

Strengthening Bank Management of Liquidity Risk: The Basel III Liquidity Standards

Tamara Gomes and Natasha Khan

Introduction

The global financial crisis highlighted the importance of ensuring that the financial system has adequate liquidity to withstand adverse circumstances. The funding pressures that began in 2007 underlined the acute deficiencies in the liquidity-risk-management practices of some banks, and the severity of the ensuing crisis required massive public sector support to stem the liquidity spiral and mitigate its detrimental effect on the real economy. Managing funding liquidity risk and market liquidity risk is integral to the role that banks play in maturity transformation, which is, in turn, a fundamental aspect of intermediation between savers and borrowers that contributes to the efficient allocation of resources in the economy. If funding liquidity risk and market liquidity risk are not adequately managed, they can lead to severe liquidity spirals.

The financial crisis prompted the Basel Committee on Banking Supervision (BCBS) to intensify its efforts to strengthen the principles and standards for capital, as well as for the measurement and management of liquidity risk.¹ “Basel III: International Framework for Liquidity Risk Measurement, Standards and Monitoring,” published in December 2010 (BCBS 2010), represents a fundamental review of the risk-management practices of banks related to funding and liquidity to address the shortcomings revealed by the recent crisis. The liquidity framework is part of a comprehensive set of complementary and mutually reinforcing measures for regulatory reform that have been introduced to strengthen the risk management and supervision of banking systems.

These new global standards encourage banks to manage their liquidity positions more prudently, giving market participants greater confidence in the ability of the banking sector to withstand periods of stress, and, hence, lowering the probability of acute shortfalls in liquidity. The standards include two quantitative metrics: the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR), which were developed to meet two separate, but complementary, objectives (**Box 1**). The objective of the LCR is to promote short-term resilience by ensuring that a bank has enough high-quality liquid assets to survive an acute stress scenario that lasts for one month. The NSFR was developed to achieve the second objective of the Basel III liquidity standards: promoting longer-term resilience by encouraging banks to fund their activities with more stable sources of funding.² Thus, even in the face of financial stress, an accumulated stock of high-quality liquid assets will help banks to absorb liquidity shocks, enabling them to continue to meet their obligations and perform their intermediation role. This will help to reduce the impact of any liquidity shocks on the broader financial system and the real economy. Given the interlinkages between banks and markets, the new standards will also dovetail with initiatives to boost the resilience of the financial market infrastructure and support the continuous operation of core funding markets.³

The Basel III liquidity framework breaks new ground. While several countries have previously established regulatory frameworks for the management and supervision of liquidity risk by banks, the Basel III standards seek, for the first time, to establish a *globally harmonized* regulatory framework. By outlining minimum requirements for all global banks, the framework encourages international consistency and cross-border

¹ The BCBS has long discussed the merits and challenges associated with the management of liquidity risk by banks. For example, it first published a framework for managing and measuring liquidity risk in 1992 and, more recently, in 2008, released a review of the principles for managing liquidity risk. The Working Group on Liquidity, a BCBS subgroup established in 2006, has issued reports that update and strengthen these documents (BCBS 2000, 2008).

² Trevisan (2011) also provides a detailed overview of the quantitative standards.

³ See, for example, Carney (2008a,b) and Fontaine, Selody and Wilkins (2009).

The Liquidity Coverage Ratio

The Liquidity Coverage Ratio (LCR) aims to increase banks' resilience to an acute 30-day stress scenario. The LCR is calculated as the

stock of high-quality liquid assets/total net cash outflows over the next 30 calendar days \geq 100 per cent.

In other words, to meet funding obligations and draws on contingent liabilities over the next 30 days, the LCR requires banks to hold a stock of unencumbered high-quality liquid assets equal to or greater than stressed net cash outflows. The requirement must be met continuously and reported to supervisors on at least a monthly basis, with an ideal time lag of no more than two weeks.

