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LIQUIDITY OF CZECH AND SLOVAK COMMERCIAL BANKS

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Abstract

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As liquidity problems of some banks during global financial crisis re-emphasized, liquidity is very important for functioning of financial markets and the banking sector. The aim of this paper is therefore to evaluate comprehensively the liquidity positions of Czech and Slovak commercial banks via different liquidity ratios in the period of 2001–2010 and to find out whether the strategy for liquidity management differs by the size of the bank. We used unconsolidated balance sheet data over the period from 2001 to 2010 which were obtained from annual reports of Czech and Slovak banks. The sample includes significant part of Czech and Slovak banking sector (not only by the number of banks, but also by their share on total banking assets). We have calculated five different liquidity ratios for each bank in the sample. The results showed that liquidity of Czech banks has declined during last ten years. On the contrary, liquidity of Slovak banks fluctuated only slightly during the period 2001–2008. Bank liquidity has fallen due to the financial crisis in both countries; the impact is worse for Slovak banks. Both Czech and Slovak banks have become less liquid also as a result of increase in lending activity. Czech and Slovak banks have the same strategies how to insure against liquidity crises: big banks rely on the interbank market or on a liquidity assistance of the Lender of Last Resort, small and medium sized banks hold buffer of liquid assets.

liquidity, liquidity risk, liquidity ratio, liquid assets, Czech Republic, Slovakia, financial crisis

1 INTRODUCTION

Bank for International Settlements (BCBS, 2008) defines liquidity as the ability of bank to fund increases in assets and meet obligations as they come due, without incurring unacceptable losses. Liquidity risk arises from the fundamental role of banks in the maturity transformation of short-term deposits into long-term loans.

The term liquidity risk includes two types of risk: funding liquidity risk and market liquidity risk. Funding liquidity risk is the risk that the bank will not be able to meet efficiently both expected and unexpected current and future cash flow and collateral needs without affecting either daily operations or the financial condition of the firm. Market liquidity risk is the risk that a bank cannot easily offset or eliminate a position at the market price because of inadequate market depth or market disruption (Drehman and Nikolau, 2009).

According to Aspachs *et al.* (2005), there are three mechanisms that banks can use to insure against liquidity crises: (i) Banks hold buffer of liquid assets on the asset side of the balance sheet. A large enough buffer of assets such as cash, balances with central banks and other banks, debt securities issued by governments and similar securities or reverse repo trades reduce the probability that liquidity demands threaten the viability of the bank. (ii) Second strategy is connected with the liability side of the balance sheet. Banks can rely on the interbank market where they borrow from other banks in case of liquidity demand. However, this strategy is strongly linked with market liquidity risk. (iii) The last strategy concerns the liability side of the balance sheet, as well. The central bank typically acts as a Lender of Last Resort to provide emergency liquidity assistance to particular illiquid institutions and to provide aggregate liquidity in case of a system-wide shortage.

Many banks struggled to maintain adequate liquidity during global financial crisis (BCBS, 2009; Teplý, 2011). Unprecedented levels of liquidity support were required from central banks in order to sustain the financial system. Even with such extensive support, a number of banks failed, were forced into mergers or required resolution. The crisis showed the importance of adequate liquidity risk measurement and management.

The aim of this paper is therefore to evaluate comprehensively the liquidity positions of Czech and Slovak commercial banks via different liquidity ratios in the period of 2001–2010 and to find out whether the strategy for liquidity management differs by the size of the bank.

2 METHODS AND DATA

2.1 Liquidity Ratios

Liquidity ratios are various balance sheet ratios which should identify main liquidity trends. These ratios reflect the fact that bank should be sure that appropriate, low-cost funding is available in a short time. This might involve holding a portfolio of assets than can be easily sold (cash reserves, minimum required reserves or government securities), holding significant volumes of stable liabilities (especially deposits from retail depositors) or maintaining credit lines with other financial institutions.

There exist a relatively large number of studies which use liquidity ratios. However, most of them use liquidity ratios only as an input for further analysis, for example of investigation of the relationship between business cycle and bank performance (Jiménez *et al.*, 2010; Maechler *et al.*, 2007), determinants of bank lending activities (Ghosh, 2010; Tamirisa and Igan, 2008), determinants of bank liquidity (Aspachs *et al.*, 2005; Bunda and Desquilbet, 2008; Moore, 2010), or for liquidity scenario analysis (Rychtárik, 2009). The other studies focus more on the liquidity of the whole banking sector and so does not use the values of ratios of individual banks (Andries, 2009; Praet and Herzberg, 2008; analysis of central banks and regulatory authorities). The contribution of this paper is therefore obvious.

Various authors provide various liquidity ratios. For the purpose of evaluation of the liquidity positions of Czech and Slovak commercial banks we will use following liquidity ratios (1)–(5):

$$L1 = \frac{liquid\ assets}{total\ assets} \times 100(\%). \tag{1}$$

The liquidity ratio *L1* should give us information about the general liquidity shock absorption capacity of a bank. As a general rule, the higher the share of liquid assets in total assets, the higher the capacity to absorb liquidity shock, given that market liquidity is the same for all banks in the sample. Nevertheless, high value of this ratio may be also interpreted as inefficiency. Since liquid assets yield lower income liquidity bears high opportunity costs for the bank. Therefore it is necessary to optimize the relation between liquidity and profitability.

$$L2 = \frac{liquid\ assets}{deposits + short\ term\ borrowing} \times 100(\%) \tag{2}$$

The liquidity ratio *L2* uses concept of liquid assets as well. However, this ratio is more focused on the bank's sensitivity to selected types of funding (we included deposits of households, enterprises, banks and other financial institutions and funds from debt securities issued by the bank). The ratio *L2* should therefore capture the bank's vulnerability related to these funding sources. The higher is the value of the ratio, the higher is the capacity to absorb liquidity shock.

$$L3 = \frac{liquid\ assets}{deposits} \times 100(\%) \tag{3}$$

The liquidity ratio *L3* is very similar to the liquidity ratio *L2*. However, it includes only deposits to households and enterprises. In contrast to the ratio *L2*, the ratio *L3* measures the liquidity of a bank assuming that the bank cannot borrow from other banks in case of liquidity need. This is relatively strict measure of liquidity but it enables us to capture at least the part of the market liquidity risk. The bank is able to meet its obligations in terms of funding (the volume of liquid assets is high enough to cover volatile funding) if the value of this ratio is 100% or more. Lower value indicates a bank's increased sensitivity related to deposit withdrawals.

$$L4 = \frac{loans}{total\ assets} \times 100(\%) \tag{4}$$

The ratio *L4* measures the share of loans in total assets. It 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.

$$L5 = \frac{loans}{deposits} \times 100(\%) \tag{5}$$

The last liquidity ratio *L5* relates illiquid assets with liquid liabilities. Its interpretation is the same as in case of ratio *L4*: the higher this ratio the less liquid the bank is. Lower values of this ratio means that loans provide by the bank are financed by deposits.

