

## EVALUATING THE LIQUIDITY DETERMINANTS IN THE CENTRAL AND EASTERN EUROPEAN BANKING SYSTEM

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### 1. Introduction

One of the current international financial crisis causes is the poor management of liquidities at the banking level. As the majority of international payments are settled through banking payment systems, the lack of funds has slowed down the payments and the lending, which has caused a reduction in the real economic activity or even the failure of some institutions. Banks' resources have been significantly reduced, leading to a disaster in the market economy where banks are considered to be the cashier of the industry, service, agriculture and construction sectors. In order to maintain an optimum level of liquidity it is necessary to know the factors that affect the liquidity in the banking system.

This study proposes an empirical research of 30 commercial banks from Central and Eastern Europe in the 2001

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– 2011 period. The starting point of the paper are the empirical studies of Vodová (2011) on banks from Czech Republic and Slovakia. In addition to this research we proposed to treat the relationship between liquidity and bank prudential supervision indices and also between liquidity and financial equilibrium indices.

### 2. Determinants of the banking sector liquidity

The analyzed banking is constituted of 30 banks from Bulgaria, Czech Republic, Lithuania, Romania, Slovakia, Slovenia and Hungary.

In order to identify the factors that influence the banks' liquidity level we will use a Panel Regression model, within the dependent variable will take one of the following forms:

–  $Liquidity\ rate_1 = \frac{Liquid\ assets}{Total\ assets}$  provides information about the general liquidity shocks absorption ability of a bank. This variable is interesting because distinguishing between liquid assets and illiquid assets from the balance sheet (such as loans). As a general rule the higher the ratio the greater the capacity to absorb liquidity shocks.

–  $Liquidity\ rate_2 = \frac{Loans\ (net\ value)}{Total\ assets}$  measures the percentage of assets invested in the loan portfolio. Moreover,

this report this report shows the percentage of illiquid loans in the total bank's assets. The higher this ratio the less liquid the bank. The World Council of Credit Union has established that banks with a 70-80% ratio have a sound financial structure.

–  $Liquidity\ rate_3 = \frac{Loans\ (net\ value)}{Total\ deposits}$  is

used to determine the lending practices of financial institutions. This report describes the ability of credit institutions to meet deposits withdrawals. The bigger the rate the more the bank relies on borrowed funds and has a lower liquidity. Loans are considered the most illiquid assets, while deposits are considered the main source of funding.

The liquidity indicators described above are determined from data supplied by Worldscope database for 30 commercial banks that activates in Central and Eastern Europe during 44 consecutive quarters in the period 2001 - 2011.

The category of explanatory variables are is represented by macroeconomic indicators, financial equilibrium indicators and by banking sector specific indices.

From the macroeconomic indicators set we want to test the significance of the following variables in explaining the liquidity level:

- *GDP* – *Gross Domestic Product growth rate* (unit of measure: GDP expressed as volume, 2005=100, estimated effect: +/-);

- *RDI* – loans interest rate (unit of measure: procentual points/year; estimated effect: -);

- *RDM* – the difference between the loans interest rate and the deposits interest rate on deposits (unit of measure: procentual points/year; estimated effect: -);

- *RI* – inflation rate (unit of measure: Consumer Price Index, 2005=100; estimated effect: +);

- *RS* – unemployment rate (unit of measure: number of unemployed persons reported at the total workforce; estimated effect: -);

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- *RTI* – interbank interest rate (unit of measure: procentual points/year; estimated effect: +);

The internal equilibrium indicators used could be defined as follows:

- *DPRIV* – private sector debt expressed as a percentage of GDP (estimated effect: -);

- *DPUB* – public sector debt expressed as a percentage of GDP (estimated effect: -);

- *FCP* – credit flow to the private sector expressed as a percentage of GDP (estimated effect:);

- *SCC* – current account balance expressed as a percentage of GDP (estimated effect: +).

We will also analyze the influence of the following aggregated banking sector specific indicators:

- *CPA* – the ratio of equity to total assets (estimated effect: +);

- *LAT* – the logarithm of total bank assets (estimated effect: +/-);

- *ROE* – return on equity that is determined as the ratio between net profit and equity (estimated effect: +).