There are two broad groups of high-quality liquid assets. The first group includes cash, central bank reserves and cash substitutes such as top-rated sovereign debt ("Level 1" assets). These assets can make up an unlimited amount of total liquid assets and are measured at full value (i.e., no

haircuts). "Level 2" assets include lower-rated public debt and higher-rated covered bonds and non-financial corporate bonds. These assets are restricted to 40 per cent of the total pool of liquid assets and are given a minimum haircut of 15 per cent.

The denominator of the LCR is net cash outflows during a 30-day period. The size of the net outflows is based on withdrawal rates on retail and wholesale funding obligations and drawdown rates on contingent liabilities that reflect the amount of liabilities that are likely to mature or be called within 30 days under a scenario that combines an idiosyncratic and systemic liquidity shock, similar to shocks observed during the 2007-08 financial crisis. The calibration assumes that runoff rates are higher for liabilities that have been shown to be less stable. For example, retail deposits are assigned much lower runoff rates than the drawdown rates for the undrawn portion of liquidity lines to non-financial corporate firms.

The Net Stable Funding Ratio

The LCR is complemented by a structural funding ratio, the Net Stable Funding Ratio (NSFR), which is structured to ensure that long-term assets are funded with a minimum amount of stable long-term funding. The NSFR is calculated as the

available amount of stable funding/required amount of stable funding $>$ 100 per cent.

"Available stable funding" includes capital, preferred stock and liabilities with remaining maturities equal to one year or more, and the portion of deposits and wholesale funding "with maturities of less than one year that would be expected to stay with the institution for an extended period in an idiosyncratic stress event." Similar to the LCR,

these categories are assigned factors that are related to their perceived stability. "Required stable funding" is calculated as the sum of unencumbered assets, as well as off-balance-sheet exposures and other activities. These assets are assigned a factor that is inversely related to their perceived liquidity; in other words, the more liquid the asset is deemed to be, the less required stable funding is needed. For example, immediately available cash is assigned a 0 per cent factor, since it is assumed to be directly on hand, whereas retail loans with a remaining maturity of less than one year are assigned a factor of 85 per cent, since they will not be fully repaid until a later date. The NSFR must be met continuously and reported to supervisors at least quarterly.

co-operation. Furthermore, by outlining additional monitoring metrics, the framework enhances regulators' toolkits and encourages greater transparency and dialogue between banks and regulatory authorities.

Designing an internationally consistent set of quantitative liquidity standards is a challenging task. The effects on banks' operations could introduce significant changes to the broader financial system, as well as having unintended consequences. Given the size and breadth of the potential effects, policy-makers have

instituted an observation period to undertake further analysis of certain aspects of the current calibration—and their implications—before the standards are finalized and implemented (in 2015 for the LCR and 2018 for the NSFR). Since the LCR is the more developed and better known of the two liquidity metrics and has garnered greater attention, the BCBS committed in 2010 to finalizing a few outstanding aspects of the LCR by mid-2013; the Committee has since agreed to accelerate its review and to introduce any adjustments to key areas

well ahead of the mid-2013 deadline. This will reduce some of the uncertainty about the final design of the LCR and will facilitate its smooth implementation (see BCBS 2011).

This report examines two types of liquidity—funding liquidity and market liquidity—and highlights how the interaction between the two led to destructive liquidity spirals during the financial crisis. As well, it underscores the importance of strong liquidity-risk management by banks in reducing the likelihood and severity of future financial crises, and outlines the benefits of the Basel III liquidity standards. Finally, it discusses some aspects of the LCR that merit further consideration.

