Factors Influencing Bank Profitability of Czech Banks and Their International Parent Companies

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Abstract—The goal of this paper is to specify factors influencing the profitability of selected banks. Next, a model will be created to help establish variables that have a demonstrable influence on the development of the selected banks' profitability ratios. Czech banks and their international parent companies were selected for analyzing profitability. Banks categorized as large banks (according to the Czech National Bank's system, which ranks banks according to balance sheet total) were selected to represent the Czech banks. Two ratios, the return on assets ratio (ROA) and the return on equity ratio (ROE) are used to assess bank profitability. Six endogenous and four external indicators were selected from among other factors that influence bank profitability. The data analyzed were for 2001–2013. First, correlation analysis, which was supposed to eliminate correlated values, was conducted. A large number of correlated values were established on the basis of this analysis. The strongly correlated values were omitted. Despite this, the subsequent regression analysis of profitability for the individual banks that were selected did not confirm that the selected variables influenced their profitability. The studied factors' influence on bank profitability was demonstrated only for Ceskoslovenska Obchodni Banka and Société Générale using regression analysis. For Československa Obchodni Banka, it was demonstrated that inflation level and the amount of the central bank's interest rate influenced the return on assets ratio and that capital adequacy and market concentration influenced the return on equity ratio for Société Générale.

Keywords—Banks, profitability, regression analysis, ROA, ROE.

I. INTRODUCTION

IN the recent past, a financial crisis struck the global economy. A number of significant banks in the USA and the European Union required bailing out by government intervention; in the better cases, profit declined by tens of percents or showed losses. This was not, however, the case for Czech banks. Czech banks survived the financial crisis without the need or necessity of government intervention and, in most cases, even achieved distinct profit. One of the reasons for these excellent – and, in Europe, unique – results is considered to be the fact that only a few years had gone by since a costly bailout of the banks by the government, during which the banks had not been able to accumulate poor quality assets. At the end of the 20th century, the Czech banking sector underwent a crisis caused primarily by a high percentage of classified loans [11]. At that time, the government was required to spend hundreds of billions of crowns to save the largest banks; subsequently, these banks were privatized by foreign financial groups. As of this point, nearly all Czech banks have been owned by foreign entities. They are characterized by unprecedented stability and they have shown many billions in profit, even during the period of the global financial and economic crisis [20].

Economic analyses are used as a foundation for decision making by bank management. At the same time, economic analyses are used extensively by the body that regulates and oversees the financial market; they are also used when adopting adequate measures for preserving the stability of the banking sector. Financial ratios are used most frequently for evaluating bank profitability. The value of a specific financial ratio has limited explanatory power on its own. For qualified analysis, it is necessary to work with a time series of ratios and monitor the trends of their development over past periods of time. However, a time series analysis conducted in this way contains only quantitative aspects of bank performance. For objective qualitative evaluation of bank profitability, it is also useful to compare the values achieved with the values of other banks' ratios. The goal of this paper is to establish profitability determinants for selected Czech banks and their international parent companies. Subsequently, a model of the selected banks' profitability ratios will be constructed for the individual banks.

The paper is constructed in the following way. In Section II, we present a review of literature in the area of bank profitability and its determinants. Section III contains a theoretical definition of regression and correlation analysis. Section IV includes an analysis and discussion of the established results. Section V contains a concluding summary.

II. REVIEW OF LITERATURE

The repercussions of bank management are wide reaching and discernible not only for individuals, mainly bank shareholders, but also for the banking sector and, consequentially, even for the business sector and the national economy as a whole. Therefore, bank management must be constantly monitored very closely and must be carefully evaluated [8]. Management analyses then serve as a foundation for decision making by the management. At the same time, management analyses are used to a large extent by the financial market's regulation and monitoring body for the adoption of adequate measures aiming to preserve the stability of the banking sector [6]. Financial profit is a key indicator for bank management, and the main profitability indicators for the banking business relate to this.

