# Assessment of selected aspects of financial stability of the Czech banks

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**Abstract:** The aim of the paper is to choose which financial ratios are the most suitable for inclusion into the aggregate financial stability index for commercial banks, to examine the selected aspects of the financial stability and performance of the Czech commercial banks and their parent companies with the use of chosen financial ratios, and to construct aggregate financial stability index. We examined the aspects of financial stability of the Czech commercial banks and their parent companies. We focused on several aspects of financial stability: the banking profitability, efficiency, liquidity, solvency and asset quality. Results show that Czech subsidiaries were more profitable, solvent and liquid than their parent companies. Nevertheless, the Czech subsidiaries are less efficient than parent companies. Finally, we created the new aggregate financial stability index.

**Keywords:** profitability; efficiency; DEA; data envelopment analysis; solvency; liquidity risk; assets' quality; financial stability; commercial bank; financial conglomerate; Czechia.

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## 1 Introduction

The banking system is an important component of a market economy, it is crucial to forming and supporting a basic level of trust in society to the national currency unit and the state. A good performance of commercial banks is a key factor for a robust financial system which can withstand volatility and shocks in the economy; however a poor performance can contribute to major financial crisis especially within emerging economies (Nimalathasan, 2008).

Financial stability is often at the centre of the banking sector policy debates. Jiang (2014) argues that issues to do with financial stability are still complicated because there are a lot of definitions used, therefore, the operational definition which is the one which should specify variables to use differs with situations. The Czech National Bank (CNB) defines financial stability as a situation where the financial system operates with no serious failures or undesirable impacts on the present and future development of the economy as a whole, while showing a high degree of resilience to shocks.

The aim of the paper is to choose which financial ratios are the most suitable for inclusion into the aggregate financial stability index for commercial banks, to examine the selected aspects of the financial stability and performance of the Czech commercial banks and their parent companies with the use of chosen financial ratios, and to construct the aggregate financial stability index.

In spite of the fact that there exist a number of empirical studies which measure financial stability with an aggregate financial stability index (some of these studies are mentioned later in this paper), we believe that an important gap still exists in the empirical literature. Individual studies use different financial ratios. However, to the best of our knowledge, there is no empirical study that would consider the fact that financial stability of banks operating within financial conglomerate may be affected also by the financial stability of the parent company. Moreover, bank performance is traditionally measured only by profitability ratios and bank efficiency is omitted.

Therefore, we will focus not only on profitability, efficiency, liquidity, solvency and asset quality of individual banks, but also on the same aspects of the financial stability of their parent companies. Our analysis covers the commercial banks operating in the Czech banking sector within the period 2001–2018.

The structure of the paper is as follows. The next section provides theoretical background, subsequently the methodology and data. Then, we focus on the results of the analysis. The final section offers concluding remarks.

## 2 Theoretical background

Measurement of the financial stability is crucial topic, therefore it is measured by the central banks, International Monetary Funds. Moreover, the financial stability is in the centre of research studies. Financial soundness indicators presented by International Monetary Fund (IMF) included capital adequacy, assets quality, earning and profitability, liquidity and sensitivity to market risk. The Czech National Banks measurement of financial stability indicators are based on the IMF's methodology with several marginal differences. Nevertheless, the International Monetary Fund and Czech National Bank assess the financial stability for whole banking sectors. In contrast, the proposed index evaluates the financial stability of individual banks. Moreover, as it was mentioned

above, we will include also bank efficiency and the impact of the financial stability of parent company (where applicable).

The most empirical studies measured the financial stability using Z-score (Berger et al., 2009; Beck et al., 2013; Lepetit and Strobel, 2015; Fiordelisi and Mare, 2014; Kočišová et al., 2018). Several authors evaluated the financial stability using CAMEL model (Ginevičius and Podviezko, 2013) or CAMELS (Roman and Şargu, 2013).

The actual studies about the financial stability applied the aggregated index of financial stability. In the Czech banking sector, Geršl and Heřmánek (2008) used the aggregated financial stability index. They included indicators: capital adequacy, asset quality (non-performing loans to total loans), profitability (return on assets (ROA), return on equity), interest rate risk and foreign exchange risk. Similar indicators were covered in study of Kočišová and Stavárek (2018). Karanovic and Karanovic (2015) used an aggregate index for measuring financial stability in the Balkans. They constructed the index using four parts: financial development index, financial vulnerability index, financial soundness indicators and world economic climate index. Authors used four indicators (bank capital to assets, non-performing loans to total loans, Z-score and liquid reserves to bank assets) as indices for financial soundness index. Similar indicators were used in study of Akosah et al. (2018), who covered other indicators (e.g., capital adequacy ratio, liquid assets to total assets, cost to income ratio, ROA or noninterest expenses to gross income).

