15.114
Change in GDP (CGDP)	3.110	11.087	-14.814	3.216
Change in CPI (CCPI)	2.537	15.370	-1.601	2.561

Sources: Author's calculations based on data obtained from Eikon

The descriptive statistics show that the average ROA in the sample during the time period under the investigation is 0.82% and, ROE 8.88%. The minimum and maximum values show that there are significant differences in the ratios, and the values for standard deviations, especially for ROE provides support for that there are radical variances. The high values of standard deviation for capital adequacy, total loans, liquidity and total deposits suggests high volatility in the ratios between different banks and different years. The big differences between minimum and maximum values provide support for that claim. The average growth in GDP in CEE countries based on the observations has been 3.11% and the average growth in inflation 2.54%. The amount of loans equals on average 63.69% of the amount of total assets. The amount of deposits equals on average 74.97% of the value of total assets. The average liquidity suggests that on average 13.75% of total assets is consisted of liquid assets.

2.2. Methodology

This thesis used the method applied in similar studies (Alper, Anbar 2011; Roman, Tomuleasa 2013; Roman, Dănuleţiu 2013). Regression analysis based on panel data is used to investigate the associations between dependent and set of independent variables, in the current paper namely explanatory indicators and bank profitability (Klimberg *et al*. 2015, 134).

As Alper and Anbar (2011, 145) explain, the panel data consists of two dimensions, time series and cross-sectional units. According to Roman and Dănuleţiu (2013, 584), the panel data helps to investigate how the cross-sectional units, in this paper banks, behave over the time period chosen.

In addition to showing whether the relationship exists or not, the results also indicate the relative impact each independent variable to the dependent variable. As the aim of the current paper is to study the impact of different indicators to the profitability, regression analysis was decided to be an appropriate method to use.

In the current paper, the regression model used is stated as follows:

$$Prof_{it} = \alpha_i + \beta_1 S_{it-1} + \beta_2 CA_{it-1} + \beta_3 TL_{it-1} + \beta_4 LIQ_{it-1} + \beta_5 NIM_{it-1} + \beta_6 CR_{it-1}$$
$$+ \beta_7 QUA_{it-1} + \beta_8 D_{it-1} + \beta_9 CGDP_{it-1} + \beta_{10} CCPI_{it-1} + \varepsilon_{it}$$

where

$Prof_{it}$ – profitability of *bank i* in the year *t*, measured in terms of ROA or ROE,

α_i – constant,

β – coefficient,

S_{it-1} – size of bank *i* in the year *t-1*,

CA_{it-1} – capital adequacy of bank *i* in the year *t-1*,

TL_{it-1} – total loans of bank *i* in the year *t-1*,

LIQ_{it-1} – liquidity of bank *i* in the year *t-1*,

NIM_{it-1} – net interest margin of bank *i* in the year *t-1*,

CR_{it-1} – credit risk of bank *i* in the year *t-1*,

QUA_{it-1} – management quality of bank *i* in the year *t-1*,

D_{it-1} – total deposits of bank *i* in the year *t-1*,

$CGDP_{it-1}$ – change in gross domestic product in the state in which the bank *i* is operating in the year *t-1*,

$CCPI_{it-1}$ – change in customer price index in the state in which the bank *i* is operating in the year *t-1*,

ε_{it} – regression residual/error term.

Either fixed or random effects model are traditionally used to estimate the panel data models. According to Alper and Anbar (2011, 147), in fixed effect model, the individual-specific effect is allowed to correlate with the explanatory variables, while in the random effects model, the individual-specific effect is uncorrelated with the explanatory variables. As it is mentioned in their paper, if the study focuses on a specific set of firms and on the behavior of these firms, fixed effects is more relevant. For this reason, main results are based on fixed effects models to analyze the associations between bank profitability and different explanatory variables in the current paper. The random effects model using country-specific dummies was run as a robustness test.

The data from Thomas Reuters Eikon is transferred into Excel, where the remaining ratios and table for descriptive statistics are created. Finally, Gretl software is used for correlation matrix and regression analysis. To avoid biases, the constant term (intercept) was added in the model, and the explanatory indicators were lagged by one period to allow weak endogeneity among explanatory variables. From the results, the coefficient, p-value of the individual indicators and of the whole model, and the R-square (R^2) are analyzed.

