Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Trade and Finance

Diploma Thesis

The impact of selected indicators on the profitability development of banks in the Czech Republic

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CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

DIPLOMA THESIS ASSIGNMENT

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The impact of selected indicators on the profitability development of banks in the Czech Republic

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Objectives of thesis

The main objective is to identify the factors determining the profitability of banks operating in the Czech Republic. The idea is to examine and evaluate the impact of key economic indicators influencing the development of banking sector in the Czech Republic.
For this reason, the main research question has been stated as follows: "To what extent could selected economic indicators influence the profitability of banks in the Czech Republic?"
The second research question relates to the first one and has been formulated this way: "Which economic indicator has the biggest impact on ROA of the banks and foreign bank branches in the Czech Republic?"

Methodology

The object of the research is the Czech banking sector and three selected commercial banks. The study contains primary as well as secondary data that were collected and then further processed and analyzed to assess the development of banking system after crisis and the impact of the key indicators. Analyzed period consists of 10 years of observations from 2008 to 2017. Furthermore, conducted research includes also economic analysis and elements of financial analysis. Correlation analysis has been carried out to determine the strength of the relationship between selected variables. In the end of the practical part, all significant factors analyzed before have been put together and incorporated into a single econometric model for the purpose of assessing the impacts of selected exogenous variables on endogenous one.

The proposed extent of the thesis

70 pages

Keywords

Banking, commercial, finance, sector, variables, modelling, trend, factors

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Recommended information sources

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Declaration

I declare that I have worked on my diploma thesis titled "The impact of selected indicators on the profitability development of banks in the Czech Republic" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the diploma thesis, I declare that the thesis does not break copyrights of any other person.

In Prague on 28th March 2019 _____

Bc. Karolína Straková

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The impact of selected indicators on the profitability development of banks in the Czech Republic

Summary

This diploma thesis focuses on the examination and assessment of the impact of selected macroeconomic and other indicators, expressed in year-over-year percentage growth on the profitability and especially on the rate of return of banking sector in the Czech Republic.

At first, theoretical part aims to define particular factors that can influence the performance of banks. Furthermore, concise description of basic banking principles and the system structure together with brief history of the Czech economy development have been included to outline the roots of the further researched issue.

In the very beginning, practical part contains the analysis of economic indicators, representative information about banking sector development as well as the performance evaluation of selected commercial banks. Moreover, based on processed data the practical part deals mainly with the construction of econometric model to find out the impacts of chosen exogenous variables on the return on assets of banks. After the model verification, the simulations and several scenarios are applied to obtain clear image about the relations and effects between selected indicators.

Keywords: Banking, commercial, finance, indicators, sector, variables, modelling, trend, factors

Vliv vybraných indikátorů na vývoj rentability bank v České republice

Souhrn

Tato diplomová práce se zabývá zkoumáním a hodnocením vlivů vybraných makroekonomických a dalších ukazatelů, vyjádřených v procentních meziročních růstech, na míru výnosnosti Českého bankovního sektoru.

V teoretické části jsou nejdříve definovány konkrétní faktory, které mohou mít vliv na výkonnost bank. Dále práce obsahuje popis základních principů bankovnictví a strukturu bankovního systému, stejně jako stručný historický vývoj České ekonomiky, který je důležitý pro uvedení do zkoumané problematiky.

Na samém začátku praktické části je vypracována analýza vývoje ekonomických ukazatelů a bankovního sektoru. Dále je zhodnocen výkon vybraných komerčních bank. Poslední kapitola praktické části je věnována konstrukci ekonometrického modelu, který slouží k nalezení a posouzení vlivů vybraných exogenních proměnných na rentabilitu aktiv Českých bank. Po verifikaci následuje samotná aplikace modelu v podobě scénářů a simulací za účelem posouzení vlivů a vztahů mezi jednotlivými ukazateli.

Klíčová slova: Bankovnictví, obchodní, finance, indikátory, sektor, proměnné, modelování, trend, faktory

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List of Abbreviations

CNB – Czech National Bank

CS – Česká spořitelna

CZSO – Czech Statistical Office

ČSOB – Československá Obchodní Banka

EAT – Earnings after taxes

EBIT – Earnings before interest and taxes

EU – European Union

GDP – Gross domestic product

GNP – Gross national product

KB – Komerční Banka

OLS – Ordinary Least Squares

PRIBOR – Prague Interbank Offered Rate

ROA – Return on Assets

ROE – Return on Equity

1. Introduction

The significance of the role banks play within any economy is indisputable. Banks and their operation can be considered the framework of both the state and global financial sector, and if managed correctly, they are capable of generating huge amounts of profit. Especially in the current global economy structure consisting of many types of economies with different paces of development, the demand for banking services and products is increasing. Apart from aforementioned important aspects, banks have the specific ability to control the real purchasing power by performing their daily activities, i.e. especially by providing loans.

Due to the favourable economic environment, some businesses and individuals are willing to invest more money, while other entities require funds at the same time. This natural cycle, based merely on the law of supply and demand, thus contributes to the overall development and welfare of society.

However, the banking system is very complex, and banks are often facing various types of risks, therefore in order to securely operate the state finances, it is necessary to gain further knowledge about the significant factors that may potentially influence the profitability of banks and investigate their relationship with each other. Although the development of macroeconomic factors itself does not pose a threat to the stability of the banking sector, the changes in various indicators do influence the performance of banks to some extent.

Globalization and interconnection of states banking sectors is a fundamental aspect of the current economy as well as future development. Banking internationalization from the perspective of ownership structure makes the financial market in the Czech Republic even more interconnected and globalized, and the growing number of foreign bank branches intending to expand to the Czech financial market together with newly arising domestic institutions undoubtedly contributes to the higher competition in this field. Regarding the banking sector in the Czech Republic, the rate of return of banks operating in this country is expected to be even higher than it is currently achieved by banks in Western Europe.

2. Objectives and Methodology

2.1. Objectives

The main objective is to identify the factors determining profitability of banks operating in the Czech Republic. The idea is to examine and evaluate the impact of key economic indicators influencing the Return on Assets of banking sector in the Czech Republic. Simultaneously, the secondary goal is to assess the impact of selected economic indicators, such as GDP growth, interest rate, unemployment, inflation rate etc. on the profitability of banks. Thoroughly conducted research takes into consideration these indicators related to the topic and therefore all the data together must be further analyzed.

For this reason, the main research question has been stated as follows: ***"To what extent could selected economic indicators influence the profitability of banks in the Czech Republic?"***

The second research question relates to the first one and has been formulated this way: ***"Which economic indicator has the biggest impact on ROA of the banks and foreign bank branches in the Czech Republic?"***

Results obtained from the conducted research has provided means to assess overall performance of Czech banking sector.

2.2. Methodology

The object of the research is the Czech banking sector in general, three selected commercial banks and last but not least mostly the return on assets of banks and foreign banks branches. The study contains primary as well as secondary data that were collected and then further processed and analyzed to assess the development of banking system after crisis and the impact of the key indicators. Theoretical part includes the methods of thorough analysis and synthesis of given literature that subsequently lead to more detailed familiarization with researched topic.

Due to the lack of data, analyzed period only consists of 10 years of observations from 2008 to 2017. All the data necessary for the study has been gathered from annual reports of banks and from public databases of the Czech Statistical Office and the Czech National Bank.

2.2.1. Banking sector, base indices

Analysis of banks and foreign bank branches in total is conducted based on the dataset gathered from the Czech Statistical Office and the Czech National Bank databases including the items such as number of banks, number of employees working in the sector, total value of assets in CZK million and earnings after tax in CZK million within the ten-year observation period.

Base index used to demonstrate the growth rate of banking assets in 2017 is computed as follows:

The value of total assets in base year (2016) denoted in CZK million…….. 100%
The value of total assets in observed year (2017)…….. x %

$$x = \frac{Value\ of\ assets\ in\ 2017}{Value\ of\ ssets\ in\ 2016}$$

Simultaneously, the index of the growth in banking earnings after tax is calculated in a similar way for the same year. In this case, the value of assets are naturally replaced by the values of net earnings. The outcome represents the percentage decrease or increase of assets/earnings in 2017 compared to the previous year.

2.2.2. Comparison of CS, ČSOB, KB

The data set containing the values of total assets as well as earnings after tax of Česká spořitelna, ČSOB and Komerční banka from 2008 to 2017 were collected from ARAD database and further analyzed for the purpose of evaluation and comparison of aforementioned banks´ performance.

The base indices were computed for each bank separately to measure their profit growth rate. The methods for index calculations are identical to those already demonstrated in the previous chapter 2.2.1.

Furthermore, based on the dataset including the values of total assets and net earnings of selected banks, the rate of return on assets was calculated for each year of the observation period for a particular bank separately. The formula is following:

$$ROA = \frac{Net\ income}{Average\ total\ assets} \times 100\ [\%]$$

Subsequently, from obtained results of ROA values, the average return on assets of each bank for the whole ten-year observation period is computed.

2.2.3. Econometric modelling

However, the main part of practical research includes the construction of econometric model for the purpose of assessing the impact of four selected exogenous variables on the endogenous one represented by the return on assets of banks in the Czech Republic. Linear regression and the estimation of parameters have been conducted via Gretl software using Ordinary Least Squares method.

First of all, the dataset containing the values of selected variables was created on the basis of information taken from the Czech Statistical Office and the Czech National Bank database. Dataset includes variables declared below. Variable *"GDP growth"* (x_{3t}) and *"Wages"* (x_{4t}) are denoted in percentage changes based on real growth adjusted for inflation.

Declaration of variables is as follows:

y_t ……ROA (Return on Assets) of banking sector in %
x_{1t} ……...Inflation Rate in %
x_{2t} ……PRIBOR (2 weeks; annual average) in %
x_{3t} ……Annual real GDP growth in %
x_{4t} ……Real wages annual change in %

Afterwards, the parameters were estimated via Gretl software. Subsequently, economic model verification has been carried out to ensure logical conformity. Based on R-squared value obtained from the Gretl output, the goodness of fit of the model has been evaluated. Statistical significance of estimated parameters has been tested on the basis of the p-value compared to the level of significance α. Therefore, the decision about the statistical significance of parameters depended on rejecting or not rejecting the Null hypothesis.

