Liquidity-Risk Measurement, Monitoring and Regulation Proposal for Colombia

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I. Introduction: Definitions

The importance of properly monitoring and regulating liquidity risk is associated with systemic risk and with stability of the financial system. If institutions do not measure liquidity risk adequately and if it is not well regulated, financial institutions could see their positions affected by a liquidity shock. Before designing a regulatory scheme, an operational definition of liquidity risk must be established. Literature offers two complementary definitions of liquidity risk.[1] The first is associated with a bank's inability to honor its obligations on time, because it does not have the liquid resources to do so (Basel Committee on Banking Supervision, 2000).

According to this definition, the structure of the bank balance sheet is divided into short-term and long-term assets and liabilities. When an institution does not have the liquid assets to meet current and maturing obligations, the liquidity risk is high. This "liquidity shortage" must be covered, either by liquidating a portion of the liquid portfolio, or by substituting liquid liabilities with other longer term liabilities.

Two conditions for good liquidity-risk management can be derived from the foregoing. The first consists of measuring the liquidity shortage as precisely as possible. This implies knowing, for example, when assets and liabilities mature, and the likelihood of their being renegotiated. The second implies having enough capacity to convert illiquid assets into cash or to substitute liabilities, when necessary.

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1 The term "operational" means the definition must be quantifiable and easy for financial institutions and regulators to monitor.

Ever since the financial crisis in the late nineties, but particularly after the events that led to the "ordered" liquidation of LTCM (Long Term Capital Management) in 1998 by the Federal Reserve Bank of New York, some works have proposed a new notion of the liquidity risk that financial institutions face.

The idea underlying these works deals with the fact that measuring liquidity shortage, as the traditional version suggests, does not detect an institution's liquidity needs adequately during times of stress.[2] In such situations, a rapid attempt by an institution to sell part of its illiquid assets (to reduce its liquidity shortage) can be curbed by market liquidity. And, in the event of a systemic shock, that liquidity becomes a constraint to solving the institution's liquidity shortage. However, the first definition does not take that potential constraint into account.

Any scheme to regulate liquidity risk must attempt to deal with these two definitions, if it is to minimize the materialization of risk in the form of a liquidity crisis. The objective of this article is to propose an alternative for measuring, monitoring and regulating liquidity risk in Colombia's financial system. The article is divided into six sections, the first being this introduction. The current regulatory scheme and is primary drawbacks are described in the second section. The third outlines several alternative methods for measurement that are now being used and will serve as a basis for our proposal. Section four contains the proposal itself. Some of the conditions for its practical application are examined in section five. Finally, several thoughts on the scheme are presented in section six by way of conclusion.

II. Current Regulations on Liquidity Risk in Colombia

A. Liquidity Gap

The current regulations on liquidity risk in Colombia are outlined in External Circular 100 of 1995, Chapter IV, issued by what was then the National Banking Authority. They stipulate that institutions must determine the extent of their exposure to liquidity risk by analyzing the maturity mismatch among assets, liabilities and off-balance sheet positions. This is done by distributing the balances outstanding on each instrument into time bands, according to their contractual or expected maturity dates. "Expected maturity" is

[2] The following paragraphs are based on the works of Muranga and Ohsawa (1997), Upper (2000), Borio (2004), Allen ad Gale (2002), Bangia et al. (1998).

understood as maturity that must be estimated through a statistical analysis of historic data, as it is not known when some items on the balance sheet will mature.

The liquidity gap for the period, which is defined as the difference between assets, plus contingent liabilities and liabilities, plus contingent assets, is determined on the basis of the foregoing. When the accumulated liquidity gap for three-month maturity is negative, it is known as "value at liquidity risk". According to the regulations, a credit institution may not present, in two consecutive assessments, a value at liquidity risk that is higher, in absolute terms, than the value of its net liquid assets[3]. What is more, these assessments must be done monthly.

B. Main Drawbacks

There are two main drawbacks to the liquidity gap that undermine its validity as an instrument that can be used to identify liquidity risk in accordance with the definitions presented above. To begin with, liquidity risk is a phenomenon that materializes during very short periods of time. However, the liquidity gap is calculated monthly, for a three-month horizon. Such a long measurement period makes it difficult to identify a liquidity crisis well enough in advance. Secondly, the liquidity gap components have measurement problems. Hence, liquidity requirements and, consequently, the actual liquidity risk each institution faces are not properly identified by the measurement. From the standpoint of liabilities, the current regulations make it impossible for the National Banking Superintendent to know how institutions calculate expected maturities. Furthermore, in a scenario where that calculation is difficult to come by, there are no frames of reference on how it should be done. Lastly, the liquidity gap assumes that institutions have a portfolio of net liquid assets that can be redeemed on the market at the prices observed at the time of valuation. However, as noted earlier, this assumption is difficult to sustain if market liquidity is included in liquidity risk calculation.

