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Factors Affecting Sensitivity of Czech and Slovak Commercial Banks to Bank Run

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Abstract

Pavla Klepková Vodová, Daniel Stavárek: **Factors Affecting Sensitivity of Czech and Slovak Commercial Banks to Bank Run**

The aim of this paper is to find out the worst-case scenario for individual banks from the Czech and Slovak banking sector and to find out determinants of their sensitivity to the bank run. The data cover the period from 2000 to 2014. Although bank liquidity measured by the liquid asset ratio has decreased in both countries during the analyzed period, Czech banks were more liquid and better prepared for a potential bank run. With the use of panel data regression analysis, we tested seven bank specific factors and seven macroeconomic factors. The sensitivity of Czech and Slovak banks to the possible bank run is determined by bank profitability. Among macroeconomic factors, interest rate and unemployment rate matter. However, the most important is the level of bank liquidity: banks with sufficient buffer of liquid assets are safer than other banks, mainly in periods of financial distress.

Key words

bank run, liquid asset ratio, scenario analysis, panel data regression analysis

JEL: C23, G01, G21

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Introduction

The recent financial crisis has shown that liquidity risk plays an important role in the current developed financial system. This is especially true for countries that are traditionally based on banks and credit markets. A liquidity shock may propagate through a real channel or an information channel and hit the entire financial system (Frait and Komárková, 2011). As systemic banking crisis can have really costly consequences such as decline in gross domestic product growth, decline in real house prices and real equity prices, increase in unemployment rate, increase in real public debt and others (Reinhart and Rogoff, 2009), it is not surprising that most regulators, policymakers and academics pay significant attention to various aspects of liquidity risk measurement and management. National regulators monitor the level of bank liquidity in individual banking sectors. New legislative rules concerning bank liquidity were issued in December 2010. A part of the Basel III rules strengthens the liquidity risk regulation through minimum standards of liquidity (Liquidity Coverage Ratio and Net Stable Funding Ratio) and monitoring tools to assess liquidity risk (BIS, 2010).

There exists also a lot of empirical studies focusing on the risk of contagion through the interbank market (e.g. Allen and Gale, 2000; Blavarg and Nimander, 2002; Memmel and Sachs, 2013; or Wells, 2004), on determinants of liquidity risk of banks (such as Aspachs et al., 2005; Bunda and Desquilbet, 2008; Dinger, 2009; Lucchetta, 2007; Moore, 2010; or Rauch et al., 2010) or on sensitivity of banks to various liquidity shocks (e.g. Boss et al., 2007; Komárková et al., 2011; Negrila, 2010; or Van den End, 2008). However, according to our knowledge, there is no empirical study focusing on determinants of bank vulnerability to a bank run. This paper therefore attempts to fill this gap.

The aim of this paper is therefore to find out the worst-case scenario for individual banks from the Czech and Slovak banking sector and to find out determinants of their sensitivity to the bank run during the last fifteen years (i.e. in the period 2000 – 2014).

There are several reasons why we focus on the Czech and Slovak banking sectors. In both countries, the financial system can be characterized as bank-oriented. Banks have a dominant role in financial intermediation and banks are also important for the whole economy of these countries. The group of these two countries should be sufficiently homogenous because of their mutual historical development. However, since the activities of banks in each country slightly differs, we can expect also some differences in vulnerability of banks to a potential bank run, as well as in factors which determine this vulnerability.

The paper is structured as follows. Next section gives theoretical background of bank liquidity and bank runs. Then we focus on methodology, data and results of the analysis. Last section captures concluding remarks.

1. Bank Liquidity and Bank Runs

Each bank has to be liquid which means it should have enough financial resources to meet its obligation as they fall due, or be able to obtain such funds at reasonable costs. Insufficient liquidity of banks may lead to a situation where the majority of depositors intend to withdraw their funds, which will in turn cause a run on the bank.

Banks have been always plagued by the problem of bank runs. Freixas and Rochet (1997) define a bank run as a situation wherein depositors observe large withdrawals from their bank, fear bankruptcy and respond by withdrawing their own deposits. Banks are vulnerable to runs that can lead to closure and liquidation because they issue liquid liabilities in the form of

deposit contracts, but invest in illiquid assets in the form of loans. A banking panic then occurs when depositors at many or all of the banks in a region or a country attempt to withdraw their funds simultaneously (Allen and Gale, 1998).

The theoretical literature on bank runs is based mostly on the study of Bryant (1980) and the model of Diamond and Dybvig (1983) that accentuate the fact that bank runs are self-fulfilling prophecies. Two types of bank run can be distinguished: efficient and inefficient. Given the assumption of the costly liquidation of some assets, there are multiple equilibriums. If depositors believe that a banking panic will occur, it is optimal for each depositor to try to withdraw his funds. The bank will have to liquidate some of its assets at a loss. Those depositors who withdraw initially will receive more than those who wait (given the assumption of first-come, first-served). Anticipating this, all depositors have an incentive to withdraw immediately. Such a situation may be called an inefficient bank run. And, on the contrary, all agents withdraw their funds according to their consumption needs if all depositors believe no panic will occur (and other equilibrium exists).

An efficient bank run is a bank run which is based on fundamental factors. Depositors who have information about an impending downturn in the business cycle may anticipate financial difficulties in the banking sector and try to withdraw their funds. Such behavior will precipitate the crisis (Allen and Gale, 1998).

The severity of the impact of a bank run on the banking sector and the whole economy depends mainly on the reaction of the depositors after the deposit withdrawal. According to Kaufman (1988), depositors have three choices as to what to do with their withdrawals: (i) direct redeposit (i.e. depositors can redeposit their funds at another bank that is perceived to be safer); (ii) indirect redeposit (i.e. depositors can purchase a security or real asset that is perceived to be safer such as a treasury security); or (iii) depositors can hold the funds in cash outside the banking system, which will turn into a run on the banking system as a whole.

As bank runs are typically perceived as costly and negative for the banking sector and the whole economy, most economists, and regulators in particular, try to find the best ways to prevent bank runs. One possibility is to establish a functional deposit insurance scheme. A major argument in favour of deposit insurance is that it maintains and promotes financial stability by preventing inefficient bank runs arising from asymmetric information and self-fulfilling prophecies (as in Diamond and Dybvig, 1983). According to Chu (2011), on the one hand, there is empirical evidence indicating that both good and bad banks are likely to suffer from massive deposit withdrawals during large-scale financial crises. But, on the other hand, many studies indicate that deposit insurance fails to maintain banking stability because of the moral hazard.