Bank profitability has been given attention in the past; authors have focused primarily on analyzing bank profitability. Two ratios are used for assessing bank

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profitability: the return on assets ratio (ROA) and the return on equity ratio (ROE) [1], [2], [6], [9], [10], [12], [14], [18], [19]. The return on assets ratio is mainly important for bank management as an indicator of bank profitability, whereas the return on equity ratio expresses the performance of invested resources for the bank's owners. Return on assets has also been understood as the return on overall capital, because it testifies to how effectively the company creates profit without differentiating whether the profit is created from its own or foreign sources [15]. In their studies, the authors have further focused on the influence not only of internal but also external determinants of bank profitability. The authors consider some internal determinants to be: i) the balance sheet total (bank size), ii) capital adequacy, iii) market concentration (the Herfindahl – Hirschman Index), iv) the cost/income ratio, v) outstanding loans, and vi) interest spread. In academic studies, authors primarily consider bank profitability's external determinants to be: i) inflation, ii) central bank interest rates, iii) GDP per capita, and iv) taxation rate.

Smirlock [18], who studied the link between profitability and a bank's economic cycle, is the first author associated with the analysis of bank profitability. In this study, the relationship between size and bank profitability, which relates to a bank's capital adequacy, is also studied. Large banks have a tendency to grow foreign capital and, therefore, seem to be more profitable.

Large banks are more profitable than small banks, because they achieve savings from scale. The positive relationship between bank size and profitability is explained in [15]. Bank size tends to be commonly measured according to balance sheet total.

Lower bank profitability can be caused by a greater accumulation of outstanding loans, which lowers bank revenues. The ratio of high-risk loans to assets was established as a substitute for risk in [1].

Most of the studies devoted to bank profitability [9], [12] list interest income as a source of bank revenue. For this reason, authors often list it as one of the basic explanatory variables for bank profitability. Another important determinant of bank profitability is the concentration of the banking market. In [12], a positive and statistically significant relationship between market concentration and bank profitability is confirmed for banks operating in an environment with little competition. On the other hand, the results from [18] show a negative but statistically insignificant relationship between concentration and bank profits. Statistically insignificant relationship between concentration and bank profits in study [7].

The size of outstanding loans lowers bank revenues, which indicates a negative relationship between risk and bank profitability. As a substitute ratio for risk, they used the ratio of provisions to loans and assets. Among others, [13] also deals with the relationship between profitability and inflation; he observes that the influence of inflation on bank profitability depends on whether wages and other bank operating costs grow more quickly than inflation. Most studies [5], [12], [16] have demonstrated a positive relationship between inflation and profitability.

The central bank (i.e., its rates) figures into banks' cost items and, thereby, affects their profitability [12]. Simultaneously, other interest rates on the market and the consequent earnings component of profit are derived from these rates.

Gross domestic product (GDP) is listed as one of the macroeconomic determinants of profitability by [4], [8], and [2]. One study [8] uses GDP per capita as a determinant of profitability. At the same time, [8] also proves in their study that bank taxation lowers bank profitability. Conversely, another study [2] comes to the conclusion that the impact of taxation on the profitability of the banking sector is low, because banks can transfer a large part of their tax burden on to their clients.

III. METHODS

A. Correlation Analysis

Correlation analysis is a method of relatively wide statistical examination of the existence of potential dependence between two random variables or between two data sets, none of which are under the control of the data producer. A mutual relationship between the variables is expressed by the correlation coefficient, which equals values from -1 to 1. The greater the absolute value of Pearson's correlation coefficient is, the closer the correlation is between the two variables. A positive correlation coefficient expresses between values, and a negative correlation coefficient expresses between both values. If the correlation coefficient value equals zero, correlation does not exist between the values.

For the correlation between two continuous random variables X and Y, the most important and frequently used tool to measure the correlation's strength is Pearson's correlation coefficient, which we use in profitability analysis for analyzing the mutual correlation of explanatory variables. Pearson's correlation coefficient takes the form [21]:

$$\rho = \frac{s_{xy}}{s_x * s_y} \quad (1)$$

where, ρ is the correlation coefficient, s_x is the standard deviation of the variable X, s_y is the standard deviation of the variable Y, s_{xy} is the covariance of the variables X and Y.