The impact of the affiliation with the parent company on the bank stability is not sufficiently research in the empirical literature. Ashcraft (2008) evaluated the relationship between holding affiliation and CAMEL ratings and suggested that a bank affiliated with a multi-bank holding company was significantly safer than either a stand-alone bank or a bank affiliated with one-bank holding company. Lambert et al. (2019) marginally included this topic in the paper and they evaluated the relationship between the holding company affiliation and risk-based capital. Zhang (2019) found that the establishment of financial holding company can indeed improve the stability of the subsidiary to some extent in China. Moreover, Raykov and Silva-Buston (2018) suggested that holding-company banks were more stable than independent banks when affected by a negative shock.

## 3 Methodology and data

We consider the banking performance as one part of the banks' stability. In general, the banking performance is defined as the achievement of the objectives set forth by the bank within the agreed time and with minimal costs while using the available resources. The performance is indicated by the banking efficiency and profitability. The reasons for considering the banking efficiency into the stability index are several. Firstly, the banking efficiency provide one value about banking performance, moreover it is comparable within other banks. Shaddady and Moore (2019) added DEA into the model for investigation of the financial stability and used CAMELS-DEA. Moreover, in the empirical literature, several authors showed the relationship between efficiency and banking stability. E.g., Kwan and Eisenbeis (1997) or Fiordelisi et al. (2011) found that inefficient banks seems to take less risk, therefore inefficiency has a positive impact on risk-taking. Therefore, the other reason of using efficiency into the financial stability index is the existence of the relationship between efficiency and banking risks that can

influence the banking stability. As Fiordelisi et al. (2011) concluded, the improvements in bank efficiency cause a lower probability of default.

We measure banking efficiency using non-parametric method, namely data envelopment analysis (DEA). Bogetoft and Otto (2011) summarised that the non-parametric models are the most flexible in terms of the production economic properties that can be invoked. We measure the technical efficiency of banks using input-oriented model with variable return to scale. We use traditional DEA models because the dynamic DEA requires the strictly balanced panel data. We consider also new establish banks and banks that merge during the period 2001–2018. Theoretical description of the DEA model presents Palečková (2018).

The profitability indicators measure the ability to absorb losses without any impact on capital and to realise business goals and plans (Pavković et al., 2018). The methodology about the profitability indicators are described in Palečková (2018). The traditional profitability indicators are ROA, return on equity, net interest margin (NIM), cost to income ratio and net non-interest margin. We use ROA and NIM. ROA is important measures of the bank's stability. If the banking stability is measured using Z-score, the ROA is the key indicator. Although in the empirical literature is mixed evidence, the authors suggested the impact of bank profitability on banking stability (e.g., Berger et al., 2009; Natalya et al., 2015). The ROA and NIM in the financial stability index are commonly used in previous studies (e.g., Kočišová and Stavárek, 2018) as well as in the financial stability index measured by the CNB.

Liquidity means bank's resilience to cash flow shocks. Such ability to withstand shocks enhances financial stability. To asses bank liquidity, e.g., following liquidity ratios are commonly employed: the liquid asset ratio (LIA), the loan-to-asset ratio, the loan-to-deposit ratio and the net interbank position (Vodová, 2013). We will include two ratios into the aggregate index of financial stability: the LIA and the net interbank position. The LIA is the most commonly used measure of bank liquidity. It belongs to the core IMF soundness indicators. Also Geršl and Heřmánek (2008), Akosah et al. (2018), Karanovic and Karanovic (2015), and Kočišová and Stavárek (2018) used this ratio. Geršl and Heřmánek (2008) used also the share of liquid assets in clients' deposits. Kočišová and Stavárek (2018) calculated, in accordance with the core IMF Soundness indicators, the share of liquid assets in short-term liabilities. However, these two ratios focus on the same aspect of bank liquidity (buffer of liquid assets) but only related to liabilities. We choose an innovative approach: to asses also the vulnerability of bank to development on the interbank market. Our second liquidity ratio is therefore the net interbank position (NIP).

Financial stability is positively influenced also by bank solvency. There exist many indicators of solvency. We will use the total capital ratio (TCR) which measures the amount of a bank's capital in relation to the amount of risk it is taking. Our approach is in accordance with Geršl and Heřmánek (2008), Kočišová and Stavárek (2018) and Akosah et al. (2018). We could also use some of the core IMF Soundness indicators: regulatory capital to risk-weighted assets, regulatory tier 1 capital to risk-weighted assets and non-performing loans net provisions to capital. Karanovic and Karanovic (2015) used the share of equity in total assets. However, we prefer the TCR ratio as this ratio reflect the different quality of bank capital (tier 1, tier 2) and different riskiness of bank activities.

