

# The Heavenly Liquidity Twin

## The Increasing Importance of Liquidity Risk

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## Abstract

Liquidity and solvency have been called the “heavenly twins” of banking (Goodhart, Charles, ‘Liquidity Risk Management’, *Financial Stability Review*—Special Issue on Liquidity, Banque de France, No. 11, February, 2008). Since these “twins” interact in complex ways, it is difficult—particularly at times of crisis—to distinguish between them, especially in the presence of information asymmetries (Information asymmetry occurs when one party has more or better information than the other, creating an imbalance of power, giving rise to adverse selection and moral hazard). An insolvent bank can be liquid or illiquid, and a solvent bank may be at times illiquid. In the latter case, insolvency is not far away, since banking is grounded in information and confidence, and it is confidence which in the end determines liquidity. In other words, liquidity is very much endogenous, determined by the general condition of a bank, as well as the perception of it by the public and market participants.

Dealing with liquidity risk is more challenging than dealing with other risks, since liquidity is the result of all the operations of a bank and it is fundamentally a relative concept which compares segments of the balance sheet on the asset and liability sides. It does not deal with absolutes, like arguably the concept of capital and it explains why there is not an internationally recognized “Liquidity Accord”.

This Working Paper addresses key concepts like market and funding liquidity and basic tools to address liquidity issues like cash flows, liquidity gaps and some selected financial ratios. It aims at providing an introductory guide to risk assessment and management, and provides useful and practical guidelines to undertake liquidity assessments which could prove useful in preparing Financial Assessment Programs (FSAPS) in member countries of the Bretton Woods institutions.

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This paper was written by F. Montes-Negret, Director of the Finance & Private Sector Department (ECSPF) in the Europe & Central Asia (ECA) Region of the World Bank. Although the paper reflects the author’s views, it is part of a larger effort in the Department to enhance the quality of its financial sector work, its crisis monitoring efforts, and quality of the Financial Sector Assessment Program (FSAP). Policy Research Working Papers are also posted on the Web at <http://econ.worldbank.org>. The author may be contacted at: [fmontesnegret@worldbank.org](mailto:fmontesnegret@worldbank.org).

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## **The Heavenly Liquidity Twin: The Increasing Importance of Liquidity Risk**

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*“There is not such a thing as a safe bank, even if its assets are sound, in the sense that they would cover all obligations if held to maturity. Any highly leveraged entity that borrows short and lends long and illiquid is vulnerable to speculative attack (run). A withdrawal of deposits, refusal to renew credit or inability to sell assets could force a bank into insolvency even if its assets were good, provided they could be held to maturity.*

*A viable banking system therefore requires a central bank that can act as lender of last resort (to offer support against funding illiquidity) and market maker of last resort (to offer support against market illiquidity of its assets)”.*

Willem Buiter

“Iceland’s bank defaults: lessons of a death foretold”

FT.com/maverecon, October 9, 2008

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## SECTION 1: INTRODUCTION: MOTIVATION & DEFINITION OF TERMS

1. Liquidity and solvency have been called the “heavenly twins” of banking.<sup>1</sup> Since these “twins” interact in complex ways, it is difficult—particularly at times of crisis—to distinguish between them, especially in the presence of information asymmetries<sup>2</sup>. An insolvent bank can be liquid or illiquid, and a solvent bank may be at times illiquid. In the latter case, insolvency is not far away, since banking is grounded in information and confidence, and it is confidence which in the end determines liquidity. In other words, liquidity is very much endogenous, determined by the general condition of a bank, as well as the perception of it by the public and market participants.

2. *Illiquidity* and *insolvency* are not interchangeable terms but very different, although related, concepts. From an accounting point of view, a bank is balance sheet *insolvent* when its total liabilities exceed its total assets (negative net assets) and, therefore, it has no option but to default on some obligations, leading the bank into receivership, intervention or bankruptcy. On the other hand, a bank is *illiquid* when it has a specific liquidity problem or experiences a liquidity crisis and it cannot obtain the funding needed, in a timely form, at market prices, to meet its obligations when due. Thus, insolvency reflects a structural and stock financial problem, while illiquidity refers to a point in time cashflow and pricing problem. One major issue for creditors, central banks and supervisors is that it is difficult to know if a bank is illiquid because it is insolvent or not. Moreover, illiquidity could also rapidly lead into insolvency if the problem is not addressed quickly and effectively in order to reassure depositors and other creditors.

3. Why is it important to make the difference between these two terms clear? The difference is important because policy actions to address a liquidity or insolvency crisis vary dramatically and, therefore, assessing the underlying problems of banks becomes crucial. Insolvency applies to individual banks or to systemic problems. In the 2007-2008 financial crisis, the underlying problem of some financial intermediaries heavily invested in sub-prime mortgages was a solvency problem, which was also translated into a liquidity crisis in view of the uncertainty about asset values and counterparty risks which raised, dramatically, market liquidity risks. Some banks were highly leveraged (often through ‘off-balance’ sheet special purpose vehicles—SPVs—structured investment vehicles—SIVs—or conduits), having securitized products which defaulted, creating not only a structural solvency problem (for the SPVs) but also a liquidity crisis for the bank as some of these vehicles required additional liquidity support. The large “shadow” banking system in the form of off-balance sheet vehicles posed extraordinary liquidity demands on banks at the worst possible time. Some of these transactions were financing long term, low quality credit with short-term funds, at a time when market liquidity was abundant and continuous refinancing was possible. Once liquidity tightened and even started to freeze, and market liquidity risk skyrocketed, participants started

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<sup>1</sup> Goodhart, Charles, ‘Liquidity Risk Management’, *Financial Stability Review -- Special Issue on Liquidity*, Banque de France, No. 11, February, 2008.

<sup>2</sup> Information asymmetry occurs when one party has more or better information than the other, creating an imbalance of power, giving rise to adverse selection and moral hazard.

to hoard cash, making even solvent banks become illiquid overnight.<sup>3</sup> It should be noted that precautionary hoarding increases when the likelihood of liquidity shocks rises and market funds are more difficult to obtain, triggering a liquidity spiral and often cross-bank contagion.<sup>4</sup>

4. Clearly, the concept of liquidity is critical for the operation of banks in good and, even more so, in bad times, when they might face more limited access options (higher market liquidity risk) and become more dependent on central bank liquidity support. Paradoxically, prior to the present crisis the theme of liquidity management has received limited attention from both international bodies (there is no ‘Liquidity Accord’ under the auspices of the Basel Committee) and in the IMF/WB Financial Sector Assessment Program (FSAPs), where there is some limited attention focused on the lender of last resort (LOLR) facilities of central banks and payment and securities settlement systems (under the rather misleading heading of “systemic liquidity infrastructure”).<sup>5</sup> Even in the stress-testing undertaken in FSAPs, the issue of liquidity does not receive enough attention. This Working Paper aims at flagging some of the critical issues in this area to provide **practical guidance** on how to approach liquidity issues in FSAPs and other Bank/IMF work, synthesizing practical approaches from a wide number of sources.

5. Why has liquidity risk become more critical? There are two inter-related fundamental reasons: (i) a change in the traditional banking intermediation model; and (ii) increased competition. Historically, banks relied on stable and low-cost core deposits (demand, savings and time deposits) as the primary source of funding to generate a portfolio of (rather illiquid) loans held to maturity. So there is a fundamental risk, as banks are in general structurally illiquid. However, as long as liquid assets (LA) were sufficient in relation to more volatile liquid liabilities (LL), that is  $LA > LL$ , banks would in normal circumstances be fine (i.e.; liquid). More recently the availability of alternative investments and savings products offered by a wider variety of financial institutions has made the banks’ traditional funding base smaller, less predictable (i.e.; more volatile) and more costly. The adoption of an ‘originate and sell’ banking intermediation model, known as a securitized model, has induced banks to rely more and more on price and credit sensitive market funding, in general increasing the share of wholesale funding in total banking funds on the liability side, and the reliance on securitization markets on the asset side. What is really new about this crisis compared with other is the extent of (complete and incomplete) securitization.<sup>6</sup> The increased competition from other banks and non-bank financial institutions, as well by securities markets, has put additional pressure on banks’ net interest margins and has driven them to optimize liquidity management, resulting in a secular decline (see below) in lower-yielding, on balance sheet, liquid assets. The search for yield (rising returns on assets ROA- and return on equity—ROE) by shareholders and bank managers in more competitive markets induced banks to increase their leverage and take more

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<sup>3</sup> Roubini, R. ‘Worse than LTCM: Not just a liquidity crisis; rather a credit crisis crunch’, *RGE Monitor*, August 2007

<sup>4</sup> See Markus K. Brunnermier, “Deciphering the 2007-08 Liquidity and Credit Crunch”, Mimeo, Princeton University, May 19, 2008.

<sup>5</sup> WB-IMF, *Financial Sector Assessment: A Handbook*, 2005.

<sup>6</sup> By incomplete securitizations I mean that the selling bank still retained the liquidity risk from maturity transformations. As observed in the present crisis, even when the securitization was complete (i.e.; risks were fully off-loaded from the bank’s balance sheet), for reputational reasons and not always for legal reasons banks provided backstop liquidity facilities and credit lines. See Brunnermeier, op.cit., page 27.

risk—including higher liquidity risks, by increasing the illiquid portion of their assets through more lending or relying excessively in the permanence of market liquidity to securitize loans on demand. As we know “linear thinking” can be quite dangerous! While the sources of funding have diversified, the dependence on market funding has also gone up and the margin for error has been reduced. At the core of the present financial crisis there was the concept of abundant and uninterrupted availability of market liquidity. In the aftermath of the current crisis, both the banking system and regulators are struggling to devise more prudent approaches to liquidity management, including the likely adoption of mandatory controversial liquidity buffers.

## **A. Cashflow is King**

6. Liquidity is defined as the ability to obtain cash for operations when needed at a reasonable cost. The liquidity needs of a bank result from its net cashflow projections--covering expected cash inflows and outflows and expected capacity to fill funding gaps, broken down by major business lines, instruments and maturity buckets in different currencies. As stressed by some supervisory agencies, given the uncertainties involved in calculating cashflows, a conservative bias seems appropriate in calculating such estimates, assigning later dates to cash inflows and earlier dates to cash outflows (OSFI).

7. Moreover, both these types of cashflow projections should be made: (i) under ‘business as usual’ assumptions, and (ii) under stressed conditions.<sup>7</sup> Banks might be confronted with liquidity risks as a result of their own internal shortcomings (‘idiosyncratic stress’) or they might be affected by systemic liquidity problems affecting all banks (‘market wide stress’). It is not easy to distinguish between idiosyncratic and systemic liquidity problems at a given point in time. Systemic issues will affect all banks’ financial performance and even their viability in case markets become completely illiquid. In the latter case banks are confronted with market liquidity risks, which might force them to go to the lender of last resort.

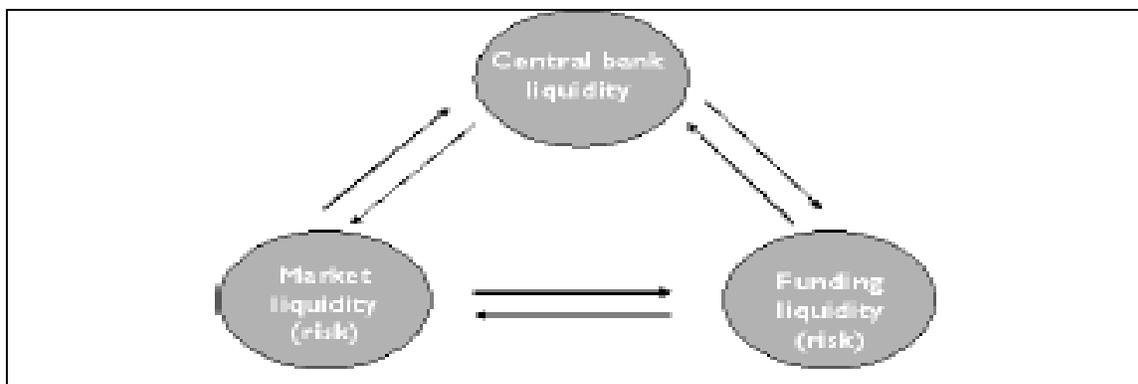
8. This stress-testing exercise is critical, since it is always the case that commercial banks die when their treasuries collapse. Bank treasuries synthesize all the operations of banks in terms of cash flows from asset and liability transactions (on and off balance sheet) in domestic and foreign currencies. Once liquid assets fall below immediate callable demands on a bank’s liability side (an immediate liquidity gap), alarms go off and bank managers must take immediate action to correct the imbalance, raising enough funds to fill the gap, otherwise the bank will fail to honor its payments. It might be the case that it is not poor asset and liability management (ALM) per se which causes illiquidity, but problems in other parts of the bank, including the bank’s trading or credit portfolios which may trigger a loss of confidence in the name of the bank (often referred to as ‘name crisis’) or eventual operational risks. It is worth repeating that *an individual bank faces a ‘liquidity risk’ – beyond normal funding problems - when it cannot obtain the next unit of funding at current market interest rates*. So, it is not simply a matter of the bank obtaining the required funds at ‘distressed’ prices; it should be able to obtain them under normal market conditions.

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<sup>7</sup> Committee of European Banking Supervisors (CEBS), ‘Consultation Paper on Liquidity Buffers & Survival Periods’, July, 2009.

9. To summarize, there are three liquidity nodes: funding liquidity by banks, by markets, and by the central bank as a last resort (see Chart 1 below).<sup>8</sup>

**Chart 1: Liquidity Nodes of the Financial System**



Source: Nikolaou [check]

10. The Basel Committee of Banking Supervision defines *funding liquidity* as the ability of banks to meet their liabilities, or unwind or settle their positions as they come due.<sup>9</sup> Alternatively, funding liquidity is the ability of banks to meet their obligations at a reasonable cost when they come due<sup>10</sup>. Consequently, funding liquidity risk is the probability of being unable to service a bank's liabilities immediately. Funding liquidity is a point in time concept, while funding liquidity risk is a forward looking term<sup>11</sup>--the latter measures the likelihood in a time horizon, not at a specific point of time, of not being able to settle obligations when due.

11. *Market liquidity* is defined as the ability to trade an asset at short notice, at low cost and with little impact on price.<sup>12</sup> Other analysts<sup>13</sup> decompose market liquidity in three sub-components measured by: (i) the bid-ask spread; (ii) market depth in terms of the price elasticity to a given volume of security sales; and (iii) market resiliency (time for a temporary drop in price to bounce back).

12. Finally, central banks, in the normal course of business, provide liquidity to the market to smooth fluctuations, seasonal or otherwise, but they also play the function of lenders of last resort, that is, extending credit to solvent banks when no one else will.

<sup>8</sup> Nikolaou, K., 'Liquidity (Risk) Concepts, Definitions and Interactions', ECB, Working Paper Series, No.1008, February, 2009.

<sup>9</sup> BIS, Basel Committee on Banking Supervision, 'Liquidity Risk: Management and Supervisory Challenges', 2008.

<sup>10</sup> Nikolaou, 'Liquidity (risk) concepts definitions and interactions', European Central Bank, February 2009

<sup>11</sup> Drehmann and Nikolaou, 'Funding liquidity risk definition and measurement', European Central Bank, March 2009

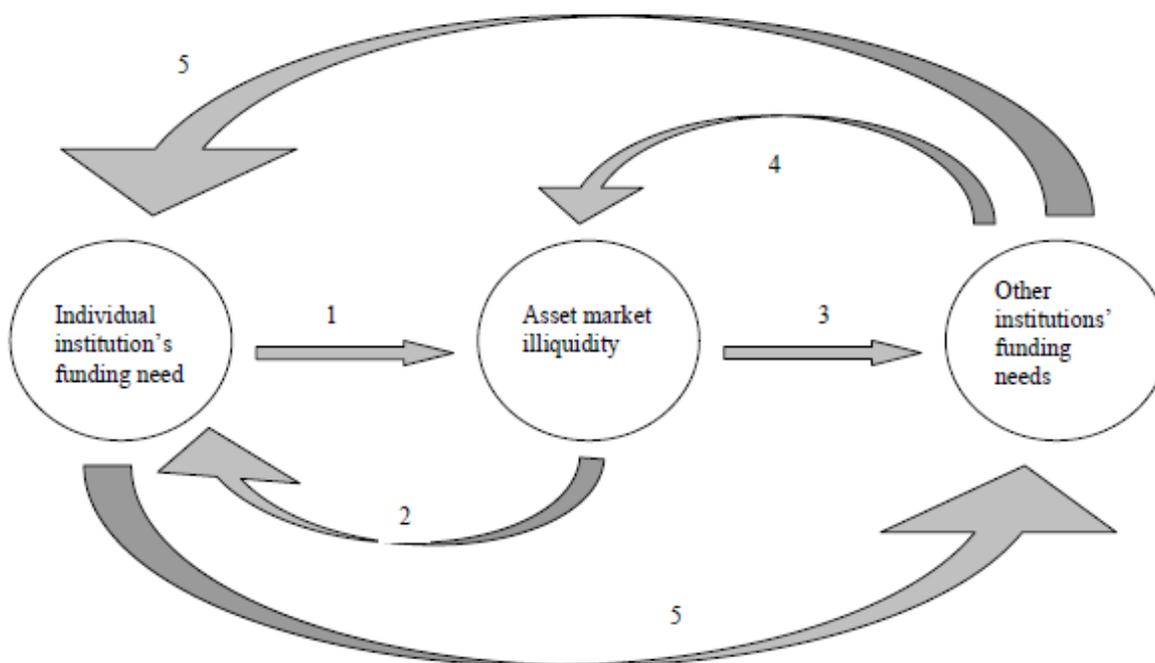
<sup>12</sup> ECB, *op. cit.*, page, 14.

<sup>13</sup> Kyle, A.S., "Continuous auctions and insider trading", *Econometrica* 53, pages 1315-1335, 1985. Quoted by Brunnermeier, *op. cit.*, page 23.

13. Clearly there are strong dynamic dependencies and complementarities between market and funding liquidity as illustrated in the diagram below (Committee of European Banking Supervisors -CEBS). Such dependency is closer in banking system models where securitization is prevalent.

Chart 2

Diagram: The interaction between funding liquidity and market liquidity



Source: CEBS

14. As illustrated in the above diagram, “attempts to sell significant amounts of less liquid assets may prompt (further) market illiquidity (channel 1 in the diagram), leaving the institution unable to raise the amount that it originally planned. A funding need can also arise from market illiquidity (channel 2), for example when an institution is unable to securitize or syndicate loans. In the case of fire sales, it may also incur losses, placing pressure on earnings and capital. If an institution is unable to securitize or syndicate loans, its balance sheet size will increase, resulting in capital pressure. The deterioration in credit quality may also constrain the institution’s access to funding markets (reinforcing channel 2).