Econometric verification included the tests on multicollinearity, autocorrelation of residues, the presence of heteroscedasticity and normal distribution of the error term. Multicollinearity has been tested by simple correlation matrix. Breusch-Godfrey test has been used to find the autocorrelation of residuals, both for the first and second-order

autocorrelation. For the purpose of rejecting the undesirable presence of heteroscedasticity, both Breusch-Pagan as well as White test have been applied. Last but not least, the normal distribution of residues has been tested. At the end of the practical part, whole model is examined and used for the application through simulations and various scenarios.

3. Theoretical Part

3.1. Basic banking principles

Before defining and assessing particular macroeconomic and other factors that could have potential impact on banking sector performance, first chapter focuses on basic principles and aims of banks.

Commercial banks belong to the most significant financial institutions in every market economy. First of all, profit maximization as the main aim of the bank is identical with any other business. However, banking sector has a range of specific features that determine its unique position in the market. There are two points of view when defining a bank as a subject: a functional form and a legal form. Functional form takes into consideration the business and economic activities of the entity, whereas legal form is based on exact definition of a bank in the relevant legislation.

Usually, banks can be split into two classes according to the objects of their activity. *Universal banks* possessing full banking licence are able to provide services to the full extent and to all customers. On the contrary, *specialized banks* may operate for instance only in a certain region, sell solely specific type of products or focus on particular group of customers.

(Revenda et al., 2000)

Principles followed by commercial banks:

1. *Principle of Liquidity*

The ability to meet obligations in the short term belongs to the most important aspects when assessing health of any business and especially regarding banking sector. Since a bank needs to be capable of returning the money to clients almost immediately, it must be able to convert its assets into cash within a short period of time.

(Fernandes, 2016)

2. *Principle of Profitability*

Generally, for a business to be profitable a simple rule that revenues must exceed expenses applies. Undoubtedly, bank should make only such deals that appears to be

lucrative without potential losses. However, into certain extent there is always a risk connected with any operation which will be discussed further in the next point.

(Fernandes, 2016)

3. *Principle of Security*

Security in banking industry may be associated either with observing the regulations and operating procedures, principles of privacy or trying to avoid or at least limit various types of potential risks that banks face.

Some major types of risks that may occur are following:

Credit risk

Sometimes it happens that for various reasons a borrower fails to meet his or her liability when it comes due. Such a situation may occur either because of business failure, a lack of income, or simply due to client´s unwillingness to repay his/her debts. Credit risk means the loss in the value of credit assets.

(Perez, 2014)

Market Risk

Second type of risk includes several components arising from the fluctuations of factors influencing financial market. Obviously, *Interest rate risk* represents potential loss caused by the movements in interest rates. This risk results from the fact that liabilities of a bank have significantly shorter maturity than it assets.

Another type of market risk is caused by the fluctuations in *Foreign exchange rates* and thus it has a negative impact on value of assets or liabilities of a bank.

Commodity risk is the result of adverse changes in prices of commodities such as agricultural, industrial or energy ones. Due to the demand and supply changes, the value of commodities fluctuate and therefore these changes pose a threat for banks holding such investments.

(Perez, 2014)

Operational Risk

Operational risk relates to the failure of internal processes or external events. Regarding everyday operations, this risk may arise basically from one of these sources – employees, information technology or process related activities.

(Perez, 2014)

Liquidity Risk

The principle of liquidity and its importance has been already explained at the beginning of this chapter. In general, liquidity risk is connected with a situation in which a bank will not have enough cash to perform its essential daily operations.

Economic (Systemic) Risk

Nowadays, due to globalization and thus the interconnection of global economies and financial markets even the economic changes occurring abroad may significantly influence functioning of domestic economy and the whole banking sector. This is the case that happened in 2008 and started global economic and financial crisis. Undoubtedly, for instance the collapse of one financial institution can launch so called domino effect and thus to threaten the stability of the whole financial system.

(Perez, 2014)

Currently, according to Breana Patel, a CEO of certain management consulting firm based in New York, the Brexit including many possible scenarios may be used as an example of possible economic threat for banks. For this reason, banks are forced to operate under some sort of uncertainty and by constantly developing various preventive future scenarios they need to be able to adapt and react quickly to economy related changes.

(Patel, 2018)

Cyber Risk

The fast development of technologies and information systems goes hand in hand with the potential threat of cybercrimes. Especially regarding digital banking services, banks and their clients are exposed to potential threat arising from banking channels abuse very

often. For the purpose of prevention, banks integrated issues related to cyber risk into the business risk management procedures.

(Patel, 2018)

Czech National Bank publishes a set of prudential rules for successful risk management and prevention that banks are required to observe. The basic rules are incorporated in the Act on Banks and include for example issues regarding maintaining capital adequacy or a ban on trading with people that have any close proprietary and personal relations to the bank preferentially etc. Furthermore, this set contains among other things the requirement for a bank to have strictly separated lending and investing transactions.

(Czech National Bank, 2017)

Credibility

Hypothetical loss of credibility, which means losing the trust of clients, would have severe consequences for a bank. Even though this fact might seem obvious, it is necessary to remind the importance of sustaining the transparency and credibility especially within banking sector. Nowadays, all businesses operating in the Czech Republic are obliged by law to publish particular documents which certainly contributes to the aspect of transparency.

The positive brand image supports the trust of customers which naturally leads to loyalty. Furthermore, due to the constantly increasing competition within banking sector, clients have opportunity to choose any bank or product they want. Therefore, banks are engaged in offering new products, diversifying of portfolio and of course in building strong brand image as any other business.

(Finextra Research, 2010)

Bank Capital

Generally, from the quantitative point of view bank capital can be expressed as the difference between the value of all assets and liabilities. From the qualitative point of view, capital is characterized as all the resources put in by shareholders when establishing a bank, including new shares issued.

(Revenda et al., 2000)

Capital, often denoted in tiers, is an important source of funds used for acquiring assets. There are two possible ways how capital can be made, either externally by issuing new shares and selling them to investors or internally, which includes forms of capital (earnings) arising from internal banking operations.

(Revenda et al., 2000)

Role of capital

Bank capital fulfils many significant functions in a banking field. Basically, it is the source for financing of banking transactions. Furthermore, capital covers losses resulting from the bad debts or decline in the market value of bank´s assets. Due to the risk prevention, CNB determined certain minimum amount of capital a bank must possess and maintain in the form of so called *capital adequacy*.

(Revenda et al., 2000)

3.1.1. Function of a bank

Banks serve as financial intermediaries on the market that allocate funds from lenders to borrowers. They operate throughout all sectors of economy, collecting deposits and providing loans to satisfy the demands naturally emerging from the essence of market mechanism.

Generally, basic functions of a bank can be divided into following categories:

Deposit function – accepting deposits from clients in an account

There are two fundamental types, either demand deposit allowing a depositor to withdraw money any time he or she wishes to do so, or a time deposit containing an interest where a client have fixed term agreed beforehand and is allowed to manipulate with funds only after certain period or giving notice.

(Investing Answers, 2018)

Loan function

Commercial banks grant loans to businesses and individuals and hereby earn money since the interests on loans banks receive are higher than interests on deposits they must pay to depositors.

Intermediary function

As it has been already mentioned before, banks connect two parties - lenders and borrowers and therefore serve as financial intermediaries by taking deposits from one party having money surplus to provide funds to people or businesses not having desired financial resources.

(Chen, 2018)

3.1.2. Banking licence

The Czech National Bank serves as the only authority with the exclusive right to issue licences for banks intended to operate in the Czech Republic. In compliance with the Act on Banks 21/1992 CNB issues licence for indefinite period containing list of permitted activities and conditions under which a bank must operate. To be able to acquire the licence, joint-stock company needs to submit a written application first including the information about the entity, the strategic plan of a bank and, among other requirements and documents, also the market analysis. The minimum capital required for establishing a bank is CZK 500 million.

Usually, the granting procedure takes six months and includes the examination of bank´s future liquidity and profitability according to proposed economic calculations, the abilities and competences of candidates nominated for leading positions in statutory board, technical preconditions, the assessment of financial strength of bank´s main shareholders etc.

Similar procedure applies in case of foreign bank branches. To run a business in the Czech Republic, such a branch needs banking licence as well. However, the cooperation of CNB with the supervisory body of a particular country where the foreign bank has its base is required.

Nevertheless, the process of acquiring and maintaining the banking licence is quite complicated due to the unique features of banking environment which has been mentioned before.

(CNB, 2018)

3.1.3. Bank balance sheet

On the contrary of the balance sheet content of any other company, the statement of financial position of a bank slightly differs, mainly regarding the list of items included. Generally, this financial statement demonstrate the value of bank´s assets, liabilities and shareholder´s equity. In this case, the last item mentioned refers to the banking capital. However, the very same equation applies and thus the Assets of a bank must be equal to the bank liabilities + equity.

Moreover, the high share of liabilities is typical for banks in a comparison to other businesses. The sources of financing are usually short-term, whereas the assets long-term. Therefore, the specific risks associated with banks actually emerge from this aspect.

(Spaulding, 2017)

Assets

Total Assets of banks include following list of items:

- Cash
- Granted loans and deposits
- Deposit with and loans to central banks
- Deposit with and loans to other credit institutions
- Loans to and other receivables from clients
- Non-marketable debt securities held by bank
- Other debt securities held by bank
- Shares and other equity held by bank
- Fixed assets
- Other on-balance sheet assets

(ARAD, 2018)

Liabilities + Equity

The liabilities of a bank and shareholder´s equity consists of:

- Received deposits and loans

- Deposits and loans received from central banks
- Deposits and loans received from other credit institutions
- Deposits and loans received from clients
- Non-marketable debt securities issued
- Other debt securities issued
- Capital and reserves (Provisions, share capital, profit/loss for previous year and for the current period)

(ARAD, 2018)

Profitability Ratios

ROA

Return on assets of a bank is considered as an important indicator of profitability expressed as the total amount of net profit after tax or EBIT divided by the volume of total assets. Regarding specific features of banking assets, even relatively low rate of 1 or 2 % may indicate sufficient revenues.

ROE

Return on equity expresses the share of the owner´s equity on the total value of average assets of a bank. In other words, it is the important measure of bank´s income returned on shareholder´s equity. This ratio also known as return on investment represent the key indicator of profitability important for any stakeholder.

