

The Impact of the Financial Crisis on Cross-Border Funding

Yaz Terajima, Harri Vikstedt, and Jonathan Witmer

INTRODUCTION

The financial crisis has demonstrated both the importance of, and the interrelationships among, core funding markets and, in particular, the importance of cross-border funding markets.¹ In normal times, cross-border funding provides an alternative, diversified, and readily available source of funding to financial institutions.² Cross-border funding markets may be deeper than the local funding sources and may provide an opportunity to borrow funds at a lower cost than in local funding markets.

During the crisis, however, two issues became clear: (i) how closely cross-border and local funding markets are inter-linked, and (ii) how quickly disruptions in one core funding market can spill over into other core funding markets. Global financial institutions that had difficulty raising U.S. dollars directly (i.e., in the United States) also encountered similar problems raising U.S. funds indirectly through cross-border funding markets, because of imbalances in the supply of and demand for U.S. dollars and heightened concerns over counterparty credit risk.

This report focuses primarily on the impact of the crisis on the foreign exchange (FX) swap market. It draws on the Bank's involvement in several working groups, including the Committee on the Global Financial System (CGFS) working group on the funding and liquidity management of international banks (CGFS 2010b) and the joint CGFS and Markets Committee (MC) working group on cross-border funding (CGFS 2010a), as well as the Canadian Foreign Exchange Committee (CFEC) working group that is assessing the performance of the Canadian FX market during the crisis

and potential areas for its improvement (CFEC 2010a). In addition, a recent regulatory proposal for new liquidity standards that could affect the way Canadian banks manage their cross-border funding and liquidity is discussed.

CROSS-BORDER FUNDING AND ACCESS BY FINANCIAL INSTITUTIONS

Cross-border funding provides an alternative source of wholesale funding for financial institutions to fund either domestic or foreign currency assets or to provide intra-company funding among foreign subsidiaries. In general, financial institutions minimize their FX risk in cross-border funding by either sourcing funds directly in the currency of the asset, or by using derivatives to transform the liability into the currency of the asset. Financial institutions can use either unsecured or secured funding markets for cross-border funding. These include intra-company transfers, offshore wholesale-debt markets, and repos. FX swaps are an integral component of the cross-border funding market and are used to convert funding from one currency to another.³

FX swaps involve the simultaneous borrowing and lending of one currency for another for a specified period of time.⁴ Since these swaps are subject to counterparty credit risk, changes in the perceived credit risk of an institution may have an impact on the availability of cross-border funding through FX swaps. FX swaps account for more than 50 per cent of global FX trading and more than 68 per cent of FX trading in Canada (BIS 2007; CFEC 2010b). They are used

¹ For a discussion of core funding markets, see Fontaine, Selody, and Wilkins (2009).

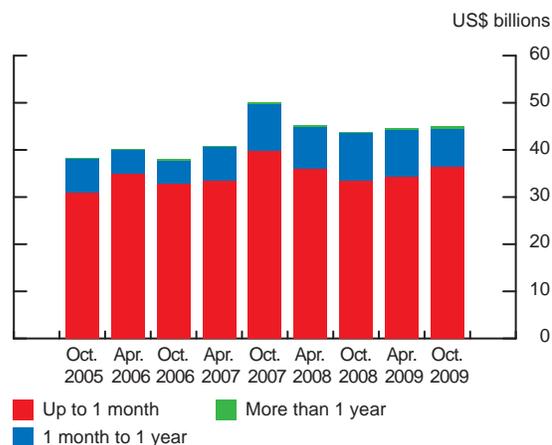
² Cross-border funding is broadly defined here to include borrowing in a jurisdiction other than that in which an entity is located and/or in a different currency than the one in which most of its operations are denominated.

³ Foreign exchange swaps can also be used as a hedging mechanism to transform longer-dated funding in one currency to another currency.

⁴ An FX swap is typically executed through simultaneous FX spot and forward transactions.

Chart 1: The vast majority of Canadian FX swap volume is executed for terms under 1 month

Canadian average daily FX swap volume, by transaction term



Source: CFEC

Last observation: 31 October 2009

primarily to address short-term cross-border funding needs, with the vast majority executed for terms under 7 days.⁵ Fewer than 1 per cent of FX swaps, both in Canada and globally, are for terms longer than one year (**Chart 1**). In contrast with other currencies, a relatively large portion of Canadian FX swaps are settled on a same-day basis to obtain overnight funding.