15. The actions of the institution can also have negative externalities (contagion). Its attempts to sell assets can reduce general market liquidity, placing other institutions under liquidity pressure, even though they may have suffered no significant first order losses. And the fall in market prices caused by “fire sales” can place other institutions under earnings and capital pressures. These institutions will then have liquidity needs of their own (channel 3), with their asset sales to meet their funding needs creating a potential feedback loop to market illiquidity (channel 4). Institutions that suffer large liquidity shortfalls may seek to close out

lending positions, particularly in the inter-bank market. These actions create direct funding liquidity needs at other market participants (channel 5)".<sup>14</sup>

16. Banks might organize their global liquidity management in different ways but, in general, they can opt for a completely centralized approach with the head office managing liquidity for the whole company in every currency. Alternatively, they could follow a decentralized model where operating units are assigned responsibilities for managing their own liquidity, subject to centrally set limits and frequent reporting to the head office. Using a different approach, the bank could also decide to centrally manage liquidity in the home currency while foreign subsidiaries or branches manage their liquidity in the currencies in which they operate.<sup>15</sup> Irrespective of the liquidity management model adopted, information must be readily available and current, supported by adequate Management Information Systems (MIS) for Sr. Managers and their Boards of Directors.<sup>16</sup>

17. One of the lessons of the present financial crisis is the importance of paying enhanced attention to liquidity issues. As mentioned in the latest BIS Annual Report:

“The crisis revealed once more that this view [substitutability between market and institutional financing] does not emphasize sufficiently the strong interdependencies between on-balance sheet and market-based intermediation. Institutions depend on markets for revenue generation, risk management and funding, while market functioning depends on institutions to provide market-making services, securities underwriting and lines of credit. These interdependencies between markets and institutions were showcased by the difficulties that institutions faced in funding their operations in illiquid markets and the problems created in the functioning of markets when the participating institutions were under stress. Heightened concern about counterparty risk led to a seizing-up of markets and undermined the liquidity of portfolios and firms’ funding strategies, causing large losses. An important message from the crisis is that the stability of both channels of financial intermediation is supported by a common capital base.” Large financial firms play an important role in both the on-balance sheet and market-based intermediation channels.<sup>17</sup> Such interaction between large financial institutions and markets gives rise to some externalities, including those resulting from liquidity shocks.

Ensuring financial stability means addressing externalities—costs that, through its actions, an institution imposes on others but does not bear itself. Two externalities are central to systemic risk: the first is joint failures of institutions resulting from their common exposures at a single point in time—common exposures because of shocks that come from outside the financial system or because of linkages among intermediaries. The shocks may take a variety of forms, including both credit and *liquidity shocks* and their interaction, while the linkages arise from the complex web of daily transactions. The second externality is what has come to be known as pro-cyclicality, the fact that, over time, the dynamics of the financial system and of the real economy reinforce each other, increasing the amplitude of booms and busts and undermining stability in both the financial sector and the real economy. Properly designed, each component of the framework—focusing on instruments, markets and institutions—can mitigate these sources of instability”.<sup>18</sup>

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<sup>14</sup> CEBS, ‘Second part of CEBS’S Technical Advice to the European Commission on Liquidity Risk Management’, June 17, 2008, pages 23-24.

<sup>15</sup> OSFI Canada, ‘Guideline’ (B-6) on the Subject of Liquidity’, December, 1995.

<sup>16</sup> The complexity of the bank will have a bearing on the design of the liquidity management system and tools used by each bank. There also implications for the management of collateral (encumbered or unencumbered) and across jurisdictions, which could prevent the quick sale or cross-border transfer of assets. [More later.](#)

<sup>17</sup> BIS, Annual Report 2009, page 51.

<sup>18</sup> BIS Annual Report 2009, page 125.

18. Adequate policy responses, including emergency liquidity provisions by central banks, helped to solve the liquidity crisis but not the structural insolvency problem (as discussed in Box 1

### **Box 1: ‘Central Bank as the lender of last resort’**

The 2007-2008 financial crisis exposed the scale of actions that central banks can implement in their function as ‘lenders of last resort’. In this role, central banks have at their disposal a variety of tools that should be tailored to address each type of liquidity shortage<sup>1</sup>.

The historical (Bagehot) argument<sup>2</sup> regarding central bank interventions states that central banks should lend to solvent banks without limit, against good collateral, at penalty rates. In recent literature<sup>3</sup>, *the role of central banks* is specified as:

- Guarantors of the entire economy and therefore having the capacity to tackle systemic liquidity risks. They are thus charged with preventing panic-induced collapses of the banking systems and minimizing the costs of bank runs.
- Shock absorbers, but not shock avoiders--by minimizing the secondary repercussions of shocks, averting contagion, spillover or domino effects. Thus, central bank interventions should be restricted to providing temporary liquidity, aimed at breaking the loop between market and funding liquidity risks.
- Temporary supporters of the financial systems, until the structural causes of liquidity risk can be dealt with. This is a very important argument, stressed by Roubini<sup>4</sup>.

Central bank liquidity interventions can act as a buffer against liquidity risk-- to halt the vicious circle between funding and market liquidity--but they cannot resolve banking insolvency (Though in some countries they have attempted to use long term funding by central bank as de facto capital/solvency support). Insolvency and credit crises lead to financial and economic distress that cannot be resolved just with liquidity injections by the LOLR. Moreover, in some jurisdictions (for example, Canada) central banks require a ‘solvency opinion’ by the supervisory agency prior to giving banks access to the LOLR facilities. Almost all central banks require a determination of solvency prior to giving access to the LOLR facilities. This determination is required from a third party when there is a separate banking supervisor. Due to asymmetric information, it is difficult for central banks to distinguish between insolvency and illiquidity and this can lead to adverse selection in lending. By rescuing undeserving institutions (insolvent banks), the central bank can be implicitly penalizing solvent but illiquid banks because it would increase their cost of funding.

Consequently, the *main risk* of central bank interventions is moral hazard. Providing liquidity during a credit crisis can induce moral hazard as it creates expectations of investors’ bailouts. Moreover, a misallocation of central bank liquidity can promote excessive risk-taking by banks and stimulate risk prone behavior by insolvent banks (‘gambling for resurrection’). For these reasons, in a financial crisis, effective supervision and regulation are the fundamental weapons against systemic risks. They can help central banks discern between illiquid and insolvent banks and can directly act against the causes of liquidity risk.

<sup>1/</sup> Cecchetti and Disyatat, *Central Bank Tools and Liquidity Shortages*, Bank for International Settlements, February 2009.

<sup>2/</sup> Bagehot, *Lombard street: A description of the money market*, 1873.

<sup>3/</sup> Nikolaou, *Liquidity (risk) concepts definitions and interactions*, European Central Bank, February 2009

<sup>4/</sup> Roubini, R. ‘Worse than LTCM: Not just a liquidity crisis; rather a credit crisis crunch’, *RGE Monitor*, August 2007.

## B. Liquidity Gaps

19. One of the main functions of banks is to provide “term-transformation” services to the economy, by taking shorter-term liabilities and transforming them into longer-term (not easy to trade) assets. However, this poses, by definition, liquidity and rollover risks (the risk that the depositors do not rollover their deposits) and, therefore, funding liquidity risk<sup>19</sup>. These risks are addressed by banks funding from one or more of the three pillars or nodes of liquidity discussed earlier. The funding liquidity risk can be minimized by holding liquid assets. But liquid assets generate no returns (cash assets) or low/lower returns (government securities) since they are riskless or low risk assets, as opposed to longer term (private) assets (loans and investments) which are more illiquid, riskier but yield higher returns. Banks always face a trade-off between holding liquid assets and using them to provide a liquidity cushion, or investing in less liquid but higher return longer term assets. These financial incentives have, over the past five decades, caused banks to dramatically reduce the share of liquid assets in total bank assets, drastically decreasing the margin of error. According to Goodhart (see Footnote 1), in the 1950s, British clearing banks typically held 30 percent of their total assets in very liquid form (treasury bonds and short-term government debt), while now they keep only one percent!

20. There are trade-offs between higher short-term earnings and prudent liquidity risk management. During ‘good times’, such trade-offs are often forgotten but they become too evident when the business cycle turns or market disruptions make it more difficult and costly to tap several potential sources of funding, including market funding sources (ex. Inter-bank lines of credit), or attract or retain deposits. Clearly, there are trade-offs between liquidity risks and banks’ profitability. Liquidity risk is certainly a major consequential risk—as many failed banks can attest—but it is also true that banks cannot afford to maintain enough excess liquidity to survive every conceivable worst case scenario.

21. Keeping in mind the structure of a bank’s balance sheet is important for understanding that liquidity gaps are intrinsic to the banking business, and funding liquidity risk is an endogenous factor that makes banks quite fragile. For this reason, risk and liquidity management are pivotal not only to the survival of individual banks but also to the stability of financial systems. Given these structural features, it is somewhat surprising that regulators pay more attention to capital than to liquidity. However, when examiners evaluate a bank’s liquidity, they focus their attention on the bank’s ability to generate funds **at a reasonable cost** to fund its operations. The point is that having access to funding, *per se*, is not indicative of a strong liquidity position.<sup>20</sup> Clearly, the analysis of a bank’s liquidity is complex since it is, as indicated above, a summary result of all its cashflow operations and it is a relative concept: availability of more liquid assets than liquid liabilities likely to leave the bank at a point in time.

22. As illustrated in Chart 3 below, when a bank has longer-term commitments compared to shorter-term deposits, immediate and future deficits occur, generating *liquidity gaps* which must be financed. The latter are more formally defined as the “projected differences between asset and liability time profiles”.<sup>21</sup> This analysis creates “buckets” of excesses (banks can lend

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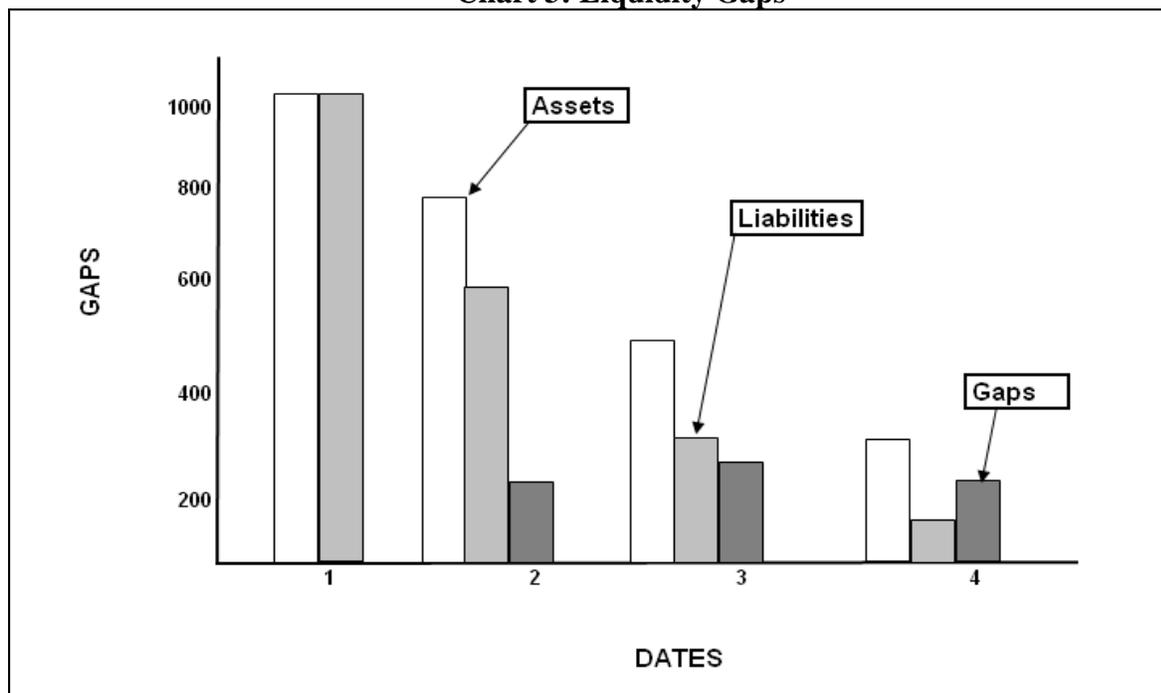
<sup>19</sup> Jenkinson, “Containing system-wide liquidity risks: some issues and challenges”, Bank of England, May 2009

<sup>20</sup> FDIC, ‘Director’s Corner’, San Francisco Region Director’s College Computer Based Training: Liquidity.

<sup>21</sup> Bessis, *Risk Management in Banking*, page 136.

excess liquidity) or deficits (banks must borrow) of liquidity for different time periods. As a result of the intrinsic fragility of banks, some safety net arrangements have been put in place to increase the public's confidence in the banks, particularly through the establishment of a safety net comprising access to the LOLR and to deposit insurance schemes protecting insured deposits up to prescribed limits.

**Chart 3: Liquidity Gaps**



Source: Bessis, Joel: *Risk Management in Banking*, Second Edition, 2002, Page 140

23. Liquidity gaps can be static (based on existing assets and liabilities) or dynamic (when the planned lending and borrowing activities are included), both giving rise to interest rate risk in fixed rate environments (more below).

### C. Funding Liquidity risk

24. Funding liquidity risk is viewed as an endemic risk of the financial system<sup>22</sup>. A bank, *per se*, is subject to liquidity risk; it is in its own nature to assume the possibility of funding liquidity risk due to the maturity mismatch of its assets and liabilities<sup>23</sup>. For the above reasons, analyzing funding requirements is critical, involving the construction of what is known as a 'maturity ladder' and the estimation of a cumulative excess or deficit of funds at selected maturity dates. In examining future expected cashflows, it is critical to distinguish between *contractual* and *behavioral* assumptions. In principle, assets or liabilities classified in the former category, and their corresponding in/out cashflows, should be more predictable. Behavioral assumptions must clearly distinguish between different **price and credit quality**

<sup>22</sup> Nikolaou, page 9

<sup>23</sup> It is further explained below in 'Liquidity gaps'

**sensitivities.** In general, wholesale funds are more credit-risk and interest rate sensitive hence more volatile than retail deposits but things can rapidly change if confidence is lost.

25. A critical aspect in liquidity risk management is the time horizon to be considered. Some supervisory agencies advice banks to consider two phases in determining the relevant time period (CEBS): (i) a short acute phase of stress (example, one to two weeks); and (ii) a longer period of less acute but more persistent stress (example, one to two months).<sup>24</sup> In other jurisdictions, banks must prepare detailed ‘funds flow analysis’ (for example, in the US). Beyond these time horizons, banks are normally required by supervisors to develop ‘what if’ scenarios (“scenario testing” by OSFI in Canada and “contingency funding plans” by the OCC in the US). This point is discussed in detail further down. An illustrative format for cashflow projections of up to three and six months from CEBS is shown in Charts 4 and 5.

**Chart 4: Up to 3 Months Cashflow Projections Format**

Date	Currency					
Flow Type	Position/Source	Up to 1 day	1 to 7 days	7 to 30 days	1 to 3 months	> 3 months
Cash Inflows						
	Sum of cash inflows					
Cash Outflows						
	Sum of cash outflows					
	Net Funding Gap					
	Cumulated Funding Gap					
Counterbalancing Capacity						
	Sum of counterbalancing capacity					
	Cumulated counterbalancing capacity					

Source: ECBS

<sup>24</sup> CEBS, page 13

**Chart 5: Up to 6 Months Cashflow Projections Format**

Credit Institute							
Date	Currency: EUR Mio (extra sheets for USD, CHF, GBP, YEN, other currencies in Euro equivalents)						
	Positions		up to 5 days	> 5 days ≤ 1 month	> 1 month ≤ 3 months	> 3 months ≤ 6 months	Comments
<b>Cash Inflows</b>	1.1	Loans due from credit institutions (interbank deposits)					
	1.2	Fixed issuances (short term, e.g. CP, CD, FRN) [incl. private placements] [conservative estimate]					
	1.3	Fixed issuances (long-term, e.g. bonds) [incl. private placements] [conservative estimate]					
	1.4	Expected issuances (short term, e.g. CP, CD, FRN) [incl. private placements] [conservative estimate]					
	1.5	Expected issuances (long term, e.g. bonds) [incl. private placements] [conservative estimate]					
	1.6	Expected inflow of wholesale deposits [conservative estimate]					
	1.7	Expected inflow of retail deposits [conservative estimate]					
	1.8	Expected loans due from non-banks					
	1.9	Other (e.g. reverse repos)					
	1.0.	<b>Sum Cash Inflows</b>					
<b>Cash Outflows</b>	2.1	Wholesale Funding					
	2.1.1.	Tender (due)					
	2.1.2.	Liabilities due to credit institutions (interbank deposits)					
	2.1.3.	Repos (due)					
	2.1.4.	Short-term paper due (e.g. CP, CD, FRN) [incl. private placements]					
	2.1.5.	Long-term paper due (e.g. bonds, incl. coupon) [incl. private placements]					
	2.1.6.	Planned advances to credit institutions (money market)					
	2.2.	Expected/unmodelled outflow of deposits (conservative estimate)					
	2.3.	Expected new loans					
	2.4.	Liquidity support of subsidiaries/branches (actually required)					
	2.5.	Other (e.g. payments for long-term liabilities, coupons)					
	2.6.	Expected calling of credit commitments (non-banks, conservative estimate, no stress)					
	2.7.	Expected calling of credit commitments (banks, conservative estimate, no stress)					
	2.8.	Expected financial investments					
	2.0.	<b>Sum Cash Outflows</b>					
	3.0.	<b>Net Funding Gap</b>					
	4.0.	<b>Cumulated Net Funding Gap</b>					
	5.0.	<b>Counterbalancing Capacity**</b>					
	5.1.	Tender/encumbered collateral					
	5.2.	Liquid Assets*** (Marketable Securities, excl. Collateral posted with CBO)					
	5.2.1.	Cash, excess reserves at CBOs					
	5.2.2.	AAA rated (average haircut: in %)					
	5.2.3.	AA rated (average haircut: in %)					
	5.2.4.	A rated (average haircut: in %)					
	5.2.5.	BBB rated (average haircut: in %)					
	5.2.6.	Others (average haircut: in %)					
	5.3.	Other assets assets available for collateralisation (e.g. credit claims and other liquid assets)					
	5.4.	Callable, committed creditlines					
	5.5.	Liquidity support received from holding company (binding commitment)****					
	6.0.	<b>Cumulated counterbalancing capacity</b>					<b>Self-assessment</b>
		* Consolidated/sub-consolidated level.					
		** NB: If the entire counterbalancing capacity can be liquidated within the first week, 5.0. will remain 0 for all other maturity buckets (non-cumulated).					
		*** How much liquidity can be generated in the respective maturity bucket under the current market situation (e.g. by repo or sale)?					
		**** Only applicable on if completed or sub-consolidated level.					