(Maverick, 2018)

3.2. Banking system in the Czech Republic

Banking system of any state represents all the banking institutions operating in particular country and serves as a base for financial market. Former one-tier system missed the separated macroeconomic activities performed by the central bank and therefore all the tasks has been carried out solely by commercial banks or simply one single so called "mono-bank" (when talking about centrally planned economies). Furthermore, the regulation of inflation seemed to be quite difficult under this system. In 1990 the Czech banking system changed to two-tier model which consists of the central bank as a supervisory body and

commercial banks. In the Czech Republic, mostly universal banks offering wide range of products and services prevail and clients are allowed to freely choose any bank they want.

(REVENDA, 2000)

3.3. Structure of banking system

3.3.1. The role of the Czech National Bank

The central bank and also the supervisory body of financial market of the Czech Republic is the Czech National bank. Because of the EU membership, the CNB also belongs to the European System of Central Banks. The primary objective of the CNB is to achieve and maintain price stability and therefore to ensure favourable conditions for economic growth of the country. Equally, the CNB sets monetary policy, supervises the whole banking sector in the Czech Republic and issues coins and banknotes.

(Czech National Bank, 2018)

Apart from functions already mentioned above, Czech National Bank provides services to the government and public sector organizations. Government debt administration belongs among major operations carried out by CNB regarding state issues. Specific conditions related to providing loans to the state are determined by law and especially in developed market economies guaranteed by government securities and their allocation on capital and financial market.

Besides, the Central bank plays the role of state representative unit concerning all monetary policy issues. In other words, one of the activities in this field lies in providing regular public notifications about changes, main problems and solutions within monetary matters.

(Revenda et al., 2000)

3.3.2. Commercial banks

Commercial banks in the Czech Republic operate under the authority of the Czech National Bank. As it was already explained in previous chapters, banks earn money from provided loans in the form of net interest income.

According to the CNB, banks may be for statistical purposes divided into large, medium or small-sized depending on their balance sheet worth. However, this categorization does not indicate bank significance, it may be useful for general overview and statistics. Anyway, bank assets must exceed the value of more than 10 % of the total banking sector volume to be able to reach the status of a large bank. For medium-sized banks the percentage ranges from 2 to 10 percent. Small enterprises hold assets that worth less than 2 percent of the total volume of banking sector assets.

(Czech National Bank, 2017)

In the Czech Republic, there are four financial institutions considered as large banks: Česká spořitelna, ČSOB, Komerční Banka and UniCredit Bank.

Table 1: Results of selected banks in the Czech Republic, 2017

Bank	Total Assets (in CZK billion)	Net profit (in CZK billion)
Česká spořitelna	1 329	14.6
ČSOB	1 316	17.5
Komerční banka	1 004	15.3
UniCredit Bank	/	7.2
MONETA Money Bank	199	3.9
Raiffeisenbank	338	2.8
J&T Banka	143	2.2
Fio banka	108	0.4
Air Bank	98.1	0.6
Sberbank	81.5	0.4
Equa bank	50.3	0.1

Source: own data processing; Source of data: Annual reports of banks

3.4. Economic situation in the Czech Republic

3.4.1. History

The economic reform in 1991 lead to transition from centrally planned economy to market economy. As the result of liberalization, the inflation rate rapidly exceeded 55% and the whole economic performance slowed down. All the system related changes also

strengthen a necessity to reorient to western market. Fortunately, within the following few years, after the dissolution of former Czechoslovakia, Czech economy managed to restore again and the inflation was successfully held under the level of 10 percent. Also the level of unemployment significantly decreased and the country became interesting for potential investors which lead to the inflow of foreign direct investments.

The second half of 1990´s brought again the economic imbalance, the currency (Czech crown) depreciated significantly, therefore the Czech National Bank decided to switch from fixed exchange rate to floating exchange rate regime.

However, at the turn of the century, Czech economy recovered and managed to decrease the level of inflation by using new regime – inflation targeting. In the next few year, inflation rate did not exceed five percent. Simultaneously, GDP growth reached 5.6 percent in 2004 and within the three following years, before financial crisis occurred, it managed to approach the level of 7 percent.

(Česká Národní Banka, 2018)

3.4.2. Economic crisis

The bankruptcy of Lehman Brothers US investment bank in September 2008 is said to be seminal event that contributed to the worst financial crisis in history since the Great Depression. Nevertheless, US mortgage crisis appeared few months before the collapse. Therefore, this combination of factors and incidents caused the world economic and financial market breakdown.

(Seetharaman, 2018)

However, Czech Republic suffered rather because of related world economic crisis which has risen from aforementioned global financial crisis. According to the former vice-governor of Czech National Bank Miroslav Singer, the initial state of domestic financial system was favourable, therefore the indirect effects of financial crisis were limited. Despite this positive fact, real economy still tended to face the troubles due to its structure, openness and mostly the dependence on exports. For Czech economy this crisis is considered to be rather the "imported" one.

Regarding the situation, the CNB identified two main risks related to impacts on domestic banking sector and economy. At first, intensification of the crisis and probability

of recession in western economies. Undoubtedly, the next threat was represented by certain level of insecurity and doubts for entrepreneurs, households and financial institutions. In the first half of 2009 the GDP declined by 5 percent (year-on-year). Fortunately, trade balance kept increasing because the amount of imports was decreasing faster than the amount of exports.

After all, Czech banking sector maintained its strong external position, shock resistance thanks to the sufficient amount of resources and capital. Nevertheless, the risks connected with the situation abroad prevailed in the form of: credit risk, uncertainty regarding production prices and long term interest rates; difficulty for some banks to obtain funds to finance their assets etc.

(Singer, 2009)

3.4.3. Development after crisis

Year 2010

The growth after the crisis has been naturally influenced by the sensitivity of Czech economy to foreign economic cycle development. However, GDP growth increased by 2.2%. Simply because of external factors were getting better. On the other hand, banking sector in the Czech Republic haven´t noticed almost any direct impacts and handled the situation without government support.

(Ministry of Industry and Trade, 2011)

Year 2011 – 2012

The second half of 2011 brought a stagnation of economy, although the year-on-year growth of GDP increased by 1.7%. The situation got worse the following year, when the value of GDP decreased by 1.1% compared to the previous one. The main potential threat though lied in unclear situation and possible recession within Eurozone that could have had negative impacts on financial sector in the Czech Republic. Czech banks are concerned solely with financing of domestic economy, therefore any troubles connected with its failure might disrupt the stability of banking system.

(Czech Banking Association, 2012)

Year 2013

Since 2013 the economic growth has been accelerating again. Despite the previous years of recession, domestic banking sector managed to keep stable position, trust of clients and performance as it was not so much influenced by adverse economic conditions. In 2013, total amount of assets in banking sector increased by 8.8%. Even though EBIT decreased mainly due to low revenues from interest rates by 4% compared to the last year, it is said to be the second best result in history. Economic growth recorded a decline by 0.9%.

(The Ministry of Finance of the Czech Republic, 2014)

Year 2014

Ten years after joining the European Union (in 2004), Czech banking sector continued with the harmonization of standards regarding EU banking legislatives. New challenges associated with increased competition in the form of new banks entering the market and especially with technological innovations in this field have appeared. The number of people using internet banking increased rapidly, as well as the number of new ATM machines, issued credit cards, financial transactions etc. All these parameters have supported ongoing great condition of domestic banking sector. Besides, the overall Czech economy recorded 2% growth compared to the previous year.

(Štěpánek, 2014)

Year 2015

In 2015 Czech economy experienced desired boost again with the GDP growth of 4.3%. This favourable development of economic activity was projected into the banking sector as well. On the other hand, key sources of risks for the stability of financial system remained connected with the uncertainty about reviving the European and global economy as a whole. In some developing economies, the growth slowed down significantly with unclear future predictions. Obviously, the global demand decreased.

Apart from this, for example Eurozone, not being able to finish the bank balance stabilization, contributed to the general concerns regarding the next progress on the financial market. Another obstacle is represented by very low interest rates, which from one point of view helped to reach price stability and supported domestic demand into some extent.

However, from the other point of view, it put banks and financial institutions under pressure to maintain its profitability.

(CNB Financial Stability Report, 2016)

Year 2016

Economic growth slightly slowed down to 2.3%. Unemployment in the Czech Republic decreased to 4%. Total household debt was increasing due to low interest rates and rising income. The number of mortgage loans have risen despite the growth in the real estate prices, which were becoming moderately overvalued, according to CNB. External environment and especially high indebted countries with unfinished banking sector stabilization process within Euro area pose a threat to other countries as they might easily return to recession.

(CNB Financial Stability Report, 2017)

Apart from aforementioned external risks, Czech banking sector faced one more completely new challenge in the form of inevitable digitalization of the whole sector. So called fin-tech companies started entering the financial market to compete with traditional system. Therefore, their role might significantly change the future of banking. The technological progress and digital transformation within Czech banking sector was considerably insufficient. In case that financial institutions underestimated the situation, they could have get into disadvantageous position on the market.

(Herz, 2016)

Year 2017

Economy in the Czech Republic was thriving, year-on-year GDP growth reached 4.6% rate. After three years (of being around 0.5%), average annual inflation increased slightly above the CNB target to 2.5% and driven by increase in wages, overall growth in household consumption etc. it was assumed to remain so.

According to OECD Economics Department, unemployment rate of 2.9% denoted as the lowest one among EU countries indicated certain constraint for potential higher growth. The lack of labour force can cause the slowdown in productivity.

(Fall, 2018)

3.5. Factors influencing banking sector

Undoubtedly, macroeconomic factors play as well the key role when assessing the banking sector performance of the country. Economic growth represented by the value of gross domestic product along with inflation, interest rates, unemployment rate etc. need to be considered to obtain clear image about how the economy and also the banking sector develops.

The Czech Republic is a relatively small open economy dependent on exports and foreign demand. Due to the globalization, even the banks operating in this country are interconnected and influenced by economic and financial events occurring in neighboring countries. Apart from other issues, the fact of internationalization contributes to the overall stability and security of banking sector and banks.

3.5.1. The state of economy

Gross Domestic Product

The performance of any economy is usually measured by GDP. Therefore, Gross domestic product represents the value of all goods and services finished and produced during a specific time period within the borders of a country. Generally, GDP measures overall economic activity of any nation. On the contrary, Gross national product (GNP) takes into account the total production of all residents of particular economy (even of those living abroad) excluding domestic production of foreigners. For instance, in case of foreign direct investment, if the Japanese company owns a factory located in Germany, the output of it would be considered as a Japanese GNP and German GDP. Usually, the GDP is computed on an annual basis, or quarterly.