These liquidity ratios are still in common. It is possible to calculate them only on the basis of publicly available data from banks´ balance sheets and it is easy to interpret their values. Their disadvantage is the fact that they do not always capture all, or any of liquidity risk.

2.2 Data

We used unconsolidated balance sheet data over the period from 2001 to 2010 which were obtained from annual reports of Czech and Slovak banks. The panel is unbalanced as some of the banks do not report over the whole period of time. Tab. I shows more details about the sample.

The sample includes significant part of Czech and Slovak banking sector (not only by the number of banks, but also by their share on total banking assets). Nevertheless, the share of observed banks on total assets may appear to be quite low, especially for the Slovakia. Partly it is a consequence of growing role of branches of foreign banks in recent years, partly it is because we do not include data from building societies and from specialized banks like Českomoravská záruční a rozvojová banka, Slovenská záručná a rozvojová banka, Česká exportní banka or Exim banka which focus on very special financial products and services.

3 RESULTS AND DISCUSSION

We have calculated five different liquidity ratios (1)–(5) for each bank in the sample in both countries. In this chapter, we present descriptive statistics of liquidity ratios. Later we focus also on the relationship between bank liquidity and the size of the bank.

3.1 Descriptive Statistics of Liquidity Ratios of Czech and Slovak Banks

Descriptive statistics of liquidity measured by liquidity ratio *L1* can be found in Tab. II., values of the ratio for individual banks can be found in Appendix. As higher value of this ratio means higher liquidity, it is evident that liquidity of Czech banks has declined during last ten years. On the contrary, during the period 2001–2008, value of the ratio *L1* for Slovak banks fluctuated only slightly. About one-third of assets of Slovak banks were liquid assets. In both countries, we can see negative impact of financial crisis on bank liquidity[1]. However, the extent of the impact differs across countries. Czech banks were least liquid in 2009 but there has been

I: *Data availability*

Indicator	01	02	03	04	05	06	07	08	09	10
Czech Republic										
Total number of banks	21	22	20	20	18	18	17	16	16	17
Number of observed banks	16	17	17	18	16	15	15	14	14	15
Share of observed banks on total assets (in %)	69	74	75	76	74	77	78	69	72	72
Slovakia										
Total number of banks	16	15	15	15	15	14	13	14	13	12
Number of observed banks	9	9	9	10	11	11	11	11	10	10
Share of observed banks on total assets (in %)	48	45	49	51	58	59	63	70	66	65

Source: author's processing

II: *Descriptive statistics for liquidity ratio L1 (in %)*

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Czech Republic										
mean	42.4	44.1	39.1	37.1	33.1	26.3	22.9	23.8	22.1	23.5
median	36.3	38.4	38.9	38.0	23.5	19.8	14.8	17.6	17.6	19.9
st.deviation	23.9	22. 6	20.1	18.7	24.5	18.7	19.8	21.9	15.5	46.6
maximum	90.6	91.5	79.2	67.7	100	63.1	56.7	83.8	58.8	60.6
minimum	0.3	0.1	1.3	0.1	0.1	0.1	0.1	1.9	1.4	4.3
Slovakia										
mean	29.4	30.7	26.3	28.8	26. 9	27.9	28.9	29.6	13.6	12.1
median	26.5	31.2	23.8	24.8	24.7	27.3	27.4	27.9	13.6	11.2
st.deviation	7.6	10.5	10.3	15.2	13.1	12.8	11.8	11.3	5.1	6.9
maximum	47.5	43.9	44.7	60.8	47.2	49.8	53.9	53.9	22.4	28.7
minimum	22.6	14.0	15.5	13.4	4.9	4.7	14.4	16.0	4.3	2.7

Source: author's calculations

1 The detailed investigation of the impact of financial crisis on the liquidity of Czech and Slovak banks with panel data regression analysis can be found in Vodová (2011).

some improvement in last year. The fall of liquidity of Slovak banks in 2009 has been followed by an even deeper decline in 2010.

Average values can be sometimes tricky so it is useful to consider other items of descriptive statistics as well. We can see relatively extreme values of minimum and maximum, mainly in case of Czech banks. Hypoteční banka and Wüstenrot hypoteční banka have the lowest share of liquid assets in total assets. Both banks focused on mortgage loans, which represent the biggest part of their assets. Maximum values were achieved by banks that have their business either started (such as Evropsko-ruská banka who obtained banking license in 2008 and opened the first branch in 2009) or ended (such as Calyon Bank Czech Republic who transferred all assets to Calyon Bank S.A. on 1st November 2005 and entered into liquidation on 2nd November 2005). Relatively high buffer of liquid assets was held also by Citibank and PPF banka.

In Slovakia, the lowest share of liquid assets in total assets has mainly VÚB banka and Tatra banka. In both cases, the volume of liquid assets decreased as a result of reduction of interbank transaction in the respective years. Due from banks in VÚB banka amounted to only one tenth of the values from previous years. Although the decline in due from banks in other banks has not been so huge, the trend has been the same. This could be a signal of market liquidity risk – the interbank market has frozen because individual banks have not trust to each other. Maximum values were recorded by Privatbanka and Poštová banka which were (as Citibank and PPF banka in the Czech Republic) strongly focused on trading on the interbank market.

Although values of ratio *L2* differ significantly from values of ratio *L1*, the trend is the same. Results confirm decrease in liquidity of Czech banks and a slight improvement in 2010 and sharp fall of liquidity of Slovak banks in last two years (Tab. III and Appendix).

High values of the ratio *L2* and thus high level of liquidity have occurred in Banco Popolare, Evropsko-ruská banka and PPF banka in the Czech Republic and in Československá obchodná banka, UniCredit bank and Privatbanka in Slovakia.