Interactions Between Funding Liquidity and Market Liquidity During the Financial Crisis

The events of 2007–08 highlighted the importance of liquidity management for the proper functioning of the banking sector and financial markets. Despite having relatively high capital levels, many banks experienced difficulties because they had not managed their liquidity properly. However, as noted in Crockett (2008), liquidity is “easier to recognize than define.” Broadly speaking, there are two different, mutually reinforcing types of liquidity: funding liquidity and market liquidity.⁴

- **Funding liquidity** is the ability of a firm to generate funds by deploying assets held on its balance sheet to meet financial obligations on short notice. The liquidity position of a given bank is determined primarily by its holdings of cash and other readily available marketable assets, as well as by its funding structure and the amount and type of contingent liabilities that may come due over a specified horizon.
- **Market liquidity** is the ability of an agent to execute transactions in financial markets without causing a significant movement in prices. Market liquidity can be considered along several different dimensions: immediacy, breadth, depth and resilience (BIS 1999).⁵ Gauthier and Tomura (2011) note that the market liquidity risk arising from endogenous fire sales of assets is an important channel of contagion that exacerbates system-wide instability.

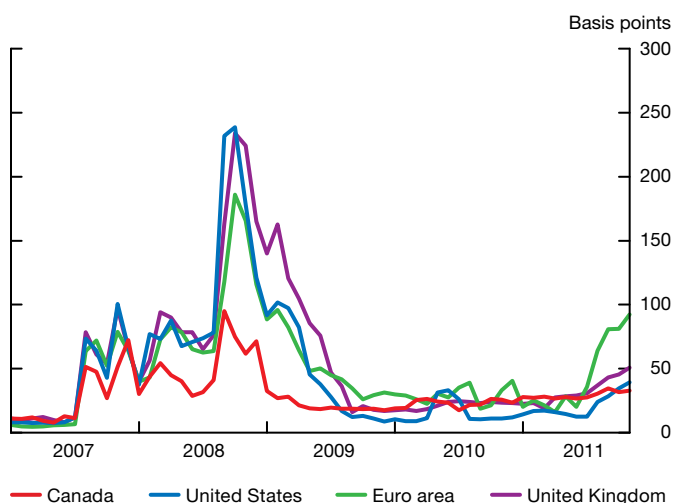
4 A third type of liquidity, monetary liquidity, refers to credit conditions and the fluctuations of monetary aggregates (Longworth 2007). This article, however, focuses only on funding and market liquidity.

5 Immediacy refers to the speed with which trades of a certain size can be executed. Breadth is the divergence in the price of an asset from mid-market prices and is generally measured by the bid-offer spread. Depth refers to either the volume of trades that can be executed without affecting current market prices or the amount of orders on the order books of market-makers. Resilience is the speed with which price fluctuations that occur during the execution of a trade return to former levels.

Market and funding liquidity tend to be highly pro-cyclical—abundant in benign periods but scarce during stressful times (Financial Stability Forum 2009). As demonstrated during the 2007–08 liquidity crisis, interactions between these two types of liquidity can lead to debilitating liquidity spirals whereby poor conditions for funding liquidity lead to a decrease in market liquidity that, in turn, contributes to a further deterioration in funding liquidity.⁶ In the absence of adequate liquidity-risk management, banks that face a liquidity shock often engage in fire sales, hoard liquidity and reduce lending to the real economy (Brunnermeier 2009). These actions in turn increase the likelihood of market disruptions and liquidity shocks faced by other institutions, resulting in a prolonged deterioration in market liquidity that has a severe impact on real economic growth. In particular, the financial crisis demonstrated the high degree of reliance that banks have on short-term wholesale funding markets, which essentially ceased to exist at maturities longer than overnight. Widening interbank funding spreads (Chart 1) and sharply lower trading activity put strong funding pressures on banks that had to find alternative financing quickly in order to replace lost sources of funding. The asset-backed commercial paper (ABCP) market in the United States and Canada came under particular stress as widespread concerns about the valuation of structured products and a lack of confidence in the reliability of credit ratings severely impaired market functioning, resulting in a dramatic decline in the stock of these securities (Chart 2 and Chart 3) and

Chart 1: Interbank funding spreads widened sharply during the crisis, forcing banks to seek alternative sources of financing