Source: ECBS

## D. Market Liquidity risk

26. *Market liquidity* is the ability of a banking institution operating in the market to raise funds at market prices. When a bank cannot access the market to sell its assets at fair prices and has to accept lower or ‘fire sale’ prices, it is experiencing market liquidity risk or distress. *Market liquidity risk*, therefore, refers to banks funding themselves in financial markets and possibly creating externalities for others (negative asset price spirals). Funding liquidity risk, on the other hand, affects only a single bank.

27. It is important to highlight the difference and linkages between funding liquidity risk and market liquidity risk for three main reasons:

- (i). First, it is important to understand that the source of liquidity risk can be the existence of asymmetric information which can create uncertainty about bank solvency or about the credit quality of structured products, as well as the existence of incomplete markets in which aggregate risk cannot be hedged away. The roots of a bank liquidity crisis can be varied--resulting from fundamental worries about its solvency or from concerns about its business model or reputation that provoke a loss of confidence by depositors that could even end up in a bank run<sup>25</sup>. The key is to assess whether the cause behind the liquidity crisis is limited to a single bank problem or is masking a market/systemic liquidity issue, as it happened in the earlier phases of the 2007-2008 crisis.
- (ii) The second reason is to analyze the *risk propagation channels* that cause a bank-specific liquidity risk to evolve into market liquidity risk, spreading the distress into financial markets. A bank liquidity problem, *regardless of* the cause(s) that led to it, can be propagated in the following markets<sup>26</sup>:
- *Interbank markets*: via banks' payment systems, balance sheet linkages or cross holdings of liabilities across banks. It is, therefore, important to analyze how interconnected or networked banks are in the financial system, since the propagation mechanisms from individual illiquidity can quickly become market illiquidity and affect all banks.<sup>27</sup>
  - *Money markets*: via flight to quality. If market confidence is diminishing, investors start shunning the commercial paper of corporate borrowers in favor of safer short-term government debt, thus reducing money market liquidity and private sector credit.
  - *Asset markets*: via liquidation of assets at "fire-sale" prices. When the interbank market is distressed, banks may seek liquidity by selling assets, further pushing asset prices downwards. This creates distortions in the financial system, hampering a source of liquidity for banks and weakening the banks' equity base (as mark-to-market valuation rules translate price declines into direct losses). The problem can have worse repercussions if the assets are highly illiquid and possibly subject to steep price declines, as occurred with some securitized products.
- (iii) The third reason this is important is for designing policy responses--according to either a single bank liquidity crisis with possible contagion effects, or a systemic liquidity crunch with repercussions for the financial system as a whole. Funding liquidity risk in a single bank is not a big concern for policy makers since the liquidity crisis can be monitored and, in principle, solved by the risk management team of the bank in the market or going to the LOLR facilities of

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<sup>25</sup> The triggers or events that raise liquidity risks are discussed in Section 1

<sup>26</sup> Nikolaou, pages 28-29

<sup>27</sup> A rich literature on "network effects" and the implications for banking system's analysis and policy is beginning to emerge (see Brunnermeier).

the central bank. Central banks play a major role when the funding liquidity risk is transmitted to the whole financial system and policy actions are needed to prevent or contain spillover effects.

28. The interaction between funding and market illiquidity is key to understanding how systemic financial crises play out. The crisis of 2007-2008 exposed the linkages of these two risks and showed that the interaction of the two can have consequences that reach beyond an individual institution. The prevalence of securitization made the connection between funding liquidity risk and market liquidity risk tighter. Thus, the failure of one bank unveiled a systemic problem (insolvency) and threatened a potential crash of the whole banking system, because the banking system was highly dependent on market liquidity which was previously taken for granted (an illustration of the dangers of “linear thinking” and a classic case of fallacy of composition by market players and policy makers).

**Recommendation 1:** The Financial Sector Assessment Program (FSAPs) needs to identify and focus more on liquidity risks in general, getting a better sense of the term-transformation risks assumed by systemically important banks, the quality of liquid assets and liabilities, and their relative weights, as well as the liquidity trends observed in the market (ex., shrinking share of liquid assets in total bank assets), undertake peer comparisons among systemically important banks and foresee liquidity stress scenarios (particularly in countries with currency boards or highly eurorized or dollarized financial systems).

### E. Central Bank Liquidity

29. *Central Bank liquidity* is the ability of a central bank to supply the liquidity needed to the financial system, which is measured as the creation of base money from the central bank. The central bank’s liquidity results from the bank managing its assets in accordance to its monetary policy stance<sup>28</sup>. The traditional means by which central banks provided liquidity into the financial systems was through their open market operations, which appear in the assets side of their balance sheet. More recently, the use of ‘quantitative easing’ by the US Fed has led to direct interventions in the market.

30.

**Chart 6: Simplified Central Bank Balance Sheet**

Assets	Liabilities
Open Market Operations	Currency
Loans to banks	Bank deposits
Government securities	Reserves

31. *Central Bank liquidity risk* is not really discussed in the financial literature because it is generally believed that central bank liquidity risk does not exist and central banks are always able to supply base money (can never be illiquid). However, it is possible that in periods of

<sup>28</sup> Nikolaou, op cit, page 16

hyperinflation or during an exchange rate crisis there is no demand for domestic currency and, therefore, the supply of base money from the central bank has no takers (flight to stronger currencies).

32. There are other risks which affect market liquidity, which often require central bank interventions, including: (i) counterparty credit risks when banks do not trust the ability of other parties to transactions to honor their commitments; (ii) collateral risks when the quality/value of an asset backing an obligation is unknown or subject to great volatility, exposing central banks to potential losses in the case of parties defaulting; and (iii) signaling or reputational risks when commercial banks are afraid of going to the lender-of-last-resort LOLR facilities for fear of the stigma attached to such action. For cross-border commercial banks managing multiple-currency liquidity, access to multiple LOLR facilities and collateral in different jurisdictions has made even more challenging managing liquidity for commercial banks in different “pockets”. In other cases when the country has a currency board central banks can only provide limited liquidity support to their banks. In highly dollarized banking systems the central bank might also be unable to cover large deposit runs. All these risks impinge on the market liquidity risk in the system.

## **F. Governance and Liquidity Management**

33. Governance is absolutely critical for managing all risks in a banking organization, a requirement that is emphasized by all supervisory agencies. The OCC states in its Handbooks that:

“Given the importance of liquidity to the viability of the bank, the board must be kept informed about the bank’s liquidity position and associated risks. Management should inform the board periodically of the bank’s liquidity exposure and its contingency funding plans. Depending on the circumstances, the board may need to receive frequent updates about the plan’s development and implementation”<sup>29</sup>. More precisely, the OCC imposes detailed requirements on banks’ boards and senior managers, demanding:

- An informed board, capable management, and appropriate staffing, able to understand the nature and level of liquidity risk assumed by the bank and the tools used to manage that risk;
- That the bank's funding strategy and its implementation be consistent with their expressed risk tolerance;
- The selection of senior managers who will have the authority and responsibility to manage liquidity risks;
- The ability to monitor the bank's performance and overall liquidity risk profile;
- That liquidity risk is identified, measured, monitored, and controlled by senior management overseeing the daily and long-term management of liquidity risk.
- That senior managers should: (i) develop and implement procedures and practices that translate the board's goals, objectives, and risk tolerances into operating standards that are well understood by bank personnel and consistent with the board's intent; (ii) adhere to the lines of authority and responsibility that the board has

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<sup>29</sup> OCC Handbook, page 52.

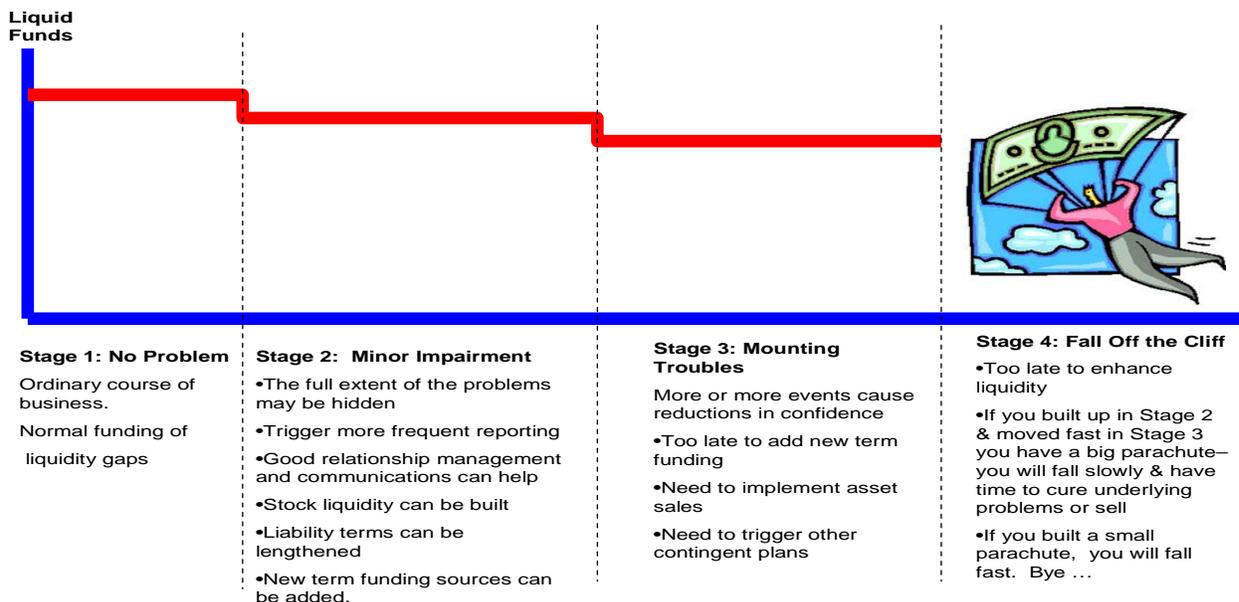
established for managing liquidity risk; (iii) oversee the implementation and maintenance of management information and other systems that identify, measure, monitor, and control the bank's liquidity risk; and (iv) establish effective internal controls over the liquidity risk management process.

## G. Stages of Funding Crisis

34. Anticipating as soon as signs of deterioration of liquidity appear, management must take immediate remedial action under certain constraints. However, managers are also subject to the requirements of their objective function, which is to maximize the bank's return to shareholders (within certain risk tolerance). For the latter reason, the initial actions to restore liquidity (Stages 1 and 2 in Chart 7, must attempt to minimize the negative impact on earnings. From Stage 3 onwards, the bank's management is under increasing pressure to take actions which privilege liquidity acquisition over short-term return considerations. Stage 4 indicates that desperate management measures are required as liquidity reserves can dry up very fast, particularly if there is distrust in the bank. Possible supervisory corrective actions would be triggered and if the bank's franchise is still valuable and the bank can be rescued, a supervisory approved plan should be put in place, including some LOLR liquidity support (if the bank still has franchise value and high quality collateral).

Chart 7:

## Stages of a Funding Crisis



Source: Matz, Leonard, 'Liquidity Risk--New Lessons and Old Lessons', *Sungard, Bancwire Risk Monthly*, September 2007.

## SECTION 2: LIQUIDITY RISK ASSESSMENT

35. Combining the definitions given in the introduction to funding liquidity risk and market liquidity risk, it can be concluded that liquidity risk is the risk of not being able to raise funds without excess costs to meet the bank's obligations when due.

36. The developments in the financial markets and the turmoil of the 2007-2008 financial crisis highlights the need for banks to have adequate liquidity risk management that defines adequate tools to identify, measure, monitor, and manage liquidity risk under different and stressed market conditions. Thus, in order for a bank to have successful liquidity risk management, it is crucial to develop and implement *effective risk measurement tools* since there is not a single measure that comprehensively quantifies liquidity risk. Assessment of liquidity risk involves a mix of tools and metrics that can evaluate the full range of liquidity risks a bank may face. It is vital that the tools allow metrics to be calculated under normal conditions (business-as-usual) and under stressed conditions, and indicators that not only be static measures but also prospective (forward looking) dynamic measures.

### 1.1 Liquidity factors

37. There is a list of factors that concern liquidity position, which senior management needs to look at on an ongoing basis in order to assess liquidity risk by business lines and activities:

## Box 2: “Bank Runs, Deposit Insurance and Liquidity”<sup>1/</sup>

Economic literature has tried to explain the existence of banks, struggling with two important questions: (i) Why is there a demand for bank (sight) deposit contracts when depositors know that there is a small but still positive probability of bank runs which are likely to result in a partial or total loss of wealth if banks are forced into ‘fire sale’ liquidation? (ii) Why do banks issue bank (sight) deposit contracts while engaging in the transformation of liquid deposits into less or illiquid assets, knowing that this term-transformation leaves banks vulnerable to runs and the risk of failure?.

The classic paper by Diamond and Dybvig provides an answer to these two questions, demonstrating that: (i) Bank deposit contracts can lead to a superior allocation of wealth and resources for depositors and banks, **provided confidence is maintained**. They demonstrate that there are multiple equilibria, with different levels of confidence, including the undesirable state of a bank run. As they indicate, the “illiquidity of assets provides the rationale both for the existence of banks and for their vulnerability to runs” (p. 403). If the optimal risk-sharing among depositors in normal times is disrupted by a run on the bank--given the sequential nature of bank deposit contracts (first-come, first-served)--depositors have the incentive to withdraw their money as fast as they can under the expectation that late comers will be faced with partial or total loss. This outcome results from the expectation that the face value of deposits will be larger than the liquidation value of the bank’s assets if bank owners are forced to liquidate assets in a rush. Under these circumstances, the only “feasible contract” that allows banks both to prevent runs and to provide optimal risk sharing is to suspend the convertibility of deposits (as witnessed during the Argentina crisis of 2001 with the infamous “corralito”).

If the bank is solvent, the suspension of convertibility--when withdrawals are excessive--removes the option of at least some depositors withdrawing funds and, in that way, restoring a ‘good equilibrium’. A second mechanism which can be used to achieve the same result is for the government to offer a deposit guarantee funded by the power of taxation. To the extent that this insurance offers a credible promise of no-loss, it will not need to be fulfilled and a ‘bad equilibrium’ can be avoided. The third option to stabilize bank deposit contracts is to design a lender of last resort facility, able to provide the same guarantee of the deposit insurance system. The fourth intervention (although not a direct financial tool) of a preventive nature has to do with a regulatory regime to contain liquidity risks.

In other words, banks are intrinsically vulnerable to shifts in expectations. Once confidence is lost and, in the absence of suspension of convertibility of deposits into cash, fire sales of bank assets become a self fulfilling prophecy for bank insolvency, resulting in losses for depositors.

Diamond and Dybvig’s approach assumes that the liquidity crisis results from a shift in expectations “which could depend on almost anything”, and it is not related only to the bad quality or loss of the underlying assets. So the fragility of the ‘good equilibrium’ is such that anything that causes depositors to anticipate a run will lead to a run. In spite of this fragility, bank deposit contracts are demanded as a form of insurance that allows depositors to request their deposits to finance their consumption as needed. The liquidity demand is driven by uncertainty and/or the presence of asymmetric information.

<sup>1/</sup> Douglas W. Diamond and Philip H. Dybvig, *Journal of Political Economy*, 1983, Vol.91, no.3.

38. ***Volume and composition of balance sheet***<sup>30</sup>. On the liability side of the balance sheet, bank analysts should look at deposits: types, amounts, concentration, possibility of withdrawals (contractual versus behavioral); and inter-bank lines of credit and loans: size, maturities, other restrictive covenants, and rollover possibilities. On the asset side of the balance sheet a bank

<sup>30</sup> Banque de France, *Financial Stability Review*, “Liquidity Regulation and the lender of last resort”, February 2008

analyst should look at the health of the current loans, liquidity of all types of assets, and uncertainty of new requests for loans.

- ***Quality of assets and ability to undertake maturity transformation***<sup>31</sup>. This is an important factor to consider because the more liquid the assets the bank holds, the less the maturity transformation that is required (less rollover risk), and the less liquidity provision is needed, but the trade off is that most likely the bank's profitability is also low (very risk averse bank).
- ***Volume and composition of the bank off-balance sheet accounts***. After the credit crisis of 2007-2008, special attention should be given to derivative products, off-balance sheet conduits, structured investment vehicles, guarantees, etc.. Illiquid assets, such as securitized products, imply that the price of the assets varies, reflecting marked to market valuation accounting<sup>32</sup>. The liquidity risk arises because banks tend not to establish the required liquidity provisions for covering these risks beforehand, relying excessively on the assets liquidation/realization prices to obtain liquidity at a certain point. It is crucial, therefore, that banks monitor and control the volume of their positions on derivatives markets and be conservative regarding their ability to sell illiquid assets at market prices. As mentioned before, there is a 'collective action problem' or a 'fallacy of composition', in the sense that individual bank actions could result in downward, self-fulfilling, asset price spirals that are very detrimental to all the participants if all banks simultaneously try to liquidate their assets.

Note that both securitizations and off balance sheet activities can either supply or use liquidity, depending on the transaction and the level of interest rates at the time. Legally binding loan commitments and potential higher rates of draw downs of credit facilities - when there is a concern regarding the individual bank or generalized market problems - could prove to be very risky for banks. Liquidity managers should then carefully assess how these activities will affect the bank's cash flows and liquidity risk on a daily basis, using a stressed scenario where unexpected events could occur.

- ***Concentration of deposits or funds***<sup>33</sup>. Funding concentration exists when a single factor can cause a significant and sudden withdrawal of funds. The liability concentration depends on the bank and its balance sheet structure. Concentrations are very credit sensitive, although collateralization may mitigate the sensitivity, depending on the quality and reliability of the collateral. Concentration of funding sources can have a significant impact on liquidity risk, as well as systemic implications for the entire banking system. To monitor concentration, management should review reports of large funds providers and set customer liability concentration caps to help prevent the bank from relying excessively on too few providers or funding sources. It can also define market liability concentration limits by segment (for example, foreign banks, money markets funds), instrument (for example, Fed funds, CDs) and geographic distribution.