Financial stability may be jeopardised by excessive credit risk. To measure the asset quality ratio, we will follow Geršl and Heřmánek (2008), Kočišová and Stavárek (2018) and Karanovic and Karanovic (2015) and focus on the share of non-performing loans in

total gross loans (NPL). Core IMF Soundness indicators contains also the sectoral distribution of loans to total loans. This ratio can not be used due to data availability. The disadvantage of another possible indicator, the share of loan loss provisions in total gross loans, lies in the fact that its values are strongly influenced by different bank's policies for loan collateral and provisioning.

### *3.1 Data*

The data set used in this paper consists of 19 Czech commercial banks and five parent companies. We consider five financial conglomerates, namely Erste Group, Société Générale Group, KBC Group, UniCredit Group, Raiffeisen Group. The data were obtained from the database Orbis Bank Focus and the annual reports of commercial banks during the period 2001–2018. All the data of the Czech commercial banks is reported on unconsolidated basis. The data for financial conglomerate consist of the consolidated data for whole conglomerate and we collect these data from annual report of individual groups. Owing to the homogeneity of the data set in particular we analyse only commercial banks that are operating as independent legal entities. We do not include the building societies, foreign bank branches and other specialised institutions.

For the estimation of efficiency it is necessary to define used inputs and outputs. Consistently with the intermediation approach, we assume that banks use the three inputs: labour measured by total number of employees, physical capital measured by fixed assets and total deposits, and one output: total loans.

## 4 Results and discussion

This section provides results of the chosen financial ratios. In all cases, tables present average value for the whole Czech banking sector, values recorded by five banks belonging to the financial conglomerate together with their parent company – i.e., Česká spořitelna and Erste Group, Komerční banka and Société Générale, ČSOB and KBC Group, UniCredit Bank together with UniCredit Group, and Raiffeisenbank together with Raiffeisen Group.

The Czech banking sector has long been profitable (Table 1). Even though, the average value of profitability of the Czech banking sector fluctuated. The decrease of profitability was visible during and after the financial and debt crisis. The impact of the global financial and debt crisis on performance is evident in the empirical literature (e.g., Miljković et al., 2013). During the period 2013–2018 ROA was increasing. Despite a low interest rate environment, the Czech banking sector indicated very good profitability, ROA slightly increased in 2016.

When we focus on the banks that belong to the financial conglomerate, their profitability is good and they are more profitable that their parent companies in all cases. All Czech subsidiaries achieved very good profitability. Nevertheless, the parent companies indicated during and after the financial crisis the low and negative value of ROA. The worst situation was in KBC group, where ROA achieved negative value during 2008–2012. Československá obchodní banka (ČSOB) reached very good profitability (except 2008) during this period.

**Table 1** Profitability measured by return on assets (in %)

| | *01* | *02* | *03* | *04* | *05* | *06* | *07* | *08* | *09* | *10* | *11* | *12* | *13* | *14* | *15* | *16* | *17* | *18* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sector | 0.7 | 0.8 | 1.2 | 0.7 | 1.0 | 0.9 | 1.0 | 0.9 | 0.3 | 0.6 | –0.2 | 0.5 | 0.6 | 0.8 | 0.8 | 1.0 | 0.8 | 0.9 |
| ČS | 0.4 | 1.3 | 1.7 | 1.9 | 1.7 | 1.8 | 1.9 | 2.2 | 1.6 | 1.6 | 1.5 | 1.8 | 1.6 | 1.8 | 1.5 | 1.5 | 1.1 | 1.1 |
| Erste G. | 0.4 | 0.4 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.5 | 0.5 | 0.6 | –0.3 | 0.3 | 0.1 | –0.7 | 0.5 | 0.6 | 0.6 | 0.8 |
| KB | 0.6 | 2.0 | 2.1 | 2.0 | 1.9 | 1.7 | 1.7 | 1.9 | 1.7 | 2.0 | 1.2 | 1.8 | 1.7 | 1.4 | 1.5 | 1.5 | 1.5 | 1.4 |
| So. Ge. | 0.4 | 0.3 | 0.5 | 0.6 | 0.6 | 0.6 | 0.2 | 0.3 | 0.1 | 0.4 | 0.2 | 0.1 | 0.2 | 0.2 | 0.3 | 0.3 | 0.2 | 0.3 |
| ČSOB | 1.0 | 1.1 | 1.0 | 1.1 | 1.3 | 1.1 | 1.7 | 0.1 | 2.9 | 1.6 | 1.3 | 1.9 | 1.6 | 1.6 | 1.5 | 1.4 | 1.3 | 1.1 |
| KBC G. | 0.5 | 0.5 | 0.5 | 0.6 | 0.7 | 1.0 | 0.8 | –0.4 | –0.8 | 0.5 | 0.2 | –0.1 | 0.4 | 0.7 | 1.0 | 0.9 | 0.9 | 0.9 |
| UC B. | 0.9 | 1.3 | 1.3 | 1.3 | 1.1 | 1.2 | 1.2 | 1.8 | 1.1 | 1.1 | 0.4 | 1.0 | 0.7 | 0.9 | 0.9 | 1.0 | 1.1 | 1.2 |
| UC G. | 0.9 | 0.9 | 0.9 | 0.9 | 0.5 | 0.7 | 0.7 | 0.5 | 0.3 | 0.2 | 0.1 | 0.2 | 0.5 | 0.3 | 0.3 | 1.3 | 0.7 | 0.5 |
| RB B. | 0.0 | 0.2 | 0.4 | 0.5 | 0.5 | 0.6 | 0.7 | 0.8 | 1.0 | 1.0 | 1.1 | 1.0 | 0.5 | 0.9 | 1.0 | 0.8 | 0.8 | 0.8 |
| RB G. | 0.2 | 0.9 | 1.1 | 0.3 | 1.1 | 2.3 | 1.3 | 1.3 | 0.4 | 0.9 | 0.7 | 0.6 | 0.5 | 0.5 | 0.4 | 0.5 | 0.9 | 1.0 |