These variables were determined based on data provided by Worldscope (the banking sector specific indicators) or by the International Monetary Fund and Eurostat (the macroeconomic and financial balance sheet indicators).

### 3. Methodology

In order to identify the determinants of banks' liquidity level we have used a panel that includes 30 commercial banks from Central and Eastern Europe analyzed for a period of 44 consecutive quarters, respectively Q1 2001 - Q4 2011.

To determine the type of the panel we have applied the F test for identifying the existence of fixed effects and the Breusch-Pagan LM test for identifying the existence of random effects.

The F statistic tests whether all dummy variables are equal to 0 ( $H_0: \mu_1 = \dots = \mu_{n-1} = 0$ ). If the probability obtained

from the test is below 5% the null hypothesis is rejected (there are fixed effects, at least one of the coefficients  $\mu_i$  is different from 0). After applying the test on all regressions no existence of fixed effects was detected.

Breusch-Pagan LM statistical test for random effects examine whether the cross/sectional variance components are zero ( $H_0: \sigma_u^2 = 0$ ). If the probability obtained from the test is below 5% the null hypothesis is rejected (there are random effects). After applying the test on all regressions we found evidence of random effects.

Given these results about fixed and random effects, we chosed the Panel Least Squares method in a panel with random effects.

For each liquidity rate, we have estimated three regressions. The first regression captures the relationship between liquidity (dependent variable) and macroeconomic indicators, the second regression captures the relationship between liquidity and internal balance indicators and the third regression analyzes the influence of bank specific indicators on liquidity, as presented below.

The impact of macroeconomic variables on liquidity:

$$L_{it} = \alpha + \beta_1 * pib_{it} + \beta_2 * rdi_{it} + \beta_3 * rdm_{it} + \beta_4 * ri_{it} + \beta_5 * rs_{it} + \beta_6 * rti_{it} + (\delta_{it} + \varepsilon_{it})$$

The impact of financial equilibrium variables on liquidity:

$$L_{it} = \alpha + \beta_1 * dpriv_{it} + \beta_2 * dpub_{it} + \beta_3 * fcp_{it} + \beta_4 * scc_{it} + (\delta_{it} + \varepsilon_{it})$$

The impact banking sector specific indicators on liquidity:

$$L_{it} = \alpha + \beta_1 * cpa_{it} + \beta_2 * roe_{it} + \beta_3 * lat_{it} + (\delta_{it} + \varepsilon_{it})$$

$L_{it}$  is one of the three liquidity rates calculated for bank  $i$  at the moment  $t$ .  $pib_{it}$ ,  $rdi_{it}$ ,  $rdm_{it}$ ,  $ri_{it}$ ,  $rs_{it}$ ,  $rti_{it}$ ,  $dpriv_{it}$ ,  $dpub_{it}$ ,  $fcp_{it}$ ,  $scc_{it}$ ,  $cpa_{it}$ ,  $roe_{it}$ ,  $lat_{it}$  are the independent variables vectors for

bank  $i$  at moment  $t$ ,  $\alpha$  is a constant,  $\beta$  is the coefficient vector of independent variables,  $\delta_{it}$  represents the random effect for bank  $i$  and  $\varepsilon_{it}$  is the error.

#### 4. Results

Estimating the liquidity calculated as the ratio of liquid assets to total assets as a function of the explanatory variables we obtained that the main determinants of the liquidity level are the loan interest rate, the interest rate spread between lending and deposits interest rates, and the credit flow to the private sector (Table 1).

The determination coefficient shows that 21.14% of the variability of liquidity is explained by independent variables  $I$ . Durbin-Watson statistic is 2.70 which means that the residues are independent and there is no first order autocorrelation.

Between the banks' liquidity level and the lending interest rate there is an inverse relationship as we set in the initial hypothesis. If the loan interest rate increases by 1% then the liquidity ratio decreases with 0.58%. Normally if the lending interest rate increases the banks will be interested in lending more the private sector to take advantage of the increased interest rate of loans. This will lower the current level of liquidity.

