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CANADA

FINANCIAL SECTOR ASSESSMENT PROGRAM

TECHNICAL NOTE—SYSTEMIC LIQUIDITY

January 2020

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FINANCIAL SECTOR ASSESSMENT PROGRAM

December 20, 2019

TECHNICAL NOTE

SYSTEMIC LIQUIDITY

Prepared By

Monetary and Capital Markets Department

This Technical Note was prepared by IMF staff in the context of the Financial Sector Assessment Program that visited Canada in October 22–November 14, 2018. It contains technical analysis and detailed information underpinning the FSAP's findings and recommendations. Further information on the FSAP can be found at http://www.imf.org/external/np/fsap/fssa.aspx

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Glossary

ABS	Asset-backed Security
ABCP	Asset-backed Commercial Paper
AMF	Autorité des marchés financiers
BIS	Bank for International Settlements
BOC	Bank of Canada
CAD	Canadian Dollar
CD	Certificate of Deposit
CDCC	Canadian Derivatives Clearing Corporation
CDCS	Canadian Derivatives Clearing Service
CDOR	Canadian Dollar Offered Rate
CDIC	Canadian Deposit Insurance Corporation
CMB	Canada Mortgage Bond
CMHC	Canada Mortgage and Housing Corporation
CORRA	Canadian Overnight Repo Rate Average
CP	Commercial Paper
CPI	Consumer Price Index
DOF	Department of Finance
ELA	Emergency Lending Assistance
FSC	Financial Supervisory Commission
FX	Foreign Exchange
GFC	Global Financial Crisis
HQLA	High-quality Liquid Asset
IMF	International Monetary Fund
LCR	Liquidity Coverage Ratio
MBS	Mortgage-backed Security
NHA MBS	National Housing Association Mortgage-backed Securities
OSFI	Office of the Superintendent of Financial Institutions
OMO	Open Market Operation
RMBS	Residential Mortgage-backed Security

EXECUTIVE SUMMARY[1]

The Bank of Canada (BOC)'s framework for market operations and liquidity provision in normal times is comprehensive and well-articulated. System-wide liquidity conditions are stable, market rates are closely aligned with the announced policy rate, and the BOC has many channels to provide liquidity against a broad range of collateral. The planned modernization of the payment systems, with a move towards the real-time gross settlement (RTGS) platform, will likely result in a substantial increase in the demand for collateral. Therefore, the BOC should enhance its monitoring of collateral availability. Furthermore, the BOC should improve further its capacity to price collateral, including the use of theoretical models, and update its valuation of banks' loan portfolios more frequently.

Money markets and public debt markets are functioning well. The resilience of core funding markets partly benefits from the predominance of secured transactions in money markets, with the majority of repos based on federal government bonds. The authorities are working on a transition towards an improved risk-free benchmark (i.e., enhanced Canadian Overnight Repo Rate Average (CORRA)) in line with IOSCO standards. Liquidity in the federal government bond market is robust, supported by a sound public debt management strategy. Liquidity in other public debt markets is also adequate, although spreads of provincial and government-guaranteed (e.g., Canada Mortgage Bond) papers could widen considerably under market stress due to their diverging credit risk (particularly, for provincial government bonds) and liquidity risk. The market size for asset-backed commercial papers remains small, well below to the level prior to the global financial crisis.

Foreign exchange markets appear liquid, and their resilience is increasingly important given the growing reliance on external, foreign-currency funding. Spot and swap transactions dominate the foreign-currency markets, with each representing 40 percent of the market share. Stress of the Canadian dollar has been relatively limited. However, external debt liabilities have increased significantly in recent years, driven by banks and other non-government entities. The latter reflects bond issuances by Canadian firms in international markets. Although banks appear to have liquidity buffers to manage sizeable funding outflows, including in foreign currency, enhanced monitoring is warranted particularly in light of the use of wholesale funding and derivatives.

The BOC has put in place a well-defined framework for managing liquidity during stress. The BOC can provide bilateral liquidity support, including in foreign currency, to eligible financial institutions and domestic systemically important financial market infrastructures (FMIs). The emergency liquidity assistance (ELA)[2] framework was amended to accept Canadian-dollar mortgages as collateral and clarify the eligibility requirements for provincially regulated entities, including the need for a provincial indemnity. The BOC has also developed a framework to provide

[1] This Technical Note was prepared by Mark Buessing-Loercks (IMF) under guidance of Phakawa Jeasakul (FSAP deputy mission chief). The review was conducted as part of the 2019 Canada FSAP led by Ghiath Shabsigh (FSAP mission chief).

[2] In the context of Canada, ELA refers to the BOC's Emergency Lending Assistance.

market-wide liquidity support to financial institutions, which can be carried out through term repo operations and a contingent term repo facility. Term repo operations, which are conducted regularly in normal times, can be easily scaled up to provide liquidity to primary dealers. The contingent term repo facility whose design can be very flexible (to be determined upon activation) should enable the BOC to respond to system-wide liquidity stress in a nimble manner. In principle, the BOC can lend to any counterparty at its own discretion to safeguard financial stability.

Additional preparatory work would help ensure smooth ELA operations. The BOC signed an MoU with AMF to facilitate decision-making around ELA. However, provinces (particularly, British Columbia, Ontario, and Quebec) remain to establish indemnity agreements, along with MoUs, with the BOC, implying that the eligibility conditions are not yet met for the BOC to provide ELA to provincially regulated institutions. In terms of preparedness, the BOC should expand its ELA simulation exercises to involve a broader set of financial institutions (including relevant credit unions) and mobilize non-standard collateral (e.g., mortgages). Such exercises should also simulate interaction among relevant business units within the BOC, interaction with provincial authorities (as provincial supervisor), as well as with inter-agency bodies (e.g., the Financial Institutions Supervisory Committee and the Senior Advisory Committee) to ensure effective information sharing and decision-making. Regular monitoring of ELA-eligible collateral should be conducted for domestic systemically important banks (D-SIBs) and other relevant institutions.

Contingency plans for market-wide liquidity support regarding intervention in securities markets and provision of foreign-currency liquidity should be developed further and tested. During the global financial crisis, the federal and (three) provincial governments provided support to securities markets (i.e., mortgage-backed securities and asset-backed commercial papers), while the BOC did not purchase securities outright. Whereas some elements of contingency plans have been established (e.g., in the form of bilateral swap arrangements with other central banks), the authorities should develop further a framework that articulates the objective of interventions (i.e., safeguarding financial stability), identifies markets that warrant support, determine triggers for intervention, and establishes principles for the design of such programs. Given the growing reliance on external, foreign-currency funding of Canadian financial institutions and other entities, the BOC and the Department of Finance (DOF) therefore should jointly develop further and test their strategy on how to handle systemic stress in foreign-currency funding. Such a strategy should be based on sufficient amounts of readily available foreign reserves and standing bilateral currency swap agreements with other major central banks.