III: *Descriptive statistics for liquidity ratio L2 (in %)*

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Czech Republic										
mean	52.4	58.2	54.7	51.6	39.3	38.1	32.2	21.7	28.9	29.5
median	50.2	50.0	53.9	47.3	28.6	23.3	18.4	20.5	20.9	27.0
st.deviation	27.6	35.9	40.0	26.8	38.1	38.3	31.9	17.5	93.2	24.6
maximum	99.9	164	181	111	165	157	109	68.1	101	96.8
minimum	0.3	0.1	1.8	0.1	0.0	0.1	0.1	0.0	6.1	0.0
Slovakia										
mean	36.1	35.6	30.4	33.2	31.9	34.7	40.2	41.4	16.6	15.8
median	35.5	39.2	28.4	29.0	30.0	30.9	36.0	33.1	16.7	13.3
st.deviation	7.4	11.1	11.2	17.8	12.9	17.4	27.7	27.3	6.3	10.8
maximum	52.9	49.9	49.5	71.5	55.0	78.4	118	113	25.5	43.3
minimum	27.6	15.8	18.0	15.6	14.5	9.9	18.9	22.1	5.7	3.7

Source: author's calculations

IV: *Descriptive statistics for liquidity ratio L3 (in %)*

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Czech Republic										
mean	94.4	79.9	86.6	81.4	50.3	49.4	37.4	37.3	45.4	46.1
median	62.2	60.1	57.2	50.9	39.2	35.4	23.9	30.5	31.6	27.1
st.deviation	69.8	52.6	61.8	69.4	41.0	40.2	29.8	29.4	34.7	48.4
maximum	281	192	214	254	165	158	109	100	132	197
minimum	25.1	7.5	24.7	4.1	0.0	2.6	3.5	0.0	12.2	7.8
Slovakia										
mean	42.1	40.7	35.5	41.2	37.6	40.2	48.4	51.1	19.3	17.5
median	37.7	41.4	29.7	35.5	36.4	38.7	43.0	39.4	18.9	14.9
st.deviation	11.8	10.8	15.1	23.2	13.9	18.4	34.5	37.1	7.3	12.7
maximum	66.4	55.1	60.3	94.3	62.2	83.2	143	153	29.2	49.9
minimum	29.0	17.3	19.2	17.9	15.2	10.7	19.3	23.9	6.2	3.9

Source: author's calculations

Hypoteční banka and Wüstenrot hypoteční banka had lowest value of the ratio *L2* among Czech banks (due to a very low value of liquid assets) and VÚB banka and Tatra banka (due to a high value of deposits) among Slovak banks.

As it was mentioned above, the liquidity ratio *L3* measures the liquidity of a bank assuming that the bank cannot borrow from other banks in case of liquidity need. Therefore it is a share of liquid assets in deposits of households and nonfinancial companies. We can see that the trend of liquidity in both countries is similar to previous two indicators (Tab. IV and Appendix).

The volume of liquid assets of the bank is high enough to cover volatile funding if the value of this ratio is higher than 100 %. This was true only for a minority of Czech banks (Banco Popolare, Calyon Bank Czech Republic, Wüstenrot hypoteční banka and LBBW BankCZ in the beginning of the analyzed period and Hypoteční banka in last three years) and for only one Slovak banks – Československá obchodná banka (in 2007 and 2008). Consequently, almost all Czech and Slovak banks are sensitive to potential massive deposit withdrawals.

Descriptive statistics for liquidity ratio *L4* is presented in Tab. V.; values of the ratio for individual banks can be found in Appendix. Increase in lending activity confirms that both Czech and Slovak banks have become less liquid. However, probably as a result of financial crisis, we can see that Czech banks are less willing to provide loans during last two years.

Minimal and maximal values indicate significant differences in business strategies of banks. In case of the Czech Republic, both banks specialized on mortgages (Hypoteční banka and Wüstenrot hypoteční banka) have the highest share of loans in total assets and are most willing to provide loans. This fully corresponds with the fact that mortgage loans represent an important part of loans provided in the Czech Republic (Vodová, 2009). As regards the Slovak banks, the highest values of the ratio *L4* have Volksbank and OTP Banka.

By contrast, eBanka and Československá obchodní banka in the Czech Republic and Privatbanka,

V: *Descriptive statistics for liquidity ratio L4 (in %)*

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Czech Republic										
mean	40.0	41.5	46.2	50.2	50.2	60.3	62.7	62.8	61.1	61.5
median	36.3	38.1	42.9	45.9	51.4	61.6	56.9	72.5	66.6	63.7
st.deviation	22.8	21.9	20.4	19.2	25.9	22.8	24.9	28.4	22.6	21.4
maximum	93.8	93.6	93.0	96.8	88.2	96.1	95.9	97.3	97.2	94.2
minimum	6.0	4.6	17.4	56.7	0.0	28.7	27.6	0.0	21.2	21.6
Slovakia										
mean	33.0	38.2	41.3	39.8	43.3	45.9	52.1	51.2	57.6	60.6
median	30.9	43.1	43.7	39.4	43.9	50.0	53.9	54.6	59.5	62.7
st.deviation	12.3	13.5	12.7	15.2	16.7	11.7	10.7	14.6	16.2	13.5
maximum	52.6	57.6	61.8	63.1	71.4	59.4	67.9	72.0	75.7	79.1
minimum	14.9	18.8	26.3	11.8	16.2	26.5	31.6	22.9	23.1	34.8

Source: author's calculations

VI: *Descriptive statistics for liquidity ratio L5 (in %)*

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Czech Republic										
mean	88.7	77.9	94.9	83.4	72.0	88.5	93.4	90.1	94.9	83.4
median	60.5	54.9	61.7	81.0	86.4	91.7	100	100	98.8	88.3
st.deviation	72.3	63.8	102	34.1	35.5	35.5	42.4	43.7	33.3	27.5
maximum	293	272	469	181	134	155	180	166	146	129
minimum	11.8	5.3	32.8	39.9	0.0	42.6	36.2	0.0	34.5	34.8
Slovakia										
mean	49.2	52.7	55.4	56.2	66.0	70.7	80.9	81.3	82.1	84.7
median	43.5	53.1	56.3	54.5	60.7	73.0	76.7	82.6	86.6	89.7
st.deviation	25.7	22.8	18.5	22.9	28.5	22.0	21.8	25.3	24.0	23.0
maximum	106	97.9	91.9	98.6	125	104	104	117	109	111
minimum	17.4	22.0	31.7	18.3	28.9	35.8	37.2	40.7	38.8	42.4

Source: author's calculations

Poštová banka and Slovenská sporiteľňa in Slovakia reached minimum values of the ratio *L4*. eBanka started to focus on lending in 2003 and Slovenská sporiteľňa in 2004; their values of the ratio are very low until the end of 2002 (respectively 2003). Československá obchodní banka, Privatbanka and Poštová banka belongs to banks that rather than lending focus on trading with securities and on transaction on the interbank market.

Results of the liquidity ratio *L5* can be found in Tab. VI. and in Appendix. As in case of results from Tab. V, high value of this ratio means low liquidity. The value of the last ratio confirms that mainly the liquidity of Slovak banks is decreasing.