*Source*: Authors' calculations based on Orbis Bank Focus and annual reports

NIM is a measure of the difference between paid and received adjusted for a total assets held by the bank (Table 2). In case of average NIM of the Czech banking sector, we also registered the decrease during and after the financial crisis. In average, almost all Czech subsidiaries except Raiffeisen bank were more efficient than their parent companies. Although, these banks are mostly below 3%. These banks are five largest banks in the Czech banking sector. The large banks have lower NIM that small banks. Horváth (2009) found the larger banks have smaller NIM.

**Table 2** Profitability measured by net interest margin (in %)

| | *01* | *02* | *03* | *04* | *05* | *06* | *07* | *08* | *09* | *10* | *11* | *12* | *13* | *14* | *15* | *16* | *17* | *18* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sector | 2.4 | 2.3 | 2.3 | 2.6 | 3.2 | 2.6 | 2.8 | 2.7 | 2.7 | 2.5 | 2.3 | 2.2 | 2.1 | 2.4 | 2.3 | 2.0 | 1.8 | 2.0 |
| ČS | 3.4 | 3.5 | 3.4 | 3.6 | 3.5 | 3.6 | 3.7 | 4.2 | 4.2 | 3.7 | 3.3 | 3.0 | 2.8 | 3.0 | 2.7 | 2.4 | 1.9 | 2.0 |
| Erste G. | 1.6 | 2.0 | 1.9 | 1.9 | 1.8 | 1.7 | 2.0 | 2.4 | 2.6 | 2.6 | 2.7 | 2.4 | 2.4 | 2.3 | 2.2 | 2.1 | 2.0 | 1.9 |
| KB | 3.1 | 2.8 | 2.7 | 2.9 | 2.8 | 2.9 | 2.7 | 2.9 | 2.9 | 2.9 | 2.7 | 2.6 | 2.5 | 2.3 | 2.4 | 2.3 | 2.1 | 2.1 |
| So. Ge. | 1.0 | 1.2 | 1.2 | 1.1 | 0.6 | 0.4 | 0.3 | 0.7 | 1.2 | 1.1 | 1.1 | 0.9 | 0.9 | 0.6 | 0.7 | 0.7 | 0.8 | 0.8 |
| ČSOB | 2.2 | 2.3 | 2.4 | 2.6 | 1.9 | 2.1 | 2.9 | 2.3 | 3.2 | 2.5 | 2.6 | 2.7 | 2.3 | 2.6 | 2.3 | 1.5 | 1.4 | 1.6 |
| KBC G. | 1.2 | 1.4 | 1.4 | 1.1 | 1.3 | 1.3 | 1.0 | 1.3 | 1.5 | 1.7 | 1.6 | 1.5 | 1.4 | 1.8 | 1.5 | 1.5 | 1.4 | 1.6 |
| UC B. | 2.4 | 2.3 | 1.8 | 1.7 | 1.8 | 1.4 | 2.5 | 2.4 | 2.4 | 2.3 | 2.3 | 2.0 | 1.5 | 1.9 | 1.7 | 1.6 | 1.7 | 2.0 |
| UC G. | 2.4 | 2.4 | 2.1 | 2.0 | 1.5 | 1.6 | 2.4 | 1.8 | 1.9 | 1.8 | 1.7 | 1.5 | 1.5 | 1.5 | 1.3 | 1.2 | 1.3 | 1.3 |
| RB B. | 1.3 | 1.5 | 1.7 | 2.2 | 2.3 | 2.5 | 2.7 | 2.9 | 3.3 | 3.8 | 3.4 | 3.2 | 2.9 | 2.6 | 2.5 | 2.0 | 1.8 | 2.0 |
| RB G. | 0.4 | 2.4 | 2.4 | 2.3 | 2.5 | 2.6 | 3.3 | 3.8 | 3.9 | 2.7 | 2.5 | 2.6 | 2.9 | 3.1 | 2.9 | 2.6 | 2.4 | 2.4 |