Table 1. Canada: Recommendations on Systemic Liquidity Issues		
Recommendations	Priority	Timeframe
BOC's Operational Framework—Liquidity Provision in Normal Times		
Expand internal capacities to assess and monitor the availability of collateral across banks, given the envisaged transition towards an RTGS system and the expected substantive increase in collateral demand. (BOC)	H	I
Enhance its capacity to price collateral also based on theoretical models and to increase the pricing frequency for loan portfolios. (BOC)	H	NT
Consider conducting the finetuning afternoon general receiver auction on a collateralized basis to mitigate associated risks. (BOC)	M	I
Money Market Reference Rates		
Continue to accelerate and complete the transition work towards a risk-free reference rate. (BOC)	H	I
BOC's Operational Framework—Bilateral Liquidity Provision in Stressed Times		
Further expand scope of tests on bilateral ELA provision, i.e. (i) to broaden the scope of involved financial institutions, (ii) to simulate procedures related to the assessment, pricing and mobilization of non-standard ELA collateral, and (iii) to simulate the interaction of relevant BOC business areas and interaction with the relevant agencies. (BOC)	H	I
Regularly monitor the availability of collateral eligible for ELA, in particular for the D-SIBs. (BOC)	M	I
BOC's Operational Framework—Market-wide Liquidity Provision in Stressed Times		
Develop further and test institutional coordination to ensure adequate monitoring of key markets and consideration should be given to developing a framework for intervention in securities markets. (BOC lead)	M	NT
BOC's Operational Framework—Liquidity Provision in Foreign Currency		
Expand ongoing planning and testing exercises for ELA and include ELA lending in foreign currency. (BOC)	M	I
Refine further and test a strategy to respond to systemic issues in foreign-currency funding markets. (BOC and DOF)	M	NT

Note: Institutions in the parenthesis are the agencies with responsibilities. In terms of priorities, H, M, and L stand for high, medium and low. In terms of timeframe, I, NT, and MT stand for immediate (within one year), near-term (within 2–3 years), and medium-term (within 3–5 years).

INTRODUCTION

1. This section examined systemic liquidity issues. The review evaluated the Bank of Canada's (BOC's) operational framework and its ability to manage liquidity conditions in normal times and in times of stress. The review also assessed the functioning and resilience of key funding markets in Canada.

2. This Technical Note is organized as follow. Section II covers liquidity management in normal times, with a focus on the BOC's operational framework. Section III and IV assess the functioning and resilience of money and debt markets, respectively. Section V assess the functioning and resilience of foreign exchange markets and addresses foreign-currency funding issues. Section VI covers measures to deal with market stress, with a focus on the frameworks to provide idiosyncratic and system-wide liquidity support, both in Canadian dollar and foreign currency.

LIQUIDITY MANAGEMENT IN NORMAL TIMES

A. Bank of Canada's Operational Framework

3. The Bank of Canada Act (Article 18) provides the BOC with the "mandate to conduct monetary policy to promote the economic and financial well-being of Canadians." The BOC has been an inflation targeting central bank since 1991. The inflation-control target is set every five years by the Government of Canada (GoC) and the BOC.[3] The inflation target is measured by the consumer price index and set at 2 percent, considered as the midpoint of the control range of 1 percent to 3 percent.

4. BOC's operating target is a secured overnight (repo) rate.[4,5] The BOC conducts its monetary policy by setting the policy rate, which targets the overnight interest rate. This policy rate is the midpoint of the operating band (corridor) as supported by the standing deposit and lending facilities, which are accessible to Large Value Transfer System (LVTS) participants against a broad range of collateral.

5. The BOC operates in an environment of neutral liquidity conditions. LVTS participants must have a zero balance in their settlement account at the end of each day, with positive balances left on deposit, remunerated at the "deposit rate" (policy rate minus 25 basis points). For negative

[3] This target has been renewed in 2016 and is ending December 31, 2021.

[4] The Overnight Money Market Financing Rate is an estimate of the collateralized overnight rate compiled at the end of the day by the BOC through a survey of major participants in the overnight market. This rate is an indicative rate released for statistical and analytical purposes only and is not intended to be used as a reference rate.

[5] The Canadian Overnight Repo Rate Average (CORRA) is a measure of the average cost of overnight collateralized funding. Thomson Reuters Benchmark Services Limited is the administrator, calculation agent and publication agent for CORRA, effective March 30, 2015.

balances, LVTS participants must enter the BOC's standing facility at the "bank rate" (policy rate plus 25 basis points). Non-LVTS participant primary dealers for GoC debt securities may access overnight standing repo facilities.

6. The BOC can influence structural liquidity mainly in two ways:

- **Adjustments to settlement balances:** The BOC sets a target for LVTS settlement balances applicable for the following day, thereby influencing trading conditions in the overnight market. Currently, these balances are stable slightly above zero.[6] Settlement balances were increased (to Can$8 billion) during the global financial crisis (GFC) to provide additional liquidity to LVTS participants, thereby factually operating a floor system. In 2010, the BOC successfully transitioned from this floor system back to a mid-corridor system, by increasing the policy rate from 0.25 to 0.50, and gradually reducing settlement balances (from Can$8 billion to currently Can$250 million).[7]

- **Overnight repo and reverse repo operations:** The BOC may provide or absorb liquidity through overnight repo or reverse repo operations, conducted via a competitive auction mechanism (and with increased participation limits)[8] to steer conditions in the Canadian general collateral overnight repo market with primary dealers s against Canadian government bonds.

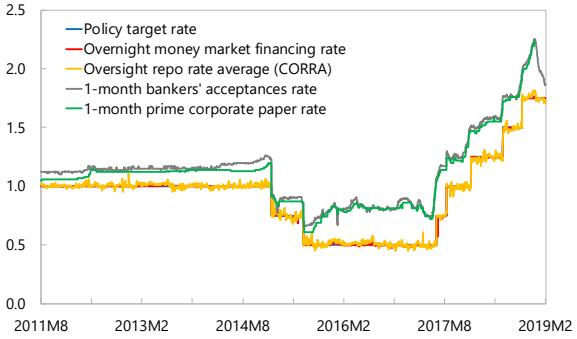
7. The correlation of the policy rate and other short-term rates is very high. The BOC is able to accurately perform forecasting of liquidity conditions due to very good insight into cash positions of the federal government. In addition, the BOC performs two daily Receiver general cash auctions, allowing the BOC to finetune with the second (afternoon) auction liquidity conditions and to ultimately reach targeted settlement balances. Correlation of the target rate with respect to the overnight money market financing rate and the Canadian Overnight Repo Rate Average (CORRA) is almost 100 percent and decreases only slightly (to 96 percent) for unsecured rates, i.e., the one-month bankers' acceptance rate and prime corporate paper rate.