To a certain extent, bank runs can be prevented also by efficient liquidity risk management. Sufficient level of bank liquidity in the form of liquidity buffers (assets such as cash, balances with central banks and other banks, debt securities issued by governments and similar securities or reverse repo trades) can prevent panic sales of assets under pressure caused by a need to cover deposit withdrawal request of by investors´ unwillingness to roll over short-term bonds issued by banks so such buffers enhance the ability of banks to absorb source shocks (Frait and Komárková, 2011). Fund-raising options also include strategy connected with interbank market (where banks can borrow from other banks in case of liquidity demand) and strategy to rely on emergency liquidity assistance of a Lender of Last Resort (Aspachs et al., 2005).

Czech banking sector experienced a bank run on – at that time the third-biggest bank – Investiční a Poštovní banka, in 2000 and on a number of small banks and credit unions in the

nineties and at the beginning of the 21st century. Bank runs have also occurred in developed economies in recent years, for example, the run on the fifth-largest mortgage lender in the United Kingdom, Northern Rock, in September 2007. Even if a potential bank run on Czech and Slovak banks may be perceived as exceptional, extreme or simply unexpected, it is still a plausible event. Therefore in accordance with the recommendation of the Basle Committee for Banking Supervision financial institutions should gauge their potential vulnerability to such events by conducting of stress tests (BIS, 2000). Such stress testing would enable us to find the worst-case scenario for each bank in the Czech and Slovak banking sector and to investigate which factors affect sensitivity of individual banks.

2. Methodology and Data

First of all, we will evaluate the level of liquidity risk of each bank in the sample with the most commonly used liquidity ratio which is a liquid asset ratio. Liquid asset ratio (LAR) is the share of liquid assets in total assets (Equation 1).

$$LAR = \frac{liquid\ assets}{total\ assets} * 100(\%) \tag{1}$$

This ratio should give us information about the general liquidity shock absorption capacity of a bank. As a general rule, the higher the ratio, the higher the capacity to absorb liquidity shock is, given that market liquidity is the same for all banks in the sample. As we use the BankScope measure of liquid assets, the term liquid assets includes cash, government bonds, short-term claims on other banks (including certificates of deposit), and where appropriate the trading portfolio.

As a next step, we will simulate a run on a bank by the withdrawal of a certain volume of clients´ deposits. There exists some studies that focus on modeling of the bank run in the Czech (Komárková et al., 2011), Slovak (Jurča and Rychtárik, 2006), Romanian (Negrila, 2010), Austrian (Boss et al., 2004 and 2007) and Luxembourg (Rychtárik, 2009) banking sector. In these studies, the possible bank run were modeled in a slightly different way. Komárková et al. (2011) simulated deposit withdrawals of an average of 11% of total deposits. Negrila (2010) tested the impact of the sudden drawing of 20% from deposits of individuals and 10% from deposits of corporate clients. Boss et al. (2004) stressed liquidity ratios by means of a scenario in which nonbank customers would withdraw 20% of their deposits; they continued their scenario analysis by testing the impact of the withdrawal of 50% of nonbank deposits (Boss et al., 2007). Jurča and Rychtárik (2006) considered the scenario of a decline in client deposits by 20%. Rychtárik (2009) measured the sensitivity of banks to the withdrawal of 20% of client deposits.

Based on the above cited studies, we will simulate a 20% withdrawal of deposits; this haircut will be applied on the total deposits not taking into account agreed maturities of different types of deposits. This is the way how we will model an outflow of primary sources from the bank caused by a bank run.

To calculate the stressed value of the liquid asset ratio, we have to deduct the volume of withdrawn deposits, i.e. 20% of clients´ deposits, from liquid assets. Bank must use liquid assets to be able to repay deposits. At the same time, volume of total assets is also decreasing as a result of this operation. Equation 2 captures these modifications.

$$LARS = \frac{liquid\ assets - 0.2 * deposits}{total\ assets - 0.2 * deposits} * 100(\%) \quad (2)$$

After that, we will compare this stress value of the liquid asset ratio (LAR_S) to the baseline value of this ratio (LAR_B, i.e. LAR). The percentage change will be calculated according to the Equation 3. The results will show the magnitude of the relative changes between the stress and baseline values which will enable us to find out which bank is the most vulnerable. We will be also able to find out the worst-case scenario for each bank in the sample.

$$\Delta LAR = \frac{LARS - LAR_B}{LAR_B} * 100(\%) \quad (3)$$

Finally, in order to identify determinants which affect the worst-case scenario for Czech and Slovak banks, we will use the panel data regression analysis (Equation 4).

$$\Delta D_{it} = \alpha + \beta' \cdot X_{it} + \delta_i + \varepsilon_{it} \quad (4)$$

where ΔD_{it} is the maximum deposit withdrawal for bank i in time t, X_{it} is vector of explanatory variables for bank i in time t, α is constant, β' is coefficient which represents the slope of variables, δ_i represents fixed effects in bank i, and ε_i means the error term.

It is evident that the most important task is to choose the appropriate explanatory variables. Although liquidity problems of some banks during the global financial crisis re-emphasized the fact that liquidity is very important for the functioning of financial markets and the banking sector, an important gap still exists in the empirical literature about liquidity and its measuring. This is especially true for determinants of bank sensitivity to any stress scenario where according to our knowledge, there is no empirical study focusing on determinants of bank vulnerability to a bank run. Therefore, we will focus on empirical studies that aimed to find out determinants of selected liquidity ratio in our literature review. In case of some studies, some determinants have positive impact in some countries, while in some other countries the impact of the same variable is negative. In generally, potential determinants of bank liquidity can be divided into two groups: macroeconomic and bank-specific variables.

Many studies tested the impact of gross domestic product on bank liquidity. This impact may be both positive (such as in Fielding and Shortland, 2005; Vodová 2013; Vodová, 2015) which signals that the cyclical downturn should lower banks' expected transactions demand for money and therefore it lead to decreased liquidity, and negative which means that banks hold a smaller amount of liquidity in periods of the stronger economic growth (as it was proved by Aspachs et al., 2005; Dinger 2009; Grant 2012; Moore, 2010; Rauch et al., 2010; Vodová, 2013).

Another macroeconomic variable, unemployment rate, is connected with demand for loans and typically act as a proxy for general health of the economy. However, its impact on bank liquidity is again mixed – positive according to Munteanu, 2012 and Vodová, 2013; and negative as in Munteanu, 2012; Rauch et al., 2010; Vodová, 2013; or Vodová, 2015.

