A COMPARATIVE ANALYSIS OF THE DETERMINANTS OF LIQUIDITY RISK EXPOSURE IN THE BANKING SECTOR OF THE REPUBLIC OF SERBIA AND BANKING SECTORS OF FORMER SOCIALIST COUNTRIES

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Abstract:

The purpose of this paper is to point out statistically significant empirical determinants of exposure to liquidity risk for banks operating in the Republic of Serbia, and to perform a comparative analysis of the impact of these determinants on Serbian banks and banks from countries that have gone through a transitional period from being socialist countries to becoming EU members. The results indicate that increased exposure to liquidity risk in the local banking sector is associated with the following factors: high financial leverage, GDP growth, decline in the unemployment rate, decline in the deficit of balance of payments and an appreciation of local currency. The general impression is that the local banking sector is faced with an excessively high level of liquidity. Based on the comparative analysis carried out, and assuming that the Republic of Serbia undergoes the transition process that follows a model similar to that of the analysed EU members, several conclusions can be drawn regarding the nature of the effect of determinants of exposure to liquidity risk on banks during the transition period. It is to be expected that larger banks will keep their liquidity at relatively lower levels, that the development of financial markets will lead to a change in liquidity management strategy and reorientation of local banks to purchased liquidity management, and that the levels of capital adequacy will converge to that prescribed by the Basel regulatory framework.

Key words:

banking sector, liquidity risk, the Republic of Serbia, panel data, regression analysis.

1. INTRODUCTION

It is characteristic of small European countries, and especially those that go through a transition process, that they rely heavily on the banking sector. The liquidity of the banking sector is therefore a very important issue, especially in times of economic crisis. In the years preceding the most recent global economic crisis, the liquidity of banks was at satisfactory levels. Funding sources were available at relatively low cost, which is why liquidity management was not given priority over the management of other types of risk. However, immediately upon the outbreak of the crisis, many banks worldwide were faced with the issue of jeopardised liquidity. This dramatic change in market conditions at the global level has forced banks worldwide to consider efficient liquidity risk management as a priority. The Bank for International Settlements defines liquidity as the ability of banks to fund increases in assets and settle their short-term

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financial liabilities as they come due, without experiencing unexpected losses. The main challenge for banking institutions in terms of liquidity management is interdependence between loan approvals and withdrawal of funds by depositors. Liquidity issues may arise in the case of deposit withdrawal when loans are not being repaid and when it is even more difficult to quickly encash less liquid assets. In addition, the off-balance-sheet items of banks can have a profound impact on their liquidity. This mainly refers to credit lines that could be used to a greater or lesser extent and guarantees that can be activated. Empirical data indicate that in normal circumstances the daily deposit outflow is mostly compensated for by the daily inflow of new deposits and daily bank revenues. However, the more frequent occurrence of financial crises, together with specific seasonal fluctuations, such as the period around New Year and the holiday season, often results in greater daily outflows compared with the daily inflows of financial assets (net deposit drains), which can have adverse effects on liquidity.

Liquidity risk is managed by means of asset management, *i.e.* affecting the size of liquid assets by converting less liquid assets into cash, by attracting new deposits and borrowing on the capital market, and by combining the above-stated strategies. The first strategy is based on using liquidity reserves that can enable banks to compensate for the lack of liquidity (stored liquidity management). Liquidity reserves are divided into primary and secondary reserves. Primary liquidity reserves, which are examined in this paper, include cash in hand and funds held at the central bank in the form of required reserves and excess reserves. Secondary liquidity reserves are highly liquid securities such as government securities and securities issued by a central bank. Yet, another liquidity risk management strategy is based on attracting new deposits as well as obtaining liquid assets through the money market and capital market (purchased liquidity management). This strategy is being increasingly employed by banks worldwide. The main reason for this is the fact that the development of money and capital markets facilitates access to nondeposit funding sources, which reduces the opportunity costs of holding larger amounts of liquid reserves and makes managing maturity mismatches on banks' balance sheets easier (Račić *et al.*, 2014). In transition countries such as the Republic of Serbia, the share of total loans in banks' total assets is greater than that in banks operating in more developed financial markets. Therefore, the quality of credit risk management is an important issue in the analysis of bank exposure to liquidity risk.

In order to analyse the exposure to liquidity risk of the banking sector in the Republic of Serbia, research was conducted to analyse the influence of variations in certain internal bank characteristics and macroeconomic factors (Račić, 2014). The scientific goal of the research is to point out statistically significant determinants of the liquidity of banks in the Republic of Serbia, and to perform a comparative analysis of the nature of the influence of those determinants on the exposure to liquidity risk in Serbian banks and banks from former socialist countries that have gone through a transition phase and are now members of the EU. The social goal of this research is to contribute to the process of tracking the exposure of Serbian banks to liquidity risk. The general hypothesis of the research starts with the assumption that there are internal and external statistically significant determinants of exposure to liquidity risk, and that differences in the nature of their influence on banks' exposure to liquidity risk depend on the degree of development of the market in which the analysed banks conduct business (Tsanana and Katrakilidis, 2014).