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<sup>31</sup> Banque de France, Financial Stability Review "Liquidity Risk Management", February 2008

<sup>32</sup> Banque de France, Financial Stability Review, "Should financial institutions mark-to-market?", February 2008

<sup>33</sup> OCC, Handbook, page 22

- **Types of funds providers.**<sup>34</sup> This is important in order to distinguish the liquidity risk level that each type of creditor poses to the bank.
  - *Retail depositors* are primarily consumers and small businesses. They are almost always federally insured and the customers value their personal relationships with the bank. Historically, these deposits are less credit quality and interest rate sensitive but, with recent market developments and structural changes, bank management can no longer assume that all the retail customers are insensitive to credit risk and interest rates. The degree of sensitivity depends on several factors, such as the customer's financial expertise, previous experiences, the bank's geographic location, and investment alternatives. It is, therefore, crucial for liquidity managers to assess the credit and interest rate sensitivity (elasticity) of the bank's retail deposit funding base and encourage close customer contact.
  - *Wholesale funds providers* are typically large commercial and industrial corporations, other financial institutions and brokers, government units, or wealthy individuals. Wholesale funds transactions are typically not insured and, as a result, they are generally very credit risk and interest sensitive, posing greater liquidity risk to the bank. The list of wholesale fund providers--ranked by lowest risk tolerance (highest credit sensitivity), based on the OCC's experience is:
    - Money market funds
    - Trust funds
    - Pension funds
    - Money market broker/dealers' own accounts
    - Multinational corporations
    - Government agencies and corporations
    - Insurance companies
    - Regional banks
    - Foreign banks
    - Medium to small corporations
    - Community banks
    - Large domestic banks
    - Individuals
  - *Institutional funds providers* and other market based sources are significantly more price and credit sensitive than retail customers<sup>35</sup>. They are less willing to provide funds to banks facing real or perceived financial difficulties. Additionally, reliance on market funding sources makes banks more susceptible to general or regional economic conditions.

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<sup>34</sup> OCC, Handbook, pages 14-16

<sup>35</sup> OCC, 'An Examiner's Guide to Problem Bank Identification, Rehabilitation and Resolution, Chapter III: Resolving Liquidity problems', January 2001, page 49

- *Foreign creditors.* Foreign depositors' behavior may differ from that of domestic depositors because of differences in the former's credit and exchange rate sensitivities and their perceptions of the bank's financial stability. Liquidity managers should evaluate the cash flows of foreign deposit accounts separately from domestic accounts. The analysis should also distinguish between retail and wholesale foreign deposits.
- *Net funding gaps*, with emphasis on short-term exposures.
- *Contractual cash in-flows and outflows* (the latter was particularly important in the crisis of 2007-2008);
- *Cash flows and sources and uses of liquidity.* The analysis should not only be retrospective but also prospective, forecasting liquidity needs under different scenarios and under sound assumptions to provide a reasonable basis for planning.
- *Reputation of the institution in the local market* (overall at a particular point in time), as a proxy for the ease of access to money markets (measured as spread over US Treasury securities).
- *Relative cost of funding* (access on a cost-effective basis as compared with selected peers).
- *The functioning of the correspondent, custodian and settlement systems*<sup>36</sup>. Banks should actively manage their intraday liquidity positions, taking into account that a large volume of payments go through these systems. Unexpected changes in their flows can have a great impact on the liquidity position and needs of a bank.
- *Collateral management*<sup>37</sup> look at the policies in place, to identify and estimate the bank's collateral needs and the collateral resources available to meet immediate operational needs in the different jurisdictions where the bank operates (cross-border).
- *Netting agreements*<sup>38</sup> that reduce credit and liquidity risk are important because they reduce the intraday liquidity needs, grouping all the positions with different participants to a single net position
- *Opinion of rating agencies* can force certain type of investors and depositors to flee.
- *Assessment of the Supervisory Agency* (CAMEL ratings or equivalent) regarding the general health of the bank.

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<sup>36</sup> CEBS, page 25

<sup>37</sup> CEBS, page 9

<sup>38</sup> CEBS, page 36

- *Quality of contingency liquidity plans.*

## 1.2 Liquidity Indicators

39. The starting point for the measurement of liquidity comes from *comprehensive analysis of the cashflows* of a bank. This analysis should incorporate the projected cashflows and liquidity implications from all material assets, liabilities, off balance sheet positions, and other activities of the bank (see Annex II).

40. Different metrics and indicators are derived from the cashflow analysis and it is, therefore, a critical tool for adequately managing liquidity risk. The cashflow analysis should take into account the following<sup>39</sup>:

- The assumptions should be reasonable and appropriate. Given the critical role of the assumptions in projecting future cashflows, it is crucial that they are conservative, critically argued, documented, reviewed, and adjusted according to specific bank conditions or market circumstances.
- Principal and interest cashflows should be incorporated under different scenarios over time.
- Pro forma cashflow statements should be forward looking and serve to identify liquidity mismatches and liquidity gaps
- The cashflow projections should be performed over incremental time periods to identify projected and contingent cashflows and calculate the cumulative net excess or shortfall over the projected timeframe.
- When projecting cashflows<sup>40</sup>, management should estimate *customer behavior* rather than rely expressly on *contractual maturities*. In addition, it should take into account that some cashflows may be seasonal or cyclical and, therefore, may be increases or decreases in liquidity in these phases.
- If the cashflow analysis is presented on a consolidated basis, bank branches or the parent company should be able to provide their own cashflow analyses (idem for unconsolidated and consolidated groups).

41. Liquidity analysis requires an integrated review of all relevant cashflows, including any inflows and outflows occurring outside the bank. Comprehensive liquidity management should analyze entity and consolidated liquidity positions of any significant bank affiliates in a multibank holding company, as well as entity liquidity of the parent company and nonbank subsidiaries.

42. The academic literature<sup>41</sup> and bank analysts recommend a number of **liquidity indicators** banks can use to determine their liquidity risks,, including the following:

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<sup>39</sup> Basel Committee on Banking Supervision, 'Principles for Sound Liquidity Risk Management and Supervision', June 2008, page 11

<sup>40</sup> OCC, Handbook, page 41

<sup>41</sup> Anthony Saunders, *Financial Institutions Management: A Modern Perspective*, Second Edition, Irwin-McGraw-Hill, 1997, pages 329-332.

- **Sources and uses of liquidity on a daily basis.** The usual technique is to look at **liquidity gaps**, in a static or dynamic way. Gap time profiles are developed, mapping excesses or deficits of funds over time, starting from the maturity schedules in the actual balance sheet of the bank. Gaps generate liquidity risk since banks might not be able to raise funds without excess costs. Moreover, there is an upper limit or boundary, to determine bank creditors gap size tolerance, depending on the bank's size, credit standing, and market liquidity at each point in time.
- **The 'Financing Gap' (G)** is broadly defined as the difference between [Average Loans - Average Deposits]. If  $G > 0$ , the bank must seek sufficient funds to close the gap and make  $G = 0$ . Banks have three primary sources of liquidity: (i) cash and cash-type assets (which can be liquidated without loss and at low cost, for example, T-Bills); (ii) maximum short-term borrowing according to credit limits; and (iii) excess reserve requirements or funds in excess of regulatory liquidity ratios the bank might have. A rising financing gap  $G$  might indicate future liquidity problems if core deposits start falling, making the bank increasingly dependent on external market borrowing (wholesale funds) to sustain a given volume of lending, at an unknown and possibly higher cost of funds. The latter is often seen as the ratio of (**core deposits/loans**). A related indicator we follow closely to look at a potential banking system external vulnerability is the **loan to deposit ratio (L/D)**. If this ratio is for example two, it means that 60 percent of the loans in the system are funding by borrowing abroad (in the market or from the parent bank), making the system very vulnerable to rollover risks as it happen early in the crisis in Kazakhstan and the Baltic Countries.

43. The posture the asset-liability management (ALM) function takes regarding the funding of the liquidity gaps has to do with the bankers' expectations as to the future behavior of interest rates. Keeping a balance sheet under-funded makes sense if interest rates are expected to fall and the bank expects to face lower funding costs in the future. Over-funding the balance sheet implies expectation of rising interest rates.

44. There are two perspectives to the liquidity gap: the static and the dynamic:

- The **static liquidity gap** gives the current liquidity position of a bank and indicates the imbalance in the cashflows generated by the maturities of the assets and liabilities. It is called static because it does not incorporate expected variations in the balance sheet elements but gives a point in time snapshot of the liquidity position.

In this indicator, therefore, assets or liabilities that do not have a maturity date are not included--such as, equities, funds or real estate. Therefore, the static liquidity gap requires the identification of balance sheet elements with a maturity date and determining the expected cash flows of each element.

Two types of static liquidity gaps can be calculated:

- **Simple static liquidity gap**--as the difference between the cashflows (CF) from the assets and the cashflows from the liabilities for each term.  

$$\text{GAP simple at } t = \text{CF (Assets)}_t - \text{CF (Liabilities)}_t$$
- **Accumulated static liquidity gap**--as the indicator of the accumulated liquidity from the beginning of the term.  

$$\text{GAP accumulated} = \sum \text{CF (Assets)} - \sum \text{CF (Liabilities)}$$
- Due to the limitations of the static liquidity gap, the **dynamic liquidity gap** incorporates ‘dynamism’ from the variations in the interest rates and from the behavior of each division of the bank. Therefore, the dynamic liquidity gap uses the same formulas as the static gap; the difference between the two comes from the fact that the dynamic liquidity gaps give the strategic liquidity position based on the expected cashflows from the businesses of the entity under different stress scenarios.

The objective of the dynamic liquidity gap is to offer a dynamic projection of the liquidity indicators under normal circumstances and under stress scenarios, in order to identify and quantify the costs, risks and benefits of the liquidity generated by each business unit.

Dynamic liquidity gaps add to the amortization profile of existing assets and liabilities the projected loans and deposits the bank expects to grant or attract, respectively, over a certain time horizon.<sup>42</sup> A recommended additional indicator reflects the ‘**cumulative maturity mismatches**’ (that is, the cumulative net funding requirements as a percentage of total liabilities) over particular time intervals--daily, weekly and monthly. An important *caveat* is that the bank should have a conservative view of the marketability of liquid assets, with a prudent ‘hair cut’ or discount to take into account price volatility of assets.<sup>43</sup> Large price swings can occur when “crowded trades” are unwounded i.e.; when many traders attempt to get out of identical positions in unison.<sup>44</sup>

An obvious difficulty results from the fact that existing balances are known, but not necessarily their maturity. Most assets and liabilities have contractual repayments schedules, but many others do not. Demand deposits are liabilities without maturity, while assets might change as committed lines of credit--including those of credit cards--are used without notice. Finally, to make things more complex, prepayment options are embedded in some loans (mortgages). Bankers must understand these contingencies to determine, measure, and manage their liquidity risks.

- **Liquidity ratios:**

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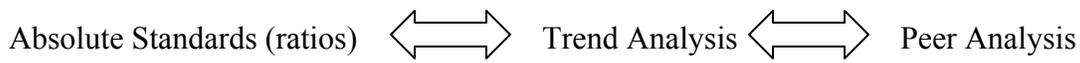
<sup>42</sup> Joel Bessis, *Risk Management in Banking*, Second Edition, Wiley & Sons, 2002. See Section 5, on Asset-Liability Management, pages, 131-150.

<sup>43</sup> Basel Committee on Banking Supervision, ‘Sound Practices for Managing Liquidity of Banking Organizations’, Basel, February 2000, page 5

<sup>44</sup> Brunnermeier, op. cit., page 23.

45. Balance sheet ratios *alone* should not be used to measure liquidity risks since they fail to properly capture<sup>45</sup>: expected funding needs or commitments, available borrowing sources, and banks' ability to convert assets to cash. They are point-in-time indicators but not reliable risk measures, hence they should not be relied upon solely but used in conjunction with dynamic forward-looking tools such as cashflow reports or sources and uses of funds analysis. They should always be used in conjunction with more qualitative information about borrowing capacity, such as the likelihood of increased requests for early withdrawals, decreases in credit lines, transaction sizes, and concentration of assets, or shortening of term funds available to the bank. These exercises should also be stressed not to assume that ample liquidity is a given.

46. Moody's Analytics<sup>46</sup> recommends a balanced approach to put into perspective ratio analysis, looking a trilogy:



Some additional useful balance sheet ratios are<sup>47</sup>:

- **(Short-term liquid assets/short-term liquid liabilities):** ideally greater than one (after a discount of asset prices to reflect potential volatility, although most likely these assets trade near par in ready markets even in periods of stress).
- **(Total loans/ total deposits ratio),** this ratio has been particularly important in the crisis countries in Europe and Central Asia where ratios in excess of two in countries like Kazakhstan and Latvia signaled great vulnerability to rollover and foreign exchange risks as it showed that more half of domestic FX loans were being funded with FX external borrowing with large maturity gaps.
- **(Borrowed Funds/total assets ratio) or (Market Funds – Liquid Assets)/ Total Assets** to assess market funds reliance.
- **(Liquid assets – Short term liabilities):** basic surplus measures the cushion that liquid assets provide over immediate funding needs.
- **(Total and net overnight funding volume/total assets):** this ratio shows what proportion of funding is purchased in the overnight funding markets.
- **(Loan commitments/outstanding loans ratio)**
- **Liquid assets ratio: (Liquid assets/short-term assets)**
- **Leverage ratio: (total assets/total equity),** this ratio is really a component of the return on equity ratio (ROE) which can be decomposed as the product of the return on assets (ROA) times the leverage ratio (ROE=ROA x Leverage).
- **(Total loans/ total equity capital)**

<sup>45</sup> Office of Comptroller of the Currency, 'The Challenges of Sound Liquidity Risk Management: OCC Expectations and Policy for Community Banks', May 2001

<sup>46</sup> Moody's Analytics, "Restructuring Financial Institutions: Training Course", World Bank, October 26-29, 2009.

<sup>47</sup> OCC, Handbook, page 62

If the first two ratios above are relatively high, the bank shows high dependence/reliance on short-term money market borrowings rather than on own sources of funding (like core deposits). If the third ratio is also high and it implies contractual commitments to disburse funds, the bank is also exposed to higher liquidity risks on the asset side.

As mentioned earlier, it is important to be cautious about balance sheet indicators which can be backward looking and can potentially give a false sense of security--implicitly suggesting that 'the future is likely to be like the past' when it is obvious that there are many surprises and 'innovations' around the corner. Certainly, it would be extremely risky to drive a car while just looking through the back mirror! For this reason, a lot of effort must be put into developing *prospective* (as opposed to retrospective) approaches to liquidity requirements and management, while combining the absolute ratio analysis with a review of liquidity trends and peer analysis as suggested above.

- *A useful, but hard to estimate, forward looking bounded liquidity ratio:  $1.0 < [\text{Projected cash-in-flows/Projected cash-outflow}] \text{ Bucket } i < 1.20$*  (or pre-defined 'comfort' level).
- *Liquidity Index (I)* - which compares 'fire sale' asset prices (Pf) with 'fair market prices' (Pm) to capture the degree of liquidity of a given asset as a function of how different these prices are.  $I = \sum [(w_i) (P_f/P_m)]$ , where (wi) is the percentage of each asset in the bank's portfolio and the  $\sum (w_i) = 1$ .

47. The above list of indicators is not exhaustive and, as usual, they should be used with care. However, it points at the importance of banks having careful liquidity planning and a good understanding of the volatility of the different items in the bank's balance sheet, particularly good probabilistic models of the degree of stability of different types of deposits.

**Recommendation 2:** FSAPs should look more closely at the current position and especially to trends (3-5 years) and peer comparisons of changes in liquidity of the largest (5) banking institutions. At least the following ratios should be looked at: (i) Loans to Deposits (L/D); (ii) Short-term Liabilities to Short-term Assets (STL/STA); (iii) [(Market Funds- Liquid Assets)/ Total Assets]; (iv) Cash-in-hand; and (v) Wholesale Funds to Total Liabilities; as recommended by the OCC to its bank examiners. A more demanding test would be to require larger banks to provide their liquidity gap profiles (in different currencies), concentration of deposits, flow of funds analyses, and contingency funding plans (CFP). It is highly recommended to look at the CFP for the largest bank in the system.

**Chart 8: Best Practice Liquidity Risk Measurement**

Recommended Tools	Metrics, Decomposition and Liquidity Stress-Testing
<p><b>Multi-period cash flow projections</b></p>	<p><b>Projected Cashflows:</b></p> <ol style="list-style-type: none"> <li>1. Base case projection</li> <li>2. Large &amp; Wholesaler Banks: daily time buckets (first projected week), 3 weekly time buckets, 11 monthly buckets</li> <li>3. Smaller and Retail Banks: monthly buckets</li> </ol> <p><b>Decomposition:</b></p> <ol style="list-style-type: none"> <li>1. Contractual versus behavior-driven cash in/out flows (both on and off balance sheet).</li> <li>2. Non-discretionary cashflows versus assumed new borrowings, and loans and securities sales (remedial actions).</li> </ol> <p><b>Stress Levels:</b> mild (with new loan commitments), serious, and worst-case scenarios.</p>
<p><b>Quantification of the bank’s liquidity reserve</b> (that is, pool of assets ready for sale in the event of a liquidity crisis)</p>	<p><b>Criteria to Assess Asset Marketability:</b></p> <ul style="list-style-type: none"> <li>• (Position of asset category held by the bank/volume of asset category traded)</li> <li>• Turnover ratio for asset category;</li> <li>• Credit quality of asset;</li> <li>• Tenor and interest rate of asset;</li> <li>• Market conditions at point of sale.</li> </ul> <p><b>Metric:</b></p> <ul style="list-style-type: none"> <li>• (Net funding Requirement/Liquid Assets)= Survival Horizon.</li> </ul>
<p><b>Key risk indicators and trends (early warning)</b></p>	<p><b>Differentiate by type of bank:</b> Wholesaler bank (more vulnerable) and Retail bank (with deposits largely insured).</p> <p><b>Metrics for defined time horizon:</b></p> <ul style="list-style-type: none"> <li>• Forecast of funding requirements (specific bank and banking system);</li> <li>• Forecast of liquid assets (bank and market);</li> <li>• Dependence on short-term borrowings</li> <li>• Changes in credit quality (NPLs and delinquency);</li> <li>• Operational risk loss;</li> <li>• Spreads for purchase funds compared to peers;</li> </ul> <p>Position of the economy in the business cycle.</p>

Source: Matz, Leonard, ‘Liquidity Risk- New Lessons and Old Lessons’, Sungard, Bancwire Risk Monthly, September 2007.1.3 Internal Warning Triggers

48. It is incumbent upon senior management to implement procedures to identify the emergence of liquidity triggers events and to measure how these factors can cause deterioration in the liquidity facilities. Some of the early **internal** warning triggers for banks include<sup>48</sup>:

- *Increasing levels of delinquent and non-accrual loans* which might be ‘hidden’ (through ‘ever greening’), under-reported and seriously under provisioned.
- *Adverse trend in overnight and short-term net funds borrowed*, reflecting poor treasury operations, deteriorating bank reputation in the market or vulnerabilities in the financing structure of the bank when market conditions tightened.
- *Adverse trends in liability concentration from volatile sources*. Increased reliance on market funding sources leaves institutions more exposed to the price and credit sensitivities of major fund providers, increasing roll over risk, making them more vulnerable to sudden liquidity shortages;
- *Adverse trend in the size of liquid assets* indicates that the bank is approaching a danger zone. Liquid assets are usually defined as: cash, near cash; assets that can be liquidated immediately at no loss (T-Bills and other government paper in deep markets—not in all markets), unconditional or contractual lines of credit available to a bank and normal access to money markets at reasonable cost, and assets that can easily be securitized. However, the ‘normality’ of market conditions and the ‘ease of access’ to liquidity cannot be taken for granted, in view of changes in the business cycle, monetary policy, and other macroeconomic policies, and also due to bank-specific factors. Moreover, the “new normal” after the crisis will not be the same as the old “equilibrium” .;
- *Deteriorating overall cash flow*. As mentioned earlier, liquidity shocks can occur from the asset or the liability side, or both, as liquidity is eventually a residual of the bank’s operations and many factors can impact it. Therefore, excessive credit expansion might be a prime source of deteriorating bank liquidity. The primacy of cashflow over other variables cannot be emphasized enough, since sustainable liquidity is the key source of survival for a bank.
- *Declining earnings*. Again, this is important as a symptom of problems in different parts of a bank’s operations—from strategy to management to other fundamentals.
- *Increasing contingent liabilities*. It is crucial to identify, measure, and monitor the potential cashflows coming from contingent liabilities, as they can have a big impact on the liquidity position of the bank.
- *Adverse trend in the size of transactions*.
- *Adverse trend in the liquidity ratios or for a particular bank compared to its peers*.
- *Drying up of alternative sources of liquidity*.
- *Decline in the cushion of unencumbered highly liquid assets*.
- *Persistent breaches of risk limits*: limit exceptions can be early indicators of excessive risk or inadequate liquidity risk management.