Difference between 3-month interbank offered rates and their respective overnight index swaps^a



a. For the United States and the United Kingdom, LIBOR; for the euro area, EURIBOR; and for Canada, CDOR

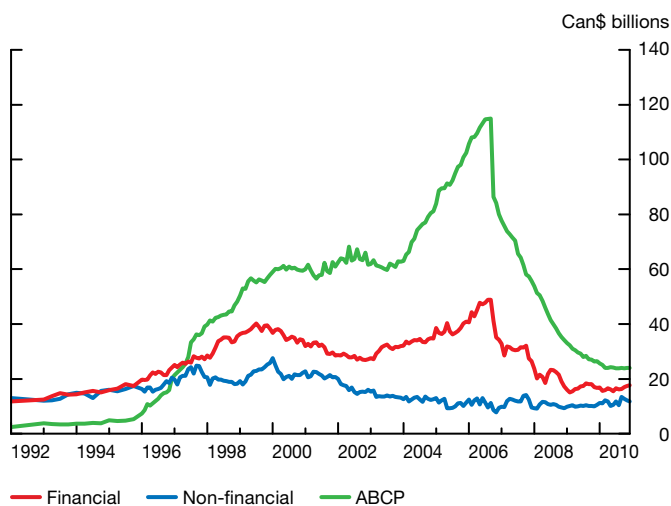
Source: Bloomberg

Last observation: November 2011

6 See, among others, Allen, Babus and Carletti (2010); Brunnermeier and Pedersen (2009); and Fontaine and Garcia (2009).

Chart 2: The asset-backed commercial paper market experienced the sharpest contraction, both in Canada . . .

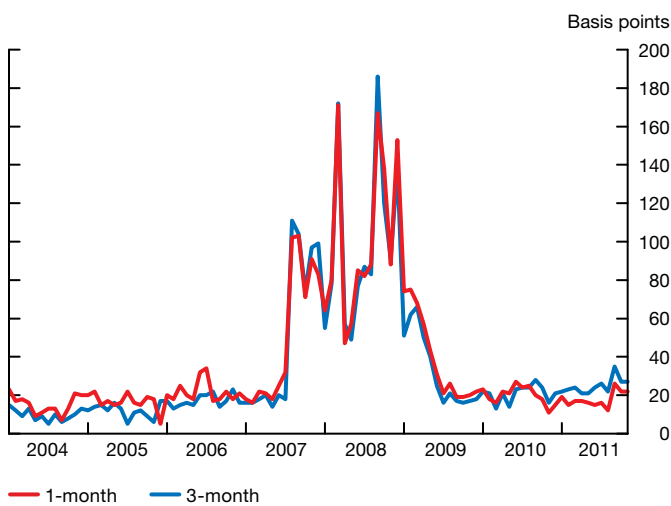
Canadian commercial paper outstanding, by type



Sources: Bank of Canada and DBRS Last observation: October 2011

Chart 4: Yield spreads on Canadian commercial paper widened considerably over the course of the crisis

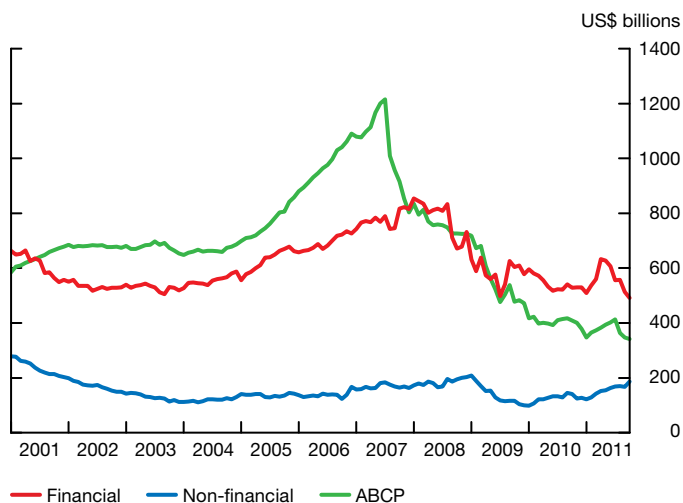
Yield spreads between R-1 mid-rated commercial paper and treasury bills



