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Determinants of the Slovak bank liquidity flows

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Abstract

Jana Laštůvková: **Determinants of the Slovak bank liquidity flows.**

This paper discusses the possible determinants of liquidity flows in the Slovak banking sector. By these flows it is meant the outflow, the net changes and the total value of the liquidity. The flows are obtained according to a specific method of measuring liquidity risk – method of gross liquidity flows. Determinants are evaluated for size groups of the Slovak banking sector conducting panel regressions. Among the factors, there are involved macroeconomic factors, as well as, factors on the level of the market and individual banks, to cover all levels of determinants influencing bank liquidity. The regressions performed have shown that the factors may not only affect liquidity creation, often investigated by other authors, but also its outflow and net changes. From the results, it is also obvious, that banks reflect external environment, as well as, internal characteristics. It seems that Slovak banks create liquidity reserves during favourable economic development and are forced to use them in the time of crisis. On the other hand, for the final value of liquidity, which is a cumulative result of individual flows for more periods, it is more important for banks to reflect the internal factors to adjust the liquidity value.

Key words

Slovak banking sector, measurement of the bank liquidity, liquidity flows, liquidity determinants

JEL: G21, G28

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Introduction

The emphasis on liquidity risk has increased recently. A significant reason for this was the last global crisis, where a number of banking systems faced liquidity problems. Liquidity risk is dealt with by both the individual regulators; e.g. in the latest Basel III, there have already been included two indicators focusing on liquidity risk, which will have to be implemented as mandatory by European countries (BIS, 2010). Attention to liquidity risk has also increased among the authors themselves. The number of studies dealing with this risk has been increasing rapidly. The authors, using different methods for measuring liquidity risk, evaluate various sectors and try to estimate the impact of diverse factors in order to reduce or prevent their negative impact on banks. The issue presented in this article is very topical, in addition, by using a new perspective on liquidity in the role of the dependent variable.

The aim of this paper is to assess potential determinants of liquidity flows in the Slovak banking sector by using regression models. The first potential flows are liquid flows from the position of their outflows, the second are net changes and finally, their overall values.

1 Creation and outflow of liquidity

The studies of the authors dealing with the determinants of liquidity have recently gained importance and frequency. In constructing the regression models, the authors nearly always operate on the side of the dependent variable with the values of liquidity gain by methods according to Berger and Bouwman (2009). They are looking for possible determinants influencing the creation of bank liquidity. The method of Berger and Bouwman (2009) is based on the distribution of all balance sheet and off-balance sheet items according to their liquidity into three groups – liquid, illiquid and semi-liquid. This division of items is made from two perspectives – according to the category of the item (cat measurement) and, secondly, according to its maturity (mat measurement). Subsequently, these three groups are assigned weights and four possible measurements of the creation of liquidity are obtained – a combination of category/maturity measurement, as well as, with/without off-balance sheet items. The authors applied their measurements to the American sector and investigated the effect of the crisis on the creation of liquidity.

As mentioned above, the authors widely used values obtained from the method according to Berger and Bouwman (2009) as the dependent variable. This is e.g. the study of Horvath, Seidler and Weill (2013), dealing with the effect of competition on this liquidity creation, the study of Pana, Park, Query (2010), who have worked with a particular influence, and thus the influence of mergers on

liquidity value. Another group of authors added to the method according to Berger and Bouwman (2009) another measurement of liquidity creation according to Deep and Schaefer (2004) – the so-called LTG gap, which is calculated as a difference between liquid liabilities and assets to the total value of the assets. Studies which use both of these methods are e.g. Lakštutiene and Krušinskas (2010) – exploring the Lithuanian banking sector, and Hackethal, Rauch, Steffen and Tyrell (2010), dealing with the German savings banks.

Regarding the studies dealing with the determinants of liquidity outflow, the only known study is by Valla, Saes-Escorbiac, and Tiesset (2006), who, however, did not construct regression models to seek determinants as such, but dealt with the evaluation of liquidity flows and compared these flows with the economic cycle to assess financial stability. The method of these authors is used in this article. The method according to Valla, Saes-Escorbiac and Tiesset (2006) starts with the values of the liquid assets for the period, which are adapted into particular flows – positive, i.e. the value of liquidity creation, negative – the outflow of liquidity from the system, and the net flow – defined as a difference between positive and negative flow. Net flow is the final flow (state) of the liquidity at a given time.