The organizational structure of an institution influences how it manages its funding and liquidity risk. Funding relates to how the institution's liabilities are sourced, while liquidity refers to how its balance sheet is managed. Funding and liquidity risk can be managed on a centralized or decentralized basis, or a combination of both, depending on the firm's business model. With a centralized approach, the majority of decisions are taken at the global or head-office level; in a decentralized structure, decisions are made at the regional or country level. Hence, banks in a centralized structure tend to rely more on cross-border transfers of funds between the head office and foreign subsidiaries than do those in a decentralized structure.

The extent to which global financial institutions access cross-border funding is driven by several factors: (i) the institution's organizational structure and asset-liability mix (e.g., a bank holding primarily retail mortgages and deposits would be less likely to use cross-border funding markets than one involved in wholesale lending in a developed market); (ii) the availability and depth of cross-border funding instruments; and (iii) the costs and benefits of accessing cross-border markets.

⁵ BIS (2007). According to the October 2009 CFEC survey, more than 80 per cent of FX swaps in Canada were for terms of less than one month.

CROSS-BORDER FUNDING DURING THE RECENT CRISIS

Before the start of the financial crisis, a number of financial institutions, primarily European-based, had acquired relatively large quantities of U.S.-dollar assets, which they had financed using both onshore and offshore short-term wholesale U.S.-dollar funding (McGuire and von Peter 2009). The beginning of the subprime crisis in the autumn of 2007 left these banks exposed to a large funding maturity gap, because the credit deterioration in their holdings of structured assets made them illiquid and very difficult, if not impossible, to sell. Liquidity dried up from the two large sources of U.S.-dollar funding for these European banks: short-term repo markets and money market mutual funds.⁶ This put substantial pressure on U.S.-dollar funding markets as banks scrambled to secure U.S.-dollar funding. It also forced banks to rely further on FX swap markets to obtain U.S. dollars. These pressures were further exacerbated for the European banks by time-zone differences.⁷

Canadian banks, on the other hand, did not have large exposures to U.S. structured credit, including subprime mortgage-backed securities. In the fourth quarter of 2008, the global U.S.-dollar assets at Canadian banks, which make up the majority of their foreign assets, increased by almost Can\$100 billion (**Chart 2**).⁸ This rise corresponds primarily to an increase in the value of foreign currency derivatives-related exposures at these banks, reflecting an increase in underlying market volatility and/or potentially wider use of FX swaps and other derivatives (**Chart 3**).

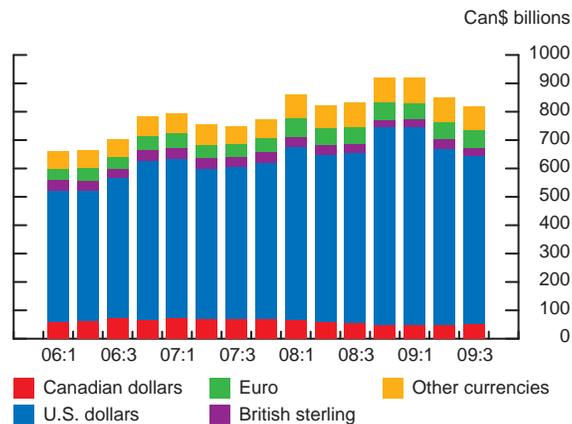
Within the guidelines set by the Office of the Superintendent of Financial Institutions (OSFI), the big six banks typically have internal limits, by currency, on the size of their wholesale funding and maturity mismatches, in order to control domestic and cross-border refunding risk. Furthermore, several Canadian banks have a stable U.S. retail deposit base providing U.S.-dollar funding for their U.S.-dollar assets, and therefore did not have to rely, to the same extent as some European-based financial institutions, on cross-border funding to access U.S. dollars. Canadian banks also benefited, to some extent, from an increased inflow of U.S.-dollar retail and wholesale deposits following the collapse of Lehman Brothers (**Chart 3**). Concerns over

⁶ According to Baba, McCauley, and Ramaswamy (2009), on 17 and 18 September 2008, institutional investors liquidated \$142 billion in prime institutional funds, while retail investors liquidated \$27 billion. See also McGuire and von Peter (2009); Gorton and Metrick (2009); and Baba, Packer, and Nagano (2008).