Sources: Bank of Canada and Bloomberg Last observation: November 2011

Chart 3: . . . and in the United States

U.S. commercial paper outstanding, by type



Source: U.S. Federal Reserve Last observation: October 2011

a sharp widening in spreads (**Chart 4**). The disruption in bank-sponsored ABCP markets also highlighted the need to better manage the liquidity risk associated with contingent liabilities, which require the sponsoring bank to provide liquidity under backstop arrangements at a time when the bank itself is already under stress.⁷ The crisis also made it clear that many global banks were not holding sufficient liquid assets to meet upcoming obligations and were thus forced to sell less-liquid assets precisely when market prices were low, which depressed

⁷ In Canada, the inability of non-bank-sponsored conduits to draw on backup bank liquidity lines prompted the Montréal Accord, through which \$32 billion of these securities were restructured as longer-term notes.

prices further and induced more selling, resulting in a vicious loss spiral.

In response, governments and central banks around the world undertook a number of extraordinary measures to inject liquidity into the financial system, in order to support banks and markets and to mitigate the impact of the crisis on the global economy. In Canada, the maximum liquidity support provided through the various Bank of Canada liquidity facilities and the government's Insured Mortgage Purchase Program reached Can\$88 billion, or 5.9 per cent of GDP, in March 2009. This was far less than the public sector liquidity support provided in other major jurisdictions. For instance, in the United States, support provided through numerous liquidity facilities peaked at US\$1,788 billion, or 12.7 per cent of GDP, in December 2008.⁸

It is essential to strengthen the management of liquidity risk in order to make the banking sector more resilient to liquidity shocks and thus reduce the probability and severity of future financial crises. To accomplish this, several interrelated weaknesses need to be addressed. First, banks were overly reliant on short-term wholesale funding markets, which can be costly and difficult to access in times of stress. Indeed, in the extreme, these markets may freeze up completely, with little or no lending occurring, and can remain frozen for extended periods of time. Second, banks underestimated both the amount of contingent liabilities they would need to

⁸ This includes support provided through the following entities: Term Auction Facility, Primary Dealer Credit Facility, Term Asset-Backed Securities Loan Facility, Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility, Commercial Paper Funding Facility, Term Securities Lending Facility, central bank liquidity swaps and discount window credit.

honour and the speed at which clients could draw on those facilities during a financial crisis. Most importantly, banks had too few high-quality liquid assets set aside to meet these obligations in the event of an acute and prolonged liquidity shock. The LCR and the NSFR are designed to address these shortcomings by creating incentives for banks to adopt more stable practices for the management of funding liquidity risk and market liquidity risk through reducing maturity mismatches, pricing liquidity risk appropriately and increasing liquidity buffers.

The Process and Challenges of Creating Global Liquidity Standards

Establishing a globally harmonized framework for managing liquidity risk, especially the calibration of quantitative metrics, is challenging, given the differences in bank funding models and market structures across various jurisdictions. As banks adopt the new standards, they may change their role as providers of credit and liquidity in ways that could have far-reaching consequences for the functioning of the financial system and the real economy. Thus, while the broad design of the new liquidity standards will achieve the objectives intended by policy-makers, there is a possibility that they may have some undesirable consequences. As a result, some aspects of the current calibration may warrant further consideration to minimize any potential adverse effects.

The observation period established by the BCBS (see page 36) provides the opportunity to address these issues. Several aspects of the design of the LCR are under consideration; three areas that are most important from a system-wide perspective, and the challenges associated with them, are discussed below.⁹

Using the pool of liquid assets during a period of stress

As noted in **Box 1**, the LCR requires banks to accumulate a pool of liquid assets so that they can meet potential short-term obligations during periods of stress. One of the main challenges for authorities is to outline under what circumstances and to what extent banks can use this pool of assets for this purpose.