Furthermore, the authors construct the value of the total reallocation. In other words, it is the total activity in the system, as net changes do not always reflect the overall creation and outflow at a given time. Compared to the method of Berger and Bouwman (2009), there is a range of differences. As an advantage of the method of Valla, Saes-Escorbiac and Tiesset (2006) it could be mentioned that there is the possibility of constructing more flows, besides the creation: the flow in the form of an outflow of liquidity, net changes and the overall reallocation. These allow the author to capture different views on liquidity, as well as, to evaluate the influence of factors from these dissimilar perspectives. The main disadvantage of this method compared to the method of Berger and Bouwman (2009) is that it uses only the active side of the balance sheet. As the value of liquid items from off-balance sheet may also exhibit liquidity risk and have recently gained importance, their inclusion is appropriate.

For the author of this article it is, however, essential to evaluate possible determinants for various forms of liquidity. It is not always only the relationship between the creation of liquidity and some factor, but this factor may have a demonstrable impact on the outflow of liquidity or overall reallocation as well. Additionally, when evaluating the impact of one factor on the liquidity creation with a resulting increase in liquidity, it could lead to the misconception that this influence leads to the creation of liquidity. However, the same factor may affect the outflow of liquidity in a larger amount, and finally the liquidity from the system can be flowed off. It is important that Valla, Saes-

Escorbiac and Tiesset (2006) note that liquidity flows – both creating and outflow – can occur simultaneously, i.e. in one moment in time liquidity is both created and also flowed off, reflecting higher reallocation in the system. In addition, the value of liquid assets, with which the author works, is specifically intended to cover the liquidity risk. For this reason the author does not consider the exclusion of the other balance and off-balance sheet items as restriction, as such. From this and the above-mentioned reasons, the author prefers to use the method according to Valla, Saes-Escorbiac and Tiesset (2006), which has not been used in the Slovak sector, nor is it known that it was included in the regression models as a dependent variable, so it will be a new view on the liquidity in the Slovak sector as well as new in general.

In regression models, with which the authors are working, besides flows (creation of liquidity) as a dependent variable, liquidity ratios are extensively used, i.e., a static view on the liquidity. This is e.g. the study of Bunda and Desquilbet (2008), Cucinelli (2013), Bonfim and Kim (2012) and Vodová (2011a, 2011b, 2012, 2013), who also evaluate the Slovak banking sector.

2 Main determinants of liqudity

Most authors involve determinants from several levels in the regression model. First, they are the macroeconomic variables – particularly GDP, unemployment and inflation; Hackethal, Rauch, Steffen and Tyrell (2010), Bunda and Desquilbet (2008), Vodová (2011a, 2011b, 2012, 2013), Lakštutiene and Krušinskas (2010). Most authors demonstrate a negative relationship for GDP and unemployment and a positive one for inflation, but some studies vary (negative impact for inflation – Vodová (2011), positive relationship for GDP – Lakštutiene and Krušinskas (2010), Vodová (2012), or that the relationship has not been significant (Vodová 2011b)). Recently the effect of the crisis on liquidity has also been evaluated and considered, and the authors declare an identically negative relationship; Bunda, Desquilbet (2008), Moore (2010), Eroglu, Eroglu (2011).

Another group is variables at the level of the banking market. Here individual interest rates (on lending, deposits, interbank rate, etc.) with a positive impact are involved – Vodová (2011a, 2011b, 2012, 2013), Hackethal, Rauch, Steffen and Tyrell (2010), Bunda and Desquilbet (2008). This category can also include the impact of legislative changes, especially regarding the banking regulatory rules (Bunda, Desquilbet, (2008)). A lot of authors do not explicitly cover these factors by particular variables; however, when interpreting their results often take these aspects into account. Such changes may relate to both changes in products and changes in regulatory tightening made by central banks or European regulators – the use of IAS / IFRS and the implementation of Basel.

Another factor affecting the banking sectors and their liquidity in this area is the entry into the euro area.