Very important seems to be also the level of various types of interest rates: monetary policy interest rate, money market interest rate, interbank interest rate and lending interest rate. Again, in some countries the effect of interest rate on bank liquidity is positive (such as Agénor et al., 2000; Bunda and Desquilbet, 2008; Dinger, 2009; Fielding and Shortland, 2005; Lucchetta, 2007; Moore, 2010; Munteanu, 2012; Vodová, 2013 and 2015), while in other

countries or in other tested periods interest rate adversely affect bank liquidity (we can mention Aspachs et al., 2005; Bunda and Desquilbet, 2008; Grant, 2012; Lucchetta, 2007; Moore, 2010; Munteanu, 2012; Rauch et al., 2010; or Vodová, 2013 and 2015). The same, e.g. mixed results, can be found also for interest margin – negative impact in Aspachs et al., 2005 or Grant, 2012; while positive link in Vodová, 2015. Positive relation between interests and bank liquidity is connected with the problem of credit rationing, while negative link shows that if the lending activity is more profitable, banks hold lower buffer of liquid assets and prefer providing loans.

Recent studies focused also on the impact of the financial crisis on bank liquidity which may be again both negative (such as in Bunda and Desquilbet, 2008; Moore, 2010; Vodová, 2013 and 2015) or positive (as it was proved by Berrospide, 2013; Cornet et al., 2012; Moore, 2010). The negative link between financial crisis and bank liquidity is quite obvious: financial crisis can be caused by poor bank liquidity; or poor bank liquidity can be a result of the financial crisis. However, positive relation of the crisis and bank liquidity can be also explained: during the crisis, banks pay more attention to cautious liquidity risk management and hold higher buffers of liquid assets. Thus, during the crisis, bank liquidity may even increase. Such behavior may be connected also with liquidity hoarding (Acharya and Merrouche, 2013; Berrospide, 2013; Kapadia et al., 2012).

Among other macroeconomic factors, type of exchange rate regime (according to Bunda and Desquilbet (2008), in extreme regimes such as pure floating and currency board and dollarized economies, banks are more liquid than in intermediate regimes); share of public expenditures on gross domestic product (which was proved to be positive by Bunda and Desquilbet, 2008); volatility of cash to deposit ratio (where higher volatility increases bank liquidity as in Agénor et al., 2000); or probability of obtaining the support from a lender of last resort in case of a liquidity shortage (which lowers the incentive to hold liquid assets as in Aspachs et al., 2005) can be mentioned. Fielding and Shortland (2005) also proved that banks hold excessive liquid reserves in periods of the political instability.

Although banks in the same country face to the same macroeconomic conditions, the levels of their liquidity differ. The reason lies in different bank-specific conditions. Many bank-specific variables such as size of the bank, its capital adequacy, profitability, quality of the loan portfolio, etc. were analyzed in individual studies.

Two different theories explain the link between capital adequacy and bank liquidity (Berger and Bouwman, 2009). The financial fragility-crowding out hypothesis suggests that bank capital may impede liquidity creation by making the bank´s capital structure less fragile. A fragile capital structure encourages the bank to commit to monitoring its borrowers, and hence allows it to extend loans. Additional equity capital makes it harder for the less fragile bank to commit to monitoring, which in turn hampers the bank´s ability to create liquidity. Capital may also reduce liquidity creation because it crowds out deposits. Such negative relation between bank liquidity and capital adequacy was found by Berger and Bouwman (2009); Diamond and Rajan (2001), Dinger (2009); Distinguin et al. (2013), Gorton and Winton (2000), Lei and Song (2013), Munteanu (2012), Vodová (2013 and 2015). An alternative view – the risk absorption hypothesis – is related to banks´ role as risk transformers and emphasizes that higher capital improves banks´ ability to absorb risk and hence their ability to create liquidity. This theory was confirmed by Berger and Bouwman (2009), Berrospide (2013), or Vodová (2013 and 2015).

Quality of bank credit portfolio also matters: with higher share of nonperforming loans, banks start to offset a higher credit risk with more cautious liquidity risk management (Vodová, 2013 and 2015).

Banks that are net lenders on the interbank market tend to be smaller than borrower ones (Lucchetta, 2007). Most studies agree that the size of banks is in negative correlation with their liquidity. Large banks are less willing to hold liquid assets as they rely more on funds from the interbank market (Berrospide, 2013; Cornet et al., 2012; Dinger, 2009; Vodová, 2013).

The link between bank profitability and its liquidity may be again both negative (such as in Grant, 2012 or Vodová, 2013) or positive (Vodová, 2013). Negative influence of bank profitability is consistent with the standard finance theory which emphasizes the negative correlation of liquidity and profitability. Positive influence of bank profitability may be a sign of a strategy where liquidity constrained banks need to accumulate the profit which then may be invest in liquid assets and thus used as a source of liquidity.

Finally, banks that are members of a holding company, have a retail orientation, and engaged in mergers and acquisitions activity during the prior three years create more liquidity (Berger and Bouwman, 2009).

The selection of explanatory variables is based on the studies cited above. We considered whether the use of the particular variable makes economic sense in case of the Czech and Slovak banking sector. We also considered which other factors could influence the sensitivity of banks to the bank run.

Tab. 1: Variables definition

Variable	Source
CAP: the share of equity in total assets of the bank	BankScope
NPL: the share of non-performing loans in total volume of loans	BankScope
ROA: the share of net profit in total assets of the bank	BankScope
TOA: logarithm of total assets of the bank	BankScope
NITA: the share of net interbank position on total assets of the bank	BankScope
LODE: the share of loans in deposits of the bank	BankScope
LOTA: the share of loans in total assets of the bank	BankScope
GDP: growth rate of gross domestic product (GDP volume % change)	IMF
INF: inflation rate (CPI % change)	IMF
IRB: interest rate on interbank transactions	IMF
IRL: interest rate on loans	CNB, NBS
IRM: difference between interest rate on loans and interest rate on deposits	CNB, NBS
MIR: monetary policy interest rate	CNB, ECB
UNE: unemployment rate	IMF

We can expect that the most vulnerable banks should be those banks whose amount of client deposits is not sufficient to finance their activities. Therefore they need to use other sources of funding. Vulnerable banks should also focus more on providing loans to non-bank customers; therefore they have a lower buffer of liquid assets. Liquidity is closely linked to profitability of banks. If banks prefer only to achieve maximum profitability, they provide relatively more loans to non-bank customers and they use more funds from the interbank market for the financing of their activities, which makes them much more vulnerable in case of crisis (which can be accompanied by, e.g. a bank run). On the contrary, the safest strategy is to hold a sufficient buffer of liquid assets (i.e. to have high value for the LAR ratio), to provide loans to non-bank customers reasonably and to finance lending activity mainly from client

deposits. These ideas, together with findings of studies focusing on determinants of liquidity ratios, are reflected in the list of used variables (Table 1).