The structure of the paper is as follows. After the introduction, the second section discusses basic conclusions of earlier research concerning the determinants of banks' exposure to liquidity risk. In the third section, we specify the model and define the variables that are used in this research. The fourth section provides a description and analysis of the results from applying the model to a sample of banks that conduct business in the Republic of Serbia. The fifth section is based on a comparative analysis of the results obtained from applying the model to a sample of banks from the Republic of Serbia and banks from Hungary, the Czech Republic and the Slovak Republic. Finally, the last section presents the conclusions reached from the conducted research.

2. LITERATURE REVIEW

This section highlights the most significant factors associated with levels of bank liquidity, briefly delivers the theoretical arguments on their anticipated effects, and summarises some notable empirical contributions to this subject. A considerable amount of research on bank liquidity in countries of Eastern Europe has been undertaken by Pavla Vodová. In a number of successive studies using panel data regression analysis on data sets that cover the period from 2001 to 2010, she examines the levels as well as the determinants of liquidity.

In general, we differentiate between two sets of determinants of potential liquidity: macroeconomic ones such

as monetary policy and economic strength indicators, and individual ones such as a bank's size or its business focus. However, determining the direction and magnitude of their impact on a bank's liquidity is by no means a trivial task. The analysis of the results of research papers dealing with this subject reveals their inconsistency across countries and time periods. Despite apparent similarities between the countries in the region of Eastern Europe, the same factors affected banks' liquid assets in individual countries in rather different ways.

The factors that are assumed to influence a bank's liquidity in a systemic and potent manner are macroeconomic ones, such as the GDP growth rate, the employment rate, the monetary policy interest rate, foreign exchange policy, inflation *etc*. Poor economic growth and climbing unemployment rates negatively influence liquidity levels through an upsurge in the ratio of NPLs, which can further promote the recession by means of triggering a credit crunch. Clearly, there is a specific feedback loop between the two, which creates a belief that the association between them has to be positive. A number of empirical results expectedly indicate that liquidity levels are adversely affected by negative macroeconomic conditions, such as the onset of a financial crisis, an economic downturn, and an increase in unemployment.

On the other hand, liquidity holdings also tend to be lower when alternative investment opportunities become more attractive (Valla *et al.*, 2006). Consequently, the impact of GDP growth on a bank's liquidity is found to be ambiguous in some research papers (Vodová, 2013b). The effects of inflation depend on the country, and are positive or insignificant.

Liquidity shocks are typically systemic shocks that affect many financial institutions simultaneously. The same economic forces that trigger liquidity shocks may also directly affect firms' investment opportunities (Schnabl, 2012). Even though an association between overall economic prosperity and bank liquidity levels always exists, the onset of financial crises is proven to affect its magnitude and thus make an adverse feedback loop particularly prominent. The recent 2008-2009 financial crisis was not different in this respect, and if anything, it illustrated that regulatory capital requirements cannot prevent a liquidity crisis. Its negative impact on liquidity levels is reported in a number of research papers. This domino effect results in reciprocated overreactions that are typical during the crisis episodes, and this research shows that on average, bank liquidity is about 8% less than what is consistent with economic fundamentals during financial crises (Moore, 2010). The aforementioned trait

of financial crises provides good reason for treating it as a separate factor that impacts liquidity above and beyond the basal dynamics of economic growth.

Under extreme circumstances, the traditional concept of "bank liquidity" could be complemented by considerations of the liquidity of monetary and other financial markets (Valla *et al.*, 2006), which calls for intervention with the use of monetary instruments. Some authors hypothesise that monetary policy is even more potent during financial crises because easing of aggressive monetary policy can make the aforesaid feedback loops less likely (Mishkin, 2009). The theories associated with the so-called monetary policy transmission channel such as the "conventional" interest rate mechanism operating through the interest rate sensitivity to spending, the "borrower net worth" mechanism assuming that the financial difficulties of borrowers can amplify the impact of initial interest rate changes, or the "bank lending" channel, can help us explain the relationship between monetary policy and bank liquidity. On this topic, researchers find that tightening monetary policy induces a decrease in liquidity, which concurs with the results reported by Lucchetta (2007) of the significant relationship between the increase in the risk-free interest rate on the one hand and loans, investment and bank risk-taking behaviour on the other. The same logic holds for Hungarian (Vodová, 2013b) but not for Slovakian banks, where the supposed effect of the monetary policy interest rate is found to be insignificant.