It is generally agreed that banks should be required to meet the standard for the LCR in normal periods, but should be allowed to use the pool in times of stress. During periods of systemic stress, in particular, the inability to use liquid assets could cause a vicious liquidity spiral, with knock-on effects on other parts of the financial system and the real economy. It could also result in earlier or more extensive reliance on central

bank funding. While central banks will continue to fulfill their role as lender of last resort, banks should still be able to deploy the pool of liquid assets, as is the intent of the standards (Northcott and Zelmer 2009).

It is difficult, however, to determine ex ante what constitutes a period of stress and, therefore, when the pool of liquid assets can be used. The source of liquidity shocks has differed significantly across various stress periods and will clearly differ in future crises as well. Moreover, even if stress can be defined, there are inevitable identification lags.

Finally, there is the question of the extent to which banks can draw down the accumulated stock of liquid assets during a period of stress. While there may be value in establishing a minimum floor in normal times, any a priori restrictions on the amount of liquid assets that can be used could simply result in a new, lower, binding minimum that constrains banks in times of stress.

Given the potential for severe negative consequences to the financial system and overreliance on central bank liquidity, further guidance on the conditions under which the pool of liquid assets can be drawn down in times of stress is important. While providing such guidance is a challenging task, it will reduce uncertainty and mitigate potential negative consequences. Most importantly, it will ensure that banks are able to use the accumulated liquid assets so that “available liquidity” is indeed “usable liquidity.”¹⁰

Defining high-quality liquid assets

Defining what constitutes high-quality liquid assets is another important aspect of the liquidity regulation. To meet the objectives of the LCR, the quality of these assets should be apparent and the assets should be easily sold in the event of a liquidity shock. As noted in **Box 1**, the current BCBS framework classifies liquid assets into two distinct categories. While the framework identifies a number of fundamental and market-related characteristics that can be used to distinguish high-quality assets that are likely to retain their liquidity in times of severe market stress, the resulting classification of assets within the two categories raises some concerns. In particular, the escalating sovereign debt crisis raises questions about the treatment of certain sovereign debt, specifically, debt consisting of “Level 1” liquid assets that require no haircuts or concentration limits, regardless of credit quality and liquidity characteristics, if held by banks in the country where the liquidity risk is being taken.

The sovereign debt crisis highlights the risk of concentrating the exposure of the banking sector within a particular asset class, including assets traditionally

¹⁰ Goodhart (2008) uses the following analogy: “...the weary traveller who arrives at the railway station late at night, and, to his delight, sees a taxi there who could take him to his distant destination. He hails the taxi, but the taxi driver replies that he cannot take him, since local bylaws require that there must always be one taxi standing ready at the station.”

⁹ Work on the NSFR will also continue during the observation period.

considered to be risk-free. In crisis situations, any asset class can prove to be less liquid than expected, depending on the source of the turbulence. Hence, it is important that banks hold a well-diversified portfolio of high-quality liquid assets to guard against unexpected liquidity demands. Furthermore, a higher structural demand for sovereign debt that stems from the liquidity framework may undermine fiscal discipline. In some jurisdictions, this may even raise the risk that the new liquidity standards might be used to force the domestic banking sector to buy sovereign debt, thereby subsidizing governments.

A narrow and discrete definition of high-quality liquid assets does not reflect the fact that the liquidity characteristics of assets vary along a continuum and can change over time. Applying too narrow a definition could institutionalize market segmentation and result in market price distortions, reduced market liquidity, increased concentration on banks' balance sheets and lower incentives for positive market development. For example, the degree of liquidity of assets that have been classified as liquid (such as government bonds) could decrease if banks hold such assets for purposes of meeting the LCR rather than actively trading them. Market-making activities for assets that are not considered eligible liquid assets under the standards could decline, negatively affecting market functioning in these asset classes.