[6] BOC has set the target level of settlement balances slightly above zero (currently Can$ 250 million) to reduce transaction costs and other frictions during the end of day process, thereby also avoiding that participants have to recourse to the standing facility frequently and at insignificant amounts.

[7] The move to the corridor system was driven by the desire to have an active money market. In hindsight, BOC is less firm on whether such corridor is strictly necessary.

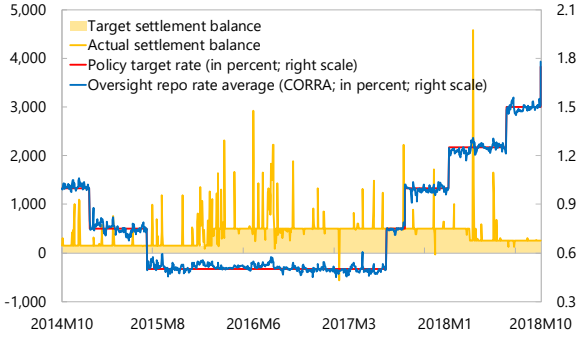
[8] Such limits of either Can$500 million or Can$150 million apply to participating institutions and are based on each institution's annual average market share in the primary, secondary and repo markets for GoC bonds and treasury bills, as determined by the BOC.

Money Market Rates, 2011-19
(In percent)



Sources: Bank of Canada; and IMF staff calculations.

Actual and Target Settlement Balances, 2014-18
(In millions of Canadian dollar)



Sources: Bank of Canada; and IMF staff calculations.

8. The BOC conducts additional financial market operations to support the efficient functioning of Canadian financial markets.

- **Government bond portfolio:** The BOC acquires on non-competitive basis GoC debt securities at each bond auction, representing 13 percent (started to gradually reduce from 20 percent in 2015) of government bonds.[9] To ensure neutrality and limit price distortions, outright holdings broadly reflect the composition of the federal governmental stock of domestic marketable debt. In addition, the BOC purchases treasury bills (T-bills) and on occasion cash management bills, based on BOC's expected future demand for bank notes and other liabilities (and maturing T-bills and cash management bills). More recently, the BOC started purchasing Canada Mortgage Bonds (CMBs).

- **Term repo operations:** The BOC conducts term repo operations with primary dealers s at 1- and 3-month terms. An aggregate amount of Can$9,400 million of 1-month (Can$,5800 million) and 3-month operations (Can$3,600 million) are currently outstanding (representing 0.4 percent of GDP).

- **Securities lending:** Under this facility, the BOC can lend to primary dealers a portion of its government bond holdings to help support liquidity. While this facility has been used actively by participants until 2015, the facility was accessed only sporadically since then (only once in September 2017 and another in March 2019). The BOC is currently reviewing the program to evaluate if the program should be updated to better reflect current market conditions.

9. BOC counterparties currently encompass 16 LVTS participants (banks, non-banks) and 12 different primary dealers. Notably, the vast majority of primary dealers are fully consolidated subsidiaries of the large banks/LVTS participants and only one primary dealer does not have a parent company (bank) with access to the BOC's liquidity facilities as an LTVS participant. The limited

[9] To avoid a conflict of interest, the BOC submits only non-competitive bids, implying that such bids specify only a quantity (no price) and is guaranteed to be allotted at the average yield of accepted competitive bids at the auction. The fact that debt securities are acquired in a non-competitive fashion represents monetary financing.

number of counterparties allows BOC to closely monitor individual counterparty's access to BOC facilities.

10. BOC's collateral requirements differ across the individual liquidity providing operations. The collateral requirements allow a broad set of assets for intraday and overnight credit, while accepting GoC securities for overnight reverse repo transactions and securities issued or guaranteed by the central or provincial government for term repo operations. The universe of (marketable and non-marketable) securities eligible for intraday and overnight facilities encompass issuers and debtors of the public and private sector.

- **Marketable public-sector collateral:** securities issued or guaranteed by the GoC, including National Housing Act (NHA) mortgage-back securities (MBS) and CMB, securities issued or guaranteed by provincial governments, securities issued by municipal governments, and marketable securities issued by the U.S. Treasury.

- **Marketable private-sector collateral:** securities issued by the private sector include bankers' acceptances (BAs) and promissory notes, including those of foreign issuers but excluding those of LVTS participants and related entities, commercial paper (CPs) and corporate bonds issued by domestic or foreign issuers, asset-backed commercial paper (ABCPs), term asset-backed securities (ABS), covered bonds, and special deposit accounts held at the BOC.

- **Non-marketable loan portfolios:** non-mortgage loan portfolios (NMLPs) of direct LVTS participants, including loans to individuals for non-business purposes and loans to individuals and others for business purposes.

11. Risk control measures include minimum credit quality requirements, concentration limits, and haircuts. Concentration limits (maximum share of specific asset categories in the collateral pool) are applied on single issuers and on specific private sector asset categories, thereby limiting the use of corporate, municipal, foreign private sector securities, and NMLPs. Haircuts are applied depending on asset category and residual maturity. Additional haircuts are applied to foreign-currency U.S. T-bills and government bonds. Marketable collateral is priced daily using multiple external price sources. For NMLPs, haircuts are determined as a portfolio weighted average, with different haircuts for secured/unsecured and consumer and business loans. NMLPs are priced based on the outstanding amount of portfolio loans, which are updated on a monthly basis.

12. The recent adjustments to the framework and envisaged changes aim at improving the framework without reducing the overall amounts of available collateral. In concrete, the BOC has reduced the "mechanistic" reliance on external ratings and developed in-house capacities to perform credit risk assessments. The BOC has also reduced its exposure to "wrong way risk," by terminating the acceptance of securities issued by LVTS participants[10] and by adjusting haircuts and limits for selected issuers. The BOC expects a substantive (up to 50 percent) increase in overall

[10] This makes BAs practically ineligible, given that a share of 98 percent is issued by D-SIBs.

collateral demand in connection with the transition to a RTGS system, envisaged to take place in the next few years.

B. Assessment and Recommendations

13. The BOC's operational framework works overall efficiently. The correlation of the operational target (CORRA) and the policy rate (target rate) is very high (99.7 percent). Also other short-term rates, i.e., 1-month BA rate and 1-month prime corporate paper rate follow closely the policy rate (with correlation of 97 percent and 96 percent, respectively). Good insight into government cash flows, the BOC is able to keep actual and target settlement balances low.

