Tamás Balás–Csaba Móré: How resilient are Hungarian banks to liquidity shocks?

For central banks, monitoring banks' liquidity risk is of great importance from a financial stability perspective. One essential gauge for assessing liquidity risk exposure is whether banks have sufficient liquidity buffers to survive a potential unexpected funding crisis. In this article, we aim to assess the resilience of Hungarian banks to liquidity shocks by using a liquidity stress test. The test is based on a hypothetical stress scenario involving a bank-specific liquidity shock, triggered by a confidence crisis, for example. The shock absorbing capacity of a bank is measured by the maximum degree of liquidity shock the bank can withstand over the short run on the strength of its liquid assets. On the basis of the results of the stress test it is believed that the current liquidity risks essentially do not pose a threat to financial stability. As for large banks, with the overwhelming part of customer deposits, the current liquidity buffers would typically enable the maintenance of liquidity even under extreme circumstances. It should be noted, however, that Hungarian banks are increasingly exposed to fluctuations in global liquidity and that intra-group financing relations may represent a contagion channel. Therefore, in the future, the study of these risk scenarios may be important in further developing stress testing practices for both the central bank and commercial banks.

INTRODUCTION

With regard to the rapid credit growth in the Hungarian banking sector during recent years, changes in banks' liquidity risk exposure have so far received little attention.[1] Recently, however, some international organisations (IMF, World Bank) have drawn attention to the fact that the dynamic increase in bank credit, in addition to exacerbating other risk exposures, may also increase liquidity risks.[2] The concerns related to the liquidity position of banks are primarily due to the fact that the role of more volatile, foreign market financing has substantially increased, at the expense of stable deposit funds in the financing of the dynamically growing long-term loans. This shift in the structure of funding sources may increase rollover risks, i.e. banks' funding becomes increasingly sensitive to deterioration in risk perception, at both a bank (or banking group) level and at the country level, as well as to unfavourable changes in global liquidity conditions.

Another important aspect of the change in the funding structure is the growing role of parent bank financing, which is illustrated by the fact that, for some large banks, the ratio of parent bank funds to liabilities amounts to 20 to 30 percent.[3] While intra-group funding is seen as beneficial for increasing the efficiency of liquidity management and for containing funding costs, it also increases the potential risk of contagion within the group (ECB, 2006). In other words, a spillover of problems incidentally arising within the group may result in financing difficulties for those Hungarian banks which substantially rely on parent company resources. That explains the importance of examining the level of liquidity stress banks can cope with on the basis of their own resources, without resorting to parent bank support.

In assessing the liquidity risk of Hungarian banks, the central bank has so far primarily relied on balance-sheet-based indicators. As far as the changes in banks' liquidity risk exposures are concerned, recent analyses of balance-sheet-based indicators have resulted in a mixed picture. While the increasing role of foreign market funds has the potential to raise funding volatility, the substantial increase in the share of long-term foreign liabilities has reduced rollover risks (MNB, 2007). However, traditional balance-sheet-based indicators are, in themselves, insufficient for a comprehensive assessment of risk exposure, as they leave out of consideration contingency liquidity risk, which is an important aspect of liquidity risk. Contingency liquidity risk can be defined as the risk that the bank does not have sufficient funds to fulfil its obligations due to a sudden and substantial increase in its net funding requirements (Matz and Neu, 2007). Contingency liquidity risk may be due, for example, to a sudden, large withdrawal of deposits, an outflow of interbank funds or unexpectedly large drawdown

[1] For the purposes of this article, *funding liquidity risk* is the risk that the bank is either unable to fulfil its (short-term) payment obligations as they fall due or can only fulfil them at the cost of a substantial profit loss. This is different from market liquidity risks, i.e. the risk that the bank is unable to dispose of its marketable assets without incurring substantial losses, due to market disturbances.

[2] See reports by the IMF (2007) and the World Bank (2007).

[3] Funds from other members of the respective banking group are also included in parent bank funding, in addition to those directly obtained from the parent bank.

of open credit lines. In order to measure this risk, a liquidity stress test is employed on the basis of a hypothetical scenario, according to which the loss of confidence in a particular institution precipitates a substantial increase in net funding requirements for the bank. The main objective of the stress test is to assess the adequacy of Hungarian banks' liquidity buffers to withstand a potential funding crisis.