The coefficient indicates the strength and the sign of the correlation. Positive coefficient indicates positive association, in other words, when the specific explanatory indicator is increasing, the dependent indicator is growing along. The negative sign indicates reverse association, meaning that the dependent indicator is decreased when the explanatory indicator is increasing. The higher the coefficient, the more the dependent variable changes per one unit of change in the independent variable. P-value shows whether the correlation is significant at some significance level. In this study, the results are analyzed using the following three significance levels: 90% ($p < 0.1$), 95% ($p < 0.05$) or 99% ($p < 0.01$). If the p-value of the explanatory indicator is below one of the values mentioned, the correlation can be stated to be significant at that particular significance level. The R-square indicates which proportion of the variance in dependent indicator is caused by the independent indicators (Tahir, Bakar 2009). The higher the value, the bigger proportion explained by employed explanatory variables.

3. RESULTS AND DISCUSSION

The correlation matrix is used to investigate the relationships between the variables included in the study. As Roman and Dănulețiu (2013) explain, the correlation matrix gives the relationship a value between 1 and -1 based on how strong the relationship between the variables is. The value of 1 implies the perfect correlation between the indicators, and -1 implies a perfect reversed correlation. As the authors mention referring to the study by Gujarati (2004), the higher is the correlation, the higher is the probability for the multicollinearity problem. When the correlation exceeds 0.8, the problem of multicollinearity is most likely faced. The correlation matrix composed of the indicators used in this study can be found on the Appendix 1. As the results shows, the problem is avoided in the current paper as all the values remain below 0.8. The highest positive correlation exist between return on assets and return on equity (0.761), and the highest negative correlation between return on assets and management quality (-0.494).

The regression results when ROA is dependent variable are presented in Table 3 and results when ROE is dependent variable are presented in Table 4. The R square (R^2) value for ROA is 0.587. This implies that 59% of the variability in the ROA is explained by the variability in explanatory indicators. Thus, 41% of the variance is caused by other factors not included in the study. Similarly, for the ROE the value of (R^2) is 0.519, meaning that about half of the variability is caused by the variability in independent indicators, and 48% of the variability is explained by external factors. The p-value of the models for both ROA and ROE are below 1% significance level, so the results from both models can be stated to be statistically significant.

Table 3. Results from regression analysis, ROA

	coefficient	std. error	t-ratio	p-value	
Const	16.160	4.589	3.521	0.001	***
S	-0.870	0.275	-3.162	0.002	***
CA	-0.094	0.038	-2.490	0.013	**
TL	-0.008	0.007	-1.115	0.266	
LIQ	-0.003	0.015	-0.209	0.834	
NIM	0.780	0.116	6.752	<0,001	***
CR	-0.147	0.074	-1.996	0.047	**
QUA	-0.506	0.080	-6.334	<0,001	***
D	-0.002	0.010	-0.170	0.865	
CGDP	0.020	0.027	0.757	0.450	
CCPI	-0.090	0.036	-2.503	0.013	**
R-squared					0.587
P-value(F)					<0,0001

Sources: Author's calculations

Notes: 1. *, **, *** indicates the significance at 10%, 5%, and 1% levels, respectively
2. For variable abbreviations, see Table 1.

Table. 4. Results from regression analysis, ROE

	coefficient	std. error	t-ratio	p-value	
Const	180.202	43.303	4.161	<0.001	***
S	-8.452	2.596	-3.256	0.001	***
CA	-1.506	0.356	-4.233	<0.001	***
TL	-0.129	0.066	-1.942	0.053	*
LIQ	-0.134	0.139	-0.967	0.335	
NIM	5.761	1.090	5.284	<0.001	***
CR	-1.791	0.695	-2.577	0.011	**
QUA	-1.891	0.754	-2.507	0.013	**
D	-0.233	0.098	-2.372	0.018	**
CGDP	0.108	0.253	0.428	0.669	
CCPI	-0.893	0.340	-2.627	0.009	***
R-squared					0.519
P-value(F)					<0,0001

Sources: Author's calculations

Notes: 1. *, **, *** indicates the significance at 10%, 5%, and 1% levels, respectively
2. For variable abbreviations, see Table 1.

As the table 3 shows, when using return on assets as a measure of profitability, six indicators are shown to have a significant impact: bank size (S), capital adequacy (CA), net interest margin (NIM), credit risk (CR), management quality (QUA), and change in inflation rate (CCPI). However, as seen on the table 4, the return on equity is affected by almost all the independent variables, except for liquidity (LIQ) and change in GDP (CGDP). The indicators that have an impact on both models are bank size(S), capital adequacy (CA), net interest margin (NIM), credit risk (CR), management quality (QUA), and changes in inflation rate (CCPI).