Last, micro-level covers the individual characteristics of the banks; Vodová (2011a, 2011b, 2012, 2013), Hackethal, Rauch, Steffen and Tyrell (2010), Lakštutiene and Krušinskas (2010), Bonfim and Kim (2012), Bunda and Desquilbet (2008), and Cucinelli (2013). There are various items; among them e.g. pre-tax profit, the value of lending or deposit, and the value of equity may be mentioned. A common variable in this category is the size of banks, often measured as the value of total assets – Vodová (2011a, 2011b, 2012, 2013), Bunda and Desquilbet (2008), or as the number of bank clients – Hackethal, Rauch, Steffen and Tyrell (2010). Here a negative relationship is presumed. Liquid assets bring almost no yield, and particularly large banks are less willing to hold these liquid assets in their portfolios, but rather they prefer to obtain it from the interbank market in times of need.

Some authors in their studies focus on specific factors that could affect liquidity; see Horvath, Seidler and Weill (2013), Pana, Park and Query (2010), or Fielding and Shortland (2005) seeking the impact of political events.

3 Methodology and the description of the model

Panel regression analysis is carried out to obtain the determinants of bank liquidity flows. The basic model is as follows:

$$Liquidity = \alpha + \beta_1 Macro + \beta_2 Bank\_sector + \beta_3 Micro + \varepsilon$$

Individual flows calculated for size class (small, medium and large banks and building societies) stay on the side of the dependent variable. The sample is the banking sector of the Slovak Republic, excluding branches of foreign banks. The development is evaluated during 2001–2012. It is calculated as negative flow – "neg" (outflow of liquidity) and net flow – "net" (final flow), based on the methodology of Valla, Saes-Escorbiac and Tiesset (2006). For the construction of these flows, the following process in the adjustment of the value of liquid assets is observed:

1. Determining the annual changes in liquid assets

$$\Delta I_{it} = I_{it} + I_{it-1} \quad (1)$$

where I_{it} is the value of the bank's liquidity i at time t, I_{it-1} is the value of the bank's liquidity i at time t-1.

2. Determining the adjusted growth rate g_{it}

$$g_{it} = \frac{\Delta I_{it}}{(I_{it-1} + I_{it})/2} \tag{2}$$

3. Determining nominal liquidity flows

By aggregating the values obtained from Equation 2, either positive (where git ≥ 0) or negative (where 0 ≤ git) nominal flows are gained.

$$POS_t^{nom} = \sum_{i|g_{it\geq 0}}^{N} g_{it}\left(\frac{(I_{it-1} + I_{it})/2}{\sum_{i=1}^{N} I_{it-1}}\right) \qquad NEG_t^{nom} = \sum_{i|g_{it\leq 0}}^{N} |g_{it}|\left(\frac{(I_{it-1} + I_{it})/2}{\sum_{i=1}^{N} I_{it-1}}\right) \tag{3}$$

4. Calculation of net changes for nominal flows

$$NET_t^{nom} = POS_t^{nom} - NEG_t^{nom} \tag{4}$$

Furthermore, as a dependent variable will be used the absolute value of liquid assets for the year – "*LA_abs*" which also reflects the final result as in the case of net changes, just from a different perspective. In the case of "*net*" flow, it is a result for a certain period, while the overall level of liquidity covers the development of liquidity for more seasons (cumulative sum) because even if there is a considerable outflow of liquidity in one period, the overall liquidity may still remain high. In other words it is a stock of liquidity accumulated over a longer period.

Several groups are used as explanatory variables, which are, respectively, several levels of variables. The first group is a group of macroeconomic variables, the second is a group of variables at the level of the banking sector and the last is a group of variables related to individual characteristics of banks. The group of macroeconomic variables involves GVA (defined as output value at basic prices less intermediate consumption valued at purchasers' prices) and inflation (the percentage change in the average price level). At the level of the banking sector short-term (money market rate) and long-term (yield on government bonds with a maturity of ten years) interest rates are used. The value of total assets and the value of pre-tax profit and equity act in the last micro-level. All necessary data are annual data – expressed in absolute or relative value obtained from Eurostat or Bankscope databases. Calculations are performed in Stata software.