Above all, this factor belongs to the main indicators when evaluating the progress, development and health of any economy. Businesses often use GDP to make decisions about potential investments.

(Kenton, 2018)

Nominal vs. Real GDP

Basically, the GDP is being collected at current (or nominal) prices and it doesn´t take into account the impact of inflation or deflation. Therefore, to be able to compare GDP

value of a country from one year to another economists came up with the idea to adjust GDP for inflation and thus to determine the real GDP, which considers price changes.

(Callen, 2018)

GDP Measurement

There are three different approaches used to determine GDP – expenditure, production and income approach.

The most commonly used method, expenditure approach focuses on spending or consumption as a base for the GDP calculation. In this case, following basic formula for GDP computation is valid: **GDP = C + G + I + NX.** "C" is the sum of overall household consumption; "G" denotes government spending, "I" stands for all investments of a country and "NX" is total exports minus total imports, thus total net exports.

The production approach can be considered as the reverse of the first one estimating the value of total economic output minus inputs consumed within the process. Generally, production approach views GDP from the perspective of accomplished economic activity.

The last approach deals with incomes gained by total production. This way of calculating GDP is said to be an intermediary between two aforementioned approaches. Among the incomes earned from production within the economy belong labor wages, interests on capital return, earned rent, profit of businesses etc.

(Kenton, 2018)

3.5.2. Inflation

However, inflation rate itself does not pose a threat to the stability of banks and banking sector, it certainly has the impact on the state of economy. Besides, high inflation causes a rise in loan prices and thus slows down the banking sector performance.

In general, inflation means increase in the average level of prices in any economy over a period of time. Often denoted in percent rate, inflation indicates decline in purchasing power of a particular currency. Basically, in case of consumer price inflation, consumers then need a higher amount of relevant currency to be able to buy the same basket of goods and services.

(Chen, 2019)

Inflation targeting regime

Maintaining price stability, as one of the essential monetary policy objectives of central banks can be achieved by one of four basic types of regimes:

1. A regime with an implicit nominal anchor
2. Money targeting
3. Exchange rate targeting
4. Inflation targeting

Czech National Bank has switched to the inflation targeting regime in 1998. Since then, the target level of inflation has changed couple of time. Current level of 2% has been set in January 2010 and will be valid till the Czech Republic joins the euro area.

(CNB, 2015)

3.5.3. Unemployment

According to the Phillips curve, unemployment have reversed and stable relationship with inflation. Unemployment rate, measured as the number of unemployed people divided by the number of currently active workforce, belongs to the factors indicating the overall health of any economy. Although, it might seem the lower the rate of unemployment, the better, the natural rate of unemployment is expected within the economies operating at full capacity, according to Keynesian approach. The lack of labor force may result in the overall decrease in production of a country and therefore to economic slowdown.

Basically, unemployment can be divided into two broadest categories, i.e. voluntary and involuntary unemployment. The first group includes people quitting one job willingly for the purpose of seeking another one, whereas the second category consists of people who were fired and thus forced to find new employment.

(Kenton, 2018)

There are three types of unemployment:

Frictional

This type is considered short-term and least harmful for economies. Naturally, it occurs in a period between people leaving the job for some reason and finding another one.

Cyclical

Second type of unemployment comes hand in hand with business cycle. In a period of recession, cyclical unemployment arises and by contrast it decreases during economic thrive.

Structural

Structural unemployment relates to the required skills and knowledges people need to own at work. Especially with technological innovations and fast development in this field, employees have to adapt for these changes and educate themselves. Sometimes, it is necessary for companies or even government to intervene to create more job positions.

(Kenton, 2018)

Obviously, the ways of measuring unemployment differ in many countries due to various perspective on the meaning of "employed" and "unemployed" labor force. In case of the Czech Republic, method for measurement remains the same as in all member states of the EU. The statistics and data about unemployment are published by Czech Statistical Office.

3.5.4. Interest rates

Basically, the Czech National Bank distinguishes between three different types of interest rates that simultaneously belong to indirect instruments of CNB.

Repo rate, also known as "two-week" repurchase agreement due to its duration, can be defined as a rate at which central banks lend money to commercial banks against securities.

Discount rate represents the interest rate charged for loans provided by Central bank to banks and financial institutions. At the same time, by the means of this rate CNB regulates the supply of money available to commercial banks. Furthermore, increased discount rate helps to decrease inflation.

Lombard rate is usually higher than previous two rates and serves for short term liquidity loans. The increase in this rate results in lower amount of loans borrowed by banks and therefore leads to inflation decline.

(Beran, 2003)

Particular interest rates set by Central bank in previous years are specified in Table 2 below.

Table 2: Interest rates in the Czech Republic; 2008 - 2017

Year	REPO rate (%)	Discount rate (%)	Lombard rate (%)
2008	2.58	1.58	3.58
2009	1.14	0.25	2.14
2010	0.75	0.25	1.75
2011	0.75	0.25	1.75
2012	0.05	0.05	0.25
2013	0.05	0.05	0.25
2014	0.05	0.05	0.25
2015	0.05	0.05	0.25
2016	0.05	0.05	0.25
2017	0.50	0.05	1.00

Source: own data processing; Source of data: ARAD CNB

PRIBOR

Prague Interbank Offered Rate indicates the estimated value of the interest rate on deposits provided by a referential bank to another one within an interbank market. Although, the Czech National Bank determines the rules for PRIBOR calculations, this rate is daily fixed by Reuters Agency and further processed by Financial Markets Association of the Czech Republic.

PRIBOR rate serves as the source of prices for the purpose of fixing the interest rates and various financial products yields. However, the value of PRIBOR is computed from quotations of referential banks and therefore it does not correspond with real operations and deals made within the interbank market. In other words, the aforementioned quotations represent only estimated interests for potential business conduct.

In contrast to repo rate, which belongs to the CNB monetary policy instruments, the rates fixed within the interbank market may reflect other market factors such as counterparty credit risk, liquidity premium etc.

(CNB Press release, 2015)

3.5.5. Investments

Undoubtedly, the total amount of investments together with investing activities within the country also belongs to the factors significantly influencing banking sector and especially the economic prosperity. During last few years, higher foreign demand supported the increase in private investments in almost every significant sector of Czech economy. Compared to the after-crisis period in 2008, when mostly smaller businesses were engaged in investing activities due to the subsidies arising from changed legislation.

Although, the Czech Republic currently have the highest investment rate contributing to GDP and thus to economic growth, the expert from the Czech Statistical Office points out that the high investment rate is typical mostly for the countries trying to catch up with more developed states.

(Krejčí, 2018)

3.6. Merger of Moneta Money Bank, Home Credit and Air Bank

One of the biggest fusions on the field of Czech banking sector has been planned since the October, 2018. Two financial institutions, Home Credit and Air Bank belonging under the PPF Group owned by famous entrepreneur Petr Kellner should have been merged with MONETA Money Bank, the fifth largest bank regarding the value of assets and profit operating in the Czech Republic.

Supposedly, due to long negotiations between participating companies about certain fusion conditions and also about the selling price conflicts, the planned merger has been stopped. According to the latest information, Moneta Money Bank decided to lower the price offered for a planned takeover – the sum decreased suddenly to 18.5 CZK billion, instead of originally proposed 19.75 CZK billion. Obviously, this action led to disagreement of Air Bank and Home Credit shareholders. Home Credit Company expressed dissatisfaction in their press release and denoted the decision of Moneta Money Bank as causeless, because of the brand potential and particularly due to very good financial and economic results achieved both by Air Bank and Home Credit within the year 2018. Therefore, from their point of view there was no reason for such a significant decline in the selling price compared to the original deal.

However, management of Moneta Money Bank affirmed the possibility of considering other future acquisition opportunities. Until then, they will focus on maintaining their existing strategies of organic growth to exceed all expectations within the Czech banking sector.

(Hovorka, 2019)

Nevertheless, this merger could have meant the biggest transaction on the Czech banking field since the privatization of Komerční Banka in 2001. The position of Czech banks would have changed as the newly created bank would represented the second largest institution regarding consumer loans and gained the third place related to the banking site size operating under the name of Air Bank.

(Miler, 2019)

4. Practical Part

Following practical part of the thesis consists of five subchapters focused on deeper studies of particular objects of the research. The analysed data includes ten years of observation from 2008 to 2017. First of all, the development of basic economic indicators such as GDP growth, unemployment rate and inflation rate is assessed together with future predictions. Second subchapter deals with the analysis of the performance of banks and foreign bank branches in total, including the computation of some basic indices to capture the growth and development in particular indicators.

Another chapter examines the results achieved by three largest commercial banks operating in the Czech Republic, i.e. Česká spořitelna, ČSOB and Komerční banka. For the purpose of the comparison of their performance, basic indices were computed to demonstrate the increase or decrease in net profit. The chapter number 4.4. contains the correlation analysis of selected indicators, followed by last analytical part including the construction of econometric model.

4.1. Analysis of economic indicators

GDP growth

The data on total value of GDP in the Czech Republic together with the year-on-year average percentage change are clearly demonstrated in the Table 3 and Figure 1 below. As the result of the crisis in 2008, annual gross domestic product growth decreased by 4.1 percent in the following year 2009. Even though, the Czech economy recorded a decline in GDP, banking sector managed to remain stable without requiring any significant support from government especially due to sufficient liquidity level of banks.