A SHORT OVERVIEW OF THE LIQUIDITY STRESS TESTS OF THE BANKING SYSTEM

In comparison with credit and market risk tests, liquidity stress tests of the banking system are considerably less widespread in the practice of central banks and the international financial institutions (e.g. the IMF) (Cihák, 2007). This absence is partly due to the lack of established and generally accepted concepts and modelling methods for assessing the exposure to liquidity risks. In addition to the above, the fact that the available regulatory reports are considerably less detailed than banks' internal risk reports, presents another problem for the authorities.[4] As far as the definitions of liquidity risk are concerned, liquidity stress tests tend to focus on the ability to fulfil payment obligations rather than the impact on profitability.[5] The liquidity stress tests of the banking system typically employ hypothetical scenarios to assess banks' resilience to liquidity shocks. Based on balance sheet data, the simpler methods examine the potential change in the liquid asset ratio of a bank in the wake of a presumed liquidity shock (e.g. a substantial deposit withdrawal).[6]

More complex liquidity stress tests, however, require the availability of data on the cash-flow-based maturity gap. In maturity tables, cash flows from assets, liabilities, off-balance sheet items, income and expenses are classified into maturity bands on the basis of contractual maturity. The maturity gap is the difference between cash inflows and cash outflows pertaining to the specific maturity bands. The typical hypothesis in maturity gap-based stress tests is that a substantial volume of customer deposits and/or interbank funds are withdrawn or that the markets of liquefiable securities become illiquid over a short period (e.g. one week to one month). In addition to the above, some banking system-wide liquidity stress tests also consider the possibility of interbank contagion. In maturity gap-based stress tests, there are two typical ways of quantifying banks' shock absorbing capacity:[7]

- the change, during a specific period, of the maturity gap or the liquid assets/maturity gap ratio following the liquidity shock compared to a normal scenario, and

- the length of time ('survival' period) during which the bank is able to maintain its liquidity after the outbreak of the liquidity crisis.

Considering both the methodological overview and data availability, we have employed the maturity gap-based approach, since it enables the 'shocking' of the liquidity position of a given bank for multiple variables. Due to their significant potential impact on liquidity risk and in addition to cash flows from assets and liabilities, we have also taken into consideration potential cash flows from contingent liabilities. The measure of shock absorbing capacity is identified on the basis of the *maximum* increase in funding requirements the bank is able to satisfy with its own liquidity reserves. In devising the stress scenarios, we have drawn on international and Hungarian experience on individual bank-level stress test practices.

DESCRIPTION OF THE STRESS SCENARIO AND THE MAIN ASSUMPTIONS

The starting point for the stress scenario is a bank-specific liquidity shock, e.g. triggered by a confidence crisis.[8] Accordingly, in the stress scenario it is assumed that a part of customer deposits and money market funds are withdrawn, in order to examine the level of liquidity shock the bank is able to survive on the strength of its own resources. The impact of the stress scenario on liquidity is measured over one-week and one-month intervals. As for the group of banks under review, it should be noted that mortgage banks, building societies and the "head bank" of cooperative banks have been excluded from the analysis due to the special composition of their liabilities.

Stress coefficients have been specified for cash inflows and cash outflows and liquid assets. For cash flows linked to assets and liabilities, the stress coefficients are an indication of the expected rate of rollover of the assets and liabilities in question under a specific risk scenario. For liquid securities, the stress coefficient reveals the level of haircut at which they can be disposed of in a stress situation or at which additional funds can be acquired by secured borrowing. The haircut used for Hungarian government securities has been adjusted

[4] For that reason, in several cases, banks perform the stress tests on their own set of data, according to the scenarios provided by the regulatory bodies.
[5] In that sense, the focus is exclusively on the downside risk, as compared to the profit and loss impact, where risks are two-sided (due to too low or too high liquidity).
[6] The use of these simpler methods may be justified by restrictions in the set of available data (e.g. the lack of a maturity table).
[7] Under both approaches it is assumed that the bank cannot resort to any external liquidity support.
[8] The bank-specific liquidity shock (withdrawal of customer and interbank funds) may be the result of actual or presumed credit losses, of a (two- or three-notch) downgrading in credit ratings or of the loss of reputation due to other reasons.

Table 1

Stress coefficients concerning cash inflows and liquid assets[9]

Cash and settlement accounts	Total stock	100%
Hungarian governement securities and central bank bonds	Total stock	98%
EMU government securities	Total stock	95%
Listed shares	Total stock	90%
Central bank and interbank deposits	Maturing within 1 week/1 month	100%
Customer loans (excl. overdrafts)	Maturing within 1 week/1 month	100%
Overdrafts		0%
Other assets	Maturing within 1 week/1 month	80%
Income (interest, fee, etc.)	Due within 1 week/1 month	80%

to values used in the MNB's collateral management, whereas conservative estimates were used for other items.