However, the value of this ratio also indicates how banks finance their lending activity. Most Czech and Slovak banks provide their loans from deposits. The exceptions are banks with the value of this ratio higher than 100 %, such as Hypoteční banka and Wüstenrot hypoteční banka (majority of their lending activity is financed by mortgage bonds issuing) and LLBW Bank CZ, Raiffeisenbank and Volksbank in the Czech Republic in some years and Československá obchodná banka, Istrobanka and OTP banka in some years in Slovakia. All these banks strongly rely on interbank market.

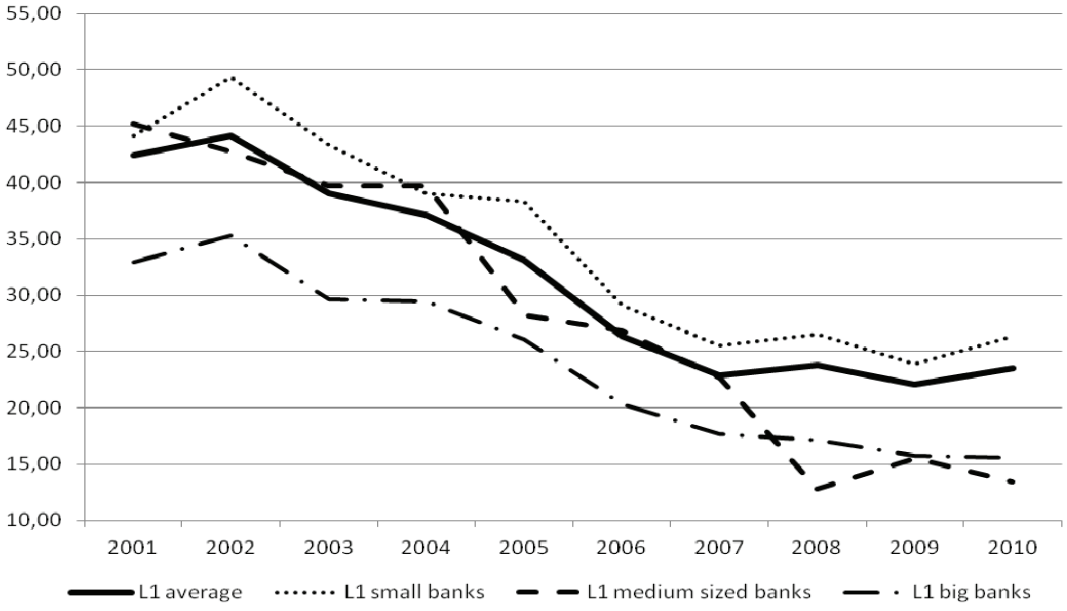
3.2 Liquidity Ratios by Group of Banks

Now we focus on the relationship between the size of the bank and its liquidity[2]. We will take into account only the values of ratios *L1* and *L4*, because these ratios are easy to interpret and did not achieve so extreme values.

We will differ between small, medium sized and big banks. Following the methodology of Czech National Bank, Czech banks were classed into groups based on the amount of their total assets[3]. In the Czech Republic, our sample included 3–4 big banks, 2–6 medium sized banks and 7–10 small banks in particular years. In Slovakia, groups of big and small banks consisted of 3 banks; group of medium sized banks included 3–5 banks in particular years.

As it can be seen from Fig. 1, liquidity of Czech banks is decreasing with the size of the bank: small banks are the most liquid, the liquidity of medium sized banks is about average and big banks are least liquid.

Fig. 2 documents that the situation in Slovak bank is almost the same: big banks are least liquid. The only difference is that liquidity of medium sized banks is above average, the liquidity of small banks is about average.



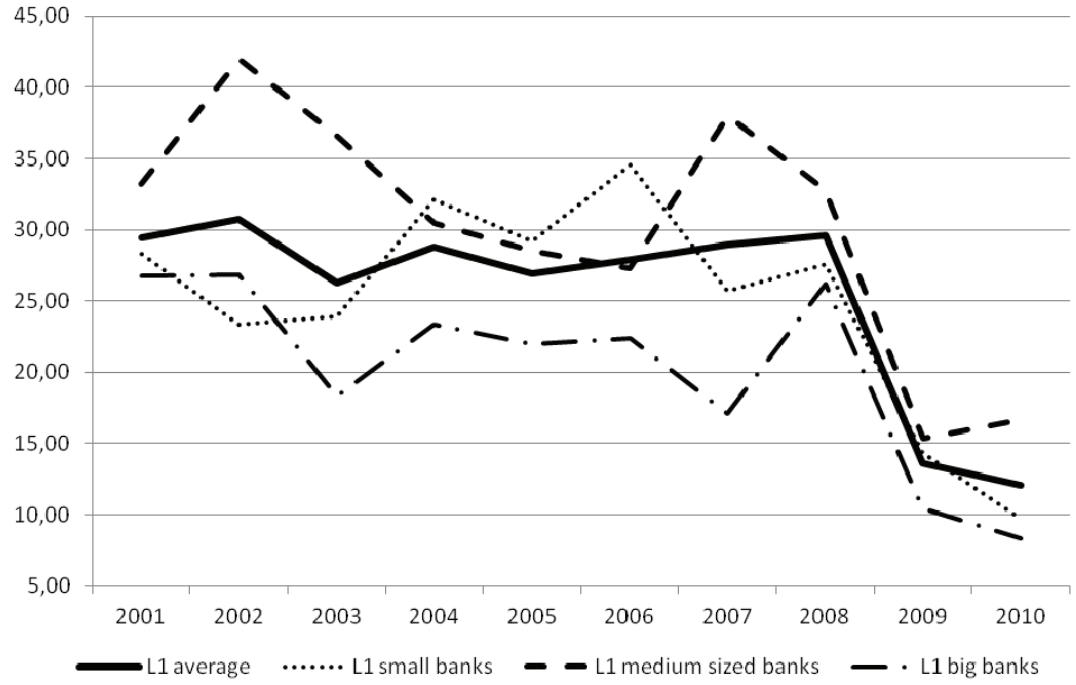
1: *Liquidity ratio L1 by group of Czech banks*
Source: author's calculations

2 The detailed investigation of the influence of the size of the bank on its liquidity for Czech and Slovak banks with panel data regression analysis can be found in Vodová (2011).