*Source*: Authors' calculations based on Orbis Bank Focus and annual reports

DEA measures the relative efficiency and the results of efficiency are in range from 0% to 100%. The Czech banking sector is efficient during whole estimated period (Table 3). The average efficiency increased from 2001 to 2019 in the Czech banking sector. We found that parent companies are mostly more efficient than their Czech

subsidiaries. The results show that Raiffeisen Group were lower efficient than Raiffeisen bank in the Czech Republic. The UniCredit Group as well as the UniCredit Bank operated at 100% efficient frontier during the analysed period. These findings are not surprising because the group of large banks (Česká spořitelna, Komerční Banka and ČSOB) were lower efficient than other banks in the banking sector. The largest banks in the banking sector are profitable but they are not efficient. Inanoglu et al. (2016) claim that large banks are lower efficient.

**Table 3** Efficiency using data envelopment analysis (in %)

| | *01* | *02* | *03* | *04* | *05* | *06* | *07* | *08* | *09* | *10* | *11* | *12* | *13* | *14* | *15* | *16* | *17* | *18* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sector | 69 | 69 | 68 | 73 | 74 | 75 | 80 | 82 | 84 | 87 | 87 | 90 | 93 | 89 | 88 | 92 | 92 | 90 |
| ČS | 41 | 41 | 46 | 43 | 40 | 45 | 50 | 43 | 55 | 58 | 59 | 63 | 67 | 70 | 70 | 71 | 79 | 83 |
| Erste G. | 98 | 94 | 100 | 100 | 85 | 82 | 86 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 97 |
| KB | 39 | 31 | 31 | 38 | 33 | 42 | 45 | 52 | 61 | 69 | 72 | 77 | 79 | 72 | 86 | 80 | 97 | 86 |
| So. Ge. | 100 | 100 | 100 | 100 | 85 | 78 | 86 | 68 | 91 | 94 | 98 | 91 | 88 | 83 | 89 | 100 | 100 | 100 |
| ČSOB | 40 | 45 | 45 | 45 | 49 | 49 | 44 | 46 | 46 | 53 | 67 | 82 | 100 | 91 | 93 | 100 | 71 | 58 |
| KBC G. | 88 | 83 | 95 | 100 | 100 | 100 | 100 | 87 | 98 | 100 | 100 | 100 | 100 | 100 | 99 | 99 | 100 | 100 |
| UC B. | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| UC G. | | | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| RB B. | 100 | 81 | 58 | 74 | 89 | 100 | 100 | 100 | 100 | 100 | 99 | 99 | 100 | 100 | 100 | 100 | 100 | 100 |
| RB G. | 70 | 77 | 82 | 83 | 63 | 69 | 92 | 67 | 100 | 100 | 100 | 100 | 99 | 100 | 90 | 98 | 92 | 93 |

*Source*: Authors' calculations based on Orbis Bank Focus and annual reports

Liquidity of the whole Czech banking sector is very good (Table 4). In the first analysed years, the average LIA was very high. Later, liquid assets accounted for more than a fifth of assets even in crisis years. In last two years, the value fluctuates again around 30% of total assets. Generally speaking, smaller banks tend, with some exceptions, to have higher liquidity. Larger banks usually rely more on funds from the interbank market. This finding is fully consistent with Berrospide (2013) or Cornett et al. (2012). Focusing on banks that are members of an international financial group, we can conclude that exceptions prove the rule: there are only some years in which parent banks have higher liquidity than their subsidiaries. Mostly, subsidiaries are (much) more liquid that their parents.

Also in terms of the net interbank position, Czech banking sector is very safe (Table 5). Although the average value of this ratio decreased during the time, it remained positive which signals that the Czech banking sector as a whole is in the position of net lender. In general, banks that are net lenders on the interbank market tend to be smaller than borrower banks, such as in Lucchetta (2007). Subsidiaries are (with only a few exceptions) in much safer position on the interbank market than their parent banks.