One of the important aspects of the stress scenario concerns the possible assumptions related to the granting of new customer loans (or the rollover of maturing loans). On the basis of international banking practices, it is assumed that banks make an effort to roll over maturing customer loans. However, in a crisis situation, the rollover of maturing loans is probably impossible to achieve in full measure, and the renewal rate may substantially vary by customer groups and types of loan. Since the cash flows linked to the various loans are only available in an aggregated form, a distinction can be made between bank overdrafts and other loans (with maturities).[10] In defining the stress coefficient it has been assumed that bank overdrafts are automatically rolled over, i.e. they are not paid back during the crisis period. Our assumptions concerning the loan renewal rate can be considered conservative as, at the level of the banking system, bank overdrafts account for 70 to 80 percent of loans maturing within one month. Table 1 contains a summary of the stress coefficients concerning cash inflows and liquid assets.

For cash outflows, it has been assumed that non-deposit liabilities maturing within 1 week or 1 month (e.g. interbank funds) are not rolled over, as they are highly sensitive to the worsening of risk assessment by market participants.[11] As the stress test examines the shock absorbing capacity of banks on a stand-alone basis, one important assumption is that potential parent bank assistance (or the rollover of parent bank funds) is not taken into consideration. As far as off-balance sheet items are concerned, with regard to guarantees, those expected to be drawn down are included, while with regard to credit lines, the actually reported amount or 5 percent (1 week) and 15 percent (1 month) of the full amount have been taken into consideration.[12] Table 2 contains a summary of the stress coefficients concerning cash outflows.

Resilience of banks to liquidity shocks is measured by comparing the one-week and one-month maturity gaps calculated through the assumption of the stress scenario with the customer funds. That indicator ('liquidity stress indicator') indicates the maximum rate of withdrawal of customer funds a bank is able to pay out, provided that it is unable to obtain new funds on the unsecured money market.

Finally, a few restricting assumptions must be mentioned before the presentation of the stress test results:

- Since the maturity structure is unavailable at a consolidated level or in a currency breakdown, the results are based on 'unconsolidated' and total (HUF + foreign currency) data. However, with regard to the substitutability between various currencies (due to well-developed FX swap markets), the importance of the lack of a currency breakdown was not considered significant.

- Since no maturity breakdown is available for the off-balance sheet items related to derivative transactions, the impact on liquidity of these transactions cannot be accounted for in the analysis.

[9] For cash inflows, higher stress coefficients indicate higher probability of cash flows incoming.

[10] Information on bank overdrafts is available from balance sheet data. It is assumed that all bank overdrafts are in the 0-7-day maturity band. If the amount of bank overdrafts was lower than the amount of loans falling into the 0-7-day maturity band, the data were adjusted accordingly.

[11] It should be noted that the deposits held by money market funds have been eliminated from interbank funds, as they typically fall into the group of customer funds collected by the banking group.

[12] The latter adjustment was necessary because of reporting errors by some banks.

Table 2

Stress coefficients concerning cash outflows (excl. customer deposits)[13]

Interbank liabilities (deposits)	Maturing within 1 week/1 month	100%
Interbank and other borrowed funds (loans)	Maturing within 1 week/1 month	100%
Debt securities	Maturing within 1 week/1 month	100%
Subordinated liabilities	Maturing within 1 week/1 month	100%
Other liabilities	Maturing within 1 week/1 month	100%
Expenses (interest, fee, operating costs, etc.)	Due within 1 week/1 month	100%
Guarantees	Due to be paid within 1 week/1 month	100%
Undrawn part of credit lines	Either: due to be drawn within 1 week/1 month	100%
	or: (1 week) total stock	5%
	and (1 month) total stock	15%

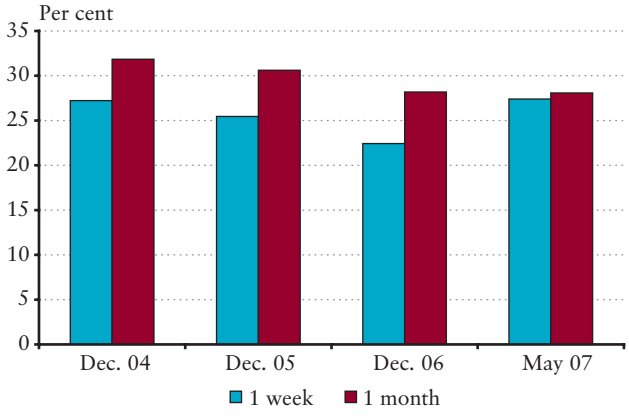
- In our stress test, we do not intend to investigate any contagion effect, which could have a significant impact on the substitutability between the forint and foreign currencies (swap market), amongst other things.