⁷ According to Goldberg, Kennedy, and Miu (2010), a premium was paid for U.S. federal funds obtained during morning trading hours in the United States, likely reflecting the difficulty that European banks faced when borrowing late in the European day (U.S. morning).

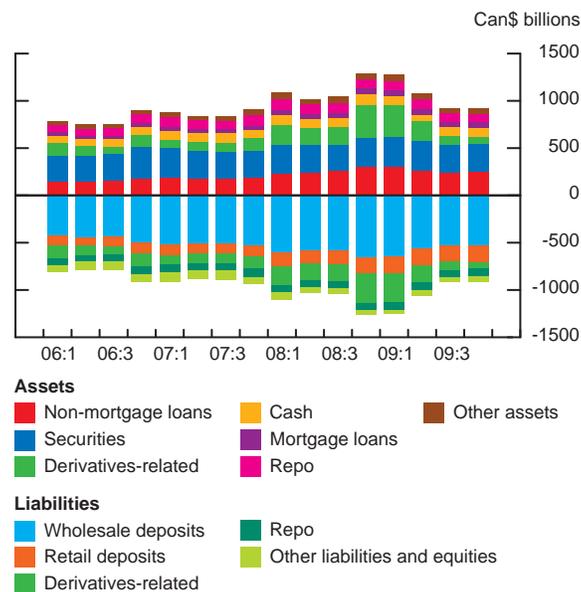
⁸ In Canada, because of nationwide branch banking, the banking sector is dominated by a few very large banks. In January 2010, about 90 per cent of all banking-sector assets were held by the six largest domestic banks, known as the "big six." On average, 30 per cent of their total global assets were non-Canadian-dollar claims, and these claims accounted for 97 per cent of the non-Canadian-dollar claims of the Canadian banking sector.

Chart 2: U.S.-dollar assets at Canadian banks increased following the Lehman collapse



Note: The chart shows the total assets of the big six banks by currency, excluding assets booked in Canada to Canadian residents in Canadian dollars.
Source: OSFI Last observation: 2009Q3

Chart 3: Foreign currency deposits at Canadian banks also increased in 2008Q4

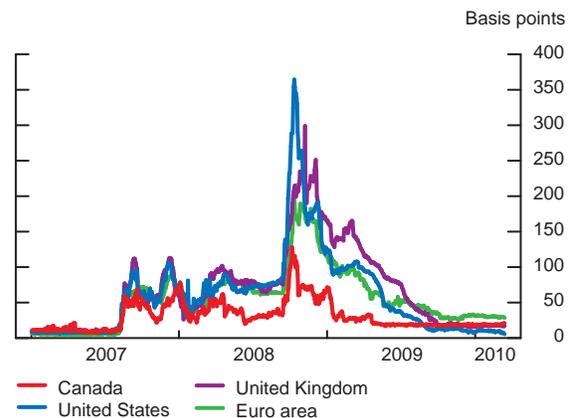


Note: The chart shows the category breakdown of the foreign currency assets and liabilities of the big six banks, with categories above zero on the y axis representing assets, and those below representing liabilities.
Source: OSFI Last observation: 2009Q4

counterparty credit risk during the crisis were less pronounced in Canada than in Europe, the United Kingdom, and the United States, as evidenced by lower spreads between unsecured wholesale bank funding rates and expected policy rates (**Chart 4**).

Because of these structural differences, dislocations in the US\$/Can\$ FX swap market were less pronounced than for other currencies. During the crisis, owing to the difficulty in borrowing funds in U.S. wholesale funding markets, borrowers wanting U.S. dollars turned to their home markets and any other jurisdiction where they could borrow in the local currency and swap the proceeds into U.S. dollars. As a result, global FX swap markets experienced large deviations from covered interest rate parity, and FX swap-implied U.S.-dollar borrowing rates increased well above U.S. LIBOR (**Chart 5**).^{9,10} At their peak, FX swap-implied U.S.-dollar borrowing rates obtained through the euro and pound sterling were more than 250 basis points above U.S. LIBOR. FX swap-implied U.S.-dollar borrowing rates obtained through Canadian dollars increased as well, but by much less, and they fell more quickly.