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<sup>48</sup> Leonard Matz, ‘Crisis Management’, slides presented at the Sound Liquidity Management Principles- Industry and Regulatory Perspectives Seminar, sponsored by APRA, Australia, May 3-4, 2007.

- *Increase in currency mismatches.*
- *Funding deterioration signals:* increased funding costs, counterparties requiring collateral, correspondent banks decreasing credit lines availability, etc..*Reduced depositors confidence:* starting early withdrawals'*Excessive' Securitization:* asset securitization raises liquidity considerations as experienced in the crisis of 2007-2008, when it was difficult to convert these assets into cash during the time that there were market disruptions that hampered market access. This eventuality should be a concern when a bank makes increasing use of asset securitization. In this sense, a bank should consider specific trigger events that may affect the pool of securitized assets.

#### 1.4 External warning triggers

49. Among the **external** triggers to detect bank-specific liquidity problems, the following are noteworthy:

- *Widening funding spreads* relative to peers.
- *Adverse trend in deposit growth* with loss of market share.
- *Adverse trend in renewal of maturing liabilities* as some depositors defect the bank.
- *Adverse trends in TED spread, country spread, swap spread, CDs curve, equity indexes.*
- *Increasing redemptions of CDs before maturity.*
- *Temporary funding difficulties* or turn downs of borrowing requests.
- *Difficulty in accessing markets*, especially foreign exchange markets when the bank operates in multiple currencies.
- *Decline in stock prices* relative to benchmark.
- *Downgrading by a rating agency.*
- *Adverse tax and regulatory changes.*
- *Decrease in the prices of the assets* that compose the securitization pool (market liquidity risk).

#### 1.5 Macro Factors

50. Macro factors can cause non-normal liquidity conditions that can have an impact on all banks with different degrees of severity. The following factors are worth mentioning:

- *The start of an economy-wide 'credit crunch'*, which might lead to an abnormal use of contractual liquidity facilities by prime borrowers (possibly reflecting difficulties in accessing capital markets).
- *Slowdown or weakening of critically important economic sectors or industries* (housing, commodity prices, transport sector, trade-related sectors, etc.).
- *Slower deposit growth and increased competition for deposits*, possibly reflecting a loss of trust in the domestic currency and flight to foreign exchange FX, or loss of confidence in the domestic banking system and flight to cash.

- *Adverse macroeconomic conditions*, possibly reflecting deteriorating fiscal or external accounts.
- *Declining stock market prices or earnings*.
- *Ratings downgrades for bank or competitors*.
- *High banking competition*<sup>49</sup>. It can even be the case that in high levels of banking competition, banks may be reluctant to lend to competitors for fear of losing market share.

51. Bank managers have the duty to be alert and vigilant about changing circumstances in their competitive environment that might affect their bank, and to watch for changes in macroeconomic circumstances which might also impact them. This is a tall order of business since the future can be quite unpredictable. In view of this, it is prudent to build cushions—in the form of higher capital and higher liquidity cushions—which can mitigate unexpected events. Matz<sup>50</sup> envisages the different stages of a bank funding crisis (see Chart 7 above), where banks transition from ‘normal times’ to face increasingly severe impairments, before reaching a point of no return when the bank collapses.

52. The old case of the failure of the Continental Illinois bank in 1984 is illustrative (see Box 3) of a rapidly growing bank with a high sector concentration of its loan portfolio. On the other hand, the recent Northern Rock bank episode (see Box 4) is illustrative of the systematic risk posed by excessive dependence on securitization as a form of short-term funding (funding liquidity risk) and high reliance on smooth market functioning (market liquidity risk). Both cases highlight the consequences of poor liquidity management.

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<sup>49</sup> Banque de France, Financial Stability Review, ‘Overview: Liquidity in a time of financial turbulence’, February 2008

<sup>50</sup> Op.cit., with adaptations from the author.

### **Box. 3: 'One Bank's Liquidity Crisis: Continental Illinois'**

*Foreign depositors:* Foreign deposits are usually Eurodollar deposits that are traded in the wholesale market. These funds are structured as interest-bearing time instruments--very liquid and short term maturities--and are denominated in the domestic currency rather than the currency of the foreign country. They are not insured by the FDIC. Foreign depositors' behavior may differ from that of domestic depositors because of differences in their credit sensitivities and their perceptions of the bank's financial stability.

*Cash flows:* Continental Illinois experienced a decrease in earnings which clearly deteriorated its liquidity position. However, the management did not view this as a problem in its fundamentals but rather as a temporary shock.

*No internal controls:* Continental Illinois' management failed to design internal controls to monitor liquidity and credit risk and a contingency funding plan was not put in place.

*External warnings* that showed the increasing liquidity risk:

- Economic conditions: Rising interest rates.
- Latin America debt crisis: Continental Illinois had significant exposure to these countries, so when the crisis emerged in this region it reinforced the worries about the bank's stability.
- Stock prices declined almost 37 percent in 1982 due to the negative consequences of the continuing decline of the energy sector in Continental Illinois' performance.
- CAMEL downgrade to 4.
- However there was no downgrade from any credit rating agency, Fitch maintained its rating, despite the increasing volume of non-performing loans coming from the energy companies that Continental Illinois was exposed to.

#### **2. Analyzing the development of the crisis**

*Penn Square Bank failure:* The Penn Square Bank failed due to speculative oil and gas exploration loans. Continental Illinois had invested heavily in Penn Square, so the failure of the latter had a negative impact on Continental Illinois' earnings and market confidence.

*Increased CD rates:* The loss of confidence in the aftermath of the Penn Square failure meant that Continental Illinois had to pay higher rates on its CDs.

*Depositors run:* The rumors in the market about potential Continental Illinois bankruptcy led depositors to run away. Overseas depositors and even domestic correspondent banks moved away.

*Fed discount window:* When the run started, Continental Illinois had to borrow from the Fed discount window; but this, however, did not prevent the depositors from running away.

*FDIC assistance package:* FDIC had to intervene as concerns were raised about the spillover effects that the bank crisis could have on the entire banking system ("too big to fail"). Thus, FDIC provided guarantees of protection to all depositors and creditors.

*'Nationalization':* As outflows continued, FDIC tried to find a merger partner for Continental Illinois but it could not. Finally, FDIC acquired 80 percent ownership of Continental Illinois

#### **3. What are the lessons from Continental Illinois regarding liquidity management?**

- Rapid loan growth is not necessarily a good indicator of the performance of a bank. Aggressive asset growth requires that liquidity needs and sources be planned for accordingly. Experience tells us that excessive bank credit growth quite often ends in 'tears'.
- A small retail deposit funding base, with high dependence on wholesale funding, is risky. Wholesale funds providers are more credit sensitive and less willing to provide funding during financial difficulties. It also exposes the bank to continued rollover risk.
- Concentration on one particular segment makes the bank very vulnerable to shocks in that segment, posing high liquidity risk. Banks need to diversify funding sources to prevent a liquidity crisis.
- Adequate liquidity risk management can prevent banks from going to the LOLR to be rescued. Robust liquidity management is critical to identify liquidity risks and put in place actions contained in the bank's contingency funding plan to overcome liquidity crises.

<sup>2/</sup> Higgins, 'Managing Growth', *Analysis for Financial Management*, Chapter 4, 9<sup>th</sup> edition

#### **Box 4: 'One Bank Liquidity Crisis: Northern Rock'<sup>1/</sup>**

The episode of the failure of the Northern Rock bank in the United Kingdom in September 2007 is telling because it unfolded at the onset of the credit crunch of 2007-2008. It is also noteworthy to compare the differences and similarities in the causes and events that led to the liquidity crisis at Northern Rock with those at Continental Illinois.

The main difference with Continental Illinois was that in the case of Northern Rock, the deposit run was not 'the event' that triggered its liquidity crisis; rather, the deposit run was an 'an event' that happened in the aftermath of its liquidity crisis.

##### **1. Analyzing the causes that triggered the liquidity crisis**

*Business Strategy:* Northern Rock followed an aggressive and risky strategy of expansion, increasing its market share by providing mortgage loans at low and ultra-competitive effective rates while funding itself with short-term wholesale funds, including an over-ambitious securitization strategy as a fundamental part of the bank's normal funding strategy]. Northern Rock moved from being a regional bank to becoming the fifth largest bank in the UK through rapid growth of its mortgage assets, while its traditional funding base of retail deposits diminished to very low levels.

Formulating an institution's funding strategy and defining its risk tolerance are the fundamental responsibility of its Board of Directors which is then implemented by the bank's senior management. The Board of Directors of Northern Rock was held responsible for the continued success of its funding strategy at a time when there were indicators of potential problems on the funding side. Northern Rock failed to have Board-approved strategies for managing liquidity risk, **under going-concern assumptions**, and under stressed conditions.

*Composition funding sources (liabilities):* Northern Rock relied heavily on non-retail funding--only 20 percent of its liabilities came from retail deposits and only a small proportion of them consisted of the traditional branch-based deposits. Most of the **retail deposits** came from non-branch deposits--such as, postal, telephone, internet, and offshore accounts. This reliance on non-branch deposits exposed the bank to significant risk as non-branch deposits are more vulnerable to withdrawal than retail deposits<sup>2</sup>. The length and depth of bank-customer relationships are factors that characterize retail deposits, and are seen as significant to mitigating depositors' propensity to run.

Most of Northern Rock's funding (75 percent of it<sup>3</sup>) came from short-term borrowing in the wholesale markets, interbank deposits, securitized notes, and other long-term funding sources such as covered bonds. The latter were long-term liabilities written against segregated mortgage assets and, as such, they were illiquid and long-term in nature.

Besides the risk of funding long-term loans with short-term wholesale funds, wholesale fund providers are considered less willing to provide funds to banks facing real or perceived financial difficulties as their funds are not insured and they are, thus, more credit sensitive.

It was the use of securitized notes that made Northern Rock's business model unusual, its balance sheet less traditional and, in the end, largely responsible for the bank's downfall. While securitization allowed banks to obtain liquidity from illiquid assets, it also makes them more reliant on the smooth functioning and stability of financial markets (market liquidity risk). If liquidity from securitizations dries up, banks are left with an unexpected funding gap, as happened in the Northern Rock case. The securitized notes were of medium- to long-term maturity, with average maturity of over one year. The bank assigned portions of its mortgage assets to a trust which then entered into an agreement with special purpose vehicles (SPVs). Unlike in the US securitization process where the SPVs are off balance sheet vehicles, in the UK, Northern Rock consolidated them on its balance sheet. Thus, when the crisis started and the trust could not place more paper with investors, the notes planned to be issued in September had to be taken back by Northern Rock in its balance sheet, draining its cash.

*Types of creditors:* The creditors of Northern Rock were not 'normal' depositors but sophisticated investors who tailor their risk-taking strategies to rapidly unfolding events. Therefore, in good times, it is easy to obtain funding from these creditors, but in bad times it is very hard. As opposed to retail depositors, these creditors face constraints in their decisions--they are subject to external constraints such a small fluctuations in the markets that can cause large shifts in funding. This illustrates the risks involved in relying heavily on concentrated market funding sources.

#### **Box 4: (cont). “One Bank’s Liquidity Crisis: Northern Rock”**

*Asset Composition:* Most of Northern Rock’s assets were mortgage loans at low and ultra-competitive effective rates of interest.

*Internal warnings* showed the increasing liquidity risk being taken, measured by:

- High leverage ratio (total assets to common equity): Northern Rock’s leverage ratio climbed from 22 percent to 58 percent in a few years. When the crisis exploded, the ratio jumped even higher due to the depletion of its common equity from the losses suffered.
- Linear thinking: The rapid growth of the bank’s balance sheet was predicated on the assumption of uninterrupted benign credit conditions and market access, while the bank’s high leverage made it very vulnerable to a reversal in market conditions.

#### **2. Analyzing the development of the crisis**

*Fluctuations in funding conditions:* The market started to show tightening credit conditions through higher ‘haircuts’ in the repo market.

*Run of short/medium term creditors:* The true run on Northern Rock was not the few retail depositors queuing at its branches, but the ‘invisible run’ of the wholesale investors that refused to renew their maturing loans and deposits. It was the withdrawal from the market of the short-term and medium-term creditor that had previously bought Northern Rock paper that caused the liquidity crisis. It was not, thus, the classic coordination failure model of bank runs by branch-based depositors that was the immediate cause of the crisis, but the fear and run of other creditors. An important fact to bear in mind is that the withdrawal of credit hit the whole market and not simply Northern Rock.

Therefore, when the short-term funding disappears, highly leveraged institutions like Northern Rock--holding long term, illiquid, assets financed with short-term debt--face a liquidity crisis.

*Spillover effects:* When the financial system as a whole finances long-term, illiquid assets funded with short-term liabilities, it is impossible that all the institutions can be hedged in terms of their maturity profile. Thus, Northern Rock was the ‘pinch point’ in the financial system where the tensions were finally manifested.

The roots of the liquidity risk, therefore, stem from securitization practices, combined with the market’s inability to keep up with them in terms of risk assessment, pricing, and management.

#### **3. What are the lessons from Northern Rock regarding liquidity management?**

- High dependence on securitization poses high market liquidity risk. The functioning of the markets cannot be taken for granted. Banks should undertake adequate stress-testing to measure and manage their capacity to absorb liquidity shocks.
- Concentration in securitized financing poses not only liquidity risk but also **systemic** implications for the entire banking system.
- Financing long-term assets (mortgage loans) with short-term funding creates a high level of leverage only sustainable under benign credit conditions. The high leverage made the bank vulnerable to a reversal in the maximum leverage tolerated by the market.
- Liquidity risk was priced too low; it was believed that the bank’s capital base offered enough cushion to face financial difficulties. Institutions should have in place adequate internal mechanism and liquidity buffers to verify that all liquidity risks are covered in both normal and stressed times.

<sup>1/</sup> Song Shin, ‘Reflections on modern bank runs: a case study of Northern Rock’, Princeton University, August 2008

<sup>2/</sup> Iyer and Puri, ‘Understand bank runs: the importance of depositor-bank relationships and networks’, Working Paper, NBER, August 2008

<sup>3/</sup> Buitter, “Lessons from the North Atlantic financial crisis”, London School of Economics and Political Science, May 2008

### SECTION 3: LIQUIDITY RISK MANAGEMENT

53. Liquidity risk management<sup>51</sup> refers to the internal policies and procedures put in place by an institution/bank to measure, manage and monitor its liquidity. The design of the liquidity risk management should be tailored to the size, degree of internationalization, and the strategy and complexity of the institution's business model. Financial institutions should be aware that liquidity risk management is and should remain a cost center – but a vital one for the bank's operation and continuity as an ongoing concern.

54. The ongoing liquidity management objectives of a bank should be: the maintenance of an appropriate amount of liquid assets under normal and stressed conditions, the measurement and projection of funding requirements under various scenarios, and the management of access to contingency funding sources (according to the bank's, up to date, contingency funding plan).

55. A bank's liquidity risk management plan should start by defining a clear liquidity strategy that should be communicated to and understood by all in the organization. The strategy must be approved by the bank's Board of Directors (see discussion on governance above). Senior management should be responsible for clearly defining the liquidity risk management policy and the procedures for its implementation, measuring all costs of alternative liquidity strategies, controlling the liquidity risks across the banking group on an ongoing basis, and monitoring trends and developments that may affect the liquidity strategy.

56. The liquidity risk management structure should be reviewed, as needed, to reflect changing business and financial market conditions, and all business units should be aware of any change in the liquidity strategy.

57. Bank management must manage not only the bank's assets, liabilities and off balance sheet cashflows, but also the release of financial information to the public. Communications at times of distress are absolutely critical—as many balance-sheet solvent but failed banks can corroborate. The public's perception about the soundness of a bank can change quickly. Customer reaction is difficult to predict but it really affects the liquidity needs of the bank, often abruptly, precipitating the need for access to contingency sources. Therefore, it is very crucial that bank management have effective processes in place to monitor and react to any contractions in deposits and other funding<sup>52</sup>. Thus, it is not only important to have a strategy but also, critically, a mechanism for implementing it.

#### 2.1 Liquidity Principles<sup>53</sup>

58. In the aftermath of the 2007-2008 “credit crunch”, the Basel Committee, , updated in June 2008 the principles for the assessment of liquidity management in order to reinforce the importance of sound liquidity risk management by the banking system (see Annex IV).

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<sup>51</sup> CEBS, page 7

<sup>52</sup> OCC, *An Examiner's Guide to Problem Bank Identification, Rehabilitation and Resolution*, Chapter III: 'Resolving Liquidity Problems', January 2001, page 48

<sup>53</sup> Basel Committee on Banking Supervision, 'Principles for Sound Liquidity Risk Management and Supervision', June 2008

59. The aim of these principles is to be not merely a declaration of good intentions, but also to provide guidance to banks, so that the principles are incorporated into their management strategies, be enforced, and serve to prevent or mitigate the mistakes exposed during the 2007-2008 crisis.