We considered seven bank specific factors and seven macroeconomic factors. We do not have an exact expectation of the impact of these factors on the bank sensitivity to the bank run as this is the first study investigating this problem. The macroeconomic data were provided by the International Financial Statistics of the International Monetary Fund (IMF), European Central Bank (ECB), Czech National Bank (CNB) and National Bank of Slovakia (NBS). The bank specific data were obtained from the unconsolidated balance sheet and profit and loss data recorded in the database BankScope.

Tab. 2: Data availability

Indicator	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
Czech Republic															
Total no. of banks	40	38	37	35	35	36	37	37	37	39	41	44	43	44	45
No. of observ. banks	15	15	16	16	16	16	13	13	12	12	13	13	14	14	14
Share of assets (%)	59	68	74	74	74	72	75	75	66	68	68	75	69	72	74
Slovakia															
Total no. of banks	23	21	20	21	21	23	24	26	26	26	29	32	29	29	29
No. of observ. banks	9	11	11	11	11	11	12	12	12	12	11	11	9	9	9
Share of assets (%)	64	72	69	72	70	73	76	79	85	85	84	85	78	79	79

Source: http://www.cnb.cz/cnb/STAT.ARADY_PKG.PARAMETRY_SESTAVY?p_sestuid=33049&p_strid=BAA&p_lang=CS; http://www.nbs.sk/sk/statisticke-udaje/prehlad-o-rozvoji-penazneho-sektora; authors' calculations

We used data over the period 2000 – 2014. Table 2 shows more details about the sample. In spite of the relatively small number of banks in the sample, the data set includes significant parts of both banking sectors (around 70% of total assets of the banking sector). Due to the homogeneity of the data set, we include only data from commercial banks. We abstract branches of foreign banks, mortgage banks, building societies and state banks with special purpose (like Českomoravská záruční a rozvojová banka, Slovenská záručná a rozvojová banka, Česká exportní banka or Exim banka). The panel is unbalanced as some of banks do not report or exists over the whole period of time.

3. Results and Discussion

The first part of this section shows the median values of the baseline and the stress values of the liquid asset ratio and also worst-case scenario for each bank. The second part of this section focuses on factors which determine this scenario.

3.1. Scenario Analysis

The median values of the baseline and stress values of share of liquid assets in total assets (LAR) for Czech and Slovak banks are presented in Figure 1. As a higher value for this ratio means higher liquidity, it is evident that bank liquidity in both countries has decrease during the analyzed period. However, the development trends differ among countries. Liquidity of

Czech banks declined in 2000-2007, due to the mutual effect of a higher lending activity of Czech banks and of the decrease of balances with central banks and other banks (CNB, 2008). After a slight improvement of liquidity during 2008-2011, the liquidity further decreased in recent years. As the biggest part of liquid assets of the Czech banking sector consists from government securities, it is evident that the development of liquid assets as a whole is strongly influenced by their volume held by banks (CNB, 2012 and 2014).

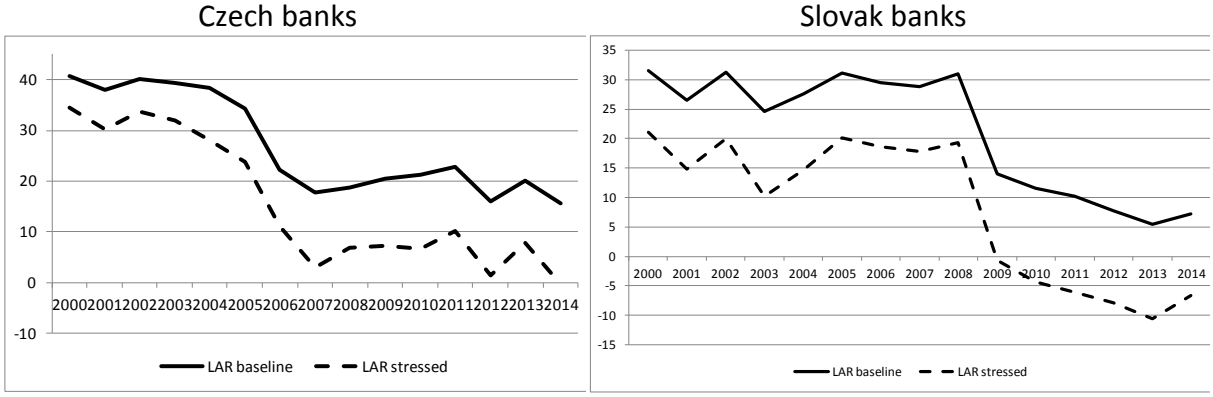

Fig. 1: Baseline and stressed values of the liquid asset ratio for Czech and Slovak banks (in %)
(Source: authors' calculations)

The liquid asset ratio of Slovak banks fluctuated only slightly during the period 2000-2008; however, this ratio sharply dropped in 2009. The year 2009 can be considered with certainty to be a turning point for the banking sector: the economic crisis adversely effected sectors in which Slovak banks have significant credit exposures. Moreover, activities in the interbank market strongly changed. While Slovak banks mostly received deposits from foreign banks and then conducted sterilization operations with the National Bank of Slovakia in previous years, after the euro changeover, these operations lost their previous significance. Most banks borrowed funds from other banks with the Eurosystem and invested these funds predominantly in government bonds and in some cases in the interbank market, mainly in transactions with parent banks (NBS, 2010). After the further decline of bank liquidity, we can see slightly improvements in 2014.

It is also evident that during the whole analyzed period, Czech banking sector as a whole has a larger liquidity buffer than the Slovak banking sector.