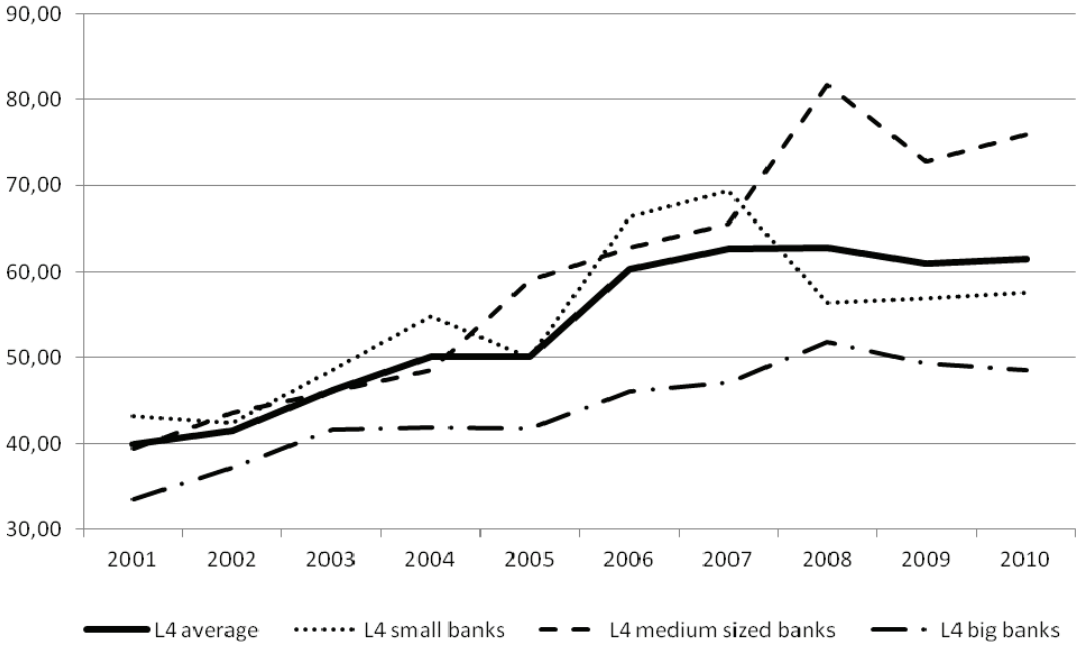
3 In 2001–2006, big banks were those with total assets of more than CZK 100 billion, medium sized banks had total assets of between CZK 20 billion and 100 billion and small banks had total assets of less than CZK 20 billion. In 2007–2008, limits changed and big banks were those with total assets of more than CZK 150 billion, medium sized banks had total assets of between CZK 50 billion and 150 billion and small banks had total assets of less than CZK 50 billion. As from 2009, total assets needed for inclusion in the large banks group were increased to CZK 200 billion, medium sized banks had total assets of between CZK 50 billion and 200 billion, the limit for small banks remained unchanged. The same methodology has been applied to Slovak banks (but the limits were in SKK).

One can conclude that both Czech and Slovak banks have the same strategies how to insure against liquidity crises. Small and medium sized banks hold buffer of liquid assets. On the contrary, big banks prefer strategies connected with the liability side of the balance sheet: they rely on the interbank market or on a liquidity assistance of the Lender of Last Resort. This finding fully corresponds to the well known "too big to fail" hypothesis. If big banks are seeing themselves as "too big to fail", their motivation to hold liquid assets is limited.

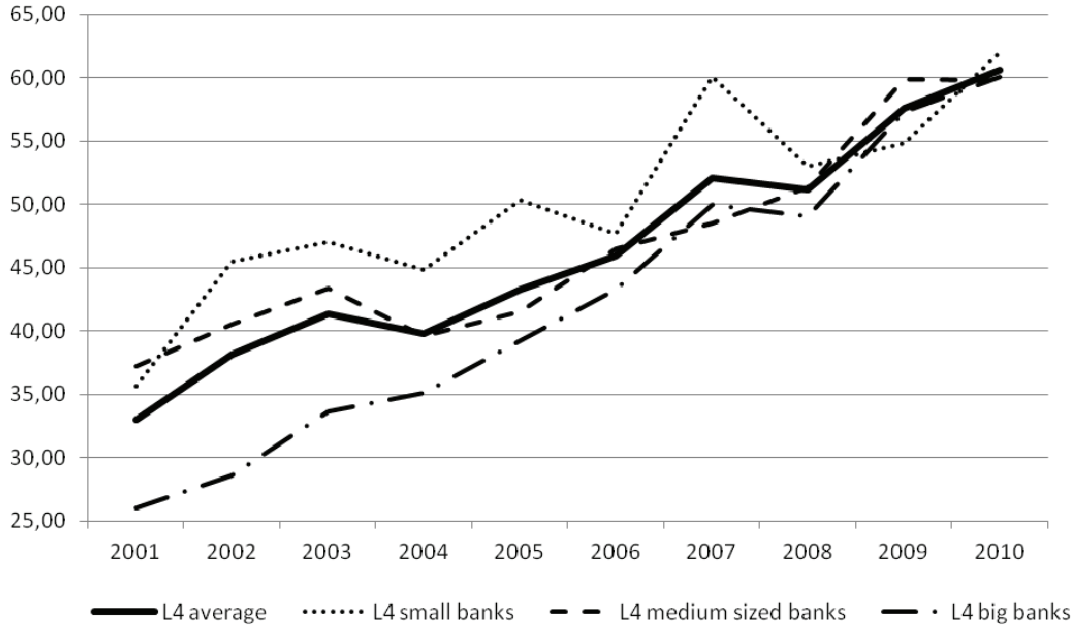
The results of liquidity ratio *L4* by group of banks are quite surprising: small and medium sized banks are most willing to lend and thus theoretically the least liquid (see Fig. 3 and Fig. 4). This is the completely opposite finding. To interpret the values



2: *Liquidity ratio L1 by group of Slovak banks*
Source: author's calculations



3: *Liquidity ratio L4 by group of Czech banks*
Source: author's calculations



4: *Liquidity ratio L4 by group of Slovak banks*
Source: author's calculations

of both ratios together, we should conclude that big banks lend only little but at the same time, their liquidity is also very low.

However, it should be emphasized that the average is deceptive in this case because in both countries, it was strongly influenced mainly by the values of just one big bank: Československá obchodní banka in case of the Czech Republic and Slovenská sporiteľňa in case of Slovakia.

Československá obchodní banka focuses mainly on trading with securities (securities are the biggest part of its assets). Most loans are provided to non-financial companies. Nevertheless, the importance of lending activity is below the average of banking sector and the level of bank liquidity as well.

The situation in Slovenská sporiteľňa differs a bit. The lending activity is below the average as well but it is improving during last years. Slovenská sporiteľňa focuses more and more on lending activity and changes the structure of its credit portfolio: at the beginning of the analyzed period, loans to non-financial companies dominated, nowadays the biggest part of loans is provided to households. Increase in lending activity is accompanied with decrease in interbank transaction. The share of securities in total assets is still very high.

Lending activity of two other Czech big banks – Československá obchodní banka and Komerční banka – are only slightly below the average but their liquidity is at or slightly above the average. Instead of lending activity, Česká spořitelna prefers activities on the interbank market; Komerční banka focuses more on trading with securities.