60. The main features of the new approach are to:

- Emphasize the importance of establishing liquidity risk tolerance limits and maintaining an adequate level of liquidity through a cushion of liquid assets.
- Stress the necessity of allocating liquidity costs, benefits and risks to the various business lines and activities.
- Emphasize the necessity of identifying and measuring the full range of liquidity risks, including contingent liquidity risks.
- Require the incorporation of severe stress scenarios and robust contingency funding plans in banks' strategies and contingency funding plans.
- Promote public disclosure information to enhance market discipline.

## 2.2 Liquidity Controls

61. The liquidity risk assessment of a bank is not complete until senior management and supervisors assess, test and feel comfortable with the internal liquidity controls the bank has in place. The liquidity controls pursued should aim to ensure the integrity of the liquidity risk management process, and make senior management responsible for ensuring implementation.

62. The bigger and more complex the bank, the more thorough should be its review and controls. The latter include the following items:

- *Oversight by the Board of Directors and senior management*: responsible for understanding the nature and level of liquidity risk assumed by the bank and the tools used to manage that risk.
- *ALM (Asset /Liability Management) Committee*: responsible for ensuring that measurement systems are adequate for identifying and quantifying the bank's liquidity exposure and the reporting systems (MIS) communicate accurate, timely and relevant information about the level and sources of that exposure.
- *Governance*: head office and senior management's understanding of the issues and ability to anticipate and control;
- *Clarity of written policies, procedures and approval authority*;

- *Definition of risk limits:* setting ceilings for borrowing capacity, funding maturity gaps, exposure to a single source or market and to unsecured borrowing<sup>54</sup>. The bank should set the limits according to its business in terms of location, complexity of the activity, nature of the products, currencies, and markets served, that is, it may set limits on an intra-group basis. The limit framework should also include measures to ensure that, under stress, the liquidity available will exceed the liquidity needs.
- *Information:* The MIS must be able to provide reliable, comprehensive, and timely information. IT systems are crucial for providing senior management with timely and forward looking information on the liquidity position of the bank and to monitor compliance with the limits and policies established. MIS should be able to:
  - Calculate liquidity positions: in all currencies--per branches and subsidiaries, and on an aggregate group basis.
  - Provide liquidity positions on an intra-day basis, day-to-day basis, and longer time periods, to be used by liquidity risk management.
  - Capture all sources of liquidity risk, including contingent risks.
  - Deliver granular information under stress scenarios.
- *Execution and post-execution (cost-effectiveness of measures taken) reporting.*
- *Intra-day liquidity management*<sup>55</sup> that ensures a bank meets its liquidity payments obligations and receives customers' inflows on time. Intra-day liquidity management requires appropriate anticipation and planning of flows throughout the day to make sure that cash and collaterals will be available for use in payment and settlement systems in normal and stressed times. Thus, it should:
  - Measure the expected daily liquidity inflows and outflows.
  - Identify key counterparties, times and circumstances that may pose particular liquidity needs.
  - Monitor key positions frequently and forecast potential funding shortfalls.
- *Multiple Currency Liquidity Management.* Cross-currency liquidity management makes institutions heavily reliant on the smooth functioning of foreign exchange markets, and those markets did not always function as expected during the 2007-2008 crisis. Thus, special attention should be paid when a liquidity event occurs because transferability, convertibility or country risks can abruptly change.
- *Internal audit* that regularly reviews the implementation and effectiveness of the liquidity strategy.

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<sup>54</sup> Office of Comptroller of the Currency, 'The Challenges of Sound Liquidity Risk Management: OCC Expectations and Policy for Community Banks', May 2001

<sup>55</sup> CEBS, page 41

**Chart 9: Sample Liquidity Risk Assessment**

Liquidity Risks	Liquidity Controls					
	Oversight	Governance	Policies	Limits	MIS	Execution
Volume and composition Assets						
Volume and composition Liabilities						
Volume and composition Off Balance Sheet						
Funds providers						
Concentration						
Net funding gaps						
Liquidity Ratios						
Cash flows						
Collateral						
Relative cost of funding						
Reputation						
Ratings						
CAMEL						
Liquidity Plan						
<b>Risks: H=High, M= Moderate, L= Low</b>						

### 2.3 Liquidity Reports

63. Liquidity reporting is important at all times but even more so as the liquidity conditions of the bank deteriorate during the different stages of a funding crisis (as mentioned earlier). Before moving on to discuss the key features of liquidity reports, it is important to point out that as liquidity deteriorates, the *frequency* of liquidity reports must increase. The *scope* of liquidity reports should also probably change as conditions worsen, to show increasing details, supplemental reports for certain bank units or bank operations or subsidiaries, and additional benchmarking of the bank against peers (spreads over cost of funds).

64. Liquidity reports aim at reporting the bank's exposure to liquidity risk at all times—under normal circumstances and under stress—so that senior management can identify any negative trends and implement mitigation actions in response. From these reports, bank management should learn how much liquidity risk the bank is assuming, whether management is complying with risk limits, and whether management's strategies are consistent with the risk tolerance approved by its Board.

65. The critical information that must definitely be contained in liquidity reports is:

- Analysis of macro-financial factors and the competitive environment
- Cash flow analysis
- Static Liquidity Gap
- Dynamic Liquidity Gap
- Liquidity indicators
- Funding sources
- Stress scenarios
- Risk limits analysis and compliance

**Recommendation 3:** FSAPs should use the Terms of Reference for Liquidity Reviews (Annex I) and the Questionnaire for Liquidity Reports (Annex II) to request supervisory agencies to conduct an adequate assessment of the liquidity management of major banking institutions. The FSAP mission might want to review if such plans are in place in systemically important banks and if the supervisor is looking at them during inspections or off-site. Crisis simulation exercises should test the readiness of such plans.

## 2.4 Contingency Funding Plan (CFP)

66. The main purpose of the Contingency Funding Plan (CFP) is to coordinate the response of the bank to funding difficulties or a liquidity crisis—to preserve its viability as an on-going concern, define a set of actions and funding sources to successfully overcome stress environments, and describe external communication policies. From the supervisory point of view minimizing negative externalities to other market participants is also an important concern.

67. A CFP is a cash flow projection and comprehensive funding plan that forecasts funding needs and funding sources under different market scenarios<sup>56</sup>. The degree and sophistication of a CFP should be commensurate with the bank's complexity, risk exposure, activities, products, and organizational structure<sup>57</sup>.

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<sup>56</sup> OCC, Handbook, page 35

<sup>57</sup> OCC, Examiners' Guide, pages 51-52

68. A sample questionnaire for assessing liquidity risks, prepared by the National Bank of Belgium, and a format for liquidity reports required by the OCC are presented in Annex II. Annex III shows a possible format for a Contingency Funding Plan (also from the OCC).

69. The first step in designing a CFP is to define severe but plausible *stress scenarios*. Stress testing allows the bank to analyze liquidity risks based on the performance of different liquidity risk drivers and variables under distressed circumstances. The stress testing, therefore, allows the bank to define in its CFP the liquidity needs that it may face under stress situations, tests the adequacy of liquidity buffers to ensure its ability to meet payments in stressed situations, and design the activation of mitigation actions.

70. The stress testing begins with the construction of scenarios. The scenarios can simulate idiosyncratic problems that only affect the entity, systemic problems that affect the banking system as a whole, or combinations of the two<sup>58</sup>. The construction of the scenarios involves the definition of risk events associated with the bank's activities, products, funding sources, and markets. It can also incorporate a historical analysis of the events (when available), and the analysis of the impact and risk under each of them. The objective of stress testing is to:

- Detect the vulnerabilities of the bank.
- Check if the bank's risk exposure falls within the risk tolerance defined by the bank's Board.
- Develop an effective CFP which contains the actions and measures to face the liquidity problems, under each scenario, based on the nature of the problems, probability of occurrence and intensity of shocks.

71. The liquidity scenarios should not focus only on expected and unexpected cash flows but also on asset liquidity, since most institutions rely on generating liquidity from securities positions. They should include<sup>59</sup>:

- Temporary disruption in liquidity when funding is required only for a short time--for example, an operation breakdown, a physical emergency, the withdrawal of a major player, etc.
- Longer term distressed environments: interbank market difficulties, distress in specific currencies, tightening credit lines.
- At least one scenario in which the bank is no longer considered to be investment grade.
- A sudden change in the composition of deposits, a sudden increase in deposit withdrawals, the impossibility of selling an asset within a given time horizon

72. The CFP should contain: a definition of the events triggering the plan, a description of the potential sources of funding on both the asset and liability sides, an escalation procedure detailing how additional funds could be raised, and a procedure for the management of the plan.

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<sup>58</sup> CEBS,, page 46

<sup>59</sup> OCC, Handbook, page 37

Thus, it should address the following elements:

- a. liquidity status
  - b. warning triggers
  - c. funding sources
  - d. actions to take, depending on the severity of the crisis
  - e. functions of the Crisis Management Team
- a) The *liquidity status analysis* should be quantitatively based on the liquidity indicators but it should also qualitative--based on the perception from the market and clients, incorporating contractual and behavioral assumptions.
  - b) *Warning triggers* should alert the bank to liquidity problems and be classified based on severity: minor, severe or very severe. These alerts allow the bank to recognize not only the liquidity risks coming from within, but also those from other counterparts or the market. Thus, the bank can identify the actions it needs to put in place when the risks occur.
  - c) *Funding sources*. The bank should define the volume and quality of liquid instruments, the stand-by lines of credit it has in place, and its access to central bank lending programs and other potential liquidity lines. Liquidity risk management should define *liquidity buffers*<sup>60</sup>, cash and other unencumbered highly liquid assets that allow the institution to meet payments in stressed situations over its defined survival period. These liquidity buffers must be regarded as the readily available funding that is not used for ongoing business.

Other potential sources of funding should be diversified and considered for use depending on the circumstances or nature of the shock. Some of them could include<sup>61</sup>: deposit growth, the lengthening of liabilities' maturities, new issues of short- and long-term instruments, intra-group fund transfers (within defined regulatory maximum exposure limits), the sale of subsidiaries, new capital issues, the sale of repos or highly illiquid assets, and borrowing from the central bank (LOLR).

- d) The *actions* needed to respond to liquidity problems should be a mix of options that take into account: the severity of the problem, its origin, the time horizon being used, the bank's risk profile, and the costs of implementing the action. Some of the remedial actions that can be implemented include:
  - Use of liquidity buffers: this liquidity cushion should enable the bank to weather liquidity stress during its defined survival period, without requiring adjustments to its business model.
  - Review of opportunities to increase the size of the liquidity reserve (moving assets to more liquid instruments or term borrowing to invest in liquid assets).

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<sup>60</sup> CEBS, page 12

<sup>61</sup> Basel, BIS Principles, page 19

- Improved collateral management to free additional collateral to be pledged for additional funds, eventually moving additional collateral to the central bank.
- Increasing net cash flow cushions through ALM actions, in the less-than-90-days buckets.
- Review of lines of credit limits to draw liquidity without making lenders even more apprehensive (to the point of calling their loans).
- Restriction on new lending, as much as possible, without triggering a confidence crisis.
- Providing additional incentives and raising interest rates to retain and attract more core deposits (without signaling severe distressed borrowing).
- Tapping alternative funding sources, securitizing assets, selling properties and real estate owned by the bank.
- Potentially transferring funds across subsidiaries, business units.
- Increased diversification of assets and reducing assets that require funding (that is, restructuring the loan portfolio).
- Replacing credit sensitive liabilities, such as public funds, with more stable, credit insensitive funding, such as term retail deposits
- Reducing concentration by borrower and industry and liabilities (contracting unsecured lines of credit, increasing diversified deposit base).
- Reducing exposure of funds providers through ‘netting’ agreements.
- Slow credit growth.
- Adopting incentives to retain core deposits; more proactive and opportunistic funding, exploiting interest rate differentials in the market’s yield curve (agile implementation of ALM policies).
- Changing the composition of securities in the bank’s portfolio in order to reduce their average maturity and/or increasing the share of marketable government paper.
- Reducing the number of branches and employees, cutting variable costs (for immediate impact) and fixed costs (for delayed impact), etc.
- As a last resort, accessing the central bank discount window.

e) The plan should contain the *functions of the Crisis Management Team*. The Crisis Management Team should be responsible for making clear, defined decisions and executing measures in a timely manner. It should also be in charge of communications, both internal (to the Board and business units) and external (to media and clients), besides managing and implementing the CFP effectively.

73. For banks operating across two or more national jurisdictions, the CFP is additionally challenging as cash and collateral are not easily transferable across borders for logistical and legal reasons. National regulators are particularly worried about liquidity being transferred during liquidity crises; minimum liquidity levels are enforced even during normal times. Country risk, foreign exchange and convertibility risks are additional concerns, particularly in shallow markets and at times of financial distress.

## SECTION 4: CONCLUDING REMARKS

74. The credit crisis of 2007-2008 exposed the negative consequences of mispricing risk and poor credit and liquidity risk management in the financial system. It also highlighted the danger of ‘linear thinking’--assuming that the future will be the same as the past or present and counting on the good times rolling on indefinitely. It also highlighted the major weaknesses in the governance of banks and the flaws in their supervisory process. All these elements have forced a re-thinking of many of the past assumptions. Liquidity management, in particular, has become more important in view of the secular decline in the share of liquid assets in many countries and shifts in the banks’ funding activities—with greater reliance on securitizations—as well as major changes in terms of products, market players, etc. which have vastly increased the complexity of banking.

75. From the perspective of the World Bank and the IMF, the new financial landscape requires that some of the earlier approaches and relative emphasis on the FSAPs be revisited, with more attention paid to liquidity risks. For example, the current analysis in FSAPs, based on rather mechanical and aggregated stress tests, lacks the capacity to assess liquidity risks in the banking system of particular countries. Stressing economic indicators in an aggregated way does not provide insightful information into the systemic liquidity risks faced by the most important banks or the entire financial system. Banks deserving particular attention are those with a large market share, significant role in payment systems, high loan-to-deposit ratios, large external borrowings, and banks with a concentrated customer deposit base or high dependence on wholesale funding. There might be other criteria, but FSAP missions will need to define which banks or other financial market players pose systemic liquidity risks for the countries’ financial systems.

76. Therefore, it becomes pivotal to look closely not only at quantitative indicators (such as composition of balance sheet, concentration of assets, types of funds providers, and liquidity ratios) but also at qualitative factors (such as behavioral assumptions about depositors’ behavior, market outlook, etc.). It is also important to assess the soundness of the liquidity management of a country’s banking system—at both the major banks and the tools used by supervisory agencies to assess liquidity risks. The latter is essential if the FSAP is to become more relevant for stability assessments. As mentioned above, trend and peer analysis for major banks will need to become a more integral part of the stability assessment of national banking systems.

77. Recent events have also highlighted that although sound liquidity management is critical for protecting protect capital, capital itself may not be an appropriate buffer in a difficult liquidity environment. The existence of a robust capital base and a high capital ratio does not minimize the importance of liquidity risk. As discussed earlier, insolvent but liquid banks can still continue to operate (particularly if they are State-owned), but no single illiquid bank can function!.

78. This Working Paper does not make any claim in terms of ‘originality’; it aims at synthesizing disperse information from many sources in order to provide an easy-to-use

reference for staff involved in FSAPs and financial crisis management in the Bank and IMF's client countries. It has an eminent practical approach. A future, longer-term objective is to develop a 'Crisis Management Handbook' for staff, to serve as a tool for focusing on key risks, starting with liquidity risks, in the FSAP missions and other financial sector work (see also Annexes). It would be desirable if this compendium could be used by supervisory agencies which deal in depth, on a day-to-day basis, with these issues which the FSAPs can only superficially assess.

79. The main lessons of this analysis are:

- *First:* It is not easy to disentangle the liquidity and solvency problems of banking institutions in the presence of asymmetric information. Moreover, this relationship is most likely not linear, meaning that even if a bank is insolvent it can continue to operate provided it is liquid. As long as the bank's cashflow remains positive, with inflows (a combination of interest income collected, loan amortizations received, new deposits collected, other borrowings and liabilities) greater than outflows (a combination of interest payments, redemption of deposits, payment of contractual liabilities, all operating expenses and taxes), it can continue to operate. This has often been the case with insolvent public banks. In a booming economy it is often easy for insolvent banks, particularly those with the implicit guarantee of the State, to remain liquid for extended periods. This does not mean that a bank's capital is irrelevant. Clearly, lower capital increases a bank's vulnerability to any shocks.
- *Second:* Funding liquidity risk is inherent to the banking system, as a result of the maturity transformation of assets and liabilities that banks undertake in an economy - its basic *raison d'être*. For this reason, strong liquidity risk management is crucial to prevent liquidity crises. On the other hand, market liquidity cannot be taken for granted. The impairment of banks' access to market or the impossibility of selling assets at market prices exposes banks to losses and poses liquidity risks for the financial system as a whole. Therefore, it is critical to assess the root causes of liquidity problems in systemically important individual banks which can initiate a systemic liquidity crisis. It is also crucial to assess the contagion channels that can spread such distress to other instruments, players and markets. One of the most interesting and important suggestions offered to mitigate the liquidity risks have to do with the proposal to require additional capital charges for financial institutions who hold assets with low market liquidity and long maturity and fund them with short-maturity liabilities, as well as new set of accounting rules to "mark-to-funding" bank assets, valuing assets "not according to the intention of the holder, but according to the funding capacity of the holder. ... driven by the maturity of the funding of the asset".<sup>62</sup>
- *Third:* The concentration of funding sources, particularly in the wholesale market, can have a significant impact on liquidity risk at a particular bank, as well as systemic implications for the entire banking system. Heavy dependence on wholesale funding (as in the case of Continental Illinois in the US and Northern

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<sup>62</sup> Brunnermeier et. al., page 39.

Rock in the UK—see Boxes 4 and 5) and a loan concentration in a few sub-sectors (for example, energy or housing) exposes banks to unmanageable risks once confidence weakens. Banks must diversify their liabilities and increase their reliance on less interest and credit-sensitive retail deposits, while diversifying their asset base.

- *Fourth:* More attention needs to be paid to liquidity planning in the context of Contingency Funding Plans by regulatory agencies and FSAPs. In assisting countries to prepare or in reviewing contingency plans, WB-IMF staff should look at a specific liquidity plan section/content in Aide Memoirs.
- *Fifth:* Central bank actions in response to a liquidity crisis should be properly tailored to address the specific type of liquidity shortage. The pro-forma review of the LOLR facilities done by the IMF in the Transparency of Monetary Policy ROSC needs to be complemented with a review of the broader set of topics suggested in this Working Paper.