A lower stressed value for this ratio is a clear signal of a liquidity outflow. With the exception of 2014, median values of the stressed liquid asset ratio for Czech banks are positive for the whole analyzed period. This means that Czech banking sector as a whole should be well prepared for a bank run, simulated by a withdrawal of 20% of client´s deposits. Of course, individual banks in individual years could have problems with such crisis development; we can mention for example Equa bank in 2011-2014, Česká spořitelna in 2006-2008 and 2014, ČSOB in 2006-2008 and 2010, GE Money Bank in 2007-2009, J&T banka and Expobanka in 2012-2014, or Raiffeisenbank in 2010-2013.

However, in case of Slovakia, the situation would be much worse. Median values of the stressed liquid asset ratio are positive only in 2000-2008. Beginning in 2009, Slovak banks on average would not be able to finance a 20% withdrawal of client deposits. During this second half of the analyzed period, only depositors of ČSOB and Komerční banka Bratislava in 2009-2011, customers of Poštová banka and Citibank in 2009, clients of Sberbank and Privatbanka in 2011 and depositors of UniCredit Bank in 2010 would be able to withdraw 20% of their

deposits. During 2009-2014, other banks would not have had enough liquidity to fund the required deposit withdrawals.

Tab. 3: Average decrease of the liquid asset ratio in Czech and Slovak banking sector (in %)

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
Czech	9	20	20	27	30	44	56	85	77	63	76	65	137	104	95
Slovak	33	44	36	59	47	36	37	38	38	105	137	160	202	294	192

Source: authors' calculations

Looking at the average impact of a bank run on the liquid asset ratio, we can see that, due to the bank run, the decrease of bank liquidity gradually increased during the years analyzed (see Table 3 for average values and Appendix for values for all banks in the sample). It is evident that the financial crisis increased the sensitivity of both Czech and Slovak banks to a possible bank run. However, it is quite surprising that banks would have been the most vulnerable a year (for Slovak banks) or two years (for Czech banks) ago. It seems that there exists a significant time lag between the emergence of the financial crisis and impacts of this crisis on financial stability of banks. It also seems that impact of the crisis on Slovak banks was much harder than for Czech banks.

Tab. 4: Average maximum deposit withdrawal in Czech and Slovak banking sector (in %)

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
Czech	131	100	85	82	86	54	49	40	31	60	44	41	29	32	27
Slovak	66	50	50	38	47	45	44	49	60	24	20	26	8	8	9

Source: authors' calculations

Our aim is also to find out the maximum volume of deposits that can be withdrawn from individual banks, i.e. to find out the worst-case scenario for each bank. The threshold volume of deposits was calculated assuming that the bank can use the whole volume of liquid assets to meet the demands for cash of depositors. The data in Table 4 shows the average maximum deposit withdrawal for Czech and Slovak banking sector. The ability of individual banks to cover deposit withdrawals, i.e. what is the maximum deposit withdrawal (in percent of deposits) which the banks would be able to survive, can be found in Appendix. The results are consistent with previous findings: Czech banks on average are able to withstand larger deposit withdrawals than Slovak banks.

Of course, there are again significant differences among banks. There exist banks that could only finance the withdrawal of less than 10% of deposits. In case of Czech banks, Expobanka in 2012-2014, Raiffeisenbank in 2010 and UniCredit Bank in 2012-2013 are the most vulnerable banks. In case of Slovakia, the group of most vulnerable banks consists from ČSOB 2013-2014, OTP banka in 2012-2013, Poštová banka in 2011-2014, Privatbanka in 2013, Slovenská sporitelňa in 2012-2014, Tatra banka in 2010-2014 and VÚB in 2012. If customers would like to reduce their deposits more, the existence of these banks would be threatened because of insufficient liquidity. Actually, depositors of Tatra banka would be able to withdraw only 1% of their deposits in 2012 which is really alarming. On the contrary, at least in some years, the depositors of some other banks, both Czech and Slovak, would be able to withdraw more than 50% of their deposits (see Appendix).

3.2. Panel Data Regression Analysis

To be able to find out which factors determine sensitivity of Czech and Slovak banks to a bank run, we used an econometric package EViews 7. After tests of stationarity, normality and multicollinearity, we proceed with regression estimation. We estimated Equation 4. First we included all explanatory variables which might have an effect on the dependent variable. To reduce the number of explanatory variables, we used information criteria (Akaike, Schwarz and Hannan-Quinn). The aim was to find a regression model with a high value of the adjusted coefficient of determination in which all the variables involved are statistically significant. The results for Czech banks are recorded in Table 5.

Tab. 5: Factors affecting bank sensitivity of Czech banks to bank run

Variable	Coefficient	Standard deviation
Constant	-1.852092*	0.324240
ROA (-2)	0.034600**	0.009717
LODE	-0.003867*	0.000626
IRL	0.214703*	0.045939
UNE(-1)	-0.104914*	0.023475
Adjusted R2	0.559081	
Durbin-Watson statistics	1.868249	
Total panel observation	172	

Note: The starred coefficient estimates are significant at the
1% (*), 5% (**) or 10% (***) level.
Source: authors' calculations

The explanatory power of the model is quite high. The sensitivity of Czech banks to the possible bank run, or, more preciously, the maximum deposit withdrawal for individual Czech banks, is determined mainly by two bank-specific and two macroeconomic factors.

Focusing on bank-specific factors, profitability and liquidity of the bank matter. The share of loans to deposits (LODE) is an indirect measure of bank liquidity. This ratio relates illiquid assets to liquid liabilities. The higher this ratio the less liquid the bank is. Values of this ratio lower than 100% mean that loans provided by the bank are fully financed from clients´ deposits. Values higher than 100% signal that bank needs also other source of funding such as interbank loans or funds from debt securities issuance. In terms of liquidity risk, banks should prefer lower value of this ratio as clients´ deposits are generally stable source of funding. Higher values indicate that the bank is more vulnerable, especially in case of market turbulence. The negative sign of the regression coefficient is consistent with the fact that the lower the values of the LODE ratio (and thus the higher the bank liquidity), the higher deposit withdrawal the bank is able to withstand. Such finding is fully logical.

The positive link between bank profitability measured by return on assets (ROA) and the ability of the bank to face a bank run may be a bit surprising. However, bank profitability is one of the key factors of financial stability of the bank. This variable is two years lagged which means that banks that were financial stable in the past are much more safer even in case of sudden deposit withdrawal.

Among macroeconomic factors, two variables are statistically significant: interest rate on loans (IRL) and the rate of unemployment (UNE). The interest rate on loans is probably connected with bank profitability. With higher interest rate on loans, the lending activity of the bank becomes more profitable. And with higher accumulated profit, the bank is more able to withstand any crisis development.