14. The finetuning afternoon general receiver auction is conducted on an uncollateralized basis and the BOC may want to consider conducting this auction on a collateralized basis, in line with international best practice. Such approach should mitigate risks associated with a potential counterparty default. Notably, the overall exposure may be limited as long as amounts of liquidity provided remain small (currently about 90 percent of liquidity is provided in the morning), but collateralization should be considered in case that amounts change going forward. In addition, operational risks related to auction and settlement procedures should eb taken into due account.

15. The BOC should assess and monitor more closely the availability of collateral across LVTS participants. The BOC's current broad collateral framework provides a good "foundation" to expand the framework in times of increased liquidity provision. The envisaged transition to the RTGS system will increase collateral demand substantively. Information on aggregate and individual levels of unencumbered assets eligible as collateral should serve as a good indicator on quantitative impact and effectiveness of individual collateral measures.

16. The BOC's capacity should be enhanced to price collateral based on theoretical models. Reliable market prices may not always be available, and this is relevant in particular in times of increased exposure to private sector collateral (without state guarantee). In addition, theoretical pricing may be required for marketable, though rather illiquid NHA MBS. Furthermore, the BOC may want to consider a differentiated treatment of "own-used" (i.e., retained and then mobilized) NHA MBS and apply more restrictive risk control measures (e.g., in the form of higher haircuts and/or limits) for retained NHA MBS; this would be prudent from a risk management perspective and be more market neutral, avoiding a preferential treatment of NHA MBS as collateral.

17. The pricing frequency for loan portfolios should be increased. The BOC has introduced strict concentration limits (20 percent) to limit its exposure to this asset class. However, a relaxation of the limit (to increase collateral supply) would increase the BOC's exposure and require higher pricing frequency to mitigate risk of overvaluation.

MONEY MARKETS

A. Overview

18. The money markets are dominated by secured transactions, undertaken mainly by the large domestic banks, pension funds and insurance companies (Table 2). In a rather concentrated market, a limited number of participants conduct the majority of repo transactions. These repo transactions are predominantly secured by (3–10 year) GoC bonds (66 percent). Fourteen percent of repo transactions are backed by provincial government bonds. Repo trading is mainly conducted on a bilateral basis, with 10–20 percent of transactions cleared via central counterparty (CCP).[11] Some of the large domestic pension funds borrow liquidity in the repo market to ultimately increase duration in their fixed income investment book. As a result, banks are on aggregate cash lenders in this market. The unsecured interbank market is used by smaller financial institutions and also among LVTS participants for end-of-day adjustment transactions.

Table 2. Canada: Money Market Instruments, June 2018
(In billions of Canadian dollar)

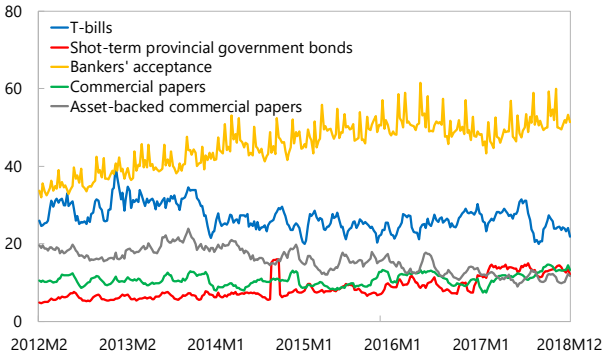
Instrument	Amount Outstanding	Main Issuers	Maturities
Treasury bills	119,300	Government of Canada	≤12 months
Repo (monthly turnover)	2,488,823	Typically large domestic banks, pension funds, insurance companies	≤120 days
Bankers' acceptances	86,452	Large banks	≤1 month
Commercial papers, issued by			≤12 months
Provincial governments	57,745	Provincial governments	
Municipalities	522	Municipalities	
Nonfinancial corporations	9,058	Corporates	
Financial corporations	11,073	Large banks	
In U.S. dollar	4,090	Large banks	
Asset-backed commercial papers	33,734	Originated by large domestic banks	≤12 months

Source: Bank of Canada.

[11] Clearing members of CDCS include large Canadian banks and their broker-dealer subsidiaries. More recently, some large domestic pension funds have become CDCC members. CDCS has obtained an uncommitted Can$12 billion credit line from a consortium of major banks in Canada as a resource to cover losses/liquidity shortfalls that could arise from a participant's default.

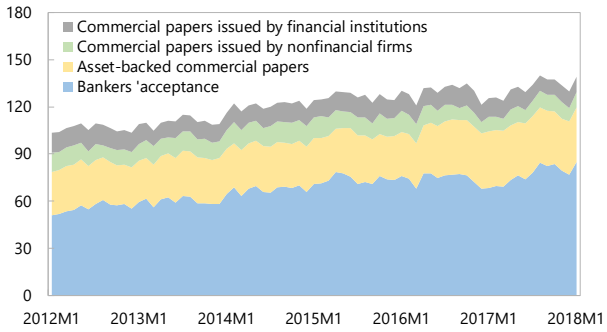
19. T-bills issued by the GoC and BAs issued by the large Canadian banks dominate the landscape of money market products in Canada. The annual issuance volume of T-bills (issued with 3, 6, and 12 months maturities) is generally larger than that of GoC bonds (Can$320 billion in 2017, vs. Can$136 billion of 2-year to 30-year GoC bonds) due to repeat issuance of 3-month and 6-month T-bills during a 12-month period. The average T-bills outstanding stock was about Can$135 billion in 2017. Banks are the largest holders of T-bills.

Market Products: Turnover, 2012-18
(In billions of Canadian dollar, monthly average)



Sources: Bank of Canada; and IMF staff calculations.

Private Money Market Products: Outstanding Amounts, 2012-18
(In billions of Canadian dollar)



Sources: Bank of Canada; and IMF staff calculations.

20. BAs account for the largest s hare of money market instruments issued by non-government entities. BAs accounted for just over 25 percent of the total money market, or slightly more than Can$86 billion outstanding, in June 2018. While the BA market declined after the GFC, it has rebounded, increasing by slightly less than 70 percent since its trough in 2010. BA turnover has been stable and has been increasing slightly over the recent years, in contrast other money market products. Main BA investors include insurance companies, pension funds, money market mutual funds, corporates, banks, government agencies and asset managers. ABCPs are the second-largest money market instrument issued by the private sector, with just over 10 percent of total money market, or about Can$34 billion outstanding, in June 2018. The size of the ABCP market in Canada has remained relatively small since the GFC owing to the reduced number of issuers and decreased investor interest in this market segment. CPs issued by financial and nonfinancial corporations accounted for just over 5 percent of total money market, or around Can$20 billion outstanding, in 2017. The size of the domestic CP market has been relatively stagnant since the GFC. Recently, large banks have tapped short term funding markets in the Unites States to meet increasing funding needs and to benefit from attractive funding conditions.