III. Methods Currently in Use

Outlined in this section are two methods for calculating liquidity risk that will be used to design an alternative to the current liquidity gap.

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[3] Net liquid assets consist of ready cash, interbank loans sold and resale agreements, minus interbank loans purchased, repurchase agreements and tradable securities.

A. The Uncovered Liabilities Ratio (ULR) Calculated by the Financial Stability Department at Banco de la República

Banco de la República's Financial Stability Department bases its liquidity-risk measurement on a statistical calculation of the liabilities of financial institutions that are susceptible to redemption.[4] These are comprised of all liquid liabilities (LL), plus the temporary component of all other liabilities (*TLr*)[5]. This calculation assumes that all liquid liabilities are susceptible to redemption in the short term. To meet its liquidity needs, an institution has all its liquid assets (LA), which it can redeem if such needs arise.

Using data from the balance sheets of financial institutions, liquidity risk is measured by the ULR, which is calculated as follows[6].

(1) $ULR = [TLr + LL\ ) - LA]/[TA - LA]$

where *TA* represents total assets; the other elements are as defined earlier. The numerator in the expression is the difference between liabilities susceptible to redemption and liquid assets. The illiquid assets[7] constitute the denominator. If the ULR is positive, the institution does not have enough liquid assets to cover its liabilities susceptible to redemption. This signifies a high liquidity risk.

In contrast to the FS liquidity gap, the ULR explicitly offers a statistical method for calculating expected maturity (in the sense proposed by External Circular 100/1995). By being based on data from the same institution, the only possibility of increasing the monitoring frequency of the indicator would be to increase the frequency with which the FS collects balance-sheet data from financial institutions.

B. The Sterling Stock Liquidity Ratio (SSLR) of the United Kingdom Financial Services Authority (FSA)

The Financial Services Authority in the United Kingdom, which is responsible for liquidity-risk monitoring, insists on the construction of an indicator using

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4 This method was used up to the March 2006 edition of the *Financial Stability Report*.

5 The Hodrick-Prescott filter is applied to the liability series to determine its temporary component (See Hodrick and Prescott, 1997). To detect the individual volatility of deposits, this calculation is done for the system as a whole and separately for each institution.

6 The expression is based on the work of Dziobek, Hobbs and Marston (2000).

7 According to Dziobek, Hobbs and Marston (2000), the difference between liabilities susceptible to redemption and liquid assets should be scaled by illiquid assets, so as not to favor the larger banks, as the amount of their operations is greater.

balance-sheet data from institutions in the financial system. It shares the basis of the liquidity gap and the ULR by attempting to differentiate between liabilities subject to redemption and the support provided by liquid assets. Nevertheless, as an alternative to these indicators, it calculates not the difference, but the ratio between these two balance-sheet components. The SSLR is expressed as follows:

(2) $SSLR = (TO)/(FN + 5\%DPM)$

where *FN* is to the net flow of payments the bank is obliged to cover during the five working days after the indicator is calculated, and *DPM* represents short-term retail deposits.

Contrary to what the FS does, the FSA monitors this indicator daily for each bank in the system. In practice, each bank is required to report the value of its SSLR to the FSA on a daily basis and must keep it above 1. At the very least, this means the liquid portfolio must be equal to the expected maturity. Furthermore, the flow of payments is calculated for a five-day horizon, which makes it possible to monitor developments in the institution's liquidity requirements more closely, just as the ULR explicitly indicates how expected maturity should be calculated.

IV. Regulatory proposal

Given what has been said up to now about the drawbacks of the liquidity gap as a tool for regulating liquidity risk and the advantages associated with the two measuring instruments summarized earlier, this section proposes a new method for measuring, monitoring and regulating liquidity risk. Like the previous methods, the new proposal is based on a continuous effort to monitor the balance sheets of institutions that are supervised by the regulators. The following liquidity-risk indicator (LRI) is proposed to do just that:

(3) $LRI = FNC + X\%D - ALM$

where *FNC* is the net flow of payments of contractual origin in a horizon of five, thirty or ninety working days; *D* is the volume of deposits reported by the institution and *ALM* is the portfolio of net liquid assets, calculated to include market liquidity elements. Accordingly, if the LRI is positive, the liquidity risk is high, because the support provided by liquid assets does not cover the institution's liquidity needs; on the contrary, if the LRI is 0 or is negative, the liquidity risk is low. This method represents an improvement on two fronts associated with the drawbacks mentioned in relation to the liquidity gap. To begin with, the indicator is step forward when it comes to measuring the components that comprise the liquidity gap. In the case of liabilities, it is based on the method used in the United Kingdom (SSLR) to estimate the component susceptible to redemption. Specifically, it implies calculating the flow of

payments stemming from contractual obligations (the nature of which is not uncertain), then arbitrarily adding an *X* percentage of the deposit stock, which varies according to the LRI measurement horizon[8] (these two elements summarize the potential shortage an institution faces). On the other hand, the ALM calculation differs from the methods described earlier, inasmuch as assessment of the liquid portfolio explicitly includes the effect of market liquidity on the value of that portfolio and, therefore, on the price it would fetch on the market. In this sense, the ALM captures the actual size of the bank's support, which eventually would be used to pay what is lacking in liquidity.