The unemployment rate is the last statistically significant variable. With increase of the rate of unemployment in previous year, bank customers are able to withdraw smaller part of their deposits. This variable can act as a proxy for general health of the economy. Therefore with increase of the rate of unemployment (and with worsening macroeconomic conditions in the past), banks are more vulnerable to possible bank runs.

Other variables (size of the bank, its capital adequacy, share of non-performing loans, share of net interbank position in total assets, share of loans in deposits, inflation rate, interbank interest rate, interest margin and monetary policy interest rate) have no statistically significant impact on sensitivity of Czech banks to the bank run.

The estimated coefficients that fit best the regression model for Slovak banks are presented in Table 6. The explanatory power of the model is slightly higher than for Czech banks. Two bank-specific and two macroeconomic factors matter for bank sensitivity to a bank run.

As in case of Czech banks, profitability and lending activity are also important also for Slovak banks. However, in case of bank profitability, the link is completely opposite. The negative influence of bank profitability (ROA) is consistent with the standard finance theory which emphasizes the negative correlation of liquidity and profitability. This impact is one year lagged. This means that banks who earned less profit in previous year pay much more attention to liquidity risk management which in turn reflects in their higher capacity to withstand a possible bank run. Such banks are able to repay higher percentage of client´s deposits.

Tab. 6: Factors affecting bank sensitivity of Slovak banks to bank run

Variable	Coefficient	Standard deviation
Constant	1.036117*	0.118131
ROA (-1)	-0.022938**	0.009717
LOTA	-0.008376*	0.001670
IRB	0.027835*	0.008781
UNE	-0.024786*	0.004901
Adjusted R2	0.684644	
Durbin-Watson statistics	1.788567	
Total panel observation	150	

Note: The starred coefficient estimates are significant at
the 1% (*), 5% (**) or 10% (***) level.
Source: authors' calculations

It is not surprising that the second bank-specific factor again takes into account just the liquidity of the bank. The share of loans in total assets (LOTA) indicates what percentage of the assets of the bank is tied up in illiquid loans; therefore the higher this ratio the less liquid the bank is. The sign of the estimated coefficient is negative which is fully logical. Banks with lower value of the ratio LOTA (i.e. banks with lower lending activity with non-bank clients) focus more on other types of banking business such as interbank loans or trading with securities. Both types of transactions increase the volume of liquid assets which makes bank less vulnerable to possible unforeseen deposit withdrawals.

Interest rate on interbank transactions (IRB) and the rate of unemployment (UNE) are statistically significant from the group of macroeconomic variables. The interbank interest rate can be perceived as the price of liquidity obtained on the interbank market. The increase of this price is a clear motive to provide more interbank loans because higher interbank interest

rate makes these transactions more profitable. As interbank loans are a part of liquid assets of the bank, the more interbank loans the bank provide, the higher its ability to withstand the deposit withdrawal is. This conclusion fully corresponds with the influence of the lending activity of a bank.

The unemployment rate is the last statistically significant variable. Its impact on the ability of the bank to survive the bank run is the same as for Czech banks, only without any time lag. With worsening macroeconomic conditions, banks are able to finance lower deposit withdrawals.

Other bank-specific and macroeconomic variables were not statistically significant.

We can compare our results only with findings of Vodová (2013) who analyzed determinants of liquid asset ratio in the Visegrad countries for the period from 2000 to 2011. When it comes to Czech banks, determinants of the holding of liquid assets are completely different from factors which influence the sensitivity of banks to potential bank run. For Slovak banks, the holding of liquid assets increased with higher interest rate on loans and decreased with higher profitability, unemployment rate and capital adequacy of the bank. As we can see, two factors that influenced the level of bank liquidity measured by liquid asset ratio matter also for the sensitivity of banks to possible bank run: bank profitability and unemployment rate. Two other factors are different. However, both of them have some connection to bank liquidity. This confirm us the fact that the ability of banks to withstand an unforeseen deposit withdrawal is strongly determined by the level of bank liquidity. Banks which have sufficient buffer of liquid assets are safer than other banks, mainly in periods of financial distress.

Conclusion

The aim of this paper was to find out the worst-case scenario for individual banks from the Czech and Slovak banking sector and to find out determinants of their sensitivity to the bank run during the last fifteen years.

Bank liquidity measured by the liquid asset ratio has decreased in both countries during the analyzed period. Liquidity of Czech banks declined in 2000-2007; then it slightly improved in 2008-2011, and after that, bank liquidity further decreased in recent years. Such development is mostly influenced by the volume of government securities held by banks. In Slovakia, the liquid asset ratio fluctuated only slightly during the period 2000-2008 but it sharply dropped in 2009. After the further decline, bank liquidity slightly improved in 2014. The decrease was caused mainly by changes in interbank transactions. Czech banks were more liquid for the whole period than Slovak banks.

Stressed values of the liquid asset ratio indicated that although Czech banks on average would be well prepared for a potential bank run; Slovak banks on average would not be able to withstand a 20% withdrawal of client deposits since 2009. In both countries, the impact of this stress scenario increased during analyzed period. The ability of individual banks to survive an unforeseen deposit withdrawal significantly differs. However, Czech banks on average are able to withstand larger deposit withdrawals than Slovak banks.

The results of the panel data regression analysis showed that the sensitivity of Czech and Slovak banks to the possible bank run, or, more preciously, the maximum deposit withdrawal for individual banks, is determined mainly by bank profitability, its liquidity (connected with lending activity), interest rate (on loans for Czech banks and on interbank transaction for Slovak banks) and unemployment rate. Although in some cases, the same factor influences the maximum deposit withdrawal in opposite direction, or at least the time lag differs, we can conclude that the ability of banks to withstand an unforeseen deposit withdrawal is strongly

determined by the level of bank liquidity. Banks which have sufficient buffer of liquid assets are safer than other banks, mainly in periods of financial distress.

References

[1] Agénor, P., Aizeman, J. and A. Hoffmaister, 2000. *The Credit Crunch in East Asia: What Can Bank Excess Liquid Assets Tell Us?* NBER Working Paper no. 7951.

[2] Acharya, V.V. and O. Merrouche, 2013. Precautionary Hoarding of Liquidity and Interbank Markets: Evidence from the Subprime Crisis. *Review of Finance*, vol. 17, no. 1, pp. 107-160.

[3] Allen, F. and D. Gale, 1998. Optimal Financial Crises. *The Journal of Finance*, vol. 53, no. 4, pp. 1245-1284.