STRESS TEST RESULTS

The results of the liquidity stress test indicate the overall low liquidity risk exposure of Hungarian banks. While the 'liquidity stress indicator' varied widely for banks included in the analysis, the average rate was over 20 percent and 25 percent, respectively, over the one-week and one-month time horizons for all periods (Figure 1). The typically lower value of the one-week stress indicators is partly due to the fact that, up to the end of 2006, central bank deposits maturing between 1 and 2 weeks were not available for short-term management of a potential liquidity shock.[14]

Figure 1

Average one-week and one-month 'liquidity stress indicator' of the banks included in the analysis"

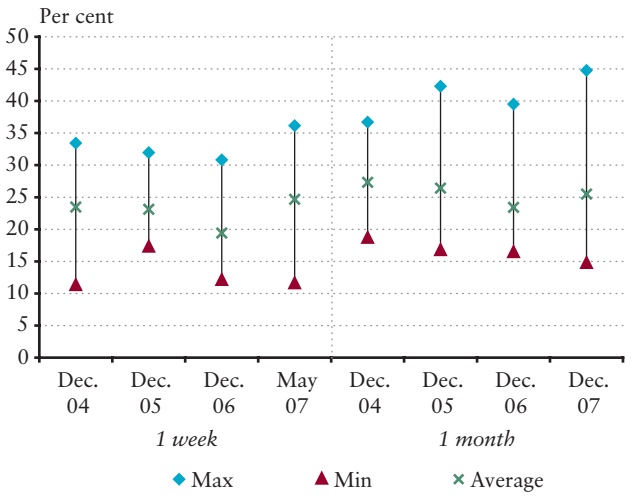


The distribution of the 'liquidity stress indicators' of systemically important large banks was separately studied, as these banks control around 80 percent of all deposits in the banking system.[15] While for the seven largest banks, the average value of the stress indicators is somewhat lower than the banking sector average, it still exceeds 20 percent over the one-week time horizon and reaches 25 percent over the one-month time horizon (Figure 2). At the dates examined, the minimum of the one-week 'liquidity stress indicator' for large banks was relatively volatile but it still remained above 10 percent.

The fact that no suitable benchmark is available for our 'liquidity stress indicator' renders the interpretation of the results of the stress test more difficult. It should also be noted

Figure 2

Distribution of one-week and one-month 'liquidity stress indicators' for large banks



[13] For liabilities, the 100-percent stress coefficient indicates that the respective liabilities are not rolled over.

[14] However, following the replacement of the two-week central bank deposit by a central bank bond from early 2007, this instrument has theoretically also become immediately available for the bridging of a potential liquidity problem.

[15] For the purposes of this article, systemically important banks are those with significant market shares in deposit markets.

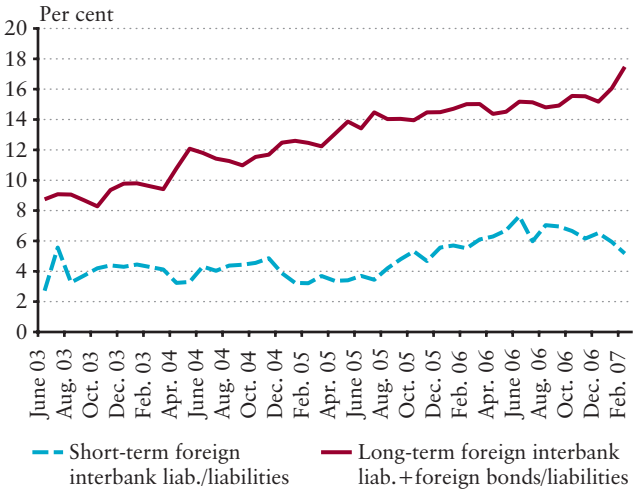
that the comparability of the results between various banks is also limited, partly because of the differences in business models (and financing patterns), even within the relatively homogeneous group of large banks. However, on the basis of the international experiences of banking stress test practices and historical experience of bank runs in Hungary, we believe that our assumptions can be considered to be conservative. According to the survey of Joint Forum (2006), in crisis scenarios, banks typically assume a withdrawal level lower than 10 percent for 'retail' deposits within a month, due primarily to the role of deposit insurance.[16] This is not contradicted by the Hungarian experience of bank liquidity crisis episodes as, in the case of Postabank, the withdrawal of customer funds at a level close to 20 percent essentially affected security-type liabilities not covered by deposit insurance.