Table 3: GDP Growth in the Czech Republic (2008 - 2017)

Year	GDP (CZK billion)	GDP Growth (%)
2008	3 689	2.5 %
2009	3 628.1	-4.1 %
2010	3 667.6	2.2 %
2011	3 807.2	1.7 %
2012	4 041.9	-1.1 %
2013	4 077.3	-0.9 %
2014	4 261.1	2.0 %
2015	4 477.0	4.3 %
2016	4 712.9	2.3 %
2017	5 049.9	4.6 %

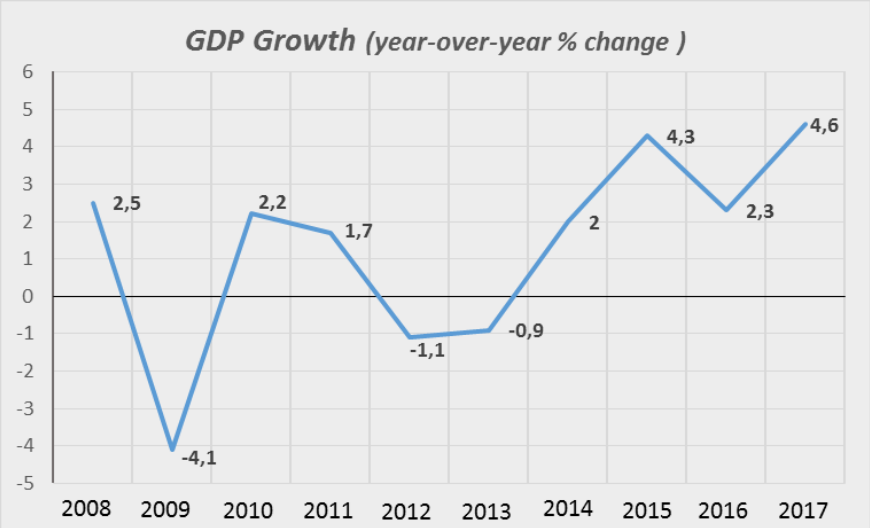
Source: own data processing; Source of data: Czech Statistical Office

Future estimations

According to the European Commission estimates, the Czech Republic is supposed to maintain 2.9% GDP growth in 2019 (similarly achieved in 2018). However, the economy is expected to slow down moderately in the following year 2020 to 2.7%. Overall increase in investments supports the economic expansion, as well as the wages growth contributes to higher consumption within the domestic private sector.

(European Commission, 2019)

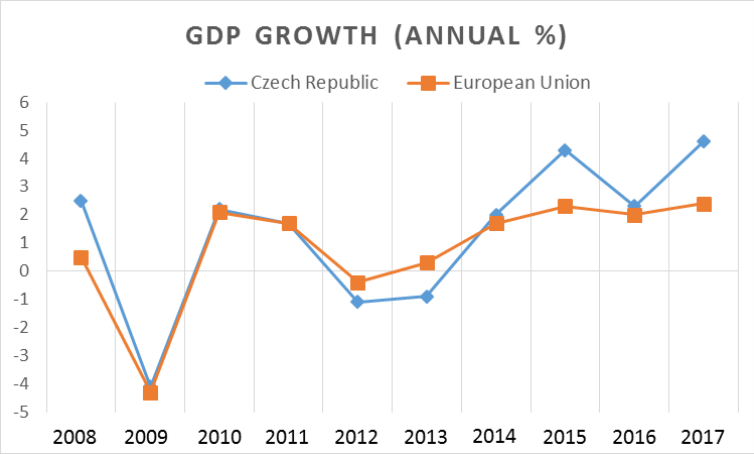
Figure 1: GDP Growth in the Czech Rep.; YoY % change (2008 - 2017)



Source: own data processing; Source of data: Czech Statistical Office

In comparison to the European Union average results, economic performance of the Czech Republic managed to recover successfully from the crisis period. Especially since 2012, the economy has recorded a constant growth in GDP being maintained slightly above the EU average. The upward trend line demonstrated in the Figure 2 indicates ongoing potential for future economic growth both of Czech Republic and EU.

Figure 2: Comparison of GDP growth; Czech Rep. vs. EU (2008 - 2017)



Source: own data processing; Source of data: Czech Statistical Office

Unemployment

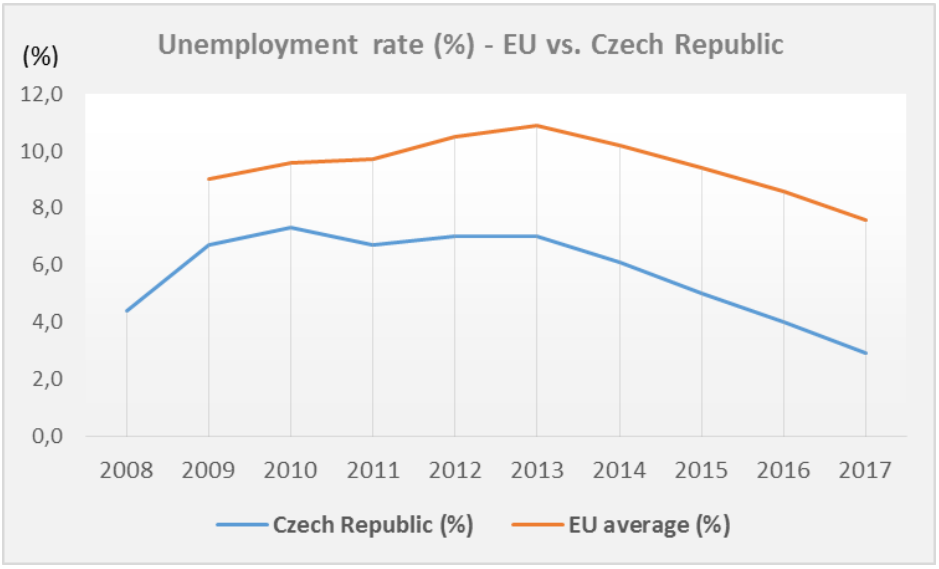
Low unemployment rate is desired into some extent, however, it may cause the slowdown in overall economy due to the lack of labour force. Therefore, the country is unable to reach its maximum level of production and higher potential economic growth. Within last two years, the Czech Republic has recorded excessive decline in unemployment and thus belongs to the countries of EU with the highest employment.

Figure 3: Unemployment rate in the Czech Republic (2008 - 2017)

Source: own data processing; Source of data: Czech Statistical Office

The significant difference between the level of unemployment of the Czech Republic and EU countries average can be seen in the Figure 4 below.

Figure 4: Unemployment rate Czech Republic vs. EU (2008 - 2017)



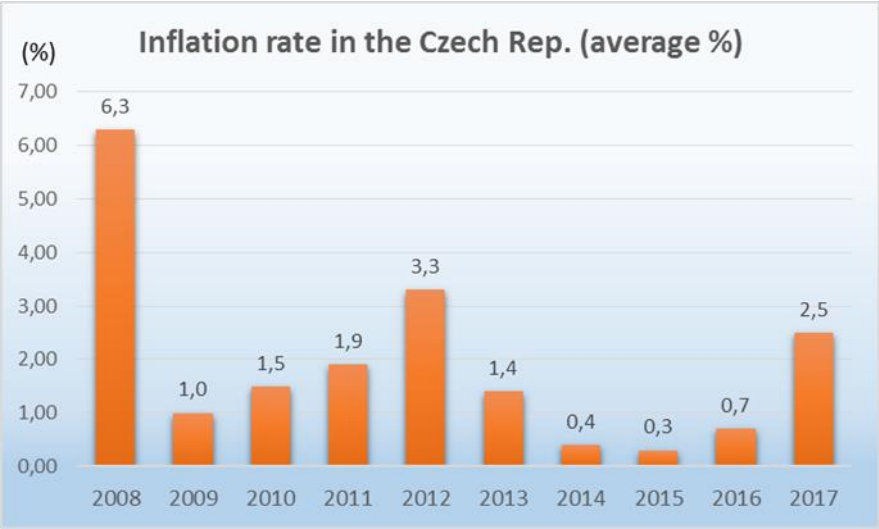
Source: own data processing; Source of data: Czech Statistical Office

Inflation

The inflation rate is expected to remain around the 2% target level both in 2019 and 2020. In the Figure 5, there are demonstrated year-on-year fluctuations of average inflation

rates from 2008 to 2017. Relatively high inflation has been recorded within the crisis period in 2008.

Figure 5: Inflation rate in the Czech Republic (2008 - 2017)



Source: own data processing; Source of data: Czech Statistical Office

4.2. Banking sector in the Czech Republic

As already mentioned before, Czech financial sector did not experience any significant damages caused by crisis in 2008. Moreover, in the year after crisis the total value of banking assets slightly increased as well as the net earnings. Although, the number of employees working in banking sector in 2009 declined, it was the consequence of overall increase in unemployment.

Regarding the quantity of banks and foreign bank branches operating in this country, the total number has ranged between 45 – 46 branches during last five years and it is expected to increase in the future, especially because of the domestic banks expansion and also due to the interest of foreign banks to obtain a license and start the business here.

Base index representing the growth in banking assets (demonstrated in the Table 4 below) from 2016 to 2017 has been computed as follows:

5 960 422 CZK million…….. 100%

7 001 932 CKZ million…….. x %

$$x = \frac{7001932}{5960422} = 1.17474 = 117.5\%$$

In 2017 the total value of banking assets increased by 17.5% compared to the previous year 2016.

Table 4: Banking sector in the Czech Republic overview

Year	Number of banks and foreign bank branches	Number of employees	Total Assets (in CZK million)	EAT (in CZK million)
2008	37	39 003	4 044 478	45 695
2009	39	37 864	4 094 626	59 740
2010	41	39 292	4 188 929	55 656
2011	44	40 018	4 475 559	53 337
2012	43	40 308	4 633 313	64 307
2013	44	40 265	5 142 450	61 048
2014	45	40 352	5 309 352	63 092
2015	46	41 192	5 468 515	66 373
2016	45	41 020	5 960 422	73 898
2017	46	41 888	7 001 932	75 354

Source: own data processing; Source of data: ARAD CNB

For the purpose of capturing the growth of banking earnings after tax from 2016 to 2017, the base index has been computed as follows:

73 898 CZK million…… 100%

75 354 CZK million…… x %

$$x = \frac{75354}{73898} = 1.0197 = 102\%$$

Banking earnings after tax increased by 2% in 2017 in compared to the previous year 2016.

Some of the basic capital ratios regarding banking sector are demonstrated in the Table 5 below, as well as the overall value of Tier 1 and Tier 2 capital. Tier 1 represents a key capital used to express capital adequacy which consists of shareholders´ equity and reserves.

Table 5: Banking sector in the Czech Rep., Capital ratios

Year	ROA (EBIT/ Assets) (%)	EAT/ Tier 1 (%)	Tier 1 Capital (in CZK million)	Tier 2 Capital (in CZK million)
2008	3.52	22.65	209 154	21 698
2009	4.11	26.98	231 610	33 126
2010	3.78	22.46	258 389	30 962
2011	3.76	19.76	277 016	26 484
2012	3.62	21.84	306 427	14 508
2013	3.51	18.62	356 265	11 932
2014	3.21	16.78	386 812	10 246
2015	3.16	16.70	410 089	10 473
2016	3.06	17.71	427 685	13 036
2017	2.58	16.95	457 747	14 013

Source: own data processing; Source of data: ARAD CNB

4.3. Analysis of Česká spořitelna, ČSOB and KB

According to the Czech National Bank, Česká spořitelna, ČSOB and Komerční banka belong to the largest commercial banks operating in the Czech Republic regarding the amount of assets and profit.