[4] Allen, F. and D. Gale, 2000. Financial Contagion. *Journal of Political Economy*, vol. 108, no. 1, pp. 1-33.

[5] Aspachs, O., Nier, E. and M. Tieset, 2005. *Liquidity, Banking Regulation and the Macroeconomy. Evidence on bank liquidity holdings from a panel of UK-residents banks*. Presentation at BIS. [online]. [2015-09-20]. Available from: http://www.bis.org/bcbs/events/rtf05AspachsNierTiesset.pdf.

[6] Berger, A.N. and C.H.S. Bouwman, 2009. Bank Liquidity Creation. *Review of Financial Studies*, vol. 22, no. 9, pp. 3779-3837.

[7] Berrospide, J., 2013. *Bank Liquidity Hoarding and the Financial Crisis: An Empirical Evaluation*. Finance and Economics Discussion Series of Federal Reserve Board no. 03.

[8] BIS, 2000. *Stress Testing by Large Financial Institutions: Current Practice and Aggregation Issues*. Basel: Bank for International Settlements.

[9] BIS, 2010. *Basel III: International framework for liquidity risk measurement, standards and monitoring.* Basel: Bank for International Settlements.

[10] Blavarg, M. and P. Nimander, 2002. Interbank exposures and systemic risk. *Sveriges Riksbank Economic Review*, vol. 2002, no. 2, pp. 19-45.

[11] Boss, M., Krenn, G., Schvaiger, M. and W. Wegschaider, 2004. Stress Testing the Austrian Banking System. *Österreichisches Bankarchiv*, vol. 52, no. 11, pp. 841-852.

[12] Boss, M., Fenz, G., Krenn, G., Pann, J., Puhr, C., Scheiber, T., Schmitz, S.W., Schneider, M. and E. Ubl, 2007. Stress Tests for the Austrian FSAP Update 2007: Methodology, Scenarios and Results. In: *Financial Stability Report*, pp. 68-92. Vienna: Oesterreichische Nationalbank.

[13] Bryant, J., 1980. A model of reserves, bank runs, and deposit insurance. *Journal of Banking and Finance*, vol. 4, no. 4, pp. 335-344.

[14] Bunda, I. and J.B. Desquilbet, 2008. The Bank Liquidity Smile Across Exchange Rate Regimes. *International Economic Journal*, vol. 22, no. 3, pp. 361-386.

[15] CNB, 2008. *Financial Market Supervision Report 2007*. Praha: Czech National Bank.

[16] CNB, 2012. *Financial Market Supervision Report 2011*. Praha: Czech National Bank.

[17] CNB, 2014. *Financial Market Supervision Report 2013*. Praha: Czech National Bank.

[18] Cornet, M.M., McNutt, J.J., Strahan, P.E. and H. Tehranian, 2012. Liquidity risk management and credit supply in the financial crisis. *Journal of Financial Economics*, vol. 101, no. 2, pp. 297-312.

[19] Diamond, D. and P. Dybvig, 1983. Bank runs, deposit insurance, and liquidity. *Journal of Political Economy*, vol. 91, no. 3, pp. 401-419.

[20] Diamond, W.D. and R.G. Rajan, 2001. *Liquidity Risk, Liquidity Creation and Financial Fragility: A theory of banking.* Working paper of National Bureau of Economic Research no. 7430.
[21] Dinger, V., 2009. Do foreign-owned banks affect banking system liquidity risk? *Journal of Comparative Economics*, vol. 37, no. 4, pp. 647-657.
[22] Distinguin, I., Roulet, C. and A. Tarazi, 2013. Bank regulatory capital and liquidity: Evidence from US and European publicly traded banks. *Journal of Banking and Finance*, vol. 37, no. 9, pp. 3296-3317.
[23] Fielding, D. and A. Shortland, 2005. Political Violence and Excess Liquidity in Egypt. *Journal of Development Studies*, vol. 41, no. 4, pp. 542-557.
[24] Frait, J. and Z. Komárková, 2011. Financial Stability, Systemic Risk and Macroprudential policy. In: *Financial Stability Report 2010/2011*, pp. 96-111. Praha: Czech National Bank.
[25] Freixas, X. and J.C. Rochet, 1997. *Microeconomics of Banking*. Massachusetts: Massachusetts Institute of Technology.
[26] Gorton, G. and A. Winton, 2000. *Liquidity Provision, Bank Capital, and the Macroeconomy.* Working Paper of the University of Minnesota.
[27] Grant, J., 2012. Liquidity Buffers of Australian-Owned ADIs. *JASSA*, vol. 2012, no. 3, pp. 31-36.
[28] Chu, K.H., 2011. Deposit Insurance and Banking Stability. *Cato Journal*, vol. 31, no. 1, pp. 99-117.
[29] Jurča, P. and Š. Rychtárik, 2006. Stress Testing of the Slovak Banking Sector. *BIATEC*, vol. 14, no. 4, pp. 15-21.
[30] Kapadia, S., Drehmann, M., Elliot, J. and G. Sterne, 2012. *Liquidity risk, cash-flow constraints and systemic feedbacks*. Bank of England Working Paper no. 456.
[31] Kaufman, G., 1988. Bank Runs: Causes, Benefits and Costs. *Cato Journal*, vol. 7, no. 3, pp. 559-595.
[32] Komárková, Z., Geršl, A. and L. Komárek, 2011. *Models for Stress Testing Czech Banks´ Liquidity Risk*. Working Paper Series of Czech National Bank no. 11.
[33] Lei, A.C.H. and Z. Song, 2013. Liquidity creation and bank capital structure in China. *Global Financial Journal*, vol. 24, no. 3, pp. 188-202.
[34] Lucchetta, M., 2007. What Do Data Say About Monetary Policy, Bank Liquidity and Bank Risk Taking? *Economic Notes by Banca Monte dei Paschi di Siena SpA*, vol. 36, no. 2, pp. 189-203.
[35] Memmel, C. and A. Sachs, 2013. Contagion in the interbank market and its determinants. *Journal of Financial Stability*, vol. 9, no. 1, pp. 46-54.
[36] Moore, W., 2010. *How do financial crises affect commercial bank liquidity? Evidence from Latin America and the Caribbean*. MPRA Paper no. 2010-21473.
[37] Munteanu, I., 2012. Bank liquidity and its determinants in Romania. *Procedia Economics and Finance*, vol. 2012, no. 3, pp. 993-998.
[38] NBS, 2010. *Analysis of the Slovak Financial Sector for the Year 2009*. Bratislava: National Bank of Slovakia.
[39] Negrila, A., 2010. The Role of Stress-test Scenarios in Risk Management Activities and in the Avoidance of a New Crisis. *Theoretical and Applied Economics*, vol. 17, no. 2, pp. 5-24.
[40] Rauch, C., Steffen, S., Hackethal, A. and M. Tyrell, 2010. *Determinants of Bank Liquidity Creation*. Working Paper of Centre for Economic and International Studies.