21. The BA market is linked to the Canadian Dollar Offered Rate (CDOR), which was originally developed to establish a daily benchmark reference rate for BA borrowings. CDOR is not a bank borrowing rate but represents a committed lending rate at which banks are contractually willing to lend cash to corporate borrowers via existing BA facilities. CDOR is also used as the main interest rate benchmark for calculating the floating-rate component of both over-the-counter and exchange-traded Canadian-dollar derivative products. Another use of CDOR is to determine interest payments on floating-rate notes.

22. Substantive progress has been achieved to enhance interest reference rates in Canada (CORRA, CDOR). The Canadian Alternative Reference Working Group's efforts are ongoing to develop an improved risk-free Canadian dollar interest rate benchmark, consistent with IOSCO principles (enhanced CORRA). CDOR has been strengthened in several ways, i.e., by the appointment of an administrator and the creation of an oversight committee for CDOR which reviews its definition, scope, and methodology. In addition, the Office of Superintendent of Financial Institutions (OSFI) is supervising governance and risk controls surrounding submission processes. Market participants are involved in the development process via market consultations.[12]

B. Assessment and Recommendations

23. The Canadian repo market is robust and resilient. The reliance on secured short-term funding should support financial stability. An increasing number of CCP participants should improve the resilience of the repo market further. In particular, CCPs should support pension funds' access to the repo market in times of market stress, which would occur in case banks would reduce repo lending. The fact that banks currently are net lenders in Canadian repo markets (and pension funds net borrowers) may change over time, in particular in case that the interest rate environment changes (and rates go up). Hence, supply and demand of liquidity in this segment require close monitoring.

24. CDOR's main vulnerabilities that the reference rate is not risk free remain and therefore transition work to a risk-free reference rate should be conducted with priority. The BOC plays an active role in the efforts to transition to a new and improved benchmark (enhanced CORRA) that complies with IOSCO principles. The timely introduction of such new benchmark should support efficient functioning of Canadian financial markets and overall financial stability.

25. The transition to a new reference interest rate is crucial in particular for the BA market, which continues to be a core funding market for Canadian banks. In addition, liquidity conditions (expressed by bid-ask-spreads) in BA markets should be closely monitored, given that that new Liquidity Coverage Ratio (LCR) and upcoming Net Stable Funding Ratio (NSFR) regulations have made holding of BAs more capital- and liquidity-intensive. As a result, dealers have reduced inventories in particular at quarter-end, leading to widened spreads. The BOC's transition work towards the improved rate should be completed with priority.

[12] In February 2019, a consultation has been launched to receive feedback on the transactions to be included for an enhanced CORRA calculation, along with the envisaged calculation methodology.

BOND MARKETS

A. Government of Canada and Provincial Government Bond Markets

26. The BOC auctions (via a multiple price auction) GoC new issuances in the form of nominal bonds, T-bills, and real return bonds (via a single price auction) to a limited set of authorized participants on behalf of the GoC. Auctions are announced well in advance and are part of a transparent debt management strategy. Nominal bonds with 2-, 5-, 10-, and 30-year maturity generally receive benchmark status after repeated re-opening.[13]

27. GoC bonds are held by a stable, though relatively concentrated, group of participants—particularly large pension funds and banks. Foreign public investors such as sovereign wealth funds and foreign central banks have also been purchasing GoC debt securities ("flight to quality"). The share of nonresident investors has increased constantly over the last 20 years, from 20 percent (2002) to nearly 40 percent (2017). The share of domestic private corporations has declined during the same period (from 60 percent to 40 percent).

28. In the secondary market, GoC bonds are still largely traded bilaterally. About 40 percent of trading activity takes place on electronic venues. Nevertheless, the GoC bond market is becoming increasingly electronic, however full centralization of trade on electronic trading platforms has not yet taken place.

29. GoC bonds can be considered liquid. Based on estimates from academic literature, effective bid-ask spreads (average of all observed trades) a range between 4 and 6 basis points, trending downwards since 2014. Observed bid-ask spreads are much tighter, with those in the 2-year maturity about 1.5 basis points for average trades of Can$50 million or more, comparing favorably to developed markets of similar size. More broadly, recent analyses conducted by the BOC on market liquidity and resilience revealed mixed results, illustrating that the price impact of large trades has increased. Since the GFC, the average trade size and trading volumes have increased for benchmark bonds but remained stable for non-benchmark bonds; liquidity proxies indicate adverse liquidity movements around stress events such as the euro area crisis in 2011, the taper tantrum in 2013 and the oil price shock in 2015. Liquidity conditions quickly rebounded after each of these episodes, however, suggesting resilience.

30. Provincial government bonds are less liquid and complement the spectrum of public sector bonds in Canada. Amounts outstanding of provincial government bonds have more than doubled since the GFC, reaching a level of Can$827 billion (Table 3). Of note, issuance volumes, credit ratings and liquidity may differ substantively across provinces, which is reflected accordingly in spreads over GoC bond yields. Provincial government bonds are impacted by individual credit ratings. Provinces with large issuances (such as Ontario and Quebec, which account for two-thirds of

[13] Similar to many other countries, benchmark status is reached not immediately after issuance, but after repeated re-openings, leading to an increased outstanding amount (referred to as "benchmark range") of the issuance.

aggregated provincial debt) seem to benefit from a liquidity discount. Episodes of spread-widening in 2014–2015, i.e., during a phase of oil price declines impacted all provinces; notably, this came along with increased trading activity, as indicated by increased levels of turnover ratio during this period. In comparison, CMB spreads are less prone to factors like fiscal stress and risk aversion and are less volatile.