Completely different is the strategy of the last two big banks – Czech UniCredit Bank and Tatra banka. Both banks have above-average share of loans in total assets which is connected with below-average liquidity. Both banks focuses mainly on loans to non-financial companies; the second most important counterparty is household sector.

4 CONCLUSIONS

The aim of this paper was to evaluate comprehensively the liquidity positions of Czech and Slovak commercial banks via different liquidity ratios in the period of 2001–2010 and to find out whether the strategy for liquidity management differs by the size of the bank.

We have calculated five different liquidity ratios for each Czech and Slovak bank in the sample. Values of ratios are influenced by business strategy of banks.

According to values of ratios using liquid assets, liquidity of Czech banks has declined during last ten years. On the contrary, liquidity of Slovak banks fluctuated only slightly during the period 2001–2008. Bank liquidity has fallen due to the financial crisis in both countries. However, the extent of the impact differs across countries: Czech banks were least liquid in 2009 but there has been some improvement in last year; the fall of liquidity of Slovak banks in 2009 has been followed by an even deeper decline in 2010. Almost all Czech and Slovak banks are sensitive to potential massive deposit withdrawals.

Results of ratios based on the share of loans showed that due to the increase in lending activity, Czech and Slovak banks have become less liquid. Probably as a result of financial crisis, we can see that Czech banks are less willing to provide loans during last two years. Maybe this is the reason why liquidity

of Czech banks is slightly higher than liquidity of Slovak banks. Most Czech and Slovak banks provide their loans from deposits; only minority of banks relies on financial sources from interbank market or from bonds issuance.

Furthermore we focused on the relationship between the size of the bank and its liquidity. We have found that both Czech and Slovak banks have the same strategies how to insure against liquidity crises. While ensuring liquidity, big banks rely on the interbank market or on a liquidity assistance of the Lender of Last Resort. On the contrary, small and medium sized banks hold buffer of liquid assets. Big banks (mainly Československá obchodní banka and Slovenská sporiteľňa) are simultaneously least willing to provide loans.

Appendix

VII: *Results of liquidity ratio L1 (in %)*

Bank	01	02	03	04	05	06	07	08	09	10
Czech Republic										
Banco Popolare / IC banka		80.4	79.2	66.0	63.5	63.1	47.2	28.7	25.8	41.0
Calyon Bank	62.5	73.4	65.2	67.7	100					
Citibank	37.9	38.4	37.0	37.8	35.3	43.7	45.9			
Česká spořitelna	29.0	30.0	20.6	16.6	18.2	14.3	11.3	13.9	18.8	24.1
ČSOB	28.5	35.8	34.3	32.8	11.7	6.3	5.5	8.0	7.5	4.7
Dresdner Bank	34.6	36.9	39.7	57.6						
eBanka	77.1	91.5	63.6	38.4	36.5	42.8	55.9			
Evropsko-ruská b.								83.8	58.8	60.6
Fio banka										42.2
GE Money Bank	80.2	53.8	45.1	34.1	21.8	14.5	7.3	8.4	16.0	21.3
HVB Bank	28.8	26.9	16.0	14.4	22.7					
Hypoteční banka	0.3	0.1	1.6	0.1	0.1	0.1	0.1	12.2	16.4	11.0
J & T banka	22.3	32.1	51.2	40.0	23.5	19.8	17.7	19.3	28.0	25.9
Komerční banka	41.3	48.6	47.7	53.8	51.8	41.8	35.5	25.1	24.1	20.0
LBBW BankCZ	31.4	37.6	26.5	48.5	42.1	32.4	10.6	18.0	22.4	18.9
PPF banka	90.6	60.0	47.7	53.6	56.3	52.9	56.7	59.1	46.9	43.6
Raiffeisenbank	47.1	42.9	37.9	38.3	34.2	22.3	14.8	17.2	15.0	5.5
UniCredit Bank						18.9	18.3	21.5	12.7	13.4
Volksbank	24.8	19.9	11.7	20.6	14.0	14.5	13.1	15.8	12.6	15.9
Wüstenrot hypot. B.				16.9	9.0	7.4	3.0	1.9	1.4	4.3
Živnostenská banka	42.4	41.8	38.9	30.8	21.8					
Slovakia										
ČSOB					4.9	4.7	53.9	54.0	17.5	28.7
Dexia banka	26.5	42.8	40.4	18.5	34.0	27.3	27.4	21.5	14.3	11.9
ISTROBANKA				33.6	20.7	22.1	39.9	24.8		
OTP banka	23.3	23.6	18.5	22.1	15.7	30.7	26.5	16.0	12.2	10.7
Poštová banka	25.5	39.4	24.7	21.8	44.4	49.9	38.0	31.9	22.4	10.4
Privatbanka	29.6	19.9	29.4	60.7	47.2	48.3	32.0	43.3	17.3	6.9
Slovenská sporiteľňa	32.3	35.3	15.9	28.9	28.2	28.2	15.7	33.4	13.4	14.5
Tatra banka	25.4	14.0	15.5	13.6	22.6	19.4	21.2	27.9	13.7	7.8
UniCredit Bank	47.5	43.9	44.7	47.7	38.4	32.5	30.9	32.0	7.2	15.7
Volksbank	32.0	26.5	23.8	13.4	24.7	24.8	18.5	23.4	13.5	11.6
VÚB banka	22.6	31.2	23.6	27.6	15.0	19.5	14.4	17.4	4.3	2.7