Chart 4: Spreads remained consistently lower in Canada than in Europe, the United States, and the United Kingdom
3-month LIBOR-OIS spreads^a

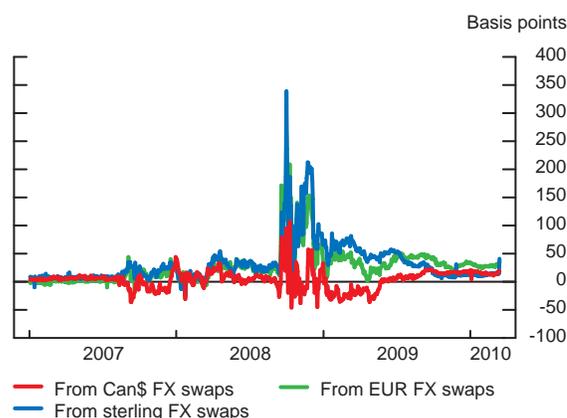


a. For the United States and the United Kingdom, LIBOR; for the Euro area, EURIBOR; and for Canada, CDOR
Source: Bloomberg Last observation: 15 March 2010

- 9** It can be argued that part of the difference between the FX swap-implied rate and LIBOR resulted from the latter being lower than actual funding costs at the time. However, Coffey, Hrug, and Sarkar (2009) provide evidence that this could not have been responsible for the full difference.
- 10** Under covered interest rate parity, the FX swap-implied U.S.-dollar borrowing rate (i.e., the cost of borrowing in the domestic currency and swapping it into U.S. dollars) should equal the cost of borrowing directly in U.S. dollars; otherwise, arbitrageurs would be able to make a risk-free profit by transacting in FX and money markets. This assumes that transactions costs, measurement error, credit risk, and liquidity risk are all negligible (Aliber 1973). A lack of arbitrageur capital may also impede the ability to arbitrage any deviations in this condition. See Coffey, Hrug, and Sarkar (2009) for an evaluation of the impact of capital constraints on covered interest rate parity during the crisis.

Chart 5: Deviations from covered interest rate parity remained consistently lower in Canada than in Europe

Spread over 3-month U.S. LIBOR



Note: The chart shows the difference between the U.S. equivalent 3-month interest rate derived from FX swaps and the domestic unsecured market, and the unsecured 3-month U.S.-dollar LIBOR. The FX swap-implied U.S.-dollar interest rates were obtained from US\$/Can\$ forward points and CDOR, as well as from Eur/US\$ forward points and EURIBOR, and sterling/US\$ forward points and sterling LIBOR, respectively.

Source: Bloomberg

Last observation: 15 March 2010

Responses to the dislocations in funding markets

The crisis does not seem to have fundamentally changed the funding and liquidity-management models at financial institutions. However, many global banks (i) tightened their risk-management limits on wholesale funding by maturity and domicile; (ii) increased their liquidity buffers; (iii) improved communications about liquidity within their institutions; (iv) improved pricing on cross-currency funds transfers to encourage more reliance on stable funding sources (e.g., retail funding), resulting in a more decentralized funding model; and (v) strengthened stress tests by increasing their frequency and basing them on more realistic scenarios (Senior Supervisors Group 2009). Some financial institutions that had not already done so also centralized their liquidity management and put more emphasis on the management of collateral and contingent liabilities. Since the Canadian financial sector fared relatively better than those in other major countries, Canadian banks made fewer adjustments. For example, their funding models were highly centralized before the crisis and continue to remain so.

Banks, both globally and in Canada, have tapped capital markets to raise additional capital and longer-term funding. Canadian banks that had access to U.S.-dollar funding were also able to swap these U.S.-dollar funds into a cheap source of Canadian-dollar funding through the Northbound FX swap (U.S. dollars swapped into Canadian dollars) in the autumn of 2008 following the collapse of Lehman Brothers.

Several policy responses were introduced, in Canada and globally, after the onset of the financial crisis. While many of

these facilities were not specifically targeted at the pressures in cross-border funding markets, they did help to alleviate them, given the interlinkage with core domestic funding markets. These policy responses became more global and more coordinated as the crisis spread. Liquidity facilities for local currency, such as the Bank of Canada's term purchase and resale agreements (PRAs), helped to address tensions in domestic funding markets,¹¹ with funding spreads in money markets declining after the expansion of these facilities in the post-Lehman period, including the spreads between CDOR and overnight index swaps (OIS) (**Chart 4**). The introduction of the government's Insured Mortgage Purchase Program also helped to provide substantial liquidity to the domestic banking sector.