As regards foreseen marks for GVA ("gva"), it is possible to expect for negative flow + and -. In the case of higher GVA, liquidity can flow off the system (higher negative flow – positive relationship). In this case the bank will want to take advantage of better economic conditions and higher profitability,

and they will invest liquidity. In times of economic growth the value of the loans is higher, which leads to higher outflow of liquidity. Conversely, it is also possible that banks prefer to keep the liquidity reserve, and liquidity outflow is reduced when there is economic growth, and at a time of economic downturn there may be higher outflow of liquidity because, as is known from studies of authors, the crisis leads to lower liquidity. There would be a negative relationship.

In the case of inflation (“infl”) for negative flow a negative relationship is expected, i.e. the higher inflation is, the less outflow of liquidity, because higher inflation value is reflected in the inner value of liquid assets. A negative relationship is also expected for interest rates (“Interest_s”, “Interest_l”), since higher rates are more expensive to borrow liquidity and vice versa.

For the value of total assets (“CA”), which represents the size of banks, a positive relationship can be expected. Smaller banks hold more liquidity because they have to rely on themselves and therefore, would have to reduce their outflow, so there should be a positive relationship, while for larger banks it is unfavourable to hold liquidity as they prefer to gain it from the interbank market.

In the case of pre-tax profit (“profit”), the general mark is based on an investment triangle, where liquidity is a counterweight to profitability. In the event of liquidity outflow, a positive relationship can be expected. For the last variable, equity (“equity”), a lot of studies show a negative relationship, but especially for creating liquidity. In the case of its outflow, a positive relationship is expected.

Which flow at any given time outweighs is essential for the net change because both creating and outflow of liquidity can take place simultaneously. In the case of identical marks as for "neg," a positive flow is assumed to prevail at the time. On the contrary, in the case of opposite sign, the superiority of the outflow of liquidity at that moment is expected. And finally, for the final values of the liquidity, regarding the marks, it can be worked here as if it was creation of liquidity.

4 Results

The following table (Table 1) presents the results for the variable NEG, a negative flow representing the outflow of liquidity from the system. From the statistically significant variables, it is obvious that all three levels prevail. Banks reflect the external environment, and the liquidity is affected by internal factors and characteristics as well.

Table 1: Results for neg flow (NEG)

NEG	
variable	**coefficient**
const	0.5066995*** (0.109)
gva	0.4641939*** (-5.39)
CA_relat	0.0782286*** (0.026)
Interest_l	-5.035908** (2.181)
Number of observation: 44 R = 0.4889	

Note: *, ** and *** denote significance at the 10, 5 and 1% level

The signs of statistically significant variables are consistent with their expected value. For GVA, where there were two possible relations, the positive one prevailed. Thus, the higher the value of GVA, the higher outflow of liquidity was. At a time of economic growth frequent investments and higher value of lending prevailed, as banks wanted to exploit the most from a favourable environment. Conversely, during adverse conditions the bank rather held the liquidity, and lending decreased as well. Here it could be mistakenly stated that in the event of a decline in GVA and decrease outflow of liquidity, the net flow should be positive. But the second flow can still play a key role – the flow of liquidity creation, see Table 2 and GVA sign for net flow; this really happened. A positive relationship is again documented for the net flow. This, in turn, reflects the fact that in the case of decreasing GVA the net value will also decrease (resulting in negative net flow), which is consistent with the theories of proving a negative relationship between liquidity and crises – Bunda and Desquilbet (2008), Moore (2010), and Eroglu and Eroglu (2011).

Table 2: Results for net flow (NET)

NET	
variable	**coefficient**
const	-0.4220614** (0.171)
gva	2.622068*** (0.731)
CA_relat	-0.1015771** (0.041)
Interest_l	5.996429* (3.435)
Number of observation: 44 R = 0.3250	

Note: *, ** and *** denote significance at the 10, 5 and 1% level

The relations for negative and net flow that have been presented would suggest that the positive flow also responded positively, therefore, during the economic downturn there was a fall in liquidity creation – and it was larger than the decline of outflows, which resulted in negative net flow (a positive relationship).

In the case of other variables, an inverse relationship between NEG, NET and variables is apparent, and here it is consistent with the development of negative flow, liquidity creation did not affect the final result; liquidity could both create (less than liquidity outflows), as well as, decrease.

The last table (Table 3) represents the dependent variable of the total value of the liquidity, which is the result of creation and the outflow, and also reflects the evolution of the values in previous years.