Moreover, according to the Joint Forum survey, for wholesale (corporate, bank, government) deposits, banks presume a withdrawal rate of 20 to 50 percent at worst, where the lower and higher values refer to corporate and interbank deposits respectively. In our stress scenario, however, we calculated using a 100-percent outflow of interbank funds. With regard to the fact that our stress scenario also considers potential cash outflows due to contingent liabilities, our hypothetical scenario can be considered as rather extreme. Taking this into account, it is considered that, the average one-week and one-month "stress indicators", at 25 percent in May 2007, for systemically important banks are high. However, it should also be taken into account that the minimum of the liquidity stress indicator for large banks is considerably below the group average.

Two important factors should be mentioned that explain the typically high liquidity shock absorbing capacity of large Hungarian banks. First, the Hungarian banking system still has a substantial structural surplus liquidity, which increases the available buffer for containing potential shocks, the degree of which may vary from bank to bank. It should also be emphasised that, in recent years, banks have made significant efforts to obtain funds with longer maturities (over one year) for financing the rapid growth in lending. This is reflected in the maturity breakdown of foreign market funds of large banks, accounting for the overwhelming part of lending activities. In parallel with the brisk increase of long-term foreign-currency loans, the ratio of long-term

Figure 3

Foreign market financing sources of large banks broken down by maturity (as a percentage of liabilities)



foreign interbank funds and bonds to liabilities increased steadily and, by the end of 2006, its share was 15 percent as compared to the 6-percent ratio of short-term foreign interbank funds (Figure 3). Altogether, the transformation of the funding structure of banks has so far not been accompanied by a significant increase of rollover risks.[17]

CONCLUSIONS

On the basis of the results of the stress test performed for Hungarian banks, it is believed that the current liquidity risks essentially do not pose a threat to financial stability. The shock absorbing capacity of large banks, controlling the overwhelming majority of deposits, is generally high, but even that of lower-liquidity banks can be regarded adequate. Our conclusions are corroborated by the fact that the possibility of parent bank assistance has been disregarded in the tests, as they were designed to assess the resilience of Hungarian banks to shocks on a stand-alone basis.[18] The high liquidity shock absorbing capacity is partly due to the fact that, in parallel with the rapid increase in long-term lending, banks have been able to substantially lengthen the average maturity of their liabilities. In addition to that, substantial structural surplus liquidity has remained in the Hungarian banking system, which increases the reserves available in order to survive potential liquidity shocks.

[16] The Joint Forum is common forum of the international associations of financial regulators (BCBS, IOSCO, IAIS) in the banking, securities and insurance sectors.

[17] This analysis does not concern the profitability risks related to the change in the funding structure. It should be noted, however, that the profitability risk has increased at a higher rate than the renewal risk, since foreign interbank funds of a maturity over 12 months bear interests at variable rates and typically have a short re-pricing period.

[18] As referred to above, one of the reasons behind disregarding potential parent bank assistance is the possibility that an individual shock may ultimately be the result of parent bank problems.

On the assessment of the results, the fact that our stress test was restricted to the investigation of the impact of a bank-specific scenario should also be taken into consideration. One of the possible directions of the further development of stress test practices could be the examination of the impact of other risk scenarios on the liquidity of banks. Of these risk factors, the more in-depth analysis of the risks arising as a result of the potential tightening of global liquidity and of intra-group financing relations may be of primary importance. There are two reasons that seem to require giving increased consideration to group-level contagion risks. First, since some large foreign-controlled banks rely on parent bank financing to a substantial extent, shocks affecting the parent bank or other group members may generate serious liquidity problems for their Hungarian affiliates. Similarly, for Hungarian banks following an active international expansion strategy, negative shocks affecting their subsidiaries can have a significant impact on the liquidity of parent banks.

With regard to the above risk factors, it may prove useful for banks to regularly perform liquidity stress tests taking into consideration the specific features of their operations. While there has been considerable progress in this area in recent years, stress tests becoming an even more established standard risk assessment tool would certainly supportive of stability. The practices employed in order to measure the ability to withstand shocks under extreme circumstances serve practical purposes (Matz and Neu, 2007). First, measuring the level of preparedness for the management of extraordinary situations may reveal potential (hidden) liquidity problems. On the other hand, stress tests should be integrated into the risk management practices of the bank, e.g. by taking their results into consideration on reviewing risk limits or contingency plans.

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