Many statistical methods assume that the basic sample has normal probability distribution. If this prerequisite is not fulfilled, it is not possible to use this method. Therefore, it is necessary to conduct a normality test, i.e., to determine whether or not the data set for the observed random variable corresponds to normal probability distribution, before conducting the correlation analysis itself. A number of normality tests exist. For the purposes of this paper, the Shapiro-Wilk test is most frequently used; its testing criterion takes the form:

$$SW = \frac{\left(\sum_{i=1}^{m} a_i(n)\left(X_{(n-i+1)} - X_i\right)\right)^2}{\sum_{i=1}^{n}(X_i - \bar{X})^2} \qquad (2)$$

However, the prerequisite for using Pearson's correlation coefficient is for both random variables X and Y to have normal distribution. This condition has been fulfilled for the data being examined, and it is not necessary to conduct the Shapiro-Wilk test.

B. Regression Analysis

Regression analysis is a statistical method with the goal of determining a statistical relationship between one or more independent or explanatory quantitative variables x and one dependent quantitative variable y. The principle for conducting regression analysis is to establish the most suitable form for the regressive model (i.e., to specify an appropriate equation to describe the dependence of Y on X). The principle for conducting regression analysis is also necessary to establish its parameters (to establish specific values for the parameters β); to establish the model's statistical significance (i.e., whether the model is essentially successful at specifying the estimate of the dependent variable). The regressive model's resulting function is written using a formula that is equivalent to the formula for the function of simple linear regression [21]:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_n X_n + \varepsilon_i \qquad (3)$$

where, Y is the dependent variable, β_0, β_i, $i = 1, \ldots, n$ are regression coefficients (also partial regression coefficients), X_i, $i = 1, \ldots, n$. are the values of the independent variable, and ε_i is the error term $i = 1, \ldots, n$.

The regression function's coefficients are established by the least squares method. As such, conducting the regression analysis is conditional on fulfilling the following prerequisites [21]:

- the absence of multicollinearity – this is determined by the Durbin-Watson test. The Durbin-Watson statistic (DW) is used for testing autocorrelation in the residuals and takes the following form:

$$DW = \frac{\sum_{i=2}^{n}(e_i - e_{i-1})^2}{\sum_{i=1}^{n}(e_i)^2} \qquad (4)$$

- the normality of the error term – the residual (e_i) must have normal probability distribution
- the error term is homoscedastic
- the relationships between the independent variables and the dependent variable are linear
- the error terms are uncorrelated.

IV. ANALYSIS OF THE INDIVIDUAL BANKS' PROFITABILITY

There were a large number of new entrepreneurial entities and privatized state enterprises that had difficult access to banking services – primarily to loans, which led to the growth of intercompany debt. The result was political and media pressure for the existing parastatal banks to increase their involvement in providing credit during privatization and, subsequently, clearing the way for new and foreign banks to enter the sector. In 1997, the Czech Republic's government began privatizing the large Czech banks. The privatization of the Czech banks was completed in 2001, and altogether privatization took place for Ceskoslovenská Obchodní Banka (CSOB), Ceská Spořitelna (CS), Investiční a Poštovní Banka, and Komerční Banka (KB). Since this time, the Czech banking sector has been considered to be stabilized with a stable ownership structure.

Large Czech banks and their international parent companies were selected for establishing profitability determinants. The classification of banks as large banks corresponds to the Czech National Bank's classification according to balance sheet total. The four banks governed by European financial groups that make up the actual group of large banks are:

i) Ceská Spořitelna AS and the Austrian Erste Group Bank AG,

ii) Ceskoslovenská Obchodní Banka AS and the Belgian KBC Bank NV,

iii) Komerční Banka AS and the French Société Générale, and

iv) UniCredit Bank Czech Republic and Slovakia AS and the Italian UniCredit SpA, via UniCredit Bank Austria AG.