Similarly, U.S.-dollar liquidity facilities addressed tensions in both domestic and cross-border U.S.-dollar funding markets. The U.S. Federal Reserve's Term Auction Facility (TAF), which provided U.S.-dollar term funds through an auction process to depository institutions in the United States, helped to reduce U.S. funding pressures, as measured by LIBOR-OIS spreads.¹² Foreign financial institutions with branches or subsidiaries in the United States, including large European and all the large Canadian banks, had access to this facility.

In addition, the Federal Reserve also established reciprocal swap lines with 14 other central banks, including the Bank of Canada, to provide U.S.-dollar liquidity to international markets (**Chart 6**). Some of these central banks, such as the European Central Bank, the Swiss National Bank, and the Bank of England, used these swap lines to conduct their own U.S.-dollar term auctions early in the trading day, which helped to reduce frictions caused by differences in time zones, as well as frictions that were present when mobilizing collateral for use in the TAF.¹³ The provision of U.S.-dollar funding by these other central banks helped to reduce deviations in covered interest rate parity (**Chart 5** and **Chart 6**).^{14,15}

The reciprocal swap agreement between the Bank of Canada and the Federal Reserve was not used because the major Canadian banks have direct access to the Federal Reserve's

¹¹ See Zorn, Wilkins, and Engert (2009) for a discussion of Canadian facilities and CGFS (2008) for a discussion of global central bank responses.

¹² See Wu (2008); McAndrews, Sarkar, and Wang (2008); Abbassi and Schnabel (2009); Christensen, Lopez, and Rudebusch (2009); and Taylor and Williams (2009) for further examination of the evidence.

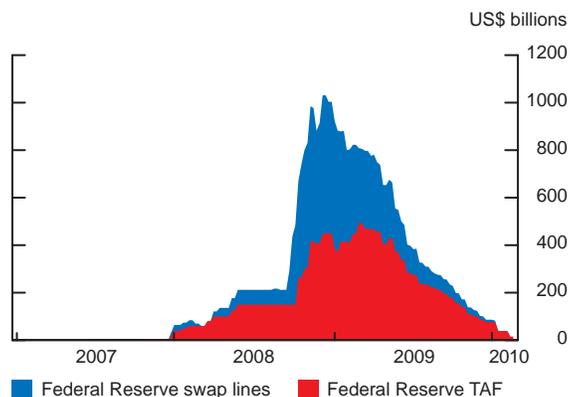
¹³ These U.S.-dollar auctions had different requirements, since they were set by the central bank providing the funding. See Goldberg, Kennedy, and Miu (2010).

¹⁴ See Baba and Packer (2009) for further examination of the evidence.

¹⁵ In response to the re-emergence of strains in U.S.-dollar short-term bank funding markets in Europe, the Bank of Canada, the Bank of Japan, the Bank of England, the European Central Bank, the U.S. Federal Reserve, and the Swiss National Bank announced in early May the re-establishment of temporary U.S.-dollar liquidity swap facilities. This was intended to help improve liquidity conditions in U.S.-dollar funding markets and to prevent the spread of strains to other markets and financial centres. Central banks will continue to work together closely as needed to address pressures in funding markets.

Chart 6: U.S.-dollar liquidity was provided through the U.S. Federal Reserve and other central banks

U.S.-dollar liquidity



Source: Federal Reserve H.4.1

Last observation: 28 February 2010

liquidity facilities, do not face time-zone differences and, importantly, were able to raise U.S.-dollar funds directly.

RECENT DEVELOPMENTS IN CROSS-BORDER FUNDING MARKETS

Infrastructure developments and initiatives in FX swap markets

Although the FX swap markets functioned relatively well throughout the crisis, as discussed above, dislocations did occur. As a result, efforts are currently under way at the industry level to further improve the resilience of market infrastructure and to further reduce the risk in FX swap transactions.

While FX swaps have lower credit risk than unsecured borrowing, since they are effectively collateralized by the currency underlying the transaction, they are still subject to two main counterparty credit risks. The primary risk involves the settlement of the two legs of the transaction. Each leg of the FX swap requires cash payment of the full notional amount specified in the contract, with the risk that one party will default after receiving a payment but before it has sent its corresponding payment to the other counterparty.¹⁶ The other risk is that the counterparty will default before the end of the contract, requiring the holder of the contract to replace a position that has a positive marked-to-market value to the non-defaulting counterparty (see, for example, Duffie and Huang 1996).

A number of industry-led foreign exchange committees, including the CFEC, the U.K. Foreign Exchange Joint Standing Committee, and the U.S. Foreign Exchange

¹⁶ This is known as “settlement” or “Herstatt” risk, after the 1974 failure of the Herstatt Bank of Germany.