Against the initial expectations, the bank size (S) has a significant negative impact on both ROA and ROE at 1% significance level. An increase of one unit in the bank size causes 0.87 unit decrease in the profitability measured by ROA. The impact on ROE is even higher; a change of one unit of size causes an 8.5 unit decrease in profitability. As it was explained in the chapter 1.3., at some point the benefits gained from increased bank size turn into disadvantage, as the costs related to bureaucracy increase. According to the results, the banks in CEE countries have passed the turning point, and experience now the declining benefits. This negative relationship between bank size and profitability was also found by Roman and Tomuleasa (2013) in Bulgaria, the Czech Republic, Latvia and Lithuania. Also, as the authors explain referring to the study by Barros *et al.* (2007), bigger banks with more diversified operations might be performing worse than smaller banks, which are able to decrease the problems related to asymmetric information. On the other hand positive relationship between the bank size has been found by Roman and Dănuleţiu (2013) in Romania and by Erins and Erina (2013) in CEE countries.

Capital adequacy (CA) is shown to have a negative correlation with the profitability measured in terms of both ROA and ROE at 5% and 1% significance levels, respectively. For the ROA, the impact is very small, as the coefficient is only -0.09. For ROE, the coefficient of -1.5 indicates that the profitability declines by 1.5 units when the ratio increases by 1 unit. The negative sign of the coefficient was not expected, but for example latest financial crises in Europe have been seen to be one factor causing the negative correlation in certain countries (Roman, Tomuleasa, 2013). This result correlates the study by Roman and Tomuleasa (2013), in which the authors found the negative correlation between capital adequacy and profitability in Bulgaria, Czech Republic, Latvia and Lithuania. Contradictory results have been found by Jílková and Stránská (2017) in the Czech Republic and by Roman and Dănuleţiu (2013) in Romania, as in both studies the positive correlation between the capital adequacy and bank profitability was found. In the Czech

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Republic, the correlation was found specifically between ROA and CA, but in Romania the correlation was found using both measures of profitability.

Total loans (TL), as expected, have a slight negative impact on return on equity at 10% significance level. The coefficient of -0.13 indicates that when the amount of loans relative to total assets increases, the profitability is decreased slightly. This result is in accordance with the study by Roman and Tomuleasa (2013), in which the significant negative correlation was found in the banks in Bulgaria, Lithuania and Poland. As the authors explain, the amount of non-performing loans and loan loss reserves increased during the financial crises, and that causes the negative impact on the profitability.

The net interest margin (NIM), according to the expectations, has a significant positive effect on both ROA and ROE at 1% significance level. According to the results, when NIM increases by 1 unit, the ROA is impacted by 0.78 units. When looking at the results using ROE, the net interest margin is the only internal indicator that is found to have a significant positive correlation with the profitability. The coefficient of 5.76 indicates a notable impact, as the profitability is increased by 5.76 units when the net interest margin increases by only one unit.

According to the expectations, the credit risk (CR) is shown to have a negative effect at a 5% significance level on both ROA and ROE. The coefficients of -0.15 and -1.79 indicate that a change of 1unit in the credit risk results in the reverse change of 0.15 and 1.79 units, respectively. This result is in line with the studies by Erina and Lace (2013), and Erina and Erins (2013), in which the negative relationship between credit risk and profitability was also found in Latvian and CEE countries' banks, respectively.

As predicted, the results show that the management quality (QUA) has a negative impact on the ROA at 1% significance level. The increase of one unit in the indicator causes a decrease of 0.5 units in the profitability measured in terms of ROA. Similarly to the results using ROA, also using ROE shows the negative correlation between management quality and profitability at a 5% significance level. An increase by 1 unit in the ratio causes a 1.9 unit decrease in the profitability. The result correlates with the study by Roman and Dănuleţiu (2013), in which the similar negative relationship was found in Romanian banking industry.

On the contrary to the initial expectations, the results show that the total deposits (TD) have a negative impact on the profitability measured in terms of ROE at a 5% significance level. The coefficient of -0.23 implies that for 1 unit change in the total deposits, there is a 0.23 unit reversed change in the profitability. The result matches the results by Roman and Tomuleasa (2013) that found the negative relationship in Hungary, Poland and Romania. As the authors explain, one possible reason for the unexpected sign might be in financial crisis. During the crises, the banks have been forced to attract the deposits at higher costs, which led to decreased net profit margin. However, the contradictory results were observed in the study by Titko *et al.* (2016) in Lithuania. The results of their study showed the positive relationship in terms of both ROA and ROE at 1% significance level.