The effect of a bank's size seems to moderate this relationship by making large commercial banks more capable of isolating their lending activities from changes in monetary policy conditions (De Santis and Surico, 2013). Owing to this and other reasons previously noted, we regard a bank's size as the most important micro-level characteristic. Another reason is the fact that small banks are more adversely affected by an increased potential for a squeeze if adverse economic conditions materialise (Fecht *et al.*, 2010). In such conditions, large banks can rely on the interbank market, whereas small and medium-sized banks have to hold a buffer of liquid assets (Vodová, 2011). Moreover, the former, by virtue of their size, benefit from factors which reduce the level of their portfolio risk such as diversification and better investment opportunities. It can also be argued that the large size of a bank provides unwarranted incentives for managing liquidity risk as a result of the somewhat sensible perception of the improved odds of government bailout (the well-known "too big to fail" concern). As expected, the size of the bank is consistently reported to have a negative association with the level of liquidity. The results based

on the analysis of a sample of commercial banks from the Czech Republic, Slovakia, Poland and Hungary support the hypothesis of such a negative relationship (Vodová, 2012; Vodová, 2013b). Even though the size effect has a clear negative effect on liquidity, it is repeatedly included in studies, since it has to be controlled for in order to improve the measurement precision of the effects of other variables included in the model.

Many banks are currently under regulatory pressure from Basel III to improve liquidity by investing in more short-term, low-risk securities and to fund assets with more long-term, stable sources of debt. Of course, higher capital adequacy and improved liquidity bring a cost in the form of reduced net interest spread (Handorf, 2014) and a resultant reduced profitability (Molyneux and Thornton, 1992). The research results obtained by a group of authors (Trenca *et al.*, 2012) confirm the existence of a relationship among the banks operating in the countries of Eastern Europe. They examined a sample of 30 commercial banks from Bulgaria, the Czech Republic, Lithuania, Romania, Slovakia, Slovenia and Hungary and report that net interest spread is one of the main determinants of bank liquidity. However, the results of the analysis of Hungarian banks show that bank liquidity is positively correlated with interest rate spread and profitability (Vodová, 2013b), while another analysis on a sample of Slovak commercial banks finds no such statistically significant relationship. This inconclusiveness makes the interest rate spread between lending and deposit interest rates an additional variable of importance for future research.

The results of similar research bring to light some further interesting macroeconomic factors. For instance, it is observed that in extreme regimes (pure floating exchange rate regimes at one end and currency boards and dollarised economies at the other end), bank assets are more liquid than those in intermediate regimes (Bunda and Desquilbet, 2008; Deléchat *et al.*, 2012). In addition, the depreciation of the domestic currency shows a positive correlation with liquidity in Czech commercial banks (Vodová, 2013a).

The ownership structure of the banking sector is another relevant factor when analysing the reaction of bank liquidity during the crisis periods. Some authors have suggested that international banks transmit liquidity shocks across countries and that transmission is strongest for domestically owned banks that borrow internationally, intermediate for foreign-owned banks and weakest for locally funded banks (Schnabl, 2012).

In consideration of the ambiguity that is more than apparent in studies of countries in Eastern Europe, we hope to add to the body of existing knowledge and contribute to the further clarification of this complex subject. With this goal in mind, we have collected a comprehensive dataset related to banks operating in the Republic of Serbia for a comparable period and analysed it by using the panel regression technique.

3. METHODOLOGY AND STATISTICS

In order to identify and assess the impact of the empirical determinants of liquidity risk exposure in the Serbian banking sector, an econometric panel model that combines cross-sectional and time-series data was used. Depending on the properties of the regression coefficients, the following regression models are typically used in panel research:

- Pooled OLS model
- Fixed effects model
- Random effects model

Each of these three models offers different estimates in terms of values and statistical significance. The decision on the model that best describes the observed interdependencies is made based on the test results provided in Table I (Corbae *et al.*, 2010).

Contrasting Models	Model Selection Test
Pooled vs. Fixed effects model	F-Test
Pooled vs. Random effects model	Breusch-Pagan Test
Fixed effects vs. Random effects model	Hausman Test

Table I. Tests for model selection in panel research

The following regression model was used for the identification and assessment of the impact of the empirical determinants of liquidity risk exposure in the Serbian banking sector:

$$L_{ij} = \beta_0 + \beta_1 cap_{ij} + \beta_2 size_{ij} + \beta_3 dummy_j + \beta_4 roae_{ij} +$$
$$\beta_5 gdp_j + \beta_6 inf_j + \beta_7 une_j + \beta_8 repo_j + \beta_9 excr_j + \beta_{10} def_j + \varepsilon \ (1)$$

The dependent model variable consists of ratios that provide an assessment of bank liquidity. Research includes the following ratio numbers:

$$L_1 = Liquid\ assets/Total\ assets \qquad (2)$$

The liquidity ratio L1 refers to first-degree liquidity, which takes into account cash and cash equivalents as well as revocable credits and deposits. It should provide information on 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. Nevertheless, a high value of this ratio may also be associated with inefficiency due to the high opportunity costs of holding liquid assets. That is why banks most often keep liquid assets at the prescribed regulatory level, while they aim to lend the leftovers. The global economic crisis has also led to a lack of funds in the global money and capital markets. Despite an apparent growth of the deposit base in the years following the crisis, an insufficient amount of external nondeposit sources for domestic banks is an aggravating circumstance when it comes to the application of purchased liquidity management. Therefore, the conclusions based on the research results start from the assumption that lower values of liquidity ratio L1 imply greater exposure to liquidity risk.