Committee, are working on initiatives to improve the infrastructure of the FX market and to further reduce counterparty risk (Bank of England 2009; Foreign Exchange Committee 2009; CFEC 2010a). These initiatives include broadening the use of the CLS (Continuous Linked Settlement) Bank across products and participants, increasing and standardizing the use of structures for mitigating credit risk, and increasing the use of straight-through processing for foreign exchange transactions through increased standardization and automation.

Broadening the use of CLS Bank

CLS Bank was created in 2002 to eliminate Herstatt risk in foreign exchange transactions. CLS Bank addresses this risk by eliminating, at settlement, the time gap between the payment in one currency and the receipt of payment in another currency, matching the two corresponding payments before simultaneously releasing them to each party.¹⁷ During the crisis, transactions through CLS Bank continued uninterrupted.

The majority of the global interbank foreign exchange volume, including FX swaps, settles through CLS Bank, which currently covers 17 currencies and more than 7,500 participants.¹⁸ Since the Lehman crisis, the number of counterparties using CLS Bank has increased by over 120 per cent, and the last of the big six Canadian banks has decided to join CLS Bank.

CFEC is supporting efforts to include same-day-settled US\$/Can\$ trades in CLS Bank, given the significant use of same-day settlement for overnight FX swaps in Canada. Same-day settlement is currently not possible in CLS Bank and is one of the main reasons that Canadian use of CLS Bank has remained low by international comparison.

Expanding the use and standardization of structures for mitigating credit risk

Counterparty credit risk is mitigated bilaterally through the International Swaps and Derivatives Association (ISDA) Master Agreements and Credit Support Annexes, which provide a framework for collateralizing marked-to-market exposures between counterparties. These agreements also allow counterparties to net their exposures to each other across both FX and non-FX product markets.¹⁹ Some weaknesses in the use of these agreements were exposed following the Lehman bankruptcy, such as a lack of a negotiated Master Agreement and Schedule, increasing the need to further improve the use and standardization of

¹⁷ See Miller and Northcott (2002a, b) for a more in-depth discussion of CLS Bank.

¹⁸ For a list of currencies covered by CLS Bank, see <<http://www.cls-group.com/About/Pages/default.aspx>>.

¹⁹ Data from the *BIS Quarterly Review* (March 2010) show that cross-product netting has a significant effect on reducing cross-product exposures.

ISDA's Master Agreements and Credit Support Annexes.^{20,21} This may also partially explain why deviations from covered interest rate parity persisted despite the presence of these types of credit-mitigation mechanisms.

The development of a central clearing counterparty (CCP) for FX swaps could also help to mitigate counterparty credit risk, especially for longer-dated products, although it could increase transactions costs and concentration risks. CFEC (2010a) notes that the multilateral netting benefit of CCPs, including efficient collateral requirements and potentially lower capital requirements, are most likely to materialize if these CCPs are global and cover a wide variety of over-the-counter products.²²

Increasing the automation of FX transactions

The bulk of interbank FX trading is automated, using straight-through processing, which minimizes the risk of operational errors and facilitates accurate real-time risk management. Automation continues to improve for non-bank counterparties, and the industry supports broadening the use of straight-through processing, including increased electronic confirmation and settlement and continued standardization of trade documentation to further reduce the risks associated with FX transactions.

Regulatory developments and cross-border funding liquidity

In December 2009, the Basel Committee on Banking Supervision (BCBS) introduced a proposal for new liquidity standards for internationally active banks, aimed at improving the resilience of financial institutions.^{23,24} These standards will be applied to international banks on a consolidated global-enterprise basis. In addition, regulators in each jurisdiction can decide to apply them “locally” on a legal-entity basis. If the standards are applied locally, banks in each jurisdiction would be required to be “self-sufficient,” holding a minimum level of liquid assets in each jurisdiction and having maturity mismatches restricted on a local balance-sheet basis, rather than on a global-enterprise basis. The impact of this proposal on cross-border funding liquidity will depend on whether the standards are applied globally or locally.

Globally applied liquidity standards are more consistent with the current business model of large Canadian banks, which currently manage both liquidity and funding globally, rather than with large international non-Canadian banks,

which already manage their liquidity in a more decentralized fashion. Local liquidity requirements may force Canadian banks to decentralize their liquidity-management operations by setting up a treasury function in each jurisdiction, with the result that they will lose the benefit of economies of scale and the flexibility of global liquidity management.