Given these considerations, additional quantitative criteria—predominantly based on market indicators such as the bid-ask spread, average issue size, turnover and price volatility—to help identify high-quality liquid assets could be considered further. Clearly, it is difficult to determine *ex ante* the liquidity characteristics of particular assets during periods of stress, since those characteristics will depend on the nature of the crisis. Nonetheless, liquidity characteristics observed over a sufficiently long time horizon, including past stress periods, may provide some insight into how the assets should be ranked in terms of expected liquidity during a crisis. Policy-makers will need to take into account the trade-off between the potential for a reduction in market segmentation based on moving to a broader definition and the data and operational difficulties associated with a broad definition, which may include assets that turn out to be less liquid under stressful conditions.

In addition to the quality and liquidity characteristics of assets, further policy objectives of the global regulatory framework should be taken into account. In particular, the objective of reducing channels of contagion within the banking sector argues for the exclusion of unsecured bank debt from the definition of high-quality liquid assets.

Committed liquidity lines

Another issue to consider is the potential impact of the assumed drawdown rates for backup liquidity lines to non-financial corporations. In the stress scenario envisioned in the LCR under the current framework, the undrawn portion of these backstops is assumed to be drawn down completely for all lines. There are concerns that this assumption may significantly reduce incentives for banks to provide these committed lines, which could have important adverse implications for economic activity and the ability of authorities to address systemic shocks that originate in the non-financial corporate sector.

Backup liquidity facilities from banks are critical components of liquidity management for non-financial firms, providing an important source of liquidity insurance against unexpected demands for funds. In the absence of this insurance, firms have to self-finance and self-insure by maintaining large stocks of liquid assets. This could increase the risk of liquidity mismanagement within the corporate sector, and induce firms to pass up valuable investment opportunities when their cash flow is low, ultimately increasing costs to the economy (Fazzari, Hubbard and Petersen 1988). Firms in certain sectors of the economy that experience large seasonal fluctuations in their cash flows may be particularly affected. In addition, bank liquidity lines support the issuance of commercial paper by non-financial corporate firms. Reduced access to this market-based financing may increase the reliance of non-financial corporate firms on bank lending and may concentrate credit intermediation within the banking sector, potentially increasing borrowing costs and amplifying the transmission of negative shocks in the banking system to the overall financial system and the real economy.

Committed lines are almost always provided by banks because they are better able to manage liquidity risk than non-financial corporate firms. In particular, deposit insurance schemes and the fact that banks have direct access to central bank liquidity facilities instill confidence that supports deposit inflows to banks, especially when market liquidity dries up. This offers a natural hedge, giving banks a competitive advantage in providing this source of liquidity insurance to the financial system (Gatev and Strahan 2006). In the absence of bank liquidity lines, central banks will have greater difficulty addressing a liquidity shock in the corporate sector. Since non-financial corporate firms do not have direct access to central bank liquidity, authorities would have to lend to banks and encourage them to lend to corporate firms, which may not happen if banks hoard liquidity at the height of a crisis.¹¹

¹¹ The Penn Central crisis in 1970 provides an example in which the Federal Reserve responded by lending aggressively to banks and encouraging them to provide liquidity to their borrowers. However, the difficulty in addressing the liquidity shock, because of the reluctance of banks to extend liquidity to firms in the midst of a crisis, resulted in borrowers purchasing backup committed lines from banks to insure against future funding disruptions.

Conclusion

The recent financial crisis exposed significant failures in the framework that supports banks in the management of liquidity risk. The Basel III liquidity framework incorporates several important measures that will enhance the resilience of banks to short-term liquidity shocks, better align their funding models with their risk preferences and incorporate liquidity risk into product pricing.