Source: author's calculations

VIII: *Results of liquidity ratio L2 (in %)*

Bank	01	02	03	04	05	06	07	08	09	10
Czech Republic										
Banco Popolare / IC banka		164	181	111	165	157	109	43.1	34.1	52.3
Calyon Bank	73.6	83.2	72.1	74.9	0.0					
Citibank	68.6	76.9	84.2	84.7	57.2	65.4	69.4			
Česká spořitelna	28.9	35.1	24.0	18.9	21.4	16.7	13.1	16.6	22.1	28.3
ČSOB	33.9	42.5	39.9	37.6	21.3	13.5	7.0	8.2	10.5	6.6
Dresdner Bank	53.5	49.0	53.9	67.8						
eBanka	96.0	97.0	79.2	44.0	43.8	50.0	69.2			
Evropsko-ruská b.								0.0	101	96.8
Fio banka										48.3
GE Money Bank	91.6	67.1	57.2	44.9	29.5	20.3	10.1	11.4	19.8	27.0
HVB Bank	33.3	32.1	19.0	16.6	26.2					
Hypoteční banka	0.3	0.1	1.8	0.1	0.1	0.1	0.1	13.9	18.7	12.6
J & T banka	35.0	40.5	60.3	43.2	28.6	23.3	20.3	21.7	31.8	29.0
Komerční banka	54.2	62.6	61.1	67.3	69.0	53.7	46.0	33.2	32.0	27.5
LBBW BankCZ	41.8	60.0	35.9	55.9	48.6	37.4	12.7	21.6	25.8	22.0
PPF banka	99.9	63.9	58.8	61.6	53.4	59.0	64.4	68.1	57.8	51.3
Raiffeisenbank	53.4	50.0	43.8	49.8	40.0	26.7	18.4	20.9	17.0	6.3
UniCredit Bank						21.7	22.0	22.8	14.9	15.7
Volksbank	28.9	22.0	12.8	22.9	16.3	17.5	17.1	19.9	14.4	18.1
Wüstenrot hypot. B.				92.2	13.7	9.5	3.5	2.1	6.1	0.0
Živnostenská banka	47.0	46.5	43.9	34.9	24.7					
Slovakia										
ČSOB					14.5	9.9	118	113	25.5	43.3
Dexia banka	35.9	46.5	44.4	19.9	37.6	31.0	31.1	25.8	16.3	17.6
ISTROBANKA				39.6	23.9	25.3	45.0	28.0		
OTP banka	39.9	30.7	21.2	24.4	20.6	41.9	36.2	22.3	13.5	12.0
Poštová banka	30.6	43.7	28.4	25.0	47.9	45.5	43.1	33.1	24.6	11.6
Privatbanka	37.6	24.2	36.5	71.5	55.0	78.4	45.5	69.8	20.9	8.2
Slovenská sporiteľňa	35.5	39.2	18.1	33.1	32.6	32.8	18.6	38.5	15.4	17.1
Tatra banka	29.7	15.8	18.4	16.2	27.1	24.6	27.3	35.4	18.1	9.9
UniCredit Bank	52.9	49.9	49.5	53.9	43.4	38.0	36.0	37.7	8.9	19.8
Volksbank	35.3	30.8	28.9	15.6	30.0	30.0	22.9	28.9	17.0	14.7
VÚB banka	27.6	39.7	29.8	33.0	18.5	24.4	17.9	22.1	5.7	3.7

Source: author's calculations

IX: *Results of liquidity ratio L3 (in %)*

Bank	01	02	03	04	05	06	07	08	09	10
Czech Republic										
Banco Popolare / IC banka		164	181	175	165	158	109	43.1	48.2	54.1
Calyon Bank	201	185	214	254	0.0					
Citibank	53.2	58.5	52.8	54.7	51.2	59.8	54.7			
Česká spořitelna	36.7	39.0	26.7	21.6	25.3	19.4	15.9	19.6	26.6	35.2
ČSOB	42.9	48.7	45.4	46.4	23.0	14.4	8.2	10.3	12.2	7.6
Dresdner Bank	108	86.5	78.9	163						
eBanka	100	104	79.4	44.3	43.9	53.3	69.4			
Evropsko-ruská b.								0.0	376	198
Fio banka										48.4
GE Money Bank	149	67.1	57.2	44.9	29.5	20.3	10.1	11.4	19.8	27.0
HVB Bank	67.3	50.1	29.8	23.5	39.2					
Hypoteční banka	25.1	7.5	179	4.1	4.3	2.6	3.5	100	132	197
J & T banka	48.8	48.6	62.9	48.0	29.7	24.4	23.4	24.9	34.4	31.4
Komerční banka	46.0	55.9	54.7	61.9	60.1	48.9	40.9	30.2	28.8	24.2
LBBW BankCZ	149	192	183	192	81.3	79.8	23.0	30.8	37.1	25.8
PPF banka	281	75.8	91.7	99.8	95.2	70.2	74.4	75.6	72.5	62.8
Raiffeisenbank	88.6	70.2	54.7	53.8	53.8	35.4	23.9	27.8	22.3	8.1
UniCredit Bank						30.7	29.6	31.5	19.6	20.8
Volksbank	55.9	44.0	24.7	34.8	22.6	24.8	23.3	32.1	23.1	26.0
Wüstenrot hypot. B.				100	100	100	41.1	84.9	58.8	22.6
Živnostenská banka	57.2	60.1	55.2	43.4	31.1					
Slovakia										
ČSOB					15.2	10.6	142	153	29.0	49.9
Dexia banka	37.9	50.1	48.5	23.3	49.9	38.0	39.0	33.9	18.9	18.9
ISTROBANKA				57.1	36.4	38.7	67.2	41.8		
OTP banka	47.1	40.1	27.5	34.5	27.6	52.5	43.0	26.2	17.9	14.6
Poštová banka	34.7	45.7	28.8	31.3	48.1	45.6	44.4	33.6	24.8	12.0
Privatbanka	54.6	38.2	54.4	94.3	62.2	83.2	46.7	76.7	29.2	8.4
Slovenská sporiteľňa	37.7	41.4	19.2	39.1	40.3	38.9	20.2	48.2	19.3	19.4
Tatra banka	33.9	17.3	20.0	19.6	31.3	25.4	28.8	39.4	18.2	10.0
UniCredit Bank	66.4	55.1	60.3	58.1	48.2	45.8	54.3	54.6	10.4	22.5
Volksbank	37.6	33.7	29.7	17.9	33.6	37.5	26.6	30.2	19.0	15.2
VÚB banka	29.0	44.5	31.5	36.4	20.8	25.9	19.3	23.9	6.2	4.0