As banks must maintain a minimum TCR of 8%, it is evident that the banking sector as a whole, all subsidiaries and their parent banks fulfil the minimum capital requirements in all analysed years (Table 6). However, solvency both the group of analysed banks and their parent companies is mostly below average. With the exception of ČSOB and Raiffeisenbank, Czech banks are more solvent than their parents.

On average, large Czech banks have smaller capital buffers than small banks. The same relation was found by many studies for other countries (e.g., Jokipii and Milne, 2008; Stolz and Wedow, 2011; Klepková Vodová, 2019).

**Table 4** Liquid asset ratio (in %)

| | *01* | *02* | *03* | *04* | *05* | *06* | *07* | *08* | *09* | *10* | *11* | *12* | *13* | *14* | *15* | *16* | *17* | *18* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sector | 46 | 48 | 41 | 37 | 36 | 28 | 27 | 26 | 26 | 27 | 29 | 20 | 20 | 19 | 21 | 18 | 32 | 28 |
| ČS | 29 | 30 | 21 | 17 | 18 | 14 | 11 | 14 | 19 | 27 | 15 | 13 | 15 | 10 | 14 | 16 | 21 | 4 |
| Erste G. | 28 | 18 | 15 | 16 | 15 | 18 | 14 | 13 | 12 | 13 | 12 | 12 | 12 | 12 | 14 | 16 | 15 | 12 |
| KB | 64 | 65 | 64 | 56 | 53 | 45 | 40 | 29 | 26 | 23 | 18 | 17 | 23 | 17 | 19 | 17 | 16 | 15 |
| So. Ge. | 23 | 22 | 22 | 24 | 37 | 45 | 41 | 24 | 30 | 32 | 28 | 35 | 40 | 13 | 10 | 12 | 14 | 13 |
| ČSOB | 64 | 58 | 42 | 34 | 44 | 32 | 43 | 21 | 24 | 24 | 25 | 21 | 27 | 32 | 35 | 31 | 27 | 25 |
| KBC G. | 28 | 31 | 31 | 29 | 29 | 31 | 31 | 32 | 26 | 27 | 26 | 21 | 24 | 25 | 19 | 27 | 31 | 32 |
| UC B. | 34 | 27 | 16 | 19 | 29 | 25 | 27 | 25 | 19 | 18 | 15 | 14 | 17 | 11 | 19 | 22 | 31 | 19 |
| UC G. | | | | | 4 | 5 | 4 | 4 | 6 | 7 | 6 | 8 | 10 | 12 | 14 | 14 | 18 | 18 |
| RB B. | 47 | 43 | 38 | 42 | 35 | 23 | 15 | 19 | 17 | 10 | 11 | 15 | 14 | 17 | 17 | 29 | 32 | 3 |
| RB G. | 15 | 22 | 18 | 19 | 16 | 15 | 10 | 14 | 14 | 13 | 15 | 12 | 14 | 16 | 20 | 22 | 17 | 21 |

*Source*: Authors' calculations based on Orbis Bank Focus and annual reports

**Table 5** Net interbank position (in %)

| | *01* | *02* | *03* | *04* | *05* | *06* | *07* | *08* | *09* | *10* | *11* | *12* | *13* | *14* | *15* | *16* | *17* | *18* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B.sector | 27 | 28 | 22 | 20 | 23 | 13 | 11 | 7 | 9 | 11 | 8 | 3 | 3 | 4 | 6 | 6 | 10 | 12 |
| ČS | 19 | 20 | 11 | 7 | 10 | 5 | 2 | 5 | 9 | 13 | 0 | –2 | –7 | –6 | –6 | –9 | –10 | 5 |
| Erste G. | –11 | –9 | –10 | –9 | –11 | –12 | –10 | –10 | –7 | –4 | –8 | –6 | –4 | –4 | –5 | –5 | –3 | 1 |
| KB | 47 | 50 | 47 | 47 | 44 | 36 | 31 | 21 | 19 | 13 | 10 | 3 | 10 | –0 | –1 | –0 | 14 | 17 |
| So. Ge. | –5 | –3 | –5 | –5 | –7 | –9 | –7 | –6 | –4 | –2 | –4 | –4 | –1 | –1 | 1 | 3 | –2 | –0 |
| ČSOB | 45 | 31 | 18 | 14 | 10 | –2 | –6 | –5 | –4 | –2 | –0 | –5 | 0 | 11 | 15 | 14 | 13 | 15 |
| KBC G. | –6 | –5 | –5 | –6 | –5 | –6 | –7 | –8 | –8 | –4 | –2 | –3 | 1 | –2 | –2 | –6 | –3 | –9 |
| UC B. | 17 | 8 | –3 | –3 | 4 | 4 | 8 | 9 | 2 | 3 | –3 | –3 | 1 | 1 | 9 | 2 | 5 | 5 |
| UC G. | | | | | –8 | –8 | –9 | –11 | –3 | –4 | –8 | –5 | –5 | –4 | –4 | –3 | –6 | –7 |
| RB B. | 21 | 24 | 24 | 30 | 15 | 6 | 1 | –0 | –1 | –7 | 2 | 4 | 4 | 8 | –3 | –8 | 23 | 19 |
| RB G. | –8 | –1 | –9 | –6 | –11 | –10 | –12 | –20 | –13 | –9 | –8 | –6 | –6 | –6 | –5 | –3 | –9 | –10 |