From the macroeconomic indicators, the change in inflation rate measured by the change in customer price index (CCPI) is the only one found to have an impact on the profitability. When measuring the profitability in terms of ROA, the coefficient of -0.09 indicates small decrease of 0.09 in ROA when the CPI is increased by one unit. In terms of ROE, the negative sign shown at the 1% significance level suggests that the increase of one unit in inflation causes a decline of 0.89 percent in the profitability. The result indicates that the banks in CEE countries have experienced disadvantages from the unexpected changes in inflation rates. This may indicate that the increase in the costs related to the daily operations has exceeded the benefits gained from increase in interest rates, similar to the results discovered in Albanian banking industry by Duraj and Moci (2015, 492). This result also correlates with the results by Roman and Tomuleasa (2013), in which the inflation rate was found to have a significant impact on the profitability. However, whether the impact was positive or negative varied from country to country based on how well the countries had been able to predict the changes in inflation rate.

From the internal indicators, total loans (TL) and liquidity (LIQ) were not found to have an impact on the return on assets at any significance level. When using return on equity as a measure of profitability, the only indicator with no correlation at any significance level was liquidity (LIQ). From the macroeconomic indicators, on the contrary to studies by Roman and Dănuleţiu (2013), Erina and Lace (2013) and Roman and Tomuleasa (2013), the CGDP was not found to have a significant impact on the profitability measured by either ROA or ROE at any significance level.

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The random effects model using country-specific dummies was run as a robustness test. The results for random effects model using ROA and ROE are shown in the appendices 2 and 3, respectively. In the calculations, the country-specific dummy for Lithuania was omitted due to multicollinearity, and the dummy for Slovenia was omitted due to lack of information. The results for bank-specific and macroeconomic indicators remained relatively stable when comparing with the results from the fixed effects model. However, some of the variables lost their significance. The analysis shows no significant associations between country-specific dummies and bank profitability.

CONCLUSION

Bank profitability analysis is a vital tool for bank management to find out any possible inefficiency in their operations, and to be able to improve the bank activities and performance. The improved bank performance contributes to improved stability in the entire banking industry, which, in turn, contributes to the growth in the economy.

Increased competition, developing technology, integration of European banking industry and the movement from traditional banking activities to non-interest banking activities and alternative savings have defined the European banking industry during the last decades. The bank management must be able to monitor these changes in the environment in order to find the ways to improve the performance and to be able to compete with other banks. The financial crisis in 2008 showed the importance of understanding not only the impact of the environment to the bank performance, but also the determinants of the bank profitability.

The aim of the current thesis was to investigate the relationships between bank-specific and macroeconomic indicators and bank profitability. The sample chosen for the current paper consisted of banks from ten different Central and Eastern European countries. Based on the data of 38 banks from the time period 2003-2017, regression analysis was used to study the correlations between the indicators and bank profitability. Bank-specific indicators studied were bank size, capital adequacy, total loans, liquidity, net interest margin, credit risk, management quality and total deposits. Macroeconomic indicators included in the study were change in inflation rate measured as the change in customer price index, and change in GDP.

Overall, the results indicated that the bank profitability is affected mostly by bank-specific indicators, or in other words the factors based on the management decisions. The empirical results showed that five bank-specific indicators had a significant effect on the bank profitability measured in terms of both return on assets and return on equity. These indicators were bank size,

capital adequacy, net interest margin, credit risk and management quality. Out of these indicators, positive association was found only between net interest margin and the profitability. The rest on the indicators were shown to have negative associations with the profitability. In addition, total loans and total deposits were found to have a significant negative impact on the profitability measured in terms on ROE. From the macroeconomic indicators, only change in customer price index was shown to have a negative significant correlation with both ROA and ROE. The rest of the indicators, liquidity and change in GDP when profitability was measured in terms of both ROA and ROE, and total loans and total deposits when profitability was measured in terms of ROA, were not found to have a significant correlation at any of the significance levels included in the study.

The negative association between bank size and bank profitability implied that, despite the initial expectations, the banks in CEE countries have passed the point until which increasing bank size increases the profits due to the economies of scale. The impact of financial crisis was found when studying two indicators, total loans and total deposits. The negative impact of total loans implied that one consequence of financial crises was that some customers were not able to pay back their loans, and the amount of non-performing loans increased. The negative association between total deposits and bank profitability implied that the banks tried to attract deposits at higher costs during the crisis. The negative association between change in inflation rate and bank profitability implied that the cost for the bank caused by increased inflation rate exceeded the increase in the interest income.