In response to these standards, banks will be required to improve their practices for liquidity-risk management. Although the new liquidity rules will result in higher costs, they will undoubtedly produce a net benefit to society by reducing the probability and impact of devastating financial crises. Thus, they complement other aspects of the global regulatory reform agenda to make the financial system more resilient.

References

- Allen, F., A. Babus and E. Carletti. 2010. "Financial Connections and Systemic Risk." National Bureau of Economic Research Working Paper No. 16177.
- Bank for International Settlements (BIS). 1999. "Market Liquidity: Research Findings and Selected Policy Implications." May.
- Basel Committee on Banking Supervision (BCBS). 2000. "Sound Practices for Managing Liquidity in Banking Organizations." Available at <<http://www.bis.org/publ/bcbs69.pdf>>.
- . 2008. "Principles for Sound Liquidity Risk Management and Supervision." Available at <<http://www.bis.org/publ/bcbs144.pdf>>.
- . 2010. "Basel III: International Framework for Liquidity Risk Measurement, Standards and Monitoring." Available at <<http://www.bis.org/publ/bcbs188.pdf>>.
- . 2011. "Outcome of the September 2011 Basel Committee Meeting." Press Release. 28 September. Available at <<http://www.bis.org/press/p110928.htm>>.
- Brunnermeier, M. K. 2009. "Deciphering the Liquidity and Credit Crunch 2007–2008." *Journal of Economic Perspectives* 23 (1): 77–100.
- Brunnermeier, M. K. and L. H. Pedersen. 2009. "Market Liquidity and Funding Liquidity." *Review of Financial Studies* 22 (6): 2201–38.
- Carney, M. 2008a. "Principles for Liquid Markets." Remarks to the New York Association for Business Economics, New York City, New York, 22 May.
- . 2008b. "Building Continuous Markets." Remarks to the Canada–United Kingdom Chamber of Commerce, London, England, 19 November.
- Crockett, A. 2008. "Market Liquidity and Financial Stability." Banque de France *Financial Stability Review*—Special Issue on Liquidity. No. 11 (February): 13–17.
- Fazzari, S. M., R. G. Hubbard and B. C. Petersen. 1988. "Financing Constraints and Corporate Investment." *Brookings Papers on Economic Activity* 19 (1): 141–206.
- Financial Stability Forum. 2009. "Report of the Financial Stability Forum on Addressing Procyclicality in the Financial System." 2 April. Available at <http://www.financialstabilityboard.org/publications/r_0904a.pdf>.
- Fontaine, J.-S. and R. Garcia. 2009. "Bond Liquidity Premia." Bank of Canada Working Paper No. 2009–28.
- Fontaine, J.-S., J. Selody and C. Wilkins. 2009. "Improving the Resilience of Core Funding Markets." Bank of Canada *Financial System Review* (December): 41–46.
- Gatev, E. and P. E. Strahan. 2006. "Banks' Advantage in Hedging Liquidity Risk: Theory and Evidence from the Commercial Paper Market." *Journal of Finance* 61 (2): 867–92.
- Gauthier, C. and H. Tomura. 2011. "Understanding and Measuring Liquidity Risk: A Selection of Recent Research." *Bank of Canada Review* (Spring): 3–11.
- Goodhart, C. 2008. "Liquidity Risk Management." Banque de France *Financial Stability Review*—Special Issue on Liquidity. No. 11 (February): 39–44.
- Longworth, D. 2007. "Liquidity, Liquidity, Liquidity." Remarks to the Investment Industry Association of Canada, Toronto, Ontario, 3 October.

- Northcott, C. A. and M. Zelmer. 2009. "Liquidity Standards in a Macroprudential Context." Bank of Canada *Financial System Review* (December): 35–40.
- Trevisan, G. 2011. "The New Framework for Liquidity Risk." In *Basel III and Beyond: A Guide to Banking Regulation After the Crisis*, 207–42. Edited by Ed. F. Cannata and M. Quagliariello. London: Risk Books.