$$L_2 = Granted\ loans/Total\ assets \qquad (3)$$

The ratio L2 measures the share of loans in total assets and hence provides information on the proportion of the bank's assets tied up in loans. Within the domain of traditional banking, loans are viewed as illiquid assets due to their typically long repayment period. Thus, conclusions based on the research results start from the assumption that the ratio L2 could be considered an inverse indicator of bank liquidity.

$$L_3 = Granted\ loans/Deposits \qquad (4)$$

The liquidity ratio L3 shows the amount of loan placements covered within deposit sources. The balance sheet structure of banks in the Republic of Serbia is such that loan placements dominate total assets, while deposits dominate the source structure. Loans as mainly long-term placements reduce the liquidity potential of banks mainly because the deposit structure is dominated by those with a maturity of less than a year. Taking into consideration the above-mentioned facts, ratio L3 can be considered an inverse indicator of bank liquidity.

In previous research, a large number of factors that determine the exposure to liquidity risk of banks operating in many different countries has been analysed. This paper examines the influence of factors that in earlier research have shown statistically significant influence on liquidity risk exposure. Potential determinants of the liquidity risk exposure of Serbian banks are shown in Table II.

Variable	Definition	Source
cap_{ij}	Capital/total assets (for the i-th bank in the j-th year)	*Bank balance sheets, www.nbs.rs*
$size_{ij}$	Natural logarithm of total balance sheet assets (for the i-th bank in the j-th year)	*Bank balance sheets, www.nbs.rs*
dummy	Dummy variable. During the crisis period (2009 and 2010), the value of the variable is 1, while for other years it is 0.	-
$roae_{ij}$	Net profit/average capital (for the i-th bank in the j-th year)	*Bank balance sheets, www.nbs.rs*
gdp_j	Real growth in GDP (%) in the j-th year	RZS, NBS, NSZ I RFPIO
inf_j	Growth rate of consumer prices (average for the period) in the j-th year	*Public Finance Bulletin*, Volume 111, November 2013
une_j	Unemployment rate according to the labour force survey RZS in the j-th year	RZS, NBS, NSZ I RFPIO
$repo_j$	Reference interest rate –1w repo in the j-th year	Overview of financial stability chart, *www.nbs.rs*
$excr_j$	Exchange rate trends (December 2007=100) in the j-th year	Overview of financial stability chart, *www.nbs.rs*
def_j	Current account balance deficit (as a % of GDP), Ratio of the four-quarter moving totals in the j-th year	Overview of financial stability chart, *www.nbs.rs*

Source: Author's review

Table II. Independent variables of the regression panel model

The analysed sample comprised 27 banks from the Republic of Serbia, whose liquidity was monitored for the period from the end of 2007 to the beginning of 2013. An analysis of the obtained statistically significant estimates of regression coefficients is presented in the following section.

4. ANALYSIS OF THE INFLUENCE OF STATISTICALLY SIGNIFICANT DETERMINANTS OF LIQUIDITY RISK EXPOSURE OF BANKS IN THE REPUBLIC OF SERBIA

The results of the panel regression model are presented in Table III. Variations in the independent variables explain 41% of variations in the share of liquidity reserves in total assets, while the remaining 59% depends on variations in other factors that are not included in this research. Variations in the independent variables explain 27% of variations in the share of loans in total assets as well as 25% of variations in the values of the loan to deposit ratio. The fixed effects regression model is considered the most suitable for the analysis of associations for all three liquidity indicators.

Starting from the fact that liquidity in the banking sector in the Republic of Serbia was at a satisfactory level during the observed period, the analysis of the statistically significant estimates of the regression coefficients leads to several conclusions. From the analysed internal bank characteristics, a statistically significant impact on exposure to liquidity risk was observed for variations in the bank capital to total assets ratio as well as for variations in total asset values. The research results support the assessment that growth in the share of capital in relation to the bank's total assets leads to an increase in the loan to deposit ratio, which increases the exposure to liquidity risk. The fact that well-capitalised banks are better protected from risk exposure enables them to maintain the outlined position without liquidity consequences.

The next internal characteristic that has a statistically significant association with banks' exposure to liquidity risk is variations in total assets. The research results support the supposition that an increase in total assets results in an increase in the ratio of loans to deposits. In the case of larger domestic banks, increased exposure to liquidity risk is compensated for by their financial strength, broad diversification of loans and improved access to external nondeposit funding sources. Large domestic banks are mostly owned by foreign entities which enables them to gain inexpensive cross-border credit lines, and efficient application of purchased liquidity management (Dinger, 2009). Smaller banks are more oriented towards stored liquidity management.