## **ANNEX I: TERMS OF REFERENCE FOR LIQUIDITY REVIEWS**

### **Objectives and Scope:**

The objective of a **liquidity review** (of an individual bank or a banking system as a whole) is to:

- (a) Identify current practices being used by financial institutions to manage their day-to-day liquidity (in various currencies, different bank units, or entities within a group, within different time horizons), with particular attention to internal policies, governance aspects, effectiveness of the reporting and monitoring formats (MIS), internal controls, and compliance with policies by the different units/group institutions.
- (b) Identify risky, as well as best practices to manage liquidity (to be later disseminated within the industry and/or to alert the supervisory authorities, design remedial measures and required TAs--for individual financial institutions and/or supervisory agencies).
- (c) Evaluate the adequacy of contingency plans, sources of liquidity risk, and establishment and compliance with risk limits.
- (d) Evaluate the adequacy of stress-testing exercises undertaken by the banks.
- (e) Assess the overall levels of risks being assumed by the banks, with particular attention to the sources of liquidity risk and sources of funding for the groups.
- (f) Assess the presence of regulatory impediments to effective liquidity management.
- (g) Assess the central bank temporary liquidity facilities available to banks (Lender of Last Resort facilities, LOLR) and the collateral policy applied.

### **Team Composition:**

The team should be composed of: (a) a liquidity expert as Team Leader; (b) a senior experienced commercial banker; (c) a liquidity risk expert with expertise in conducting stress-testing exercises; (d) a senior bank supervisor; (e) a bank information technology (IT) expert; and (f) ideally, a senior central banker.

## Key Questions to be addressed:

- Governance:
  - What is the specific role of the Board and the Audit Committee (of the group and individual entities) in defining the strategy for liquidity and collateral management of the group and its entities?
  - What is the role of the executive management in liquidity and collateral management and what kind of internal controls are set up, again both at group level and at the level of the individual entities?
  
- Determinants and Management of the Bank's Liquidity Position:
  - Which bank units are net providers/demanders of liquidity and how does this change at different stress levels? By currency?
  - On a going concern basis, to which transactions, products or activities are the principal funding needs of the group related and what are the principal funding sources of the group? In this context, in which countries does the group have access to central bank money?
  - How is the group's access to the market managed in terms of the diversification of liabilities, relationships with creditors and the marketability of assets?
  - What are the group's key products, contract types and operations that can give rise to sudden (unexpected) material demands for liquidity? How, if at all, do these sources pose greater liquidity risk today than previously?
  - Which assets held by the group are particularly vulnerable to loss of market liquidity?
  
- Monitoring Liquidity Position:
  - How does the group monitor liquidity risk in the products, contracts and operations from which unexpected demands for liquidity could emerge?
  - To what extent are the group's procedures for the control of liquidity risk linked to procedures for the management of other risk types (for example, reputational risk or the market, credit, insurance and operational risks that may result in a sudden need for liquidity)?
  - How are the various proximate sources of liquidity risk mitigated or managed? (Exclude from the answer the mitigation of more distant triggering events, such as credit, market, insurance, and operational risks. Include in the answer, how the group mitigates the liquidity risk that arises from any options in its liabilities and assets.).
  
- Liquidity Contingency Planning:
  - Describe the group's Contingency Funding Plan as regards to liquidity stresses at the individual group and market levels.
  - What are the major mechanisms (borrowing, repurchase agreements, sales of assets, securitizations, accelerated payments from obligators to the group, etc.) through which the group anticipates accessing liquidity from outside sources during stress scenarios? Over what time frames are such approaches likely to be executed?

- Does the group maintain a single pool of liquidity to be drawn on in stress situations, or are there multiple pools in different currencies? What are the assumptions underlying the group's contingency funding plan and the group's plan to monitor the continued validity of those assumptions?
- Stress-Testing: INCORPORATE EXAMPLES OF SCENARIOS CONSTRUCTION (283 pdf)
  - Undertaking stress testing naturally involves the metrics that the group has adopted for the measurement of liquidity risk. Which types of measures—for example, liquid assets on the balance sheet, unencumbered assets that can be used to obtain secured funding, and a comparison of cash inflow and outflows across a variety of maturity buckets—are paramount in managing the group's liquidity risk?
  - Where unencumbered assets are involved as collateral for potential borrowings, what assumptions are being made? (For example, what assumptions underlie any 'haircuts' that might be made? What assumptions are made about the collateral that might be requested by counterparties in a stress situation? How does collateral posted for real-time gross settlement and other settlement systems fit in the framework?)
  - What assumptions underlie cash flow projections (for example, assumptions about the run-off of assets and liabilities and the intake of new business)? Are committed facilities and derivatives included? What type of modeling is done, for example, deterministic or probabilistic?
- Regulations & Liquidity:
  - *Legal and regulatory requirements might affect the management of liquidity on a group-wide basis.* Do you agree with this view? Please explain and cite specifics wherever possible. You may want to consider commenting on:
    - Whether prudential regulations affect liquidity management more across financial sectors (banking, securities, and insurance) or more across jurisdictions within sectors.
    - Whether any restrictions on cashflows between affiliates are relevant mostly to normal day-to-day operations, to situations of stress, or both.
    - Issues specific to home-host country regulation.

## ANNEX II: LIQUIDITY REPORTS

### (1) Questionnaire on Management of Liquidity Risk

This questionnaire is a joint effort by the Banking, Finance and Insurance Commission (BFIC) and the National Bank of Belgium (NBB) to integrate general questions on liquidity and collateral management. The document is meant to provide guidance for a first presentation by the management of the large Belgian financial conglomerates in this area of risk management. This first presentation will be attended by both BFIC and NBB staff members--in the context of the joint interest of banking supervisors and central banks in liquidity and collateral management practices—and, thus, in order not to duplicate the groups' efforts. Both the BFIC and NBB will, on an individual basis and each within their own field of competence, touch upon more specific central bank and supervisory issues at a later stage.

The questionnaire is based on a survey on liquidity management in cross-sector and cross-border financial groups, and has been prepared by a working group of the Joint Forum (international forum of bank, securities and insurance supervisors). The questionnaire encompasses five building blocks: the group's and individual entities of the group's collateral and liquidity management practices, the sources of liquidity risk and sources of funding for the group, contingency funding plans, the group's experience in terms of liquidity stress-testing, and a final set of questions regarding regulatory considerations. We would appreciate it if a short written reply to this questionnaire could be provided in the context of the presentation. The reply to this questionnaire will be treated as a confidential document within the BFIC and the NBB. A part of the reply to this questionnaire will nevertheless be used –anonymously--in the context of the Joint Forum study.

#### 1. Liquidity risk and collateral management within financial groups.

*One question of interest to global supervisors is: How do liquidity strains spread within financial groups? This question, in turn, leads to other questions on how liquidity is managed at the group level versus subsidiary levels.*

1.1 How are liquidity and collateral management implemented at the group level and at the level of different entities? While determining the extent of centralization of liquidity risk management within financial groups in mind, please outline the structure of the group with respect to the management of liquidity and collateral. Which divisions play an essential role in liquidity and collateral management and what are their respective roles? We are particularly interested in the roles played by a central unit and those played by subsidiaries and other business units located both in the home country and in foreign countries, with respect to:

- Managing cash and collateral on a day-to-day basis
- Establishing risk limits
- Monitoring liquidity positions against limits
- Identifying sources of liquidity risk
- Maintaining creditor relationships

- Creating a contingency funding plan
- Managing stress situations

1.2 In addition, what is the specific role of the Board and the audit committee (of the group and individual entities) in defining the strategy for liquidity and collateral management of the group and its entities? Along the same lines, what is the role of the executive management in liquidity and collateral management and what kind of internal controls are set up, again both at group level and at the level of the individual entities? Was an analysis of the procedures and internal controls, with respect to (segments of) the liquidity and collateral management of the group, incorporated into the recent internal audit cycles?

1.3 To what extent is information on the liquidity and collateral management publicly disclosed to market participants, creditors and the general public?

1.4 For those groups that are materially engaged in more than one financial sector (banking, securities and insurance), how does the group integrate (if it does) the sector-specific liquidity concerns and risk management methodologies?

1.5 How are the group's policies and procedures influenced by its technological capability to aggregate liquidity information across business and geographical units? Does the management information system enable a global measurement and monitoring of net funding requirements and limits set in the context of collateral and liquidity management?

1.6 Where, inside the group, does management visualize liquidity strains as most likely to emerge?

1.7 Does the group's liquidity policy address the possibility that liquidity pressures would spread between the component business units within the group or the geographical areas in which it operates? If so, by what means are the pressures visualized to spread and how does the policy address them?

1.8 How is the size of limits at the group level determined and allocated to subsidiaries or other operating units? Are these limits based on cumulative cash flow mismatches or on the coverage of short-term liabilities by liquid assets etc.?

## **2. Sources of liquidity risk/Sources of funding**

*One of the issues is whether liquidity risk for complex financial groups has changed or increased in recent years and, if so, how.*

### *Products and obligations*

2.1 On an going concern basis, to which transactions, products or activities are the principal funding needs of the group related and what are the principal funding sources of the group? In this context, in which countries does the group have access to central bank money?

2.2 How is the group's access to the market managed in terms of the diversification of liabilities, relationships with creditors and the marketability of assets?

2.3 What do you see as the group's key products, contract types and operations that can give rise to sudden (unexpected) material demands for liquidity<sup>63</sup>? How, if at all, do these sources pose greater liquidity risk today than previously?

2.4 How does the group monitor liquidity risk in the products, contracts and operations from which unexpected demands for liquidity could emerge?

2.5 Which assets held by the group do you consider particularly vulnerable to loss of market liquidity?

2.6 To what extent are the group's procedures for the control of liquidity risk linked to procedures for the management of other risk types (for example, reputational risk or the market, credit, insurance and operational risks that may result in a sudden need for liquidity)?

2.7 How are the various proximate sources of liquidity risk mitigated or managed? (Exclude from your answer the mitigation of more distant triggering events, such as credit, market, insurance and operational risks. But please include how your group mitigates the liquidity risk that arises from any options in its liabilities and assets.)

#### *Cross-currency and cross-jurisdictional funds transfers*

2.8 What are the main liquidity needs and funding sources of the group in currencies other than the home country's currency? To what extent does the group view cross-currency funds transfers as an important source of liquidity risk? How does this component of liquidity risk enter into its management framework?

2.9 To what extent does the group view cross-sector (intra-group or inter-affiliate) funds transfers as a source of liquidity risk/source of funding?

### **3. Contingency funding plans**

*This section focuses on the availability of and demand for liquidity in stress situations.*

3.1 Please describe the group's Contingency Funding Plan with respect to liquidity stresses at the individual, group and the market levels.

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<sup>63</sup> Please consider the full range of possibilities, including transactions that incorporate ratings triggers, market movements that entail increasing collateralization requirements, and insurance policy payouts at market values in excess of the values recorded in the company's books. Also consider, more traditional contracts like commercial paper, inter-bank borrowings, sight deposits, and insurance policies resulting in large claims.

- Among other things, please indicate the extent to which the group expects to rely on outside parties (either governmental/central bank or private) in the event of stress. To what extent would group entities rely on the parent or affiliates for liquidity support in times of stress? In this context, does the Contingency Funding Plan incorporate potential liquidity transfers between bank, insurance and investment entities of the group? How does that differ from the inter-affiliate dependencies in normal times?
- Do group entities also develop their own Contingency Funding Plans?

3.2 What factors would trigger the implementation of the Contingency Funding Plan? Who makes the decision to initiate the Plan?

3.3 To what extent was the group's contingency plan influenced by regulatory or supervisory requirements (see also questions on regulatory considerations in the final section of this questionnaire)?

3.4 If the group offers or is engaged in large-volume payments and securities settlement and clearing services, how do the needs for intra-day liquidity and end-of-day liquidity combine in the group's Contingency Funding Plan? Likewise, how are the group's global custody activities, if any, reflected in the Plan?

3.5 What are the major mechanisms (borrowing, repurchase agreements, sales of assets, securitizations, accelerated payments from obligators to the group, etc.) through which the group anticipates accessing liquidity from outside sources during stress scenarios? Over what timeframes are such approaches likely to be executed?

3.6 Does the group maintain a single pool of liquidity to be drawn on in stress situations, or are there multiple pools in different currencies?

3.7 Please describe the key ways in which corporate units within a group would obtain liquidity from parents and affiliates in a stress situation. What are the specific policies?

3.8 How does the plan reflect cross-jurisdictional and cross-currency movements of funds and collateral? At what level of the enterprise are these movements reflected?

3.9 We would also like to understand the assumptions underlying the group's Contingency Funding Plan and the group's plan to monitor the continued validity of those assumptions. Can you indicate the assumptions and the monitoring, if any? (For example, what assumptions are made about the availability of funding from outside sources and the stability of the marketplace in which that funding would be raised? What assumptions are made about the duration of a liquidity crisis?)

3.10 Does the group periodically test access to funding lines? More generally, does the group conduct exercises testing the effectiveness of its Contingency Funding Plan?

3.11 Have you had to initiate any part of your Contingency Funding Plan at any time over the past ten years or so? More generally, have the experiences of your group--due either to firm-specific or market-wide stresses--led to any 'lessons learned' regarding the management of liquidity during such episodes?

#### **4. Stress testing**

*This section investigates the kinds of liquidity stress events that complex groups seek to prepare for and how they assess their capacity to handle such stress events.*

4.1 The undertaking of stress testing naturally involves the metrics that the group has adopted for the measurement of liquidity risk. First, please indicate which types of measures—for example, liquid assets on the balance sheet, unencumbered assets that can be used to obtain secured funding, and a comparison of cash inflow and outflows across a variety of maturity buckets—are paramount in managing the group's liquidity risk?

- Where unencumbered assets are involved as collateral for potential borrowings, what assumptions are being made? (For example, what assumptions underlie any 'haircuts' that might be made? What assumptions are made about the collateral that might be requested by counterparties in a stress situation? How does collateral posted for real-time gross settlement and other settlement systems fit in the framework?)
- What assumptions underlie cash flow projections (for example, assumptions about the run-off of assets and liabilities and the intake of new business)? Are committed facilities and derivatives included? What type of modeling is done, for example, deterministic or probabilistic?<sup>64</sup>
- What factors are used to determine the limits on exposures to liquidity risk accepted by the group?
- Some firms also use a measure that indicates the length of time that the firm can continue (normal or limited) operations before it becomes unable to meet an obligation when due. Does your group use such a measure? If so, would you please describe it, indicating (among other things) the expectations for what might happen during this time period and how (if at all) the assumptions discussed above would change?

4.2 We would like to learn more about the group's stress testing. Please describe in some detail the stress scenarios that your group uses to assess its capacity to withstand funding liquidity pressures. We would be interested in, among other things:

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<sup>64</sup> A deterministic model is one that assumes that there is only one possible outcome. A probabilistic model is one that recognizes that a range of outcomes is possible and assigns probabilities to input and/or output factors.

- The extent to which the funding liquidity stress tests include firm-specific or general market shocks
- Whether the scenarios pertain to the group as a whole or if there are separate simulations for the various business units or legal jurisdictions
- An indication of how severe the scenarios are; the assumptions made (including, among other things, the behavior of inflows and outflows, the take-up of options that give counterparties the right to withdraw funds immediately, the availability of secured and unsecured funding, haircuts on collateral, and the correlation of liquidity shocks across business units)
- The time horizon used
- The extent to which the liquidity stress tests are integrated with those for other types of risks (for example, market, credit, insurance, and operational risks)
- The frequency with which liquidity stress testing is done
- When various units perform their own assessments, how consistent are the assumptions used by the various units

4.3 Could you tell us how the results of stress testing are incorporated in the group's limits on exposures to liquidity risk and its contingency plans?

## 5. Regulatory considerations

5.1 *Legal and regulatory requirements might affect the management of liquidity on a group-wide basis.* Do you agree with this view? Please explain and cite specifics wherever possible. You may want to consider commenting on:

- Whether prudential regulations affect liquidity management more across financial sectors (banking, securities, and insurance) or more across jurisdictions within sectors
- Whether any restrictions on cash flows between affiliates are relevant mostly to normal day-to-day operations, to situations of stress, or both
- Issues specific to home-host country regulation

5.2 A particular issue is that present prudential regulations pose challenges to the centralization of liquidity management. Do you see this as an issue? If yes, to which prudential regulations on liquidity is the group subject in countries outside the home country, and in which way do these regulations affect the (centralized or decentralized) liquidity management in the head office? In this connection, how has the extent of central control in your group evolved over the past several years? What benefits has the group realized (or expect to realize) from greater central management of liquidity?

5.3 Do you see any tension between the objective of consumer protection (for example, for long-term life insurance policyholders) and the desire to manage liquidity centrally across the group, particularly in times of stress? If you do, how do you propose this tension might be resolved?

5.4 Can you suggest a few changes in law or regulation that you believe would facilitate the group's management of liquidity?

5.5 In particular, how would the group's liquidity management and liquidity posture change if regulators relaxed some of the restrictions on the movement of funds between affiliates within a group?