*Source*: Authors' calculations based on Orbis Bank Focus and annual reports

The overall quality of Czech banks' loan portfolio is quite good (Table 7), with two peaks: one at the beginning of the analysed period (which was influenced by higher level of bad loans mainly of Komerční banka from the previous era) and the second peak (which was caused probably by the aftermath of the financial crisis).

The comparison of parents and their subsidiaries is not so unambiguous as it was for previous ratios. In majority of years, subsidiaries have better quality loans, while in some other years, parent company is better, for all analysed banks in the sample. With the exception of Komerční banka at the beginning of the analysed period, quality of loan

portfolio of analysed large banks is very good. Small banks have on average much worse portfolio. This is in accordance, e.g., with Curak et al. (2013) or Salas and Saurina (2002).

**Table 6** Solvency (total capital ratio; in %)

| | *01* | *02* | *03* | *04* | *05* | *06* | *07* | *08* | *09* | *10* | *11* | *12* | *13* | *14* | *15* | *16* | *17* | *18* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B.sector | 27 | 19 | 18 | 20 | 18 | 16 | 16 | 30 | 22 | 16 | 19 | 16 | 16 | 18 | 18 | 18 | 18 | 19 |
| ČS | 15 | 17 | 15 | 13 | 11 | 11 | 9 | 10 | 12 | 14 | 13 | 16 | 18 | 18 | 21 | 20 | 19 | 19 |
| Erste G. | 11 | 11 | 11 | 11 | 11 | 10 | 11 | 10 | 13 | 14 | 14 | 16 | 16 | 16 | 17 | 18 | 18 | 18 |
| KB | 14 | 13 | 12 | 12 | 13 | 13 | 11 | 12 | 14 | 17 | 16 | 16 | 16 | 17 | 17 | 17 | 19 | 19 |
| So. Ge. | 11 | 11 | 12 | 12 | 11 | 11 | 9 | 11 | 13 | 12 | 12 | 13 | 15 | 14 | 16 | 18 | 17 | 17 |
| ČSOB | 12 | 13 | 14 | 11 | 11 | 9 | 11 | 9 | 12 | 17 | 14 | 14 | 15 | 16 | 18 | 19 | 17 | 18 |
| KBC G. | 15 | 14 | 13 | 13 | 12 | 12 | 12 | 13 | 14 | 17 | 16 | 19 | 18 | 19 | 20 | 21 | 19 | 18 |
| UC B. | 15 | 14 | 14 | 10 | 11 | 11 | 10 | 11 | 13 | 14 | 16 | 16 | 15 | 15 | 15 | 15 | 19 | 20 |
| UC G. | | | | | 11 | 11 | 11 | 11 | 12 | 13 | 12 | 15 | 14 | 13 | 14 | 12 | 18 | 16 |
| RB B. | 9 | 9 | 11 | 10 | 9 | 10 | 9 | 11 | 11 | 11 | 12 | 14 | 13 | 16 | 18 | 16 | 16 | 17 |
| RB G. | 10 | 12 | 11 | 12 | 10 | 11 | 12 | 10 | 13 | 13 | 14 | 15 | 16 | 15 | 17 | 19 | 18 | 18 |