Table 3. Canada: Bond Market Instruments, June 2018
(In billions of Canadian dollar)

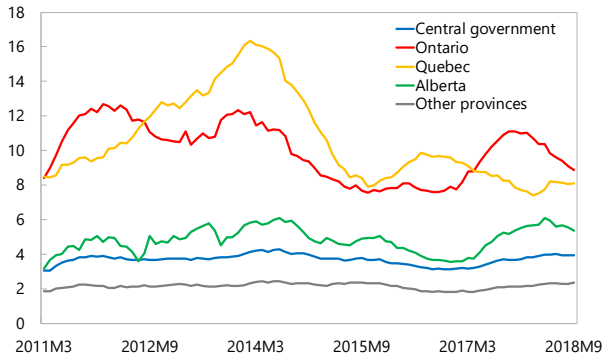
	Amount Outstanding		Main Issuers	Maturities
Instrument	Domestic	Foreign		
Federal government bonds	572,573	13,580	Government of Canada	2–30 years
Provincial government bonds	670,102	156,739	Provinces, in particular Ontario, Quebec, British Columbia and Alberta	
Municipality bonds	62,592	846	Municipalities	
CMBs	236,700	0	Canada Housing Trust	Mainly 5, 10 years
NHA MBS[1]	486,270	0	Large banks, mortgage finance companies	5 years
Covered bonds	9,800	137,100	Large banks	Mainly 5, also 3, 7 years
Financial corporation bonds	275,849	470,168	Large banks	1–10 years (mainly)
Term asset-backed securities	61,300	-		-10 years
Nonfinancial corporation bonds	300,636	342,537	Corporates	>4 years

Source: Bank of Canada.
1/ NHA MBS issued include those sold to Canada Housing Trust and backing CMBs.

31. Analyses on liquidity and resilience reveal a mixed picture. Bid-ask spreads have increased modestly since 2010 across all provincial government bonds. At the same time, price impact measures and trade size have remained stable since 2010.

Bond Market Turnover, 2010-18

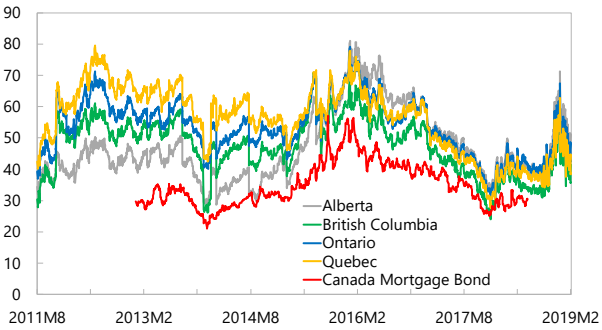
Based on total value of monthly trades per outstanding stock of bonds



Sources: Bank of Canada; Bloomberg; and IMF staff calculations.

Spreads of Provincial Bonds and Canada Mortgage Bond, 2011-19

(In basis points; relative to Government of Canada bond, based on 5-year bonds)



Sources: Bloomberg; and IMF staff calculations.

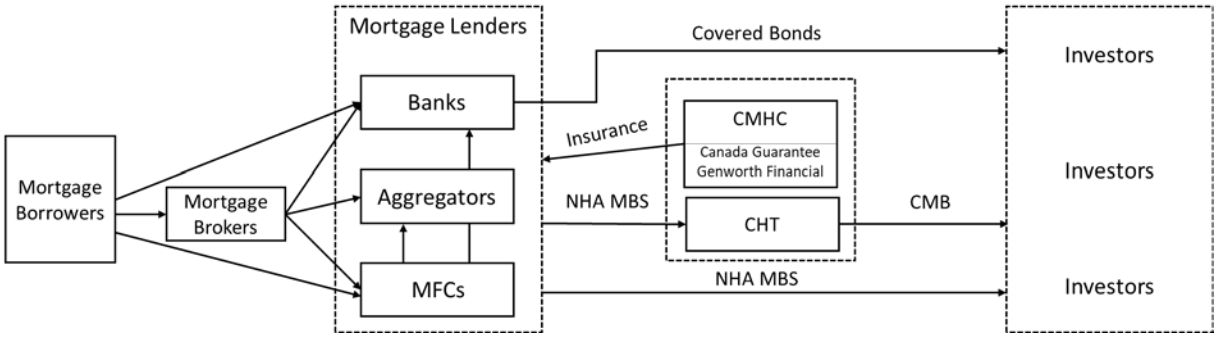
B. Mortgage Securitization Markets

32. Residential mortgage securitization in Canada plays an important role in mortgage financing and is mostly government supported. Predominantly the large Canadian banks (in terms of issuance volume), but also small to medium sized lenders use the NHA MBS program to issue mortgage backed securities backed by pools of mortgage loans that are insured under the NHA. About half of NHA MBS is sold to the Canada Housing Trust (CHT) immediately after issuance, which in turn funds the purchase by issuance of CMB. A large share of NHA MBS are retained on the balance sheet of the originating bank, mainly for regulatory reasons, as NHA MBS are considered high-quality liquid asset (HQLA) Level 1 assets. Only a small fraction is sold to end investors and investor demand is muted given the prepayment risk inherent to the NHA MBS. NHA MBS liquidity is perceived to have deteriorated recently and market participants' perception on liquidity is comparable to that of investment grade corporate bonds. The annual issuance of NHA MBS had been capped at Can$80 billion a year in 2018, based on an annual decision by the Department of Finance (DOF). For 2019, this cap has been substantively increased to $140 billion.

33. CMBs play an important role in Canadian fixed income markets, and markets are liquid. CMBs (mainly 5-year fixed, but also 10-year fixed and 5-year FRN) are traded with a lower turnover than provincial government bonds but at lower spreads due to the more limited credit risk (government guarantee). Unlike NHA MBS, the CMB Program converts monthly amortizing cash flows into typical bond-like payments (i.e. semi-annual or quarterly coupon payments and a final full principal payment). As a consequence, the investor base is broad and diversified. There are 11 dealer global syndicates that provide market making. Since 2013, CHT has limited the annual issuance of CMBs to Can$40 billion.

34. Covered bonds are an important complementary source of funding used to securitize uninsured mortgages. Prudential regulation limits the amount of covered bonds outstanding per bank to a maximum of 4 percent of its total assets. Covered bonds are issued mainly in foreign denomination (mainly euro, but also British pound and U.S. dollar) and issuers tap markets mainly in Europe.

Figure 1. Mortgage Securitization in Canada



Source: IMF staff.

35. Private-label mortgage securitization via residential MBS plays a very minor role in this market segment due to uneconomical funding costs. However, there have been efforts to revitalize this market segment. This could benefit smaller lenders and small/mid-sized banks particularly in case that access to mortgage insurance is tightened and volumes of uninsured mortgages increase further. The BOC has assumed an active role to facilitate discussions among counterparties in the Canadian Fixed Income Forum.

C. Assessment and Recommendations

36. The debt management strategy in combination with a well-functioning GoC bond market play a crucial role in financial markets and support system-wide liquidity. The GoC bond market is resilient, and this is important for Canada's cash, repo and securities lending markets. The BoC's efforts to closely monitor and support liquidity conditions in this market further support system-wide liquidity. The increasing share of international investors has diversified and strengthened the investor base further.

37. There is a strong 'footprint' of the Canadian government in mortgage securitization markets, which are crucial for mortgage originators. Issuance limits on NHA MBS and CMB, regulatory standards (OSFI) and the covered bond law created an environment, which in turn influences mortgage financing conditions, related market conditions and asset encumbrance. This supports system-wide liquidity and financial stability as securitization products are standardized. However, it impairs currently the revitalization of private market solutions, such as the residential MBS market.