As it was seen in the review of previous empirical studies, the indicators that have a significant impact on profitability vary from study to study, and therefore the universal results do not exists. Therefore, the consistency between the results from this paper and the previous studies could not be fully confirmed. Both correlating and contradictory results could be found for most of the indicators when reviewing previous studies.

Some restrictions were present in the current study due to the lack of the relevant data available in the database used. For this reason, two CEE countries, Latvia and Albania, were excluded from the study. Another restriction concerned the amount of available data. Despite that the data from 47 banks were collected, only 38 could be included in the study. Nine banks did not provide enough data to be included in the regression analysis. For the further studies, the method for collecting data or the database could be changed in order to be able to collect more data. The

data used in this study was restricted only to the banks that have been incorporated in the CEE countries. For further studies, the data from foreign bank branches operating in CEE countries could also be included in order to be able to collect more data.

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APPENDICES

Appendix 1. Correlation matrix

	ROA	ROE	S	CA	TL	LIQ	NIM	CR	QUA	D	CGDP	CCPI
ROA	1.000											
ROE	0.761	1.000										
S	0.289	0.366	1.000									
CA	0.138	0.005	-0.136	1.000								
TL	0.068	-0.113	0.279	-0.112	1.000							
LIQ	-0.086	-0.050	-0.346	-0.133	-0.304	1.000						
NIM	0.446	0.416	0.061	0.096	0.083	-0.030	1.000					
CR	-0.193	-0.263	0.175	-0.124	0.072	0.026	0.327	1.000				
QUA	-0.494	-0.309	-0.341	0.161	-0.291	0.136	0.162	0.017	1.000			
D	-0.042	-0.146	0.124	0.022	0.243	0.092	-0.286	0.027	-0.133	1.000		
CGDP	0.160	0.305	0.066	-0.010	-0.116	0.039	0.157	-0.257	0.040	0.071	1.000	
CCPI	0.203	0.244	-0.058	0.061	-0.198	0.115	0.381	-0.049	0.170	-0.207	0.167	1.000

Sources: Author's calculations
Notes: For variable abbreviations, see Table 1.

Appendix 2. Random effects model with country dummies using ROA

	coefficient	std. error	z	p-value	
Const	2.453	2.304	1.064	0.287	
S	-0.055	0.141	-0.390	0.697	
CA	-0.032	0.032	-0.996	0.319	
TL	-0.015	0.007	-2.228	0.026	**
LIQ	0.009	0.014	0.627	0.531	
NIM	0.888	0.104	8.501	<0.0001	***
CR	-0.191	0.070	-2.717	0.007	***
QUA	-0.394	0.063	-6.307	<0.0001	***
D	-0.004	0.010	-0.373	0.709	
CGDP	0.023	0.027	0.851	0.395	
CCPI	-0.053	0.034	-1.553	0.120	
Slovakia	-0.716	1.071	-0.669	0.504	
Bulgaria	-0.029	1.076	-0.027	0.979	
Poland	0.280	1.041	0.269	0.788	
Czech Republic	0.156	1.255	0.124	0.901	
Croatia	-0.071	1.039	-0.068	0.946	
Hungary	-1.304	1.280	-1.018	0.308	
Estonia	-0.142	1.490	-0.095	0.924	
Romania	-0.838	1.165	-0.719	0.472	

Sources: Author's calculations

Notes: For variable abbreviations, see Table 1.

Appendix 3. Random effects model with country dummies using ROE

	coefficient	std. error	z	p-value	
Const	49.335	26.372	1.871	0.061	*
S	-0.536	1.583	-0.339	0.735	
CA	-1.149	0.320	-3.596	0.000	***
TL	-0.166	0.064	-2.608	0.009	***
LIQ	-0.011	0.133	-0.083	0.934	
NIM	6.774	1.025	6.607	<0.0001	***
CR	-1.903	0.679	-2.802	0.005	***
QUA	-0.612	0.624	-0.981	0.326	
D	-0.233	0.095	-2.463	0.014	**
CGDP	0.132	0.253	0.522	0.602	
CCPI	-0.498	0.325	-1.531	0.126	
Slovakia	-12.865	13.633	-0.944	0.345	
Bulgaria	-1.059	13.626	-0.078	0.938	
Poland	-1.558	13.109	-0.119	0.905	
Czech Republic	-0.415	15.689	-0.026	0.979	
Croatia	-6.673	13.098	-0.510	0.610	
Hungary	-21.638	15.840	-1.366	0.172	
Estonia	-0.606	18.169	-0.033	0.973	
Romania	-15.907	14.583	-1.091	0.275	

Sources: Author's calculations

Notes: For variable abbreviations, see Table 1.