Total Assets

Table 6: Total Assets of Česká spořitelna, ČSOB and Komerční Banka (2008 - 2017)

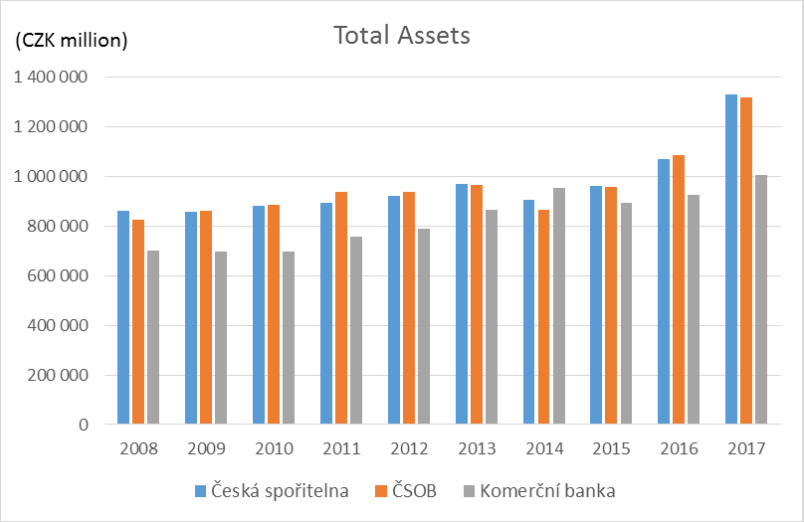
(in CZK million)

	Česká spořitelna	***ČSOB***	***Komerční banka***
2008	862 230	824 485	699 044
2009	855 137	858 972	695 075
2010	881 629	885 055	698 014
2011	892 598	936 593	754 810
2012	920 403	937 174	786 836
2013	968 724	962 954	863 980
2014	902 589	865 639	953 261
2015	959 584	956 325	891 556
2016	1 066 526	1 085 527	922 737
2017	1 329 223	1 315 590	1 004 039

Source: own data processing; Source of data: annual reports of CS, KB and CSOB

The comparison of the amount of assets of chosen banks together with ten-year development is clearly visible in the Figure 6.

Figure 6: Total Assets of Česká spořitelna, ČSOB and Komerční Banka (2008 - 2017)



Source: own data processing; Source of data: annual reports of CS, KB and CSOB

Net profit

Based on the data displayed in the Table 7, the base indices for the year 2017 has been calculated to capture the growth in net profit of each bank.

Table 7: Net profit of Česká spořitelna, ČSOB and Komerční Banka (2008 - 2017)

(in CZK million)

	Česká spořitelna	ČSOB	Komerční banka
2008	15 813	1 094	13 233
2009	12 022	17 417	11 094
2010	12 052	13 562	13 410
2011	13 638	11 206	9 718
2012	16 612	15 281	14 231
2013	15 588	13 651	12 906
2014	15 071	13 621	13 330
2015	14 293	13 989	13 132
2016	15 457	15 148	14 074
2017	14 610	17 516	15 274

Source: own data processing; Source of data: annual reports of CS, KB and CSOB

Česká spořitelna

15 457 CZK million……. 100%

14 610 CZK million……. x %

$$x = \frac{14610}{15457} = 0.945 = 94{,}5\%$$

The net profit of Česká spořitelna decreased by 5.5% in 2017 compared to the previous year 2016.

ČSOB

15 148 CZK million…….. 100%

17 516 CZK million…….. x %

$$x = \frac{17516}{15148} = 1.156 = 115.6\%$$

The net profit of ČSOB recorded significant increase of 15.6% in 2017 compared to the previous year 2016.

Komerční banka

14 074 CZK million…….. 100%

15 274 CZK million…….. x %

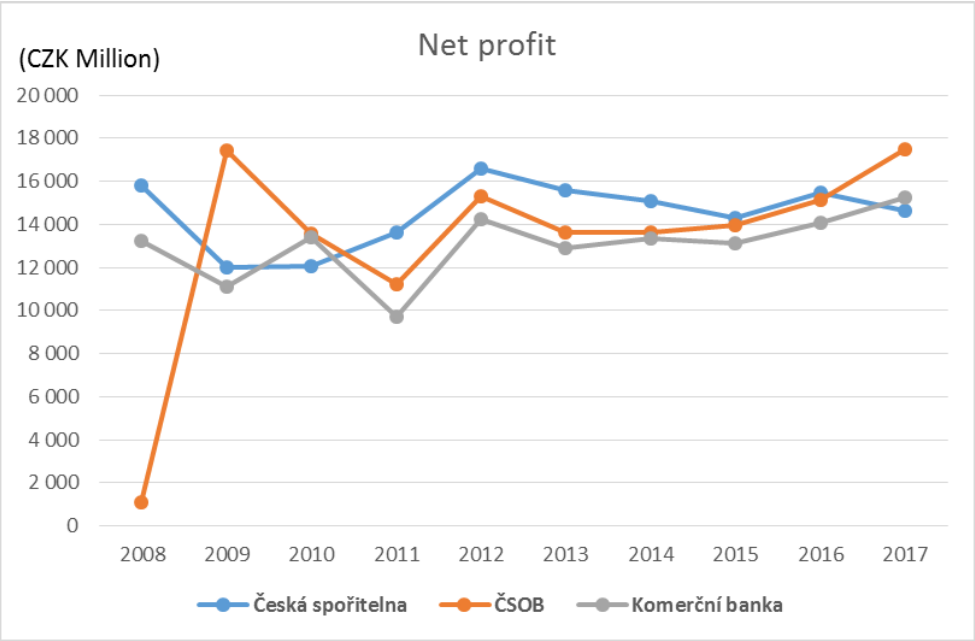
$$x = \frac{15274}{14074} = 1.085 = 108.5\%$$

In 2017, the net profit of Komerční banka increased by 8.5% compared to the previous year 2016.

Comparison

From all the three analyzed commercial banks, ČSOB managed to reach the highest growth of 15.6 % in net profit. The comparison of achieved results can be clearly seen in the Figure 7 below.

Figure 7: Net profit of Česká spořitelna, ČSOB and Komerční Banka (2008 - 2017)



Source: own data processing; Source of data: annual reports of CS, KB and CSOB

The percentage of profit that selected commercial banks generate in relation to its total value of resources expressed as ROA ratio has been calculated from the values published by chosen banks demonstrated in the Table 6 and 7.

Among the three examined entities, Komerční banka reached the highest average value of Return on Assets (1.59%) within the observed period, followed by Česká spořitelna (1.53%) and ČSOB (1.37%). Calculated rates of return of aforementioned banks are demonstrated in the Table 8 below.

Due to the huge amount of assets held, the ROA moving around 1.4 - 2% is considered as sufficient regarding large banks. This value can be compared to the data representing Czech banking sector including all the banks and foreign bank branches operating in the Czech Republic where the average ROA for the same period equals to 3.43%.

Table 8: Return on Assets of selected banks

	Česká spořitelna	ČSOB	Komerční banka
2008	1,83%	0,13%	1,89%
2009	1,41%	2,03%	1,60%
2010	1,37%	1,53%	1,92%
2011	1,53%	1,20%	1,29%
2012	1,80%	1,63%	1,81%
2013	1,61%	1,42%	1,49%
2014	1,67%	1,57%	1,40%
2015	1,49%	1,46%	1,47%
2016	1,45%	1,40%	1,53%
2017	1,10%	1,33%	1,52%

Source: own data processing

4.4. Correlation analysis

Correlation analysis is a method used to determine and measure the strength of a relationship between selected variables. Before building an econometric model itself, the correlation matrix demonstrated in the Figure 8 below has been created for the purpose of detecting preliminary relations among chosen variables.

Declaration of variables is following:

y_t ……ROA (Return on Assets) of banking sector in %

x_{1t} ……...Inflation Rate in %

x_{2t} ……PRIBOR (2 weeks; annual average) in %

x_{3t} ……Annual real GDP growth in %

x_{4t} ……Real wages annual change in %

x_{5t} ……Unemployment Rate in %

Figure 8: Correlation matrix

	yt	*x1t*	*x2t*	*x3t*	*x4t*	*x5t*
yt	1					
x1t	0,079786	1				
x2t	0,441209	0,793662	1			
x3t	-0,73965	0,018524	-0,22174	1		
x4t	-0,59878	-0,1993	-0,06236	0,322048	1	
x5t	0,81624	-0,21068	-0,03815	-0,59459	-0,8179	1

Source: own data processing

As it can be clearly seen from the Figure 8 above, there is no significant multicollinearity detected between explanatory variables. The highest positive correlation coefficient of 0.82 has been recorded between the ROA and unemployment rate. However, this variable has been omitted in the forthcoming econometric model because of insufficient significance.

The unemployment rate is difficult to include into the model because of its reverse effect compared to other variables – the lower the rate, the better. Of course, only into a certain level.

4.5. Econometric modelling - Linear regression

This chapter contains the examination and evaluation of the dependency of profitability of banking sector (expressed as ROA) on selected variables, i.e. economic and banking indicators. Due to the lack of data, only ten years of observations from 2008 to 2017 have been included for the purpose of econometric modelling to answer defined research questions.

At first, the econometric model explains the impacts of selected economic and banking indicators on the endogenous variable represented by Return on Assets of the Czech banking sector.

Secondly, considered model aims to determine which economic indicator has the biggest impact on ROA of the banks and foreign bank branches in the Czech Republic.

Basic data necessary for building desired econometric model were taken from the Czech Statistical Office and the Czech National Bank database. Variable "GDP growth" (x_{3t})

and "Wages" (x_{4t}) are denoted in percentage changes based on real growth adjusted for inflation.