In addition to internal characteristics, liquidity risk exposure is affected by numerous external factors. From the analysed external (macroeconomic) factors, a statistically significant association with liquidity risk exposure is observed for variations in GDP, unemployment rate, balance of payments deficit and currency exchange rate deficit.

Independent variables	Coefficient L_1		Coefficient L_2		Coefficient L_3	
	Regression coefficient	Std. deviation	Regression coefficient	Std. deviation	Regression coefficient	Std. deviation
cap	-	-	-	-	3.048[*]	1.586
size	-	-	-	-	0.241[**]	0.112
gdp	-1.369[***]	0.229	1.486[***]	0.247	3.298[**]	1.187
une	2.463[**]	1.023	-	-	-	-
excr	1.339[***]	0.319	-0.790[*]	0.421	-	-
def	1.118[**]	0.462	-	-	-	-
Model	*Fixed effects (within) regression*		*Fixed effects (within) regression*		*Fixed effects (within) regression*	
R^2	0.41		0.27		0.25	
Total obs.	135		135		135	

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

Table III. Statistically significant determinants of liquidity

Studies show that liquidity has, for the most part, a negative association with the business cycle. GDP is the best indicator of the current business cycle phase of a given economy. The research results support the assessment that GDP growth results in increased lending activity and a decrease in the share of liquid reserves in total assets, which then increases bank exposure to liquidity risk. An increase in lending activity is expected during an expansion, as most business entities want to take loans when there is a higher probability of carrying out lucrative business projects. It is important to highlight the fact that growing economies are less susceptible to systemic risk, which reduces the interest rate for external funding sources. This enables banks to efficiently implement purchased liquidity management.

During the analysed period, a negative GDP growth rate accompanied by an increase in unemployment was observed in the Republic of Serbia. Results from previous studies show that the unemployment rate is negatively correlated with the lending activities of banks (Bernal-Verdugo *et al.*, 2013). This assessment is confirmed in the case of the banking sector of the Republic of Serbia. The growing unemployment has shrunk the pool of potential creditworthy borrowers and caused a drop in their borrowing capacity, thereby forcing banks to reduce lending activities in order to preserve liquidity.

Another macroeconomic variable that determines banking sector exposure to liquidity risk is variation in the balance of payments. The balance of payments was in deficit during the observed period in the Republic of Serbia. The research results support the assessment that an increase in the balance of payments deficit leads to a decrease in a bank's lending activity as well as an increase in the share of liquid reserves in assets. A greater number of imports than exports is an indicator of the poor competitiveness of domestic products and reduced aggregate demand for them, which further contributes to a decline in economic activity and increase in NPLs, which in turn force banks to reduce their lending activity.

Finally, the last factor that determines banking sector exposure to liquidity risk covered in this research is the exchange rate variation. The research results support the assessment that an increase in the exchange rate leads to a drop in the share of loans in total bank assets and an increase in liquidity reserves. Depreciation of the local currency enables local export-oriented companies to decrease their demand for loans and rely more on internal sources of funds. At the same time, it increases the share of NPLs in total loans. About 70% of loans in the Republic of Serbia are indexed in euros, which is why an increase in the exchange rate leads to an increase in loan instalments that debtors pay to banks. The growth in loan instalments, together with growth in the unemployment rate, has resulted in a greater number of NPLs, thus forcing banks to reduce their lending activity.

5. A COMPARATIVE ANALYSIS OF THE INFLUENCE OF STATISTICALLY SIGNIFICANT DETERMINANTS ON LIQUIDITY OF SERBIAN BANKS AND BANKS FROM FORMER SOCIALIST COUNTRIES

The Republic of Serbia is a former socialist country that is striving to transform itself into a modern European country. The transitional period began in 2000 after democratic changes and is still ongoing, with Serbia being on the verge of starting initial negotiations with a view to joining the EU. The financial market in the Republic of Serbia is bank-centred, and it can be said that the banking sector makes an important contribution to the process of transforming the economy into a market economy. Therefore, monitoring, measuring and managing the liquidity risk of the banking sector is extremely important during this transition period. In this section, a comparative analysis of the influence of determinants of the exposure to liquidity risk among banks from the Republic of Serbia and their influence on banks from former socialist countries which have already gone through a transition period is presented. The analysis includes banks from the Slovak Republic, Czech Republic and Hungary. As far as determinants of bank liquidity from the above-mentioned countries are concerned, it is important to emphasise that the results from earlier research have been used (Vodová, 2011; Vodová, 2013b).

For banks that conduct business in the analysed financial markets, the impression is that larger banks are less liquid. For most banks in the Republic of Serbia and the Czech Republic, lower liquidity is the consequence of a larger volume of loan placements in relation to deposits. In the case of larger banks from the Slovak Republic and Hungary, lower liquidity is the consequence of retaining a smaller share of liquid assets in total assets. It can be concluded that financial strength, the possibility of broad diversification of placements and a better approach to external nondeposit sources enable larger banks to retain their position of greater exposure to liquidity risk without consequences.