**(2) OCC Liquidity Report**  
**APPENDIX A: FUNDS FLOW ANALYSIS OF THE ABC BANK**  
FOR SELECTED ASSETS AND CREDIT SENSITIVE LIABILITIES \$ THOUSANDS

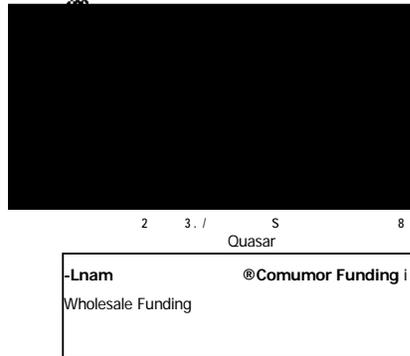
Sample Format, tailor  
as appropriate

Quarter	BANK ASSETS					BANK LIABILITIES					PARENT NONBANK ASSETS	NONBANK LIABILITIES
	(1) Federal Reserve Balance	(2) <b>Total Loans &amp; Leases</b>	(3) Free Securities	(4) Money Market Assets	(5) DOA Net of Float	(6) Consumer Deposits	(7) Fed Funds Purchased	(8) COs >\$100m	(10) Foreign Deposits	(9) Other Sensitive Funds/Dep	(11) Short-Term Assets	(12) Short-Term Liabs
1	\$5,000	\$310,000	\$70,000	\$7,500	<b>\$96,000</b>	\$389,000	\$10,000	<b>\$40,350</b>	\$0	\$0	\$10,000	<b>\$8,500</b>
2	\$5,000	\$320,000	<b>\$68,000</b>	\$7,500	<b>\$94,000</b>	\$384,000	\$10,000	\$42,000	\$1,000	\$1,000	\$10,000	\$8,500
3	\$5,200	\$325,000	<b>\$66,500</b>	\$6,800	<b>\$94,000</b>	\$383,000	\$12,000	\$43,000	\$1,000	\$2,200	\$10,000	\$8,500
4	\$5,100	\$330,000	\$67,500	\$5,500	\$92,400	<b>\$384,000</b>	<b>\$14,500</b>	\$44,000	\$1,000	\$3,800	\$10,000	\$8,500
5	\$5,000	<b>\$345,000</b>	<b>\$68,000</b>	\$5,000	\$90,400	<b>\$383,900</b>	\$13,000	<b>\$47,400</b>	\$1,000	\$4,000	\$10,000	\$8,500
6	\$4,800	\$396,000	\$23,200	\$5,000	\$74,000	\$377,000	\$10,000	<b>\$50,500</b>	\$1,000	\$5,500	\$10,000	\$8,500
7	\$5,100	<b>\$455,500</b>	\$19,000	\$4,000	\$75,300	\$370,000	\$11,000	\$51,000	\$2,700	\$7,500	<b>\$6,000</b>	\$4,500
8	\$3,900	\$473,000	\$12,500	\$2,000	\$80,000	<b>\$365,000</b>	\$14,000	\$51,100	\$5,000	\$10,400	\$4,500	\$3,000
Change from previous	(\$1,200)	\$17,500	(\$6,500)	(\$2,000)	\$4,700	(\$5,000)	\$3,000	\$100	\$2,300	\$2,900	(\$1,500)	(\$1,500)

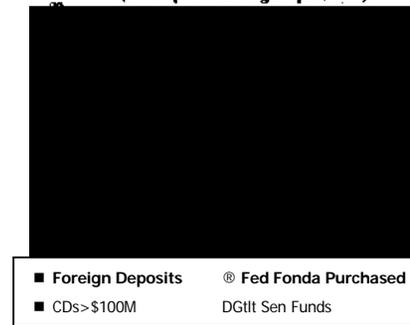
**Sources and Uses Quarter 7 to Quarter B**

Sources		Uses	
FRB BALANCE	\$1,200	LOANS & LEASES	\$17,50
<b>FREE</b>	\$6,500	<b>CONSUMER DEP</b>	\$5 ADO
MMA	\$ 2,000		
DOA	\$4,700		\$22,50
F FP	\$ 3,000		
CDs	\$100		
<b>FOREIGN DEP</b>	\$2,300		
<b>OTHER 41AB5</b>	-\$2,900		
	<hr/>		
	\$22,700		

**ABC's Total Loans and Total Funds  
(Over previous eight quarters)**



**ABC's Wholesale Funding  
(Over previous eight quarters)**



NOTE: Sources and Uses do not balance on this schedule as it purposely includes only balance sheet line items likely to affect liquidity. Longer term assets/liabilities, such as fixed assets or other liabilities, which usually two liule impact art liquidity, are excluded in order to locos on meaningful cash (laws. The out at balance condition can be monitored and controlled, and 7 significant should be researched This process allows for a more timely availability and presentation of data.

## **Appendix A: Continued Funds Flow Analysis Sample Line Item Definitions**

Most of the line item definitions can be modified by the bank to clarify individual bank reports, but there are certain exceptions, as noted.

### **Bank Assets**

*(Note: Include ONLY bank balances, NOT nonbank subsidiaries)*

(1) *Federal Reserve Balance*

The sum of Federal Reserve due from bank balances.

(2) *Total Loans and Leases*

The sum of gross loans plus other real estate owned.

(3) *Free Securities*

This term is strictly limited to securities meeting the following characteristics: saleable securities held, securities available for pledging, unpledged securities in transit, and assets securitized. These securities are not encumbered in any way and are of sufficient unit/transaction size and credit quality to be repurchased or sold in the market at will. Book value rather than market value is acceptable.

An accurate number for 'free securities' is not typically available from the general ledger. Management's judgment is required to arrive at a representative figure in accordance with the definition provided. Various methods may be used, but should be subject to periodic testing to ensure reasonable accuracy.

(4) *Money Market Assets*

This term is limited strictly to the following instruments held externally in non-affiliated banks. No variance in the definition of 'money market assets' is allowed. Additional columns may be added, if necessary, to provide an accurate portrayal of other liquid assets.

Federal funds sold, both overnight and term (do not include Repos)

Negotiable CDs purchased

Foreign deposits placed, both overnight and term (Euro-dollar and other foreign currencies)

## **Bank Liabilities**

*(Note: Include ONLY bank balances, NOT non-bank subsidiaries)*

(5) *DDA Net of Float*

Total demand deposit ledger balances, net of due from banks-deferred, due from Fed-deferred, and 'other' cash items, such as items in process.

(6) *Consumer Deposits*

Separate consumer accounts, which exceed \$100m, if significant. The line (does not include DDA, which is reported separately) should reflect consumer deposits, such as:

NOW accounts.

Money market checking accounts.

Non-transaction accounts, interest or non-interest bearing.

CDs < \$ 100m (net of public funds).

Passbook savings.

Money market savings.

IRA and Keogh accounts.

(7) *Federal Funds Purchased — Overnight*

The sum of Fed funds purchased as principal on an overnight basis.

(8) *Fed Funds Purchased — Term*

The sum of Fed funds purchased as principal for a term longer than overnight.

(9) *Foreign Deposits — Overnight*

All Eurodollars and foreign currency accepted as foreign branch liabilities on an overnight basis. Report retail deposits separate from wholesale or professional funds providers, if significant.

(10) *Foreign Deposits — Term*

All Eurodollars and foreign currency accepted as foreign branch deposits for a term longer than overnight. Report retail deposits separate from wholesale or professional funds providers, if significant.

(11) *CDs >\$100m*

Total balance of jumbo CDs (net of investment agreements and public funds). This category could include deposit notes, or other similar liabilities, if they are in excess of

\$100m. Include the entire deposit if it is greater than \$100m, but not deposits that are less than or equal to \$100m if possible, based on MIS availability.

Note: For potential erosion estimates, it is best to assume that an entire deposit

which exceeds \$100m will leave the bank rather than the amount in excess of \$100m. However, for identification of uninsured deposits for FDIC purposes, only the amount of each deposit exceeding \$100m is technically uninsured.

(12) *Other Sensitive Funds/Deposits*

Total of all funding sources that may exhibit unusual credit sensitivity that are not already defined.

(13) *Treasury, Tax, and Loan*

The sum of the Treasury, tax, and loan balances.

(14) *Fed Discount Window*

Total borrowings at the discount window.

### **Non-bank Assets (Parent)**

(15) *Short-Term Internal Investments*

Foreign deposits placed (from parent's perspective). Other short-term liquid assets.

Note: Typically, these parent company assets are placed in affiliated bank liability accounts, such as foreign deposits taken and, therefore, are also reflected on the bank's asset side--presumably in money market assets. An understanding of how these funds flow from the parent to affiliate and back is critical in an analysis of the Funds Flow Analysis report to avoid double counting. It must be assumed that the bank's liabilities to the parent will have priority on the bank's liquid assets. Therefore, for analysis purposes, they must be subtracted from the money market asset number for an assessment of bank level liquidity.

(16) *Short-Term External Assets:* Cash, foreign deposits placed, other short-term liquid assets.

Note: Ensure that these assets are not carried in the 'consolidated' Funds Flow Analysis MMA figure (4). They represent liquid assets the parent maintains outside of its own corporation and are available to the parent over the listed total MMA figure in the Funds Flow Analysis Report.

### **Non-Bank Liabilities (Parent)**

(17) *Commercial Paper, etc.*

Total commercial paper issued by the parent company or subsidiary, master notes, and any other short-term liability, including term debt or debt payments that are approaching maturity.

**APPENDIX B: CONTINGENCY FUNDING PLAN SUMMARY**  
 (Example format, tailor as appropriate)

	CURREN T BALANC E	1 B/C	2 C	3 C/D	4 D	5 D/E
POTENTIAL FUNDING EROSION						
LARGE FUND						
PROVIDERS (from list)						
FED FUNDS						
CDs						
EURO TAKINGS /						
FOREIGN DEPOSITS						
COMMERCIAL PAPER						
SUB TOTAL						
OTHER UNINSURED FUND						
PROVIDERS FED FUNDS						
CDs						
EURO TAKINGS /						
FOREIGN DEPOSITS						
COMMERCIAL PAPER						
DDAs						
"CONSUMER" MMDA,						
SAVINGS,						
ETC.						
TOTAL UNINSURED FUNDS						
INSURED FUNDS TOTAL						
FUNDING BASE						
OFF-BALANCE-SHEET FUNDING						
REQUIREMENTS L/Cs						
LOAN COMMITMENTS						
SECURITIZATIONS (AMORTIZING)						
OPTIONS						
TOTAL OFF-BALANCE-SHEET ITEMS						
TOTAL POTENTIAL FUNDING EROSION						
SOURCES OF FUNDS TO MEET DEMANDS (WHICH MAY OR MAY NOT BE UTILIZED, DEPENDING ON NEED) (ASSUMING NEEDED ASAP)						

IMMEDIATE 30 DAYS 60 DAYS 90 DAYS  
180+ DAYS

---

SURPLUS MONEY  
MARKET ASSETS  
FREE SECURITIES  
ASSET SALES / SECURITIZATION  
CREDIT CARDS,  
    AUTOs,  
    CMOs,  
    ETC.

LOAN ATTRITION

TOTAL INTERNAL SOURCES

ESTIMATED LINE CAPACITY TO \_\_\_\_\_  
BORROW IN MARKET  
BROKERED FUNDS CAPACITY \_\_\_\_\_  
DISCOUNT WINDOW COLLATERAL \_\_\_\_\_ 'BORROWING VALUE'

## **APPENDIX C: LIQUIDITY INFORMATION REQUIREMENTS**

(Note: The forms referred to in this list are included in the OCC MIS liquidity monitoring package. They are only samples or ideas. Tailor reports to fit your specific needs.)

### **Daily Bank Information Needs**

- Management should contact examiners immediately if significant activity occurs in the market or deterioration of any kind occurs throughout the day.
- Press articles, potentially damaging media, applicable Dow reports, and other pertinent information received over the wire—throughout the day.
- Wire room activity report—daily and periodically as appropriate.
- Daylight OD numbers.
- Stock quote.
- CD rate survey.
- Funds Flow Analysis (see form).
- Fed funds summary (see form).
- Net intercompany funding positions report (see form).
- Total deposit trends report (see form).
- Damage assessment report (see form).
- Summary balance sheets on all banks and affiliates.
- Sources and uses analysis (see form).
- Meet with examiners to discuss reports.
- Close of business estimates (see form).

### **Daily Examiner Requirements**

- Management should contact examiners immediately, if significant activity occurs in the market or deterioration of any kind occurs throughout the day.
- Press articles, potentially damaging media, applicable Dow reports, and other pertinent information received over the wire—throughout the day. +

- Wire room activity report—daily and periodically, as appropriate. \*\*
- Daylight OD numbers.
- Stock quote.
- CD rate survey. #
- Funds flow analysis (see form). +
- Fed funds summary (see form). +
- Net intercompany funding positions report (see form). \*\*, +
- Total deposit trends (see form). +
- Damage assessment reports (see form). \*\*, +
- Summary balance sheets on all banks and affiliates. \*\*
- Meet with management to discuss reports. \*\*
- Prepare daily e-mail. +
- Sources and uses analysis (see form).
- Narrative of (1) sources and uses analysis and (2) any important events.
  - Close of business estimates.
  - Unfunded commitment report \*\*
  - Maturities report
  - Consolidated maturities summary +
- Summary lead banks balance sheets with significant changes explained \*\*
- Due from/to correspondent bank summary \*\*
- Trust balance (secured portion) \*\*
- ALCO packet
- Fed discount window collateral (see form) +
- TT&L collateral (see form) +
- Attend bank ALCO \*\*

- Loan sales report (may be in ALCO Packet)
- Parent company weekly cash flow +
- Top 20 customer analysis (consolidated)
- Jumbo CD rates comparisons +

# Monthly - until conditions exist that adversely threaten the company's funding position.

\*\* Needed only when bank is under examination or conditions exist that would affect the company's funding position adversely.

±

**APPENDIX D: CONTINGENCY LIQUIDITY PLAN (OCC)**

**CONTINGENCY FUNDING PLAN SUMMARY**

(Example format, tailor as appropriate)

POTENTIAL EROSION	FUNDING	CURREN T 1 B/C 2 C 3 C/D 4 D 5 D/E
LARGE FUND PROVIDERS (from list) FED FUNDS CDs EURO TAKINGS / FOREIGN DEPOSITS COMMERCIAL PAPER SUB TOTAL		
OTHER UNINSURED FUND PROVIDERS FED FUNDS CDs EURO TAKINGS / FOREIGN DEPOSITS COMMERCIAL PAPER DDAs "CONSUMER" MMDA, SAVINGS, ETC. TOTAL UNINSURED FUNDS		
INSURED FUNDS TOTAL FUNDING BASE		
OFF-BALANCE-SHEET REQUIREMENTS L/Cs LOAN COMMITMENTS SECURITIZATIONS (AMORTIZING) OPTIONS TOTAL OFF-BALANCE-SHEET ITEMS	FUNDING	
TOTAL POTENTIAL FUNDING EROSION		

SOURCES OF FUNDS TO MEET DEMANDS  
(WHICH MAY OR MAY NOT BE UTILIZED, DEPENDING ON NEED)  
(ASSUMING NEEDED ASAP)

	IMMEDIATE	30 DAYS	60 DAYS	90	DAYS
			180+ DAYS		

---

SURPLUS MONEY MARKET  
 ASSETS FREE  
 SECURITIES

ASSET SALES / SECURITIZATION  
 CREDIT CARDS,  
 AUTOs,  
 CMOs,  
 ETC.

LOAN ATTRITION

TOTAL INTERNAL SOURCES

ESTIMATED LINE CAPACITY TO \_\_\_\_\_  
 BORROW IN MARKET BROKERED  
 FUNDS CAPACITY \_\_\_\_\_

DISCOUNT WINDOW COLLATERAL \_\_\_\_\_ "BORROWING VALUE"

## ANNEX III: BIS PRINCIPLES FOR SOUND LIQUIDITY RISK MANAGEMENT AND SUPERVISION

### *Fundamental principles for the management and supervision of liquidity risk*

**Principle 1:** A bank is responsible for the sound management of liquidity risk. A bank should establish a robust liquidity risk management framework that ensures it maintains sufficient liquidity, including a cushion of unencumbered, high quality liquid assets, to withstand a range of stress events, including those involving the loss or impairment of both unsecured and secured funding sources. Supervisors should assess the adequacy of both a bank's liquidity risk management framework and its liquidity position and should take prompt action if a bank is deficient in either area in order to protect depositors and to limit potential damage to the financial system.

### *Governance of liquidity risk management*

**Principle 2:** A bank should clearly articulate a liquidity risk tolerance that is appropriate for its business strategy and its role in the financial system.

**Principle 3:** Senior management should develop a strategy, policies and practices to manage liquidity risk in accordance with the risk tolerance and to ensure that the bank maintains sufficient liquidity. Senior management should continuously review information on the bank's liquidity developments and report to the Board of Directors on a regular basis. A bank's Board of Directors should review and approve the strategy, policies and practices related to the management of liquidity at least annually, and ensure that senior management manages liquidity risk effectively.

**Principle 4:** A bank should incorporate liquidity costs, benefits and risks in the product pricing, performance measurement and new product approval processes for all significant business activities (both on- and off-balance sheet), thereby aligning the risk-taking incentives of individual business lines with the liquidity risk exposures their activities create for the bank as a whole.

### *Measurement and management of liquidity risk*

**Principle 5:** A bank should have sound processes for identifying, measuring, monitoring, and controlling liquidity risk. These processes should include a robust framework for comprehensively projecting cash flows arising from assets, liabilities and off-balance sheet items over an appropriate set of time horizons.

**Principle 6:** A bank should actively manage liquidity risk exposures and funding needs within and across legal entities, business lines and currencies, taking into account legal, regulatory and operational limitations to the transferability of liquidity.

**Principle 7:** A bank should establish a funding strategy that provides effective diversification in the sources and tenor of funding. It should maintain an ongoing presence in its chosen funding markets and strong relationships with funds providers to promote effective diversification of funding sources. A bank should regularly gauge its capacity to raise funds quickly from each source. It should identify the main factors that affect its ability to raise

funds and monitor those factors closely to ensure that estimates of fund raising capacity remain valid.

**Principle 8:** A bank should actively manage its intraday liquidity positions and risks to meet payment and settlement obligations on a timely basis, under both normal and stressed conditions, and thus contribute to the smooth functioning of payment and settlement systems.

**Principle 9:** A bank should actively manage its collateral positions, differentiating between encumbered and unencumbered assets. A bank should monitor the legal entity and physical location where collateral is held and how it may be mobilized in a timely manner.

**Principle 10:** A bank should conduct stress tests on a regular basis for a variety of institution-specific and market-wide stress scenarios (individually and in combination) to identify sources of potential liquidity strain and to ensure that current exposures remain in accordance with a bank's established liquidity risk tolerance. A bank should use stress test outcomes to adjust its liquidity risk management strategies, policies, and positions and to develop effective contingency plans.

**Principle 11:** A bank should have a formal Contingency Funding Plan (CFP) that clearly sets out the strategies for addressing liquidity shortfalls in emergency situations. A CFP should outline policies to manage a range of stress environments, establish clear lines of responsibility, include clear invocation and escalation procedures, and be regularly tested and updated to ensure that it is operationally robust.

**Principle 12:** A bank should maintain a cushion of unencumbered, high quality liquid assets to be held as insurance against a range of liquidity stress scenarios, including those that involve the loss or impairment of unsecured and typically available secured funding sources. There should be no legal, regulatory or operational impediment to using these assets to obtain funding.

### *Public disclosure*

**Principle 13:** A bank should publicly disclose information on a regular basis that enables market participants to make an informed judgment about the soundness of its liquidity risk management framework and liquidity position.

### *The role of supervisors*

**Principle 14:** Supervisors should regularly perform a comprehensive assessment of a bank's overall liquidity risk management framework and liquidity position to determine whether they deliver an adequate level of resilience to liquidity stress given the bank's role in the financial system.

**Principle 15:** Supervisors should supplement their regular assessments of a bank's liquidity risk management framework and liquidity position by monitoring a combination of internal reports, prudential reports and market information.

**Principle 16:** Supervisors should intervene to require effective and timely remedial action by a bank to address deficiencies in its liquidity risk management processes or liquidity position.

**Principle 17:** Supervisors should communicate with other supervisors and public authorities, such as central banks, both within and across national borders, to facilitate effective cooperation regarding the supervision and oversight of liquidity risk management. Communication should occur regularly during normal times, with the nature and frequency of the information sharing increasing, as appropriate, during times of stress.

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