**Table no. 1. Determinants of liquidity (Liquidity rate 1)**

Variable	Coefficient	Error
Agregated banking sector indicators		
<i>RDI</i>	-0.0058	0.0028
<i>RDM</i>	0.0066	0.0035
R <sup>2</sup>	0.2114	
Prob (F-statistic)	0.0450	
Durbin-Watson	2.7020	
Financial equilibrium indicators		
<i>FCP</i>	-1010.2	659.9
R <sup>2</sup>	0.2301	
Prob (F-statistic)	0.0398	
Durbin-Watson	2.0801	

Note: In the table are presented only the coefficients significant at a 5% confidence level. Source: authors' calculations

We have found that the difference between the loans interest rate and the deposits interest rate directly influences the bank liquidity level, contrary to the expectations we have originally made. Normally, the loan interest rate is higher than the interest rate on deposits, so that the banking institution remains with a surplus after paying the debts to its creditors and when the loans interest rate is higher the liquidity is low. But in our case, an increase in the interest rate spread increases the bank liquidity.

If the difference between loans interest rate and deposits interest rate increases by 1% then the liquidity rate increases by 0.66%. Thus, if the spread between the two rates increase and the liquidity also increase we could conclude that there are other factors that maintain liquidity at the optimal level (eg. funds borrowed by the bank on the the interbank market).

From the table above it could be seen that a single financial equilibrium indicator influences the bank liquidity level: the credit flow to the private sector. The determination coefficient shows that 23.01% of the variability of liquidity is explained by the independent variable (the credit flow to the private sector). The Durbin-Watson statistic is 2.08 which means that the residues are independent and there is no first order autocorrelation.

The credit flow to private sector influences the liquidity rate as in the originally hypothesis. It's increase determines the liquidity rate to decrease. In general if the loan interest rate decreases the credit flow increases and the supply of loans to private sector will reduce bank's liquidity level. The bank will be interested in achieving a higher profit.

In Table no. 2 are presented the factors that affect the bank liquidity level determined by dividing the net loans to total assets (Liquidity rate 2). A great value of this ratio is translated into a low level of liquidity. Thus the positive sign of

the coefficient indicates a negative impact on liquidity and vice versa.

The macroeconomic indicator that influences the Liquidity rate 2 is the lending interest rate. The determination coefficient shows that 11.79% of the liquidity variability is explained by this interest rate. The Durbin-Watson statistic is 2.32 which means that the residues are independent and there is no first order autocorrelation.

Studying the regression results we could observe that in this case also persist an inverse relationship between the liquidity rate and the lending interest rate, according to the initial hypothesis settings. If the lending interest rate increases by 1% then the Liquidity rate 2 drops with 1.51%. Normally, the instability and the lending interest rate increase will deteriorate the business environment, affecting especially the reimbursement capacity of those clients that borrow from the bank. It may worsen their ability to repay the loans which may lead to a decline in the liquidity level of the banking institution.

Private debt and current account balance are financial equilibrium indicators that affect the Liquidity rate 2. The determination coefficient shows that 12.80% of the variability of liquidity is explained by these independent variables. The Durbin-Watson statistic is 2.77 which means that the residues are independent and there is no first order autocorrelation. Private debt influences the liquidity level in an opposite direction that originally has been made. If private debt increases by 1% then the rate of liquidity will decrease by 0.57%.

The private sector debt represents money borrowed from individuals, companies and non-governmental organizations in a country. Normally an increase in private debt is translated into an increase in loans granted to individuals, firms, non-governmental organizations. Thus an increase in loans

determine a decrease in the liquidity level. The surplus and respectively the deficit directly affect the liquidity. If the current account balance increases by 1% then the Liquidity rate 2 will increase with 2.77%.

The aggregated indicator specific to the banking system that influence the Liquidity rate 2 is the capital to total assets ratio. The determination coefficient shows that 10.78% of the liquidity variability is explained by this ratio. The Durbin-Watson statistic is 2.83 which means that the residues are independent and that there is no first order autocorrelation.

**Table no. 2. Determinants of liquidity (Liquidity rate 2)**

Variable	Coefficient	Error
Macroeconomic indicators		
<i>RDI</i>	0.0151	0.0091
R <sup>2</sup>	0.1179	
Prob (F-statistic)	0.0729	
Durbin-Watson	2.3287	
Financial equilibrium indicators		
<i>DPRIV</i>	0.0057	0.0025
<i>SCC</i>	-0.0044	0.0020
R <sup>2</sup>	0.1280	
Prob (F-statistic)	0.0167	
Durbin-Watson	2.7780	
Aggregated banking sector indicators		
<i>CPA</i>	0.0113	0.0039
R <sup>2</sup>	0.1078	
Prob (F-statistic)	0.0137	
Durbin-Watson	2.8375	

Note: In the table are presented only the coefficients significant at a 5% confidence level.