	Serbia			Hungary	Slovakia			Czech		
	L_1	L_2	L_3	L_1	L_1	L_2	L_3	L_1	L_2	L_3
size			+	-	-					+
cap			+	+	-			+	-	-
gdp	-	+	+	+		-	-		+	
dummy					-	+	+	-		
une	+					+	+			

Table IV. Nature of influence of statistically significant determinants of liquidity risk exposure of analysed banking sectors
Source: Adapted from Vodová (2011, 2013b)

The financial markets of the Czech Republic, Hungary and the Slovak Republic are more developed and flexible than the financial market of the Republic of Serbia. That is chiefly due to the fact that since 2004 they have been members of the EU and have better access to international money and capital markets. Banks that conduct business in developed financial markets principally rely on purchased liquidity management. On the other hand, banks that do business in developing markets, as is the case with banks from the Republic of Serbia, mostly rely on liquidity reserves. Figure 1 shows that banks in the Republic of Serbia hold a larger share of liquid assets in their total assets than banks that conduct business in the financial market of the EU.

However, results show that stored liquidity management has exhibited greater efficiency in the initial impact period of the latest world economic crisis. A lack of financial resources on the global money and capital markets resulted, in the case of the Slovak Republic and Czech Republic, in the fall of their liquidity. On the other hand, in the case of banks from the Republic of Serbia, liquidity remained stable, which implies that orientation toward traditional banking provides stable bank liquidity in the initial impact period of an economic crisis.

The next statistically significant determinant of the exposure to liquidity risk of the analysed banks is the capital to asset ratio. Banks that have larger values for this indicator are less exposed to risks because they finance assets from their own sources. Banks in Serbia that are financed from their own sources have a higher ratio of loans to deposits, while banks in Slovakia have a smaller portion of liquid assets in total assets. Banks in the Republic of Serbia are able to maintain the described position without consequences for liquidity because their level of capital adequacy far exceeds the minimum prescribed by the Basel regulatory framework. On the other hand, values for this coefficient in the case of the banking sector of the Czech Republic and Hungary are lower, which means that banks keep their capital at a level that is closer to the regulatory minimum. According to the research results, in the case of the Czech Republic and Hungary the growth in the value of the capital to asset coefficient is associated with the growth of liquid assets in total assets and can be a consequence of the need for larger liquidity as required by the Basel regulatory framework. Figure 2 shows the values for the capital to asset coefficient of the analysed banking sectors. It can be seen that the Serbian banking sector is much better capitalised than other banking sectors covered by this analysis.
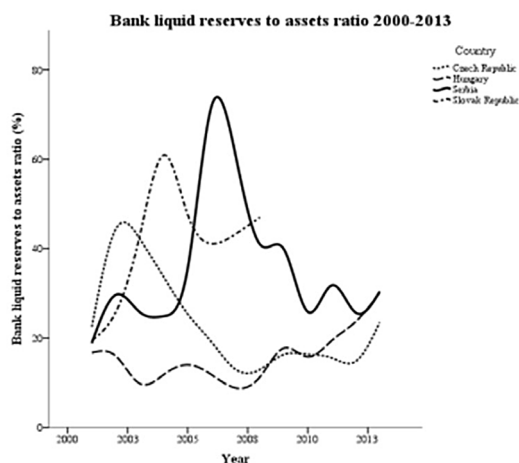

Figure 1. Bank liquid reserves to bank assets ratio (*World Development Indicators, The World Bank*).
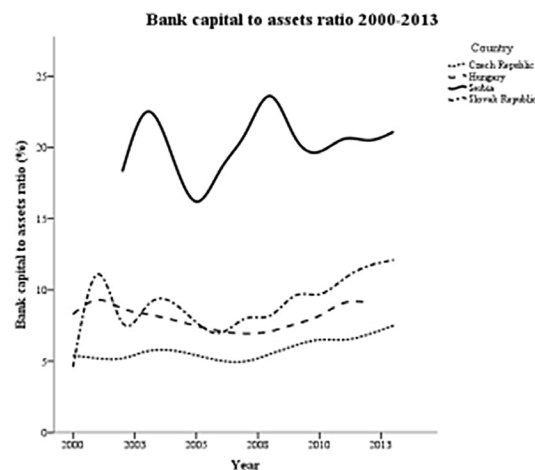

Figure 2. Bank capital to assets ratio (*World Development Indicators, The World Bank*).