UniCredit Bank Czech Republic and Slovakia and its international owner needed to be eliminated from the analysis on account of insufficient data. Data are evaluated for the years 2001 – 2013. In 2000 and 2001, there were acquisitions of Czech banks by foreign banks; therefore, the evaluation of the profitability determinants begins after 2001. Two ratios are used for evaluating bank profitability: the return on assets ratio (ROA) and the return on equity ratio (ROE). The return on assets ratio is mainly important for bank management as an indicator of bank profitability, whereas the return on equity ratio expresses the performance of invested resources for the bank's owners. The following ratios were selected to analyze bank profitability:

i) bank size,

ii) capital adequacy,

iii) the ratio of high-risk loans to assets,

iv) interest margin,

v) the cost/income ratio,

vi) market concentration,

vii) inflation,

viii) GDP per capita,

ix) taxation rate,

x) central bank interest rates.

The goal of the following analysis is to establish variables that have demonstrable influence on the development of the observed banks' profitability ratios and to subsequently compose a model of the profitability ratios for these banks.

Macroeconomic data for analysis was acquired from the Eurostat database; data concerning individual banks were derived from the Bankscope database [3].

A. Correlation Analysis of the Individual Banks

Correlation analysis using Pearson's correlation coefficient

was conducted in the program Excel. Analysis was conducted for the individual banks that were assessed, i.e., CS, CSOB, and KB and Erste Group, KBC Bank, and Société Générale. Correlation analysis pointed to unusually large dependence between many variables for all the banks examined. In Table I, the results of the correlation analysis are listed for the explanatory variables for Ceská Spořitelna, AS.

The correlation analysis specifies dependence exceeding an absolute value of 0.9 for ten of the pairs that were evaluated. The highest Pearson's correlation coefficient is for bank size and the country's GDP; next, for bank size and taxation rate; and also for the bank's cost/income ratio and taxation rates. The next five pairs of variables show dependence at an absolute value between 0.8 and 0.9. For subsequent analysis, it is always necessary to leave out one of the mutually dependent variables, because its trend is already depicted in the trend of the second variable from the correlated pairs of variables. Leaving out both dependent variables could distort any further analysis.

Correlation analysis shows a similar dependence for the other banks observed. The main cause of such a high number of correlated variables is not their direct mutual relationship but a low number of observations. Considering the short history of Czech banks, the number of observations was limited to 13, which is not sufficient for adequate qualified conclusions.

TABLE I
CORRELATION ANALYSIS OF THE CESKÉ SPOŘITELNY [3], [11]

Ceska sporitelna	Bank size	Capital adequacy	The ratio of high risk loans to assets	Costs/ income ratio	Interest margin	Market concentration	Inflation	GDP	Taxation rate	Central bank interest rate
Bank size	1,0000									
Capital adequacy	0,0005	1,0000								
The ratio of high risk loans to assets	-0,2950	0,5345	1,0000							
Costs/income ratio	**-0,9655**	-0,0408	0,3575	1,0000						
Interest margin	0,8493	-0,2008	-0,1730	-0,8292	1,0000					
Market concentration	**-0,9121**	-0,1365	0,2819	**0,9286**	-0,7368	1,0000				
Inflation	0,0263	-0,1844	0,4744	0,1249	0,1764	-0,0475	1,0000			
GDP	**0,9893**	-0,0531	-0,3592	**-0,9553**	0,8367	**-0,9271**	0,0175	1,0000		
Taxation rate	**-0,9798**	-0,0637	0,2470	**0,9722**	-0,8519	**0,9475**	-0,0304	**-0,9671**	1,0000	
Central bank interest rate	-0,7284	-0,2449	0,5199	0,8345	-0,4710	0,7964	0,4302	-0,7257	0,7584	1,0000

For further assessment, the correlated values with a level of correlation at an absolute value greater than 0.9 points will be left out. Therefore, we have the following mutually correlated values:

- Ceská Spořitelna – size, GDP per capita, taxation rate, and market concentration were left out. Here, all the omitted variables are correlated with the cost/income ratio.
- CSOB – size, GDP, taxation rate, and the cost/income ratio are omitted for the reason of being represented in the trend for interest margin.
- Komerční Banka – size, taxation rate, the cost/income ratio, and market concentration will not be included in further analysis. The omitted values are represented at a rate of more than 90% in the development of GDP.
- Erste Bank – only three variables are omitted: the share of high-risk loans to assets, the cost/income ratio, and market concentration. The trend for these values is represented in the trend for capital adequacy, interest margin, and GDP.
- KBC – the cost/income ratio, market concentration, and the ratio of high-risk loans to assets were eliminated due to correlation with the GDP per capita ratio.
- Société Générale – the values for size, the ratio of high-risk loans to assets, market concentration, GDP, and interest margin will not be assessed any further. The reason is correlation with taxation rate.

B. Regression Analysis of the Individual Banks

The analyzed data fulfills the preconditions listed in 2.2., i.e., verification by the necessary tests using the software program Statistica 12. The program's outputs for the analysis prerequisites are collectively depicted in Table II.

TABLE II
TEST AUTOCORRELATION – DURBIN-WATSON TEST FOR SIGNIFICANCE LEVEL 0,05 [2]

Bank	Explained variable	Durbin-Watson(d)	Lower limit	Upper limit
CS	ROE	1,773906	0,328	2,692
	ROA	2,234037	0,328	2,692
CSOB	ROE	2,414585	0,328	2,692
	ROA	2,511909	0,328	2,692
KB	ROE	1,776950	0,328	2,692
	ROA	2,622927	0,328	2,692
Erste	ROE	2,356872	0,147	3,266
	ROA	2,339278	0,147	3,266
KBC	ROE	1,476508	0,230	2,985
	ROA	1,876391	0,230	2,985
SG	ROE	1,759923	0,445	2,390
	ROA	1,934849	0,445	2,390

Regression analysis was conducted for the needs of the analysis. Regression analysis is used to find relevant explanatory variables (profitability determinants) and their introduction into a linear model in order to make it possible to establish factors influencing the selected banks' profitability. All this was conducted using Statistica 12 software at a 0.05

level of significance, i.e., with 95% probability that the conclusion of the analysis is correct.

V. DISCUSSION OF THE ACHIEVED RESULTS

As was specified for the correlation analysis, the number of observations for individual banks is distinctly limited by the time series, which is dependent on the short history of Czech banks. It is possible to assume that this fact is the main reason why neither a relevant mathematical model specifying bank profitability nor relevant explanatory variables were created by qualification at a 0.05 level of significance. The only exception is confirmation of the influence of inflation rate and central bank interest rate on return on assets for Ceskoslovenska Obchodni Banka as well as the influence of capital adequacy and market concentration on return on equity for Société Générale. The results of the regression analysis for these banks are listed in Tables III and IV (in Appendix).

A. Regression Analysis of CSOB

The regression analysis of CSOB (Table III) confirms the variables of inflation rate and the amount of the central bank's interest rates (CB) as a significant parameter (determinant) explaining the return on assets ratio. The findings that were determined are also supported by the results of research [18], [14].

From the regression analysis data, it is possible to compose a simple mathematical model, which is estimated to be 90% relevant and 81% explanatory of the problem of explaining the return on assets ratio.

$$ROA = 0,117*X_1 - 0,202*X_2 + \varepsilon i \qquad (5)$$

where, X_1 is inflation, X_2 is central bank interest rate, ε_i is the error term i = 1, …, n.

Proving the influence of explanatory on explained variables in analysis using a small number of observations is very difficult, because even confirming the influence of two values is considered to be successful.

B. Regression Analysis of Société Générale

For the French Société Générale, a relevant model explaining return on equity was found despite the very short time period that was observed (Table IV). The low number of explanatory variables included in the analysis is not only due to the elimination of mutually correlated explanatory variables, i.e., gross domestic product and bank size. The influence of the values for the variables of capital adequacy and market concentration on the return on equity ratio were confirmed by analysis for Société Générale for the time period analyzed. It is possible to find the same conclusions in [14], [17]. The model explains 92% of return on equity during the time period monitored, and the model was evaluated by analysis as being 96% relevant.

$$ROE = 3,477*X_1 - 0,077*X_2 + \varepsilon i \qquad (6)$$

where, X_1 is capital adequacy, X_2 is market concentration, ε_i is the error term i = 1, …, n.