Table 3: Results for final value of the liquidity (LA_abs)

LA_abs	
variable	**coefficient**
const	315.5803 (0.851)
equity_abs	-4.394374*** (0.851)
CA_abs	0.4773575*** (0.088)
profit_abs	5.889951** (2.380)
Interest_s	30837.9** (11085.4)
Number of observation: 48 R = 0.7884	

Note: *, ** and *** denote significance at the 10, 5 and 1% level

In the case of this dependent variable, there were significant internal factors rather than external factors. The reason for this could be caused by the strategy of liquidity risk management by banks. Banks can maintain a constant level of liquidity or a level that at that moment they consider adequate, taking into account the development of the other bank items. In this endeavour, also poses some factors both internal and external, which affect the creation and outflow of liquidity and thus the final value of liquidity. This, however, can still be inconvenient for banks, e.g. unnecessarily high or low, and by its management and adapting internal factors that are under greater control than external factors, it may affect it. They are key items of the bank statements; the value of total assets was statistically significant, which represent the size of the bank, with a positive effect. Even though many authors documented a negative relationship between the amount of liquidity to total assets, working mainly with the idea of "too big to fail," which emphasizes the big banks, which rely on help from regulators and liquidity is not held; Vodová (2011a, 2011b, 2012, 2013), Bunda and Desquilbet

(2008). But Slovak banks are small; globally their biggest banks are around 1000th place. Therefore, they prefer to maintain a certain ratio of liquid assets to total assets, as no help from the regulator would have to come.

Regarding the equity value, the relationship of a series of studies about the negative relation between these variables is confirmed; see the studies by Distinguin, Roulet and Taraz (2013), Lei and Song (2013), Fungáčová, Weill and Zhou (2010), based on the theory of so-called crowding out of deposit or the theory of financial fragility structure by Diamond and Rajan (2001) or Gorton and Winton (2000).

The short-term interest rate is also important. Its current level and development may be more convenient to banks that want to instantly adjust the value of their liquid assets, as opposed to long-term rate, which rather represents a long-term trend and a possible risk in the system. The value of pre-tax profit as the sole thing does not match the predetermined mark, but if it is taken into account, the liquidity risk management by banks, then a positive relationship also makes sense. In addition, it is not a profit, respectively revenue from a certain transaction, which could really be less liquid, but the total profit of the bank reached from the whole activity. If the bank is doing well and its profit increases, it has no problem having a higher level of liquid assets in order to increase its stability. Conversely banks that often show losses also have liquidity problems. Hackethal, Rauch, Steffen and Tyrell (2010) also achieved a positive relationship in their study.

Conclusions

The aim of this paper was to identify possible factors affecting the liquidity outflow, respectively its net changes and the final value. The regressions performed have shown that the factors may not only affect liquidity creation, often investigated by other authors, but also its outflow and net changes. An important consideration is the simultaneous existence of both flows – both creation and outflow of liquidity. The possible correlation between some factors and one of the flows does not always lead to the same sign of the net change – see the relationship with flows and GVA – but the role and volume of the second flow is also important.

It is evident from the regressions that the liquidity of all size groups has been affected by a variety of factors, both inner and outer. There was, on one hand, GVA value, which represents the overall economic situation in the economy – implicitly associated with developments in unemployment or inflation, too. Where in the case of Slovak banks it may be noted that in the economically favourable environment both flows are relatively high, and banks form liquid reserves while investing a lot,

whereas in the economically poorer conditions both flows are low with the liquidity outflows prevailing, where banks have to use reserves not to get into liquidity problems. There was also the interest rate, which also represents the economic situation and is associated with lending and deposit activities, which are the basic activities of all banks. The last variable, the value of total assets, is closely connected with the management of liquidity risk. For the final value of liquidity, internal factors prevailed, as they are more under the control of the banks and they can better correct the value of liquidity.

The present study is the first subsection of a solved problem. The intention of the author is carried on with this issue, e.g. by the incorporation of other countries because the significance of external factors, which are the same for all units, may not be so apparent. It is also possible to incorporate multiple internal factors or to use calculated positive flows as the dependent variable for comparison with other studies and overall reallocation. In addition, data can be applied to individual banks, where different variables could occur.

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