FOREIGN EXCHANGE MARKETS AND FOREIGN-CURENCY FUNDING

A. Foreign Exchange Markets

38. The Canadian dollar is the sixth most traded currency globally and the second most traded currency in the Americas.[14] The Canadian foreign exchange market is active, with a wide range of instruments (Table 4). Spot and FX swap transactions represent the most prominent instruments with a share of each nearly 40 percent in daily turnover, followed by outright forwards (13 percent). Cross-currency swaps and FX options play a smaller role (1.6 percent and 2.2 percent, respectively). BIS analysis reveals that the overall market turnover for the Canadian dollar has increased continuously over the past 15 years and turnover in FX derivatives exceeds turnover in the spot market. Whereas global foreign-exchange trading has declined between 2013 and 2016, Canadian dollar trading has grown continuously since 2001.

39. According to the Canadian Foreign Exchange Committee survey, 77 percent of FX swaps carried a maturity less than one month as of April 2018. 82 percent of FX options carry a maturity of less than 6 months with half of that amount maturing in less than 1 month. Cross currency swaps make up less than 2 percent of the total market share. Typical counterparts to bank foreign-currency hedging activities are other domestic and international banks. Pension funds and foreign investors also provide hedges on banks' foreign-currency liabilities.

40. Large dealer banks are still considered to provide liquidity for the spot, forward and swap markets. Futures are widely and actively traded in international money markets through nonresident accounts. Nevertheless, turnover of other financial institutions exceeds banks' turnover. The domestic foreign exchange market mainly comprises domestic and international banks, institutional investors, hedge funds and proprietary trading firms, and official sector financial institutions (e.g., government accounts and their agencies, sovereign wealth funds). As is the case in other countries, market oversight and monitoring performed by the BOC is complicated by a considerable proportion of trades conducted outside of Canada in the increasing importance of electronic trading platforms, including the use of algorithm trading.

[14] Based turnover data April 2016, in Bank for International Settlements "Triennial Survey of foreign exchange and OTC derivatives trading."

Table 4. Canada Foreign Exchange Market Size and Composition
Based on average daily turnover, as of April 2016
(in billions of U.S. dollar and in percent of total trade)

	Canadian Dollar		Other Currencies							
			USD	EUR	JPY	GBP	AUD	CHF	CNY	SEK
Instrument	in USD	In percent	In percent	In percent	In percent	In percent	In percent	In percent	In percent	In percent
OTC										
Spot	104.6	40.1	31.2	32.7	36.0	32.5	41.0	23.5	33.4	30.0
Outright Forwards	34.5	13.2	13.5	11.2	13.8	14.2	11.7	12.3	13.8	11.9
FX Swaps	103.1	39.6	48.7	50.7	41.8	47.1	39.6	61.5	42.6	52.6
Currency Swaps	4.3	1.6	1.7	1.4	1.7	1.6	2.0	0.7	1.3	0.8
Options	14.1	5.4	4.9	4.0	6.7	4.6	5.6	2.0	8.8	4.7
Total	260.6	100	100	100	100	100	100	100	100	100
Total in percent of GDP	**16**		**23**	**13**	**22**	**25**	**26**	**36**	**2**	**21**

Source: Bank for International Settlements, Foreign exchange liquidity in the Americas, March 2017 and Triennial Central Bank Survey: Global foreign exchange market turnover in 2016.

41. The spot market appears liquid and resilient; it weathered well past episodes of market stress. Average daily turnover across the various instruments (see Table 4) is comparatively smaller (in relation to GDP) when compared to several other large economies. However, dedicated liquidity analyses[15] revealed that periods of market stress, such as the "taper tantrum"[16] in May 2013, did not negatively impact Canadian dollar liquidity.

B. Foreign-currency Funding

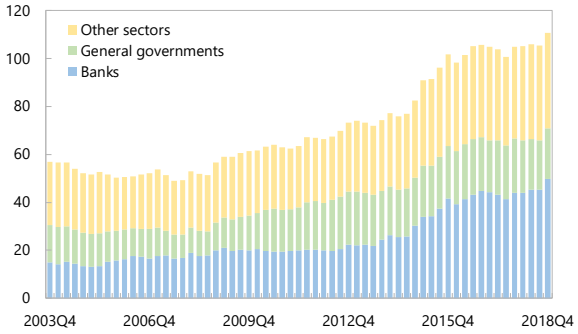
42. In particular since the GFC, banks have increasingly relied on external funding, i.e., from foreign investors. Over the past five years, the banking sector's external debt liabilities have increased by about 150 percent, reaching Can$1 trillion, or 46 percent of GDP, as of 2018Q3. About 40 percent of the increase has been driven by issuance of long-term debt instruments, including covered bonds. Currently, two-thirds of banks' external borrowing is short-term.

43. Banks' foreign-currency funding (held by domestic and foreign investors) is also sizeable. As of October 2018, foreign-currency funding amounted to Can$2.9 trillion or 55 percent of total funding. The sheer size of foreign-currency funding is broadly matched with investment and lending activities on the assets side (Can$3 trillion), some of which are carried out by subsidiaries in the United States. Nonetheless, banks heavily rely on foreign-currency wholesale funding, which accounted for about 40 percent of total funding. Banks appear to tap international capital markets to obtain foreign-currency wholesale funding at attractive costs, with a bulk from issuances of term deposits. More recently, banks have increased these issuances in European markets.

[15] As reflected and described in BIS report on "Foreign Exchange Liquidity in the Americas," March 2017.

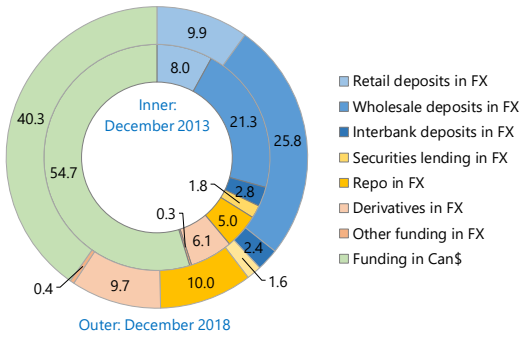
[16] This event refers to the announcement of the eventual reduction of in large-scale asset purchases by the Federal Reserve. The "taper tantrum" led to a significant rise in long-term U.S. bond yields and also appreciation of the U.S. dollar.

External Debt Liabilities, 2003-18
(In percent of GDP)



Sources: Haver Analytics; and IMF staff calculations.