[41] Reinhart, C.M. and K. Rogoff, 2009. The Aftermath of Financial Crises. *American Economic Review*, vol. 99, no. 2, pp. 466-472.
[42] Rychtárik, Š., 2009. *Liquidity Scenario Analysis in the Luxembourg Banking Sector*. BCDL Working Paper no. 41.
[43] Van den End, J.W., 2008. *Liquidity Stress-Tester: A macro model for stress-testing banks´ liquidity risk*. DNB Working Paper no. 175.
[44] Vodová, P., 2013. Liquid assets in banking: What matters in the Visegrad Countries? *E+M Ekonomie + Management*, vol. 16, no. 3, pp. 113-129.
[45] Vodová, P., 2015. To Lend or to Borrow on the Interbank Market: What Matters for Commercial Banks in the Visegrad Countries. *Prague Economic Papers*. [online]. [2015-09-20]. Available from: https://www.vse.cz/pep/529.
[46] Wells, S., 2004. *Financial interlinkages in the United Kingdom´s interbank market and the risk of contagion*. Bank of England Working Paper no. 230.

Appendix

Decrease of the LAR ratio due to a bank run for all banks in the sample (in %)

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
Czech banks															
Air													19	26	164
Caly	3	4	3	3	3										
Citi	15	20	18	16	16	26	20	18							
ČS	10	46	42	70	91	76	104	131	103	71	50	56	100	64	120
ČSOB	9	38	31	34	34	85	145	263	126	100	145	21	23	22	60
Dr.b.	9	13	16	17	6										
eBan	1	5	2	11	34	35	26	15							
Equa			3	3	4	5	5	11	38	34	26	215	104	119	113
ERB										2	4	10	69	45	47
Expo	6	10	7	8	6	16	18	86	60	48	74	52	519	313	243
Fio											29	17	20	16	10
GE	3	3	16	23	35	62	98	215	187	101	69	60	76	56	58
HVB		23	33	63	83	45									
J&T	6	35	32	19	30	61	79	83	77	50	56	52	148	133	109
KB	10	31	22	23	18	19	29	38	60	63	79	81	136	87	62
PPF	9	1	13	13	10	10	16	14	13	16	21	23	30	28	9
Raiff	9	13	19	26	27	28	50	81	68	88	269	128	182	156	97
Sber	30	29	40	79	52	87	78	84	58	85	74	65	83	59	109
UniCr							60	63	58	103	96	68	407	336	128
Živno	6	24	22	26	37	59									
Slovak banks															
Citi	18	57	90	41	28	21	20	35	14	32					
ČSOB						134	197	7	6	65	32	74	163	294	275
KB Br	3	6	6	22	8	11	26	15	11	28	34	14			
OTP		36	43	69	52	69	30	39	73	113	143	136	280	360	124
Pošt	62	50	32	63	58	29	32	34	51	76	181	322	818	1086	1219
Prim	68	45	28	29	83	31	45	43	53	107	107	172	156	179	169
Priva	29	29	47	29	10	20	14	34	17	64	266	51	181	487	183
Sber	25	44	52	61	114	53	46	71	60	106	137	48	151	131	167
Sl.sp.	36	43	38	105	43	41	43	99	32	104	103	184	272	518	369
Tatra	48	52	119	100	102	58	75	64	43	111	220	414	209	275	282
UniCr		18	24	22	22	30	34	29	28	207	87	186			
VÚB	36	63	36	57	47	95	73	104	81	361	571	184	217	153	164

Source: authors' calculations

Average maximum deposit withdrawal in Czech and Slovak banking sector (in %)

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
Czech banks															
Air													59	50	13
Caly	184	201	184	213	254										
Citi	80	68	76	84	84	57	65	69							
ČS	80	36	39	26	21	25	19	15	19	26	35	31	20	28	17
ČSOB	97	42	48	45	46	23	14	8	16	20	14	77	71	72	30
Dr.b.	145	108	86	78	162										
eBan	186	100	103	79	44	43	53	69							
Equa			164	181	175	165	157	109	43	48	54	10	19	17	18
ERB										375	197	96	27	36	36
Expo	208	148	190	178	191	81	79	23	30	37	25	34	4	7	9
Fio											48	63	57	63	72
GE	143	148	67	57	44	29	20	10	11	19	27	30	25	31	31
HVB		67	50	29	23	38									
J&T	215	48	48	62	47	29	24	23	24	34	31	33	14	15	18
KB	87	46	55	54	61	60	48	40	30	28	24	23	15	22	29
PPF	103	281	75	91	99	95	70	74	75	72	62	58	50	52	56
Raiff	130	88	70	54	53	53	35	23	27	22	8	16	11	13	20
Sber	54	55	44	24	34	22	24	23	32	23	26	29	23	31	18
UniCr							30	29	31	19	20	27	5	6	16
Živno	117	57	60	55	43	31									
Slovak banks															
Citi	71	31	21	40	52	63	68	45	82	46					
ČSOB						15	10	142	153	28	49	25	12	7	7
KB Br	238	140	163	62	116	102	58	87	118	58	48	119			
OTP		47	40	27	34	27	52	42	25	17	14	15	7	6	16
Pošt	29	34	45	28	31	48	45	44	33	24	11	7	2	2	1
Prim	27	37	50	48	23	49	38	38	33	18	18	12	13	11	12
Priva	54	54	38	54	94	62	83	46	76	29	8	34	11	4	11
Sber	54	37	33	29	17	33	37	26	30	18	15	36	13	15	12
Sl.sp.	42	37	41	19	39	40	38	20	48	19	19	11	8	4	6
Tatra	35	33	17	19	19	31	25	28	39	18	9	5	1	8	7
UniCr		66	55	60	58	48	45	54	54	10	22	11			
VÚB	44	29	44	31	36	20	25	19	23	6	3	11	9	13	12

Source: authors' calculations