*Source*: Authors' calculations based on Orbis Bank Focus and annual reports

**Table 7** NPL ratio (in %)

| | *01* | *02* | *03* | *04* | *05* | *06* | *07* | *08* | *09* | *10* | *11* | *12* | *13* | *14* | *15* | *16* | *17* | *18* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B.sector | 13 | 10 | 7 | 4 | 4 | 3 | 2 | 4 | 5 | 7 | 8 | 7 | 9 | 12 | 9 | 6 | 6 | 6 |
| ČS | 6 | 6 | 2 | 2 | 2 | 3 | 3 | 4 | 6 | 7 | 6 | 6 | 5 | 5 | 1 | 2 | 1 | 2 |
| Erste G. | 3 | 6 | 6 | 5 | 5 | 4 | 4 | 5 | 7 | 8 | 8 | 9 | 10 | 8 | 7 | 5 | 4 | 3 |
| KB | 28 | 22 | 7 | 3 | 3 | 2 | 4 | 5 | 7 | 7 | 5 | 5 | 5 | 5 | 6 | 5 | 6 | 5 |
| So. Ge. | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 6 | 7 | 7 | 7 | 8 | 9 | 7 | 3 | 2 | 3 |
| ČSOB | 4 | 4 | 3 | 2 | 1 | 1 | 1 | 3 | 6 | 7 | 5 | 4 | 3 | 3 | 3 | 1 | 2 | 3 |
| KBC G. | 3 | 3 | 4 | 3 | 3 | 3 | 2 | 3 | 5 | 7 | 6 | 8 | 10 | 10 | 9 | 7 | 7 | 5 |
| UC B. | 3 | 3 | 2 | 2 | 2 | 1 | 2 | 3 | 4 | 5 | 6 | 6 | 5 | 5 | 5 | 4 | 4 | 4 |
| UC G. | | | | | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 4 | 4 | 4 | 4 | 2 | 2 | 1 |
| RB B. | 1 | 1 | 2 | 2 | 3 | 2 | 2 | 2 | 3 | 4 | 5 | 7 | 7 | 6 | 5 | 4 | 3 | 2 |
| RB G. | 20 | 24 | 18 | 17 | 20 | 21 | 10 | 10 | 7 | 9 | 9 | 10 | 11 | 12 | 12 | 9 | 6 | 4 |

*Source*: Authors' calculations based on Orbis Bank Focus and annual reports

The aim of this paper was also to construct the aggregate financial stability index. We construct the index as a weighted sum of selected indicators. The main categories of the index, their weights, selected ratios and their expected impact on the financial stability index are presented in Table 8.

As it can be seen, performance, liquidity, solvency and asset quality have the same weight, 22.5%. The affiliation with the financial conglomerate, e.g., the financial stability of the parent company, affects 10% of aggregate financial stability index.

**Table 8** Aggregate financial stability index

| *Category* | *Weight* | *Ratios* | *Impact* |
|---|---|---|---|
| Performance | 0.225 | DEA | + |
| | | ROA | + |
| | | NIM | + |
| Liquidity | 0.225 | LAR | + |
| | | NIP | + |
| Solvency | 0.225 | TCR | + |
| Asset quality | 0.225 | NPL | – |
| Affiliation with the fin. conglomerate | 0.1 | Parent company stability | + |

*Source*: Authors' processing

## 5 Conclusions

The aim of this paper was to choose which financial ratios are the most suitable for inclusion into the aggregate financial stability index for commercial banks, to examine the selected aspects of the financial stability and performance of the Czech commercial banks and their parent companies with the use of chosen financial ratios, and to construct the aggregate financial stability index. We focused on following aspects of financial stability: the banking profitability, efficiency, liquidity, solvency and asset quality. In cases that the banks belong to the financial conglomerate, we also took into consideration the financial stability of the parent company.

When we focus on banking performance, we prefer three measures: the ROA and NIM as indices of profitability and banking efficiency using DEA. When it comes to liquidity, we prefer two ratios: the LIA and the share of net interbank position in total assets. As an indicator of bank solvency, we choose TCR. We used the share of non-performing loans in total loans as a measure of asset quality.

Profitability of the Czech banking sector is very good, although the profitability decreased during and after the financial crisis, the Czech banks remained profitable. The Czech banking sector is efficient. However, the largest banks were profitable, they were lower efficient than small and medium-sized banks. The Czech subsidiaries are more profitable than their parent companies. Nevertheless, the Czech subsidiaries are less efficient than parent companies. Liquidity of the whole banking sector, measured by both ratios, is very good. Although the liquidity of five analysed banks is below average in some years, mostly they are more liquid than their parent companies. Czech banks are mostly more solvent than their parents and less solvent than other banks in the Czech banking sector. In case of the quality of the loan portfolio, subsidiaries have better quality loans in majority of years, both than their parent companies and other Czech banks.

Our results also showed that for the next step of the analysis, i.e., for the application of the aggregate financial stability index on Czech banks, it will be appropriate to exclude some banks from the sample. Banks that are specialised only on providing mortgage loans (Hypoteční banka, Wüstenrot hypoteční banka) reached completely non-standard values of some ratios which would complicate further analysis.

Finally, we have construct the aggregate financial stability. It includes the above mentioned measures of bank performance, liquidity, solvency and asset quality. Moreover, it takes into consideration also financial stability of the parent company (where applicable).

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