Studies have shown that the phase of an economic cycle statistically influences banks' exposure to liquidity risk. Results mostly point to the fact that liquidity is inversely associated with the business cycle phase as confirmed by the cases of banks from the Republic of Serbia and the Czech Republic. GDP growth influences an increase in the lending activity of banks, which therefore reduces their liquidity. In the case of the Czech Republic, this correlation is statistically significant with a three-year lag. That means that companies in the Czech Republic needed three years after the recession to increase their lending capability and start to provide loans. The ability to recover without necessarily increasing debt shows that companies in the Czech Republic are sufficiently developed to overcome a crisis by using their own resources. On the other hand, variations in GDP in the Republic of Serbia influence banks' exposure to liquidity risk without a time delay. This means that the economy is underdeveloped and that internal resources at its disposal are not adequate to overcome the consequences of a crisis. After the impact of the global financial crisis, the economy of the Republic of Serbia entered a recession that has quickly resulted in a growth in unemployment, an increase in the share of nonperforming loans in total loans and a reduction in lending activity. The ratio of nonperforming loans to total loans for the analysed banking sectors is chronologically presented in Figure 3.
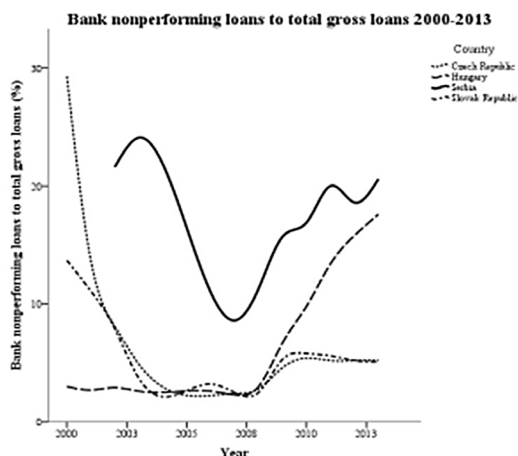

Figure 3. Ratio of bank nonperforming loans to total gross loans (*World Development Indicators, The World Bank*).

Unlike the Republic of Serbia and the Czech Republic, in the case of the Slovak Republic and Hungary the relationship between the liquidity of banks and the business cycle is positive (Moore, 2010). That means that during the expansion phase, companies from these countries re-

duce the level of debt to banks by relying more on growing internal sources. The opposite also applies, which means that during the recession phase the number of approved loans grows thus resulting in a reduction in bank liquidity. In the case of the Slovak Republic this effect is becoming statistically significant after two years, which means that companies during the recession phase have enough resources to do business for two years without increasing their credit debt. Their ability to rely on internal resources after the economy has entered the recession phase offers banks protection from increased exposure to credit risk during the period of transition to the recession phase.

5. CONCLUSION

The research results support the conclusion that domestic banks are faced with decreased lending activity in the post-crisis period, which is for the most part the result of an increase in the number of NPLs and a decline in the number of potential creditworthy clients. The decline in lending activity has resulted in an increase in the share of available liquid assets in total assets and consequently has resulted in high levels of liquidity. In order to avoid the opportunity costs of holding liquid assets above the optimal level, many banks have initiated repayment of cross-border loans. The given scenario is in accordance with the second Vienna initiative, which aims to create sustainable bank business models that rely more on local rather than on external funding sources. Thus, it is important to stress that the deposit base of the banking sector in the Republic of Serbia experienced growth during the observed period, which also contributed to the creation of an efficient banking system relying on the second Vienna initiative model.

The research results suggest that greater banking sector exposure to liquidity risk is triggered by several factors. The first factor refers to the value of total assets. Larger banks are able to achieve a wide diversification of loans and to apply purchased liquidity management more efficiently, thus maintaining higher loan to deposit ratio values. Also, results confirm that banks with a larger capital share in balance sheets are generally more protected from risk exposure. External variables with a statistically significant impact on increased exposure to liquidity risk include growth in GDP, a decline in the unemployment rate, a decrease in the balance of payments deficit and a drop in the exchange rate. An increase in the lending activity of banks and a reduced share of liquid assets in total assets are observed during the expansion phase of a business cycle. This increases exposure to liquidity risk

as well as the possibility of the efficient application of purchased liquidity management as a result of a decline in systematic risk. With regard to the current account balance, the results support the proposition that a decline in the current balance of payments deficit through increased exports and demand for domestic products, contributes to an increase in economic and lending activity, which further increases bank exposure to liquidity risk. The last factor that has an impact on increased exposure to liquidity risk is a decline in the exchange rate. This leads to a reduction in credit instalments that debtors pay to banks due to euro-indexed loans. This results in a decline in the share of NPLs in total loans and an increase in the number of creditworthy clients, which thus enables banks to increase their lending activity, which further increases exposure to liquidity risk.

Assuming that the Republic of Serbia continues to develop its use of the model of former socialist countries that are included in this analysis, several conclusions can be drawn regarding the exposure to liquidity risk of the Serbian banking sector. Economic development and the development of financial markets could, in at least two ways, influence the reduction in the opportunity costs of banks based on maintaining high levels of assets that are not lent. Development of the financial market could increase efficiency in the application of purchased liquidity management. On the other hand, development of the real economy might contribute to a reduction in credit risk, which would then create conditions suitable to increasing lending activity and to reducing the capital adequacy level to close to the regulatory minimum. The results of this comparative analysis indicate that the nature of the influence of the analysed internal macroeconomic variables on banks' exposure to liquidity risk depends on the degree of market development where the banks conduct business; this, therefore, confirms the general hypothesis of the research.