However, locally applied standards offer better protection for local creditors in the event of the failure of a global financial institution, since they assure a minimum pool of liquid assets within the local jurisdiction.^{25,26} Under locally applied standards, the volume and importance of cross-border funding would likely be lower, which would reduce cross-border funding risks and might thus improve the resilience of the global financial system in the presence of a worldwide systemic shock to liquidity. However, banks would likely need to hold a larger aggregate pool of liquidity under locally applied standards, which could reduce bank profitability. Ultimately, this loss of efficiency would be transferred to consumers and firms in the form of higher fees or higher intermediation spreads.

This trade-off between an improvement in the resilience of the financial system under a systemic liquidity shock and a need to hold a larger pool of liquidity could vary, depending on how stringent the local standards are in relation to the global consolidated standards. As well, the protection afforded to local creditors in the case of an institution's failure will also depend on the stringency of the local standards. For example, banks could be required to adhere to a global standard on a global consolidated basis, but also to a local standard that is less stringent than the global standard. This scenario would ensure some protection for local creditors in the event of an institution's failure, while allowing some flexibility for banks to reallocate liquidity across the group in the presence of a jurisdiction-specific liquidity shock. In the end, any combination of the two approaches will require close coordination between the home and host regulators (a waiver process to reduce local liquidity requirements for banks that globally satisfy certain conditions could be one method to facilitate this coordination).

A concern with strict locally applied standards is that they could create “trapped liquidity” in each jurisdiction without the benefit of funding economies of scale or global diversification of the associated risks. Conceptually, it is possible that trapped liquidity could make the financial system less resilient to jurisdiction-specific shocks. When a large idiosyncratic and adverse liquidity shock hits a legal entity (e.g., a subsidiary or a branch) in one of the jurisdictions in which a global bank operates, the bank may not be

20 For example, a Lehman subsidiary did not file for bankruptcy until three weeks after the parent company declared bankruptcy, and several counterparties could not trigger a default until the subsidiary declared bankruptcy, which further aggravated the situation.

21 See Parker and McGarry (2009).

22 See Duffie and Zhu (2009) for a discussion of the trade-offs between a CCP and bilateral netting agreements.

23 See BCBS (2009) for details.

24 See Northcott and Zelmer (2009) for a review of these liquidity standards.

25 Efforts to improve cross-border bank-resolution mechanisms could also help to manage the need for locally held liquidity. See BCBS (2010).

26 The U.K. Financial Services Authority (FSA) is in favour of locally applied liquidity requirements, owing to a concern over recent events that “demonstrate that when a group gets into difficulty, liquidity which was believed to be available to the whole group can be ‘hoarded’ by the parent or, in some cases, seized by local authorities intervening to protect their own depositors” (FSA 2008).

able to reallocate liquidity from another jurisdiction, which would leave the local entity at greater risk. Furthermore, if the shock were jurisdiction-specific (and not institution- or entity-specific), all financial institutions in that jurisdiction would be at greater risk, and restrictions on obtaining liquidity from outside the jurisdiction could result in a greater need for central bank liquidity.

CONCLUSIONS

Cross-border funding is an important source of wholesale funding for international financial institutions, and its resilience is important for financial stability. During the financial crisis, the stresses in U.S. funding markets quickly spread to all cross-border funding markets, but had the greatest impact on those financial institutions that had been using short-term wholesale U.S.-dollar funding markets to fund illiquid U.S.-dollar assets.

Several policy responses—from the industry and from the public sector—helped to alleviate the funding stresses caused by the crisis. Banks raised additional capital and funding through both local and cross-border markets and began to place greater importance on their management of liquidity. Central banks around the world provided both local and U.S.-dollar liquidity to address the stresses in domestic and cross-border funding markets, respectively.

Efforts are under way to further improve the resilience of cross-border funding markets. Although the infrastructure of the FX swap market performed well during the crisis, more can be done to make the market more resilient to crisis, including greater use of CLS Bank, increased use of structures for mitigating credit risk, and more straight-through processing of transactions.

Furthermore, the Basel Committee on Banking Supervision is proposing new liquidity standards to improve the stability of the financial system. The application of these new standards could have a major impact on cross-border funding markets and, more specifically, could affect how international banks manage their global liquidity and funding requirements.

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