Source: author's calculations

X: *Results of liquidity ratio L4 (in %)*

Bank	01	02	03	04	05	06	07	08	09	10
Czech Republic										
Banco Popolare / IC banka		17.6	17.4	31.4	32.2	35.0	50.2	69.7	73.1	46.4
Calyon Bank	28.1	19.6	28.8	0.0						
Citibank	71.4	65.6	10.1	69.0	69.0	73.1	70.1			
Česká spořitelna	35.7	35.9	42.9	39.8	45.6	50.7	56.6	56.6	57.5	53.9
ČSOB	32.7	29.5	32.9	33.4	27.2	28.7	29.5	29.2	23.2	21.5
Dresdner Bank	54.6	49.5	41.7	34.9						
eBanka	9.1	4.6	26.3	46.0	51.4	48.3	41.4			
Evropsko-ruská b.								0.0	21.2	30.1
Fio banka										39.5
GE Money Bank	15.0	38.0	48.6	62.3	74.6	81.2	88.2	87.1	71.6	69.7
HVB Bank	43.8	55.7	61.5	59.6	56.8					
Hypoteční banka	93.8	93.6	93.0	96.8	88.2	96.1	95.9	86.7	83.0	88.9
J & T banka	31.7	50.9	39.4	51.7	69.0	74.5	78.7	77.7	56.4	63.0
Komerční banka	32.1	27.6	29.3	34.7	37.6	43.6	45.4	52.2	53.2	55.2
LBBW BankCZ	61.9	53.3	68.2	45.8	5.4	53.2	83.3	75.3	69.8	74.2
PPF banka	6.0	23.5	31.6	37.5	37.4	38.3	27.6	19.8	31.4	35.6
Raiffeisenbank	49.4	51.9	50.6	57.0	62.3	76.1	80.6	76.3	73.9	82.1
UniCredit Bank						61.6	57.0	69.6	63.4	63.7
Volksbank	71.8	75.9	84.1	75.8	82.3	82.7	82.8	81.7	80.0	79.4
Wüstenrot hypot. B.				81.4	82.4	93.4	94.7	97.3	97.2	94.2
Živnostenská banka	37.0	42.4	46.2	52.4	63.1					
Slovakia										
ČSOB					16.2	36.8	38.5	35.4	57.1	59.1
Dexia banka	26.8	43.6	48.6	48.6	54.4	52.4	53.9	59.3	67.8	70.5
ISTROBANKA				41.2	57.5	59.4	59.3	66.7		
OTP banka	52.6	57.6	61.8	63.1	71.4	57.2	62.3	72.0	69.3	72.3
Poštová banka	37.3	25.9	31.6	30.1	30.3	31.0	31.6	40.9	38.8	43.5
Privatbanka	23.6	32.4	27.3	11.8	21.9	26.5	50.1	22.9	23.0	34.8
Slovenská sporiteľňa	14.9	18.8	26.3	26.4	36.7	42.4	51.1	45.5	53.1	55.6
Tatra banka	39.4	43.1	43.7	40.4	44.0	50.0	55.3	54.6	60.8	66.2
UniCredit Bank	47.6	51.9	50.8	38.5	49.1	52.8	59.1	54.5	75.7	66.3
Volksbank	30.9	46.3	52.0	59.8	57.7	59.3	67.8	63.9	72.2	79.1
VÚB banka	23.9	23.9	30.8	38.4	37.0	37.4	43.6	47.0	58.1	58.5

Source: author's calculations

XI: *Results of liquidity ratio L5 (in %)*

Bank	01	02	03	04	05	06	07	08	09	10
Czech Republic										
Banco Popolare / IC banka		36.0	40.0	83.3	86.4	57.3	116	105	137	61.2
Calyon Bank	90.6	49.4	94.2	100	0.0					
Citibank	51.5	55.0	61.7	52.1	51.9	42.8	39.4			
Česká spořitelna	45.3	46.7	55.6	52.0	63.2	68.8	79.4	79.1	81.6	78.6
ČSOB	49.2	40.2	43.6	47.2	35.7	42.6	49.4	48.7	37.5	34.9
Dresdner Bank	170	116	82.9	98.5						
eBanka	11.8	5.3	32.8	53.1	61.9	60.3	51.4			
Evropsko-ruská b.								0.0	136	98.2
Fio banka										45.3
GE Money Bank	27.8	47.5	61.7	82.0	101	114	122	119	88.9	88.3
HVB Bank	102	104	115	97.0	97.8					
Hypoteční banka	292	272	430	169	128	149	173	152	128	120
J & T banka	69.4	77.1	48.3	61.9	87.0	91.7	104	101	69.2	76.3
Komerční banka	35.7	31.7	33.6	39.9	43.7	51.1	52.3	62.8	53.5	66.7
LBBW BankCZ	293	273	469	181	104	155	180	129	116	101
PPF banka	18.6	29.6	60.8	69.9	63.2	50.8	36.2	25.3	45.9	51.3
Raiffeisenbank	93.0	84.9	73.0	80.1	98.0	121	130	124	110	121
UniCredit Bank						100	92.1	102	97.6	98.7
Volksbank	162	168	177	128	134	142	147	166	146	129
Wüstenrot hypot. B.				100	100	100	130	147	117	118
Živnostenská banka	49.9	61.1	65.6	71.8	90.2					
Slovakia										
ČSOB					50.8	82.7	102	100	94.6	103
Dexia banka	38.4	51.0	57.0	61.1	76.8	73.0	76.7	93.4	89.4	111
ISTROBANKA				70.0	101	104	99.9	112		
OTP banka	107	94.9	91.9	98.6	125	97.8	101	118	102	98.3
Poštová banka	50.8	30.1	36.9	43.1	35.2	35.8	37.2	45.9	43.0	50.1
Privatbanka	43.5	62.3	50.5	18.3	28.9	45.7	73.0	40.6	38.8	42.4
Slovenská sporiteľňa	17.4	22.0	31.7	35.7	52.5	58.7	66.0	65.6	76.7	74.4
Tatra banka	52.8	53.1	56.3	58.2	60.8	65.5	75.3	77.3	81.2	84.4
UniCredit Bank	66.5	65.3	68.6	46.8	61.6	74.4	104	93.1	109	94.9
Volksbank	36.2	58.9	64.8	79.7	78.4	89.7	97.3	82.6	102	104
VÚB banka	30.7	34.0	41.1	50.8	51.3	49.8	58.5	64.7	83.9	84.4

Source: author's calculations

SUMMARY

Liquidity is the ability of bank to fund increases in assets and meet obligations as they come due, without incurring unacceptable losses. To insure against liquidity crises, banks can hold buffer of liquid assets, borrow from other banks or rely on emergency liquidity assistance from the Lender of Last Resort. Due to the financial crisis, the bank liquidity, its measurement and management is very actual topic. The aim of this paper was therefore to evaluate comprehensively the liquidity positions of Czech and Slovak commercial banks via different liquidity ratios in the period of 2001–2010 and to find out whether the strategy for liquidity management differs by the size of the bank. In section 2, we have described five different liquidity ratios (the share of liquid assets in total assets, the share of liquid assets in deposits and short term borrowing, the share of liquid assets in deposits, the share of loans in total assets and the share of loans in deposits) and the data sample (we used unconsolidated balance sheet data over the period 2001–2010 which were obtained from annual reports of 14–18 Czech and 9–11 Slovak banks). The results of calculated liquidity ratios enable us to conclude that liquidity of Czech banks has declined during last ten years but liquidity of Slovak banks fluctuated only slightly during the period 2001–2008 but sharply dropped in 2009 and 2010, mainly as a result of worsening

economic conditions. Liquidity of both Czech and Slovak banks decreased also due to their lending activity. The strategy of liquidity risk management is same in both countries: big banks rely on the interbank market or on a liquidity assistance of the Lender of Last Resort, small and medium sized banks hold buffer of liquid assets.

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