Data set

Table 9: Econometric modelling - data set

Year	ROA (EBIT/ASSETS %)	Inflation Rate (%)	PRIBOR (2 weeks, annual average %)	Real GDP growth (%)	Real wages (annual change, %)
	y_t	x_{1t}	x_{2t}	x_{3t}	x_{4t}
2008	3.52	6.3	3.62	2.7	1.9
2009	4.11	1	1.73	-4.8	3
2010	3.78	1.5	0.96	2.3	0.4
2011	3.76	1.9	0.84	1.8	0.3
2012	3.62	3.3	0.65	-0.8	-0.6
2013	3.51	1.4	0.23	-0.5	0.1
2014	3.21	0.4	0.17	2.7	2
2015	3.16	0.3	0.16	5.3	3.1
2016	3.06	0.7	0.15	2.6	3.5
2017	2.58	2.5	0.26	4.3	4.4

Source: own data processing; Source of data: CZSO; ARAD CNB

Steps of econometric model construction:

1. *Economic model*

   $y_t = f(x_{1t}; x_{2t}; x_{3t}; x_{4t})$

The return on assets of banks (y_t) is a function of Inflation rate, PRIBOR, growth in real GDP and growth in real wages.

2. *Formulation of econometric model, declaration of variables*

   $y_t = \gamma_0 + \gamma_2 x_{2t} + \gamma_3 x_{3t} + \gamma_4 x_{4t} + u_t$

In the second step, the constant and parameters have been added to the original economic model together with a random component.

Single-equation econometric model consists of one endogenous variable, four exogenous variables and a random (stochastic) term u_t. Chosen variables are declared as follows:

y_t ……ROA (Return on Assets) of banking sector in %

x_{1t} ……...Inflation Rate in %

x_{2t} ……PRIBOR (2 weeks; annual average) in %

x_{3t} ……Annual real GDP growth in %

x_{4t} ……Real wages annual change in %

3. Parameters estimation – Gretl

Ordinary Least Square Method in Gretl software has been used for the estimation of parameters. The obtained results are following:

Model 1: OLS, using observations 2008-2017 (T = 10)
Dependent variable: ROA

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	3.82014	0.0800697	47.71	<0.0001	***
InflR	−0.195996	0.0428374	−4.575	0.0060	***
PRIBOR	0.391577	0.0709202	5.521	0.0027	***
GDP	−0.0477187	0.0169030	−2.823	0.0370	**
IncomeGr	−0.154605	0.0276988	−5.582	0.0025	***

Mean dependent var	3.431000	S.D. dependent var	0.437809
Sum squared resid	0.074799	S.E. of regression	0.122311
R-squared	0.956640	Adjusted R-squared	0.921953
F(4, 5)	27.57862	P-value(F)	0.001328
Log-likelihood	10.28827	Akaike criterion	−10.57654
Schwarz criterion	−9.063614	Hannan-Quinn	−12.23621
rho	0.176806	Durbin-Watson	1.588114

Econometric model including estimated parameters:

$y_t = 3.82014 – 0.195996\ x_{1t} + 0.391577\ x_{2t} – 0.0477187\ x_{3t} – 0.154605\ x_{4t} + u_t$

4. *Model verification*

   a) *economic verification/interpretation + logical conformity*

If the inflation rate (x_{1t}) increases by 1%, the Return on assets of banks will decrease by 0.195996%, ceteris paribus. However, the inflation itself does not have significant effect on stability, it may have negative impact on ROA because it slows down the banking sector performance. Therefore, the parameter can be considered as verified.

If PRIBOR (x_{2t}) increases by 1%, ROA of banks and foreign bank branches will increase by 0.391577%, ceteris paribus. Since PRIBOR influences the interests on deposits made within an interbank market, this information reflects also into the interests on loans provided by banks to customers. Therefore, the higher the PRIBOR, the higher the amount of interests earned on loans which indicates the increase in profitability of banks and even higher Return on Assets.

The increase in GDP growth (x_{3t}) by 1% will cause the decline in ROA of banks and foreign bank branches by 0.0477187 %, ceteris paribus. Although, the growth in GDP may theoretically cause the increase in profits of businesses which could lead to higher deposits in banks and therefore to the significant increase in banking assets, the net profit of banks itself does not necessarily had to increase as well. In other words, any disproportional rapid growth in the assets value compared to the profit of banks causes the decline in rate of return on assets.

If the real wages (x_{4t}) increase annually by 1%, then the ROA of a banking sector will decrease by 0.154605 %, ceteris paribus. From economic point of view, this parameter can be considered as verified. Theoretically, the higher income could lead to less borrowings and more spending of households and individuals, people are not so indebted and thus this fact may have negative impact on net interest earnings of banks.

In case that any other effects are equal to 0, the ROA will be 3.82014 %.

b) statistical verification

R^2 – this value is important in assessing of how well the model approximates real data points

Generated R-squared of 0.956640 indicates that changes in endogenous variable y_t (ROA) are explained from 96 % by the changes in selected independent variables.

Statistical significance of parameters

Obviously, as it can be clearly seen from the Gretl output demonstrated above, all the parameters including a constant marked with a star "*" appeared to be statistically significant.

Null hypothesis: parameter is statistically insignificant

With the level of significance $\alpha = 0.05$

	Coefficient	*p-value*	
const	3.82014	<0.0001	***
InflR (x_{1t})	−0.195996	0.0060	***
PRIBOR (x_{2t})	0.391577	0.0027	***
GDP (x_{3t})	−0.0477187	0.0370	**
IncomeGr (x_{4t})	−0.154605	0.0025	***

Actually, all the considered parameters within this model comply with the condition of $p < \alpha$. Therefore, by rejecting the Null hypothesis it indicates statistical significance of all the parameters.

c) econometric verification

Multicollinearity

The presence of high correlation among explaining variables has been already examined in the previous chapter by the means of correlation matrix. Therefore, the occurrence of multicollinearity can be rejected based on the results obtained from computed matrix.

Autocorrelation

Breusch-Godfrey test for autocorrelation of residuals, demonstrated in the Figure 9 below, has been conducted in Gretl software as well, both for autocorrelation of the first and second order.

Figure 9: Breusch-Godfrey test

```
Breusch-Godfrey test for first-order autocorrelation
OLS, using observations 2008-2017 (T = 10)
Dependent variable: uhat

             coefficient   std. error   t-ratio    p-value
  ---------------------------------------------------------
  const      -0.00361243   0.0865083    -0.04176   0.9687
  InflR      -0.0196661    0.0581920    -0.3380    0.7524
  PRIBOR      0.0273247    0.0909030     0.3006    0.7787
  GDP         0.00512501   0.0204193     0.2510    0.8142
  IncomeGr    0.00606835   0.0317825     0.1909    0.8579
  uhat_1      0.410313     0.739540      0.5548    0.6086

  Unadjusted R-squared = 0.071458
```

Source: Gretl software

LM test for autocorrelation up to order 1; for n=10

Null hypothesis: no autocorrelation

Test statistic: LMF = 0.307827

with p-value = P(F(1, 4) > 0.307827) = 0.608578

level of significance $\alpha = 0.05$

In this case, when $p > \alpha$ the null hypothesis cannot be rejected, therefore there is no autocorrelation of the first order in the model.

LM test for autocorrelation up to order 2; for n=10

Null hypothesis: no autocorrelation

Test statistic: LMF = 0.343039

with p-value = P(F(2, 3) > 0.343039) = 0.734235

level of significance $\alpha = 0.05$

Similarly, $p > \alpha$ meaning that the null hypothesis is not rejected, which indicates there is no autocorrelation of the second order in the model.

Heteroscedasticity

Regarding this econometric model, Breusch-Pagan test (shown in the Figure 10) and White test have been conducted via Gretl software to find out whether there is a heteroscedasticity present.

Figure 10: Breusch-Pagan test for heteroscedasticity

```
Breusch-Pagan test for heteroskedasticity
OLS, using observations 2008-2017 (T = 10)
Dependent variable: scaled uhat^2

             coefficient   std. error   t-ratio   p-value
  ---------------------------------------------------------
  const       1.97182       0.854318     2.308    0.0691  *
  InflR      -0.286749      0.457061    -0.6274   0.5579
  PRIBOR      0.0928052     0.756696     0.1226   0.9072
  GDP         0.0776429     0.180350     0.4305   0.6847
  IncomeGr   -0.343045      0.295537    -1.161    0.2981

  Explained sum of squares = 3.32996

Test statistic: LM = 1.664982,
with p-value = P(Chi-square(4) > 1.664982) = 0.797068
```

Source: Gretl software

Null hypothesis: heteroscedasticity not present

Test statistic: LM = 1.66498

with p-value = P(Chi-square(4) > 1.66498) = 0.797068

level of significance $\alpha = 0.05$

Based on the comparison of p-value with the level of significance α, $p > \alpha$; therefore the Null hypothesis cannot be rejected. Breusch-Pagan test proved there is a homoscedasticity in the model, which means the residues have constant and finite dispersion.

Normal distribution

Conducted test for normality of residuals indicates whether the u_t values are normally distributed around the mean according to the Gauss curve.

Null hypothesis: error term is normally distributed

Test statistic: Chi-square(2) = 2.24099
with p-value = 0.326118
level of significance $\alpha = 0.05$

In case of considered model, test made in Gretl showed $p > \alpha$, which means not rejecting the Null hypothesis. Therefore, the error term is normally distributed.

5. *Model application – simulations, scenarios, interpretation*

The comparison of the impacts of selected indicators is based on the values of estimated parameters that simultaneously represent the elasticity coefficients because of their expression in percentages. The output data obtained from Gretl software enables to assess which variable influence the rate of return on assets of banks the most.

Excluding the constant, exogenous variable "PRIBOR" denoted as x_{2t} indicated the highest coefficient of 0.391577 percent. Therefore, the most significant impact on ROA of banks has the value of PRIBOR.

Undoubtedly, this result was highly expected. The transactions made within an interbank market certainly influence the profitability and rate of return of banks. As it was already mentioned, the higher the PRIBOR value, the higher the deposits for banks. Naturally it may result in higher interests put on loans and thus reflect the net interest income earned by banks.

Following several illustrative scenarios have been made up to prove again the relations among chosen variables and especially to find out the intensity of the effect they have on Rate of return on assets. First of all, the theoretical value were computed for the tenth observation period, which is the year 2017.

Afterwards, the impacts of the changes in particular variables on the endogenous one are examined through four various scenarios, where each of the simulations contain the change in one particular variable compared to the original model.