REFERENCES

Bernal-Verdugo, L.E., Furceri, D., & Guillaume D. (2013). Banking crises, labor reforms, and unemployment. *Journal of Comparatives Economics. 41* (4), 1202-1219. DOI: 10.1016/j.jce.2013.03.001.

Bunda, I., & Desquilbet, J.B. (2008). The bank liquidity smile across exchange rate regimes. *International Economic Journal. 22*(3), 361-386. DOI: 10.1080/10168730802287952.

Corbae, D., Durlauf, S.N., & Hansen, B.E. (2010). *Econometric theory and practice-Frontiers of analysis and applied research*. Cambridge: Cambridge University Press.

Deléchat, C., Henao, C., Muthoora, P., & Vtyurina, S. (2012). *The determinants of banks' liquidity buffers in Central America*. International Monetary Fund.

De Santis, R.A., & Surico, P. (2013). Bank lending and monetary transmission in the euro area. *Economic Policy. 28*(75), 423-457. DOI: 10.1111/1468-0327.12013.

Dinger, V. (2009). Do foreign-owned banks affect banking system liquidity risk? *Journal of Comparatives Economics. 37*(4), 647-657. DOI: 10.1016/j.jce.2009.04.003.

Fecht, F., Nyborg, K.G., & Rocholl, J. (2010). The price of liquidity: Bank characteristics and market conditions [Electronic version]. Swiss Finance Institute Research Paper, No. 10-20. Retrieved January 20, 2016, from: SSRN:http://ssrn.com/abstract=1605084. DOI: 10.2139/ssrn.1605084.

Handorf, W.C. (2014). The cost of bank liquidity. *Journal of Banking Regulation. 15*(1), 1–13.

Lucchetta, M. (2007). What do data say about monetary policy, bank liquidity and bank risk taking? *Economic Notes. 36*(2), 189-203. DOI: 10.1111/j.1468-0300.2007.00180.

Mishkin, F. (2009). Is monetary policy effective during financial crises? [Electronic version]. NBER Working Paper No. 14678. Retrieved December 20, 2015, from: http://www.nber.org/papers/w14678.

Molyneux, P., & Thornton, J. (1992). Determinants of European bank profitability: A note. *Journal of Banking & Finance. 16*(6), 1173-1178. DOI: 10.1016/0378-4266(92)90065-8.

Moore, W. (2010). How do financial crises affect commercial bank liquidity? Evidence from Latin America and the Caribbean [Electronic version]. MPRA Paper 2010-21473. Munich: Munich Personal RePEc Archive. Retrieved January 27, 2015, from: https://mpra.ub.uni-muenchen.de/21473/1/Determinants_of_Liquidity_in_Latin_America.pdf. DOI:10.1057/jbr.2012.14.

Račić, Ž. (2014). Uticaj osnovnih makroekonomskih pokazatelja na likvidnost bankarskog sektora Srbije. *Škola biznisa. 2,* 1-10. DOI: 10.5937/skolbiz2-6916.

Račić, Ž., Stanišić, N., & Račić, M. (2014). A comparative analysis of the determinants of interest rate risk using the example of banks from developed and developing financial markets. *Engineering Economics. 25*(4), 395-400. DOI: 10.5755/j01.ee.25.4.3112.

Schnabl, P. (2012). The international transmission of bank liquidity shocks: Evidence from an emerging market. *Journal of Finance. 67*(3), 897-932. DOI: 10.1111/j.1540-6261.2012.01737.x.

Trenca, I., Petria, N., Mutu, S., & Corovei, E. (2012). Evaluating the liquidity determinants in the central and eastern European banking system. *Finance–Challenges of the Future. 12*(14), 85-90.

Tsanana, E., & Katrakilidis, C. (2014). Do Balkan economies catch up with EU? New evidence from panel unit root analysis. *Empirica. 41*(4)*,* 641-662.

Valla, N., Saes-Escorbiac, B., & Tiesset, M. (2006). Bank liquidity and financial stability. *Banque de France Financial Stability Review* (89-104). Paris: Banque de France.

Vodová, P. (2013a). Determinants which affect liquid assets ratio of Czech and Slovak commercial banks. *Financial Assets and Investing. 1*, 25-41. DOI: 10.5817/FAI2013-1-2.

Vodová, P. (2013b). Determinants of commercial bank liquidity in Hungary. *e- Finanse. 9*(3), 64-71.

Vodová, P. (2012). Liquidity of Czech and Slovak commercial banks. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis. 60*(7), 463-476. DOI: 10.11118/actaun201260070463.

Vodová, P. (2011). Liquidity ratios of banks in the Czech Republic. Conference Proceedings from the 8th International Scientific Conference Financial Management of Firms and Financial Companies, 6-7 September. Ostrava. Czech Republic: VŠB-TU.