Even when the analysis of the individual banks was able to statistically prove the influence of capital adequacy, market concentration, inflation rate, and central bank interest rates on profitability ratios using so few observations, it still is not possible, however, to consider these conclusions as relevant. Because of the short time series, it would be appropriate to repeat the analysis in a few years' time, once further observations are available.

VI. CONCLUSION

The two most common profitability ratios, i.e., return on equity and return on assets, were chosen as endogenous variables. The goal of the subsequent analysis was to specify which determinants can be confirmed as ratios with significant influence on the selected European banks' profitability. The exogenous variables selected for use in the analysis were bank size, the bank's capital adequacy, the ratio of high-risk loans to assets, interest margin, the cost/income ratio, market concentration, inflation, gross domestic product per capita, taxation rate, and the central bank's interest rate. The time series analyzed contains data for the years 2001 – 2013. First, the data was submitted to correlation analysis in order to eliminate the influence of correlated values. However, as a result of the low number of observations resulting from the Czech banks' short history, a large number of mutually related values appeared. Even when the strongly correlated values were omitted, the subsequent regression analysis of the profitability of the individual banks was not able to prove any influence for the selected ratios that would have explained the individual banks' profitability. The only exception was a confirmation of the influence of inflation rate and interest rate on the return on assets ratio for CSOB and the influence of capital adequacy and market concentration on the return on equity ratio for Société Générale.

In order to ground the analysis in a sample with more observations, it would be more suitable to conduct an analysis of all the selected banks at the same time, thereby creating a general model that expresses the relationship between explanatory variables and bank profitability ratios.

APPENDIX

TABLE III

REGRESSION ANALYSIS OF CSOB- ROA (IN %) [2], [10]

N=13	b*	Standard deviation (from b*)	b	Standard deviation (from b)	t(6)	p-value
Abs. term			-2,073	2,0401	-1,016	0,3486
Capital adequacy	0,1476	0,5390	0,011	0,0425	0,273	0,7934
The ratio of high risk loans to assets	-0,4356	0,4808	-0,247	0,2727	-0,906	0,3998
Interest margin	0,3707	0,3998	0,1664	0,1795	0,9273	0,3895
Market concentration	1,0147	0,5514	0,0022	0,0015	1,839	0,1153
Inflation	**0,9164**	**0,3070**	**0,1173**	**0,0393**	**2,9840**	**0,0244**
Central bank interest rate	**-1,3259**	**0,4840**	**-0,202**	**0,0738**	**-2,739**	**0,0337**

R= 0,90287354 R2=0,81518063 Upravené R2=0,63036126, F(6,6)=4,4107 p<,04692 Směrod. chyba odhadu:0,12722

TABLE IV

RESULTS OF REGRESSION WITH DEPENDENT VARIABLE ROE (IN %), SOCIÉTÉ GÉNÉRALE REGRESSION ANALYSIS OF CSOB- ROA (IN %) [2], [10]

R= 0,96148958 R2 = 0,92446221 Upravené R^2= 0,87050665, F(5,7)=17,134 p<,00084 Směrod. chyba odhadu: 2,6609

N=13	b*	Standard deviation (from b*)	b	Standard deviation (from b)	t(7)	p-value
Abs. term			58,01710	87,74496	0,66120	0,529637
Capital adequacy	**0,487506**	**0,190518**	**3,47754**	**1,35903**	**2,55885**	**0,037615**
Inflation	-0,023435	0,188340	-0,26756	2,15027	-0,12443	0,904472
Taxation rate	-0,357728	0,277674	-4,11955	3,19765	-1,28831	0,238586
Central bank interest rate	0,392712	0,196224	2,51776	1,25803	2,00134	0,085450
Market concentration	**1,016437**	**0,422124**	**0,07686**	**0,03192**	**2,40791**	**0,046918**

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