The calculation of theoretical values for the last year of observation period (2017):

$\hat{\mathbf{y}} = 3.82014 - 0.195996 * 2.5 + 0.391577 * 0.26 - 0.0477187 * 4.3 - 0.154605 * 4.4$

$\hat{y}$ = 2.547

actual value of y in 2017 = 2.58

Scenario 1:

If the inflation rate in 2017 was 2%, which is the target level set by CNB, what would be then the value of ROA?

y = 3.82014 – 0.195996 * **2** + 0.391577 * 0.26 – 0.0477187 * 4.3 – 0.154605 * 4.4

y = 2.6445

In case that inflation in 2017 dropped by 0.5% and reached the desired 2% level, the rate of Return on assets of banks would have increased to 2.65 % compared to the original theoretical rate of 2.55, ceteris paribus.

Scenario 2:

If PRIBOR was the same in 2017 as it was in 2018, i.e. at the level of 1.12%, how would it influence the ROA ratio of banks?

y = 3.82014 – 0.195996 * 2.5 + 0.391577 * **1.12** – 0.0477187 * 4.3 – 0.154605 * 4.4

y = 2.8833

The increase in Prague Interbank Offered Rate from original 0.26 to 1.12 percent would have meant significant raise of Return on assets of banks to 2.88%, ceteris paribus.

Scenario 3:

If the real economic growth expressed by GDP value unexpectedly slowed down to 1.56 % which is the average growth rate of the observed period, what would it cause to the ROA of banks?

y = 3.82014 – 0.195996 * 2.5 + 0.391577 * 0.26 – 0.0477187 * **1.56** – 0.154605 * 4.4

y = 2.677

In case of scenario 3, GDP growth was 1.56%, then the ROA of banks would still have increased to 2.68%, ceteris paribus. However, this information only proves that from economic point of view the overall growth in total amount of GDP itself does not significantly impact the rate of return on assets of banks.

From one point of view, although the positive growth of GDP could lead to increased profit of businesses and therefore to higher bank deposits which would have caused the incline in banking assets, the net profit of banks does not necessarily had to increase as well. Therefore, in other words, disproportional rapid growth in the value of assets in relation to the profit of banks causes the decline in rate of return on assets.

Scenario 4:

If the real wages grew by 5% in 2017, what would be the value of ROA ratio?

$y = 3.82014 – 0.195996 * 2.5 + 0.391577 * 0.26 – 0.0477187 * 4.3 – 0.154605 * \mathbf{5}$
$y = 2.454$

The real wages keep increasing constantly within last few years. According to the scenario 4, if the growth of real wages increased by 5%, the return on assets of banks would have slightly decreased to 2.45%, ceteris paribus. On one hand, the constant increase in real wages supports higher consumption of households and their willingness to spend money which undoubtedly contributes to the higher GDP and therefore economic growth. On the other hand, it does not necessarily has to be connected with bank´s profitability. By increasing real wages, hypothetically the demand for loans could decrease for a short time period which would have the decline in the value of bank assets and profit as well.

4.6. Synthesis

Preceding chapters of the practical part contained detailed analyses divided into several sections according to the examined objects chosen for the purpose of the research. First part was dedicated to investigation of the development of particular macroeconomic

factors and the assessment of their growth including future estimations and comparison with averages of EU countries.

Next analysis was focused on the evaluation of performance of Česká spořitelna, ČSOB and Komerční banka, the three largest commercial banks operating in the Czech Republic. Generally, basic indices showing the growth rate of the net earnings generated by these entities compared to the previous period were computed for each bank separately. Based on aforementioned calculations, the results were used to determine which bank was able to reach the highest net earnings growth in 2017.

Last but not least, the practical part contained the section including the construction of econometric model for the assessment of the impacts of selected exogenous variables expressed by chosen indicators on the return on assets of banks representing the explained endogenous variable. Eventually, the actual overall evaluation of obtained findings is summarized and discussed in the following chapter 5.

5. Results and Discussion

The analysis of any banking sector and its overall performance is a comprehensive topic which gives author the opportunity to choose from different fields of operations related to this issue and afterwards to carry out the research from various perspectives.

Even the profitability of banks itself may be examined from assorted point of views including wide range of considered potential factors. The object of this thesis was the study of selected indicators such as inflation rate, PRIBOR, GDP and wages growth and their impact on the return on assets of banks and foreign bank branches operating in the Czech Republic.

In a comparison to the research conducted by different authors in other theses, the obtained results were difficult to compare. Even though, in several cases the object of the study, i.e. return on assets of banks was the same, the selected indicators were slightly different from those examined in this document. Apart from this fact, also the expression of the input data in distinct units contributed to the uniqueness of conducted research. The year-over-year percentage change in the value of selected indicators has been taken into account instead of using the volume itself.

Regarding the number of observations, this thesis used only limited number of observations due to the lack of data. Nevertheless, the intention was to capture the changes in the development of banking sector mainly after the crisis period which was successfully accomplished.

Although the correlation analysis indicated that unemployment rate has the highest impact on the banks return on assets, this fact had to be reconsidered and after all lead to the modification of the model by removing this variable completely. Despite the possibility that unemployment rate may actually have certain impact on the rate of return of banks, this indicator was considered as unsuitable to be included into the econometric model construction. This fact is caused by the inverse effect of unemployment compared to other indicators used – generally, the lower the rate of unemployment, the better. Naturally, only into a certain extent.

The results obtained from the econometric model output showed that PRIBOR variable had the highest impact on return on assets of banks. This finding makes sense from the economic perspective, because the Prague Interbank Offered Rate reflects the value of

interests on loans and therefore the net interest income of banks which is included in ROA ratio.

However, in spite of achieved results it is not possible to claim that only this particular indicator has the biggest impact on the return on assets of banks in general. There is still a lot of factors influencing banks that were not considered or could not be added into the model for various reasons, like in the case of unemployment. Therefore, the obtained results prove the impacts and strength of relationships only among selected indicators.

6. Conclusion

Thoroughly conducted research aimed to assess the impacts of selected indicators on the rate of return on assets of banks and foreign bank branches operating in the Czech Republic. Moreover, this diploma thesis focused on the evaluation of the banking performance, profitability and development including the brief analysis of economic environment and aforementioned factors. Last but not least, the thesis dealt with the examination of profit growth of Česká spořitelna, ČSOB and Komerční banka for the purpose of a comparison of individual outcomes.

The achieved results confirmed the stability and strength of the Czech banking sector during the period of crisis and even after that. Regarding banks and foreign bank branches in total, computed basic indices showed that the value of assets had increased by 17.5% in 2017 compared to the previous year, together with 2% increase in net earnings. Moreover, the final outcome based on the parameters estimated from constructed model indicated the biggest impact of the value of Prague Interbank Offered Rate on the banks rate of return on assets. The strength of this mutual relationship relates to the evident connection between transactions made within an interbank market and the rate of return of banks.

From aforementioned commercial banks that undoubtedly successfully maintain their dominant position on the domestic market, ČSOB actually managed to reach the highest net profit growth rate of 15.6% in 2017, followed by Komerční banka (8.5%). On the contrary, Česká spořitelna recorded a 5.5% decrease in net earnings compared to the previous year. Furthermore, performed analysis proved the ability of these banks to preserve a substantial rate of return on assets compared to the values that are common for this particular sector regarding large banks. Simultaneously, concerning banks in total the development of ROA has indicated the decrease over last years despite the constant growth in net profit and held assets. The reason lied in a disproportional increase of value of mentioned banking assets in relation to the amount of profit earned.

According to the future predictions, overall economic growth is expected to slow down moderately. However it will not significantly influence the performance of banks. Even the inflation is estimated to remain moderately below the target level which will certainly have the positive impact on the purchasing power of businesses as well as individuals living in the country.

Undoubtedly, the economic environment as well as its overall development is closely interconnected with banking sector. Therefore, there are many various factors that may influence the current state of the economy and banks. Whereas some of them might be regulated, others seem to be difficult to even predict. Nevertheless, in spite of results emerging from conducted analysis, it is impossible to claim that only one particular indicator does have the biggest impact on the return on assets of banks in general. The obtained results in fact demonstrated the comparison of impacts and strength of relationships only among indicators selected for the purpose of this research.

As it was already mentioned couple of times, the analysis of any banking sector and its overall performance is a complex topic offering the possibility to examine this issue from various perspectives considering wide range of potential factors that require deeper knowledge and detailed study. Eventually, the objectives defined at the very beginning of this thesis were completely met and both determined research questions were answered as well.

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8. Appendix

Document 1: Gretl Output

```
Model 1: OLS, using observations 2008-2017 (T = 10)
Dependent variable: ROA

             coefficient   std. error   t-ratio   p-value
  ---------------------------------------------------------
  const       3.82014      0.0800697    47.71     7.64e-08 ***
  InflR      -0.195996     0.0428374    -4.575    0.0060   ***
  PRIBOR      0.391577     0.0709202     5.521    0.0027   ***
  GDP        -0.0477187    0.0169030    -2.823    0.0370   **
  IncomeGr   -0.154605     0.0276988    -5.582    0.0025   ***

Mean dependent var   3.431000   S.D. dependent var   0.437809
Sum squared resid    0.074799   S.E. of regression   0.122311
R-squared            0.956640   Adjusted R-squared   0.921953
F(4, 5)              27.57862   P-value(F)           0.001328
Log-likelihood       10.28827   Akaike criterion    -10.57654
Schwarz criterion   -9.063614   Hannan-Quinn        -12.23621
rho                  0.176806   Durbin-Watson        1.588114

LM test for autocorrelation up to order 1 -
  Null hypothesis: no autocorrelation
  Test statistic: LMF = 0.307827
  with p-value = P(F(1, 4) > 0.307827) = 0.608578

LM test for autocorrelation up to order 2 -
  Null hypothesis: no autocorrelation
  Test statistic: LMF = 0.343039
  with p-value = P(F(2, 3) > 0.343039) = 0.734235

White's test for heteroskedasticity -
  Null hypothesis: heteroskedasticity not present
  Test statistic: LM = 9.96911
  with p-value = P(Chi-square(8) > 9.96911) = 0.2672

Breusch-Pagan test for heteroskedasticity -
  Null hypothesis: heteroskedasticity not present
  Test statistic: LM = 1.66498
  with p-value = P(Chi-square(4) > 1.66498) = 0.797068

Test for normality of residual -
  Null hypothesis: error is normally distributed
  Test statistic: Chi-square(2) = 2.24099
  with p-value = 0.326118
```