In this regard, one variable that helps us to detect the impact of market liquidity on the price institutions face is the discount BR offers on domestic government bonds in repo transactions with financial institutions (haircut). Because BR is the lender of last resort, the haircut is the worst discount an institution would be prepared to accept on its investment portfolio. Therefore, when it comes to liquidity risk, that portfolio does not have to be valued at market prices, but at prices corrected by the haircut ($\hat{P}$):

$$(4) \quad \hat{P} = P*(1 - h)$$

where P is the market price and h is the haircut BR applies to tradable securities.

Because the net liquid assets in the FS liquidity gap include balance-sheet positions that constitute immediate liquidity (e.g. available and interbank funds), the only liquid assets to valuate when considering market liquidity are tradable securities and the net foreign currency position. Accordingly, in addition to the aforementioned haircut on tradable securities, a haircut has to be calculated for the net foreign currency position:

$$(5) \quad \hat{P}_{me} = P_{me}*(1 - h_{me})$$

where P_{me} is the market value of the net foreign-currency position[9].

Therefore, the net liquid-asset portfolio is valued as follows, according to the price calculated with the foregoing expressions:

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[8] The shorter the time horizon, the larger the percentage (*X*) should be.

[9] The Financial Stability Department is constructing the discount for foreign-currency positions. VaR at one day for dollars and the use of implicit devaluation calculated by Market Development Department are the two proposals found in the study.

(6) $ALM = \hat{P} * IN + \hat{P}_{me} * PNME + (AL - IN - PNME)$

where PNME is the net foreign-currency position.

In this way, including the LRI when measuring liquidity risk overcomes the problems encountered in calculating the liquidity-gap components, and offers a better approximation to the real impact of liquidity risk.

Last but not least, the monitoring frequency is the second front on which the LRI constitutes a step forward with respect to the traditional measurement of liquidity risk. The following section explores the practical requirements involved in putting this method into practice.

V. PUTTING THE REGULATORY SCHEME INTO PRACTICE

LRI monitoring must be daily. As such, it can follow FSA operational practices closely. Insofar as institutions supply LRI figures on a daily basis and make sure the indicator is equal to or less than zero, practical application requires daily information from the balance sheets of institutions that are supervised by the banking authority and information on the haircuts used by BR.

According to the capital requirements adopted by the Basel Committee, the LRI calculation method described herein should be regarded as the standard method to which supervised institutions may adhere. However, they must be allowed the possibility of designing their own LRI calculation methods, particularly when it comes to measuring expected maturity.

The FS will have to evaluate the relevance of the method each institution chooses to determine the liquidity-risk rate implied by expected maturity. Therefore, application of this method, in practice, will demand a great deal of supervisory capacity on the part of the FS. It is important to note that the general form of the LRI would not vary from one institution to another. In other words, it demands only that the difference between its two components be equal to or less than zero day after day. Still, the authorities must decide whether institutions will have to adhere to the calculation parameters established by the FS or be allowed to construct their own method for calculating the LRI components.

VI. CONCLUSIONS

Instituting an LRI-based regulatory scheme raises several additional questions. In practice, the scheme being suggested is tantamount to imposing a liquidity requirement on financial institutions. In this sense, is equivalent to what has been done with the liquidity gap.

Based on the experience of the Chilean financial system, the possibility of a variation in LRI components according to the nature of an institution's liabilities is an interesting suggestion. Particularly, the distinction between wholesale and retail liabilities would help us do a better job of detecting the dynamics of the risk. Nevertheless, in Colombia, information of this sort is limited.

An element missing from the proposal outlined in the previous section is the penalty institutions would face for not keeping their LRI negative. The penalty would have to depend on the nature of the shock that results in an institution being unable to comply with this requirement. The FS would have to analyze and establish the means for instituting any such penalty.

The FS also will have to design ways and means to publicize information on the LRI position of institutions. Appropriate circulation of such information can reduce financial panic when liquidity problems in an institution do not imply capital adequacy problems. However, the method of dissemination must be accompanied by a far broader strategy to divulge information on the institution's financial situation[10].

[10] The impact of market liquidity on institutions' risk position can be calculated by means other than a haircut. One interesting alternative recently explored in literature is to include the liquidity risk measurement when calculating capital requirements associated with market risks. Specifically, calculating a liquidity value at risk (LVaR) that can be added to the values at risk associated with the measurement of market risk is one option that can be explored (sees Hisata and Yamai, 2000; Dowd, 2005, and Erwan, 2002).

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