Source: authors' calculations

The ratio between equity and total assets negatively influence the bank liquidity, contrary to the hypothesis originally stated. If this ratio increase with 1% then the banks' liquidity ratio will decrease by 1.13%. Normally a bank's equity growth increases the possibilities of that institution to meet the payment obligations that become due. But it seems that banks with low capital adequacy pay more attention to liquidity risk management and maintain a sufficient level of liquid assets. Vodová (2011) has reached the same result.

Table no. 3 presents the factors affecting the bank liquidity. In this case the liquidity is determined as the ratio of net loans to total deposits (Liquidity ratio 3). A great value of this ratio is translated into a low liquidity level. So, the positive sign of the coefficient shows a negative impact on liquidity and vice versa.

**Table no. 3. Determinants of liquidity (Liquidity rate 3)**

Variable	Coefficient	Error
Macroeconomic indicators		
<i>RDM</i>	-0.1847	0.0886
R <sup>2</sup>	0.1062	
Prob (F-statistic)	0.0974	
Durbin-Watson	2.0311	

Note: In the table are presented only the coefficients significant at a 5% confidence level.

Source: authors' calculations

From the above analysis it can be seen that that only factor that affects the Liquidity rate 3 is the spread between the lending interest rate and the deposits interest rate. The determination coefficient shows that 10.63% of the liquidity variability is explained by this variable. The Durbin-Watson statistic is 2.03 which means that the residues are independent and there is no first order autocorrelation.

We could see that the spread between lending interest rate and the

deposit interest rate influence the bank liquidity level contrary to or expectations. In this case, an increase in the spread will increase the bank liquidity. If the spread increases by 1% then the Liquidity rate 3 increases by 18.47%. Thus, if banks face a decrease in the interest rates spread even though they also face a decrease in the liquidity rate there are other factors that maintain liquidity at optimum level.

### 5. Conclusions

The purpose of this paper is to determine the factors that influence the

liquidity level in the Central and Eastern European banking system. Using a panel of 30 commercial banks from this zone, we have found several factors that determine the liquidity. Among them are the lending interest rate, the spread between the lending interest rate and deposits interest rate, the credit flow to the private sector, the ratio between equity and total assets, and also the private debt and the current account balance.

### REFERENCES

Adolphus Toby (2006)	<i>Empirical study of the liquidity management practices of nigerian banks</i> ", Journal of Financial Management and Analysis, pag.57-70;
Aušrinė Lakštutienė, Rytis Krušinskas (2010),	<i>Lithuanian banks liquidity creation in 2004-2008, Economics and Management</i> ;
Florin Georgescu (2012)	<i>Guvernnanță economică la nivel european</i> ", BNR, București
Guaraji M. (2004)	<i>Basic Econometrics- fourth edition</i>
Moore Winston (2009)	<i>How do financial crises affect commercial bank liquidity? Evidence from Latin America and the Caribbean</i> , MPRA Paper No. 21473;
Muhammad Farhan Akhtar, Khizer Ali, Shama Sadaqat (2011)	<i>Liquidity risk management: a comparative study between conventional and Islamic banks of Pakistan</i> ;
Oriol Aspachs, Erlend Nier, Muriel Tieset (February 2005),	<i>"Liquidity, banking regulation and the macroeconomics; Evidence on bank liquidity holdings from a panel of UK-resident banks"</i> ;
Pavla Vodová (2011)	<i>Determinants of Commercial Bank's Liquidity in Slovakia</i>
Pavla Vodová (2011)	<i>Liquidity of Czech Commercial Banks and its Determinants</i>
S.O.Uremadu (2009)	<i>Determinants of financial system liquidity (1980-2005): Evidence from Nigeria</i> , Economic and Administrative Series, Nr. 3 pag.123-137;
Samuel O. Fadare, (2011)	<i>Banking Sector Liquidity and Financial Crisis in Nigeria</i>