Composition of Banks' Funding, 2013-18
(In percent of total funding)



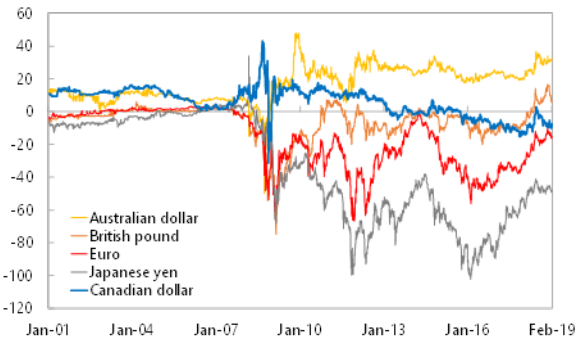
Sources: OSFI; and IMF staff calcuations.

44. In aggregate, while foreign-currency exposures appear to be hedged naturally, liquidity profiles have become quite volatile. The banking sector as a whole benefits from overseas earnings as a hedge for foreign-currency exposures from the funding side. However, some banks do not have meaningful operations abroad. Banks can also use foreign-currency swaps and other derivatives to hedge their exposures. In fact, the component of foreign-currency derivatives becomes larger and more volatile over time, underpinning the large swings in foreign-currency liabilities to total liabilities. The growing reliance on financial hedging in turn requires well-functioning foreign exchange markets.

45. Canadian banks reportedly run a relatively small currency risk mismatch as a percentage of Canadian dollar assets. The BOC revealed that Canadian banks do not take meaningful active currency risk.[17] Whether short-term or longer-term, funding programs are fully hedged from a currency and term basis by using a combination of FX forwards and/or cross-currency basis swaps.

46. An analysis of the 5-year cross currency basis suggests that funding stress in U.S. dollar market has been muted, especially when compared with other major currencies. This indicator suggests U.S. dollar funding stress in Canada during the Canadian dollar episodes of heightened volatility in particular between 2008 and 2009. This indicator points to muted levels of volatility since then, with U.S. dollar funding stress in Canada much more limited than in other major economies.

Cross-Currency Swaps vis-à-vis U.S. Dollar, 2001-18
(In basis points)



Sources: Bloomberg; and IMF staff calcuations.

[17] Specific data regarding bank hedging activities are confidential and were therefore not shared with the FSAP mission team.

C. Assessment and Recommendations

47. Foreign exchange markets appear liquid, and their resilience is increasingly important given the growing reliance on external, foreign-currency funding. Spot and swap transactions dominate the foreign-currency markets, with each representing 40 percent of the market share. Based on 5-year cross-currency swap basis of major currencies vis-à-vis the U.S. dollar, stress of the Canadian dollar appears relatively limited. Since end-2013, external debt liabilities to GDP have increased by about 30 percentage points, driven by banks (two-thirds) and other non-government entities (one-third). The latter reflects bond issuances by Canadian firms in international markets.

REGULATION RELATED TO LIQUIDITY RISK

A. Regulation for Banks

48. In Canada, LCR requirements entered into force in January 2015.[18] OSFI is responsible for the implementation of the LCR via the Liquidity Adequacy Requirement guideline (LAR guideline) and Guideline D-11 on disclosure requirements, applicable to all banks, federally regulated trust or loan companies, bank holding companies and cooperative retail associations. It excludes provincially regulated credit unions, in particular the major credit union in Quebec, for which LCR requirements are enforced by AMF's Liquidity Adequacy Guideline. In October 2017, the BCBS's Regulatory Consistency Assessment Program assessed OSFI's LCR regime as being compliant with the Basel III standards. LCRs by significant currency are implemented according to Basel standards as a monitoring tool.

49. OSFI has recently updated the LAR guideline,[19] with a more differentiated and conservative treatment of less stable retail deposit types and run-off rates in the LCR calculation and the introduction of a Liquidity Activity Monitor (LAM). OSFI conducted a re-assessment of assumptions relating to the stability of certain retail funding sources and will apply increased run-off rates for less stable deposits such as brokered deposits and rate-sensitive deposits. These changes are to be implemented in January 2020, together with the NSFR requirements. In addition, the LAM should provide timely balances of key accounts for selected institutions, as determined by OSFI.

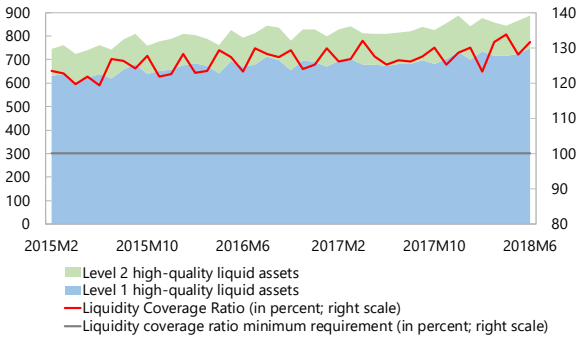
50. Since January 2015, Canada's DSIBs' LCR levels have on aggregate been well above the minimum level (100 percent). According to the LCR metric, banks in general have held sufficient amounts of HQLA Level 1 assets on their balance sheet, including central and provincial government

[18] Of note, the requirement took effect without any phase in, i.e. banks had to meet a minimum requirement of 100 percent as of January 2015.

[19] OSFI had a public consultation seeking market participants' feedback on the envisaged amendments to the LAR guideline by March 15, 2019. Final rules were issued in April 2019: http://www.osfi-bsif.gc.ca/Eng/fi-if/rg-ro/gdn-ort/gl-ld/Pages/LAR19_let.aspx

bonds, CMBs and NHA-MBS.[20] HQLA Level 2 assets, comprising corporate debt, commercial paper, covered bonds and RMBS, play a smaller role.

Liquidity Coverage Ratio Complianec of D-SIBs, 2015-18
(In billions of Canadian dollar)



Sources: Bank of Canada; IMF staff calculations.

51. OSFI intends to make the Basel NSFR a minimum standard effective January 1, 2020. As of January 2020, NSFR requirements (at a level of 100 percent) will enter into force, initially applied to D-SIBs, only. In addition to meeting the LCR requirements, OSFI expects institutions to adhere to a set of sound liquidity management principles as outlined in OSFI's Guideline B6—Liquidity Principles which incorporate the BCBS's Principles for Sound Liquidity Risk Management and Supervision. This also includes the Net Cumulative Cash Flow (NCCF),[21] a domestic liquidity horizon metric, as specified in the LAR guideline.

B. Regulation for Nonbanks

52. Mutual funds are regulated by provincial securities commissions in Canada. The Canadian Securities Administrators (CSA)—an informal council of securities regulators—coordinates provincial securities regulation through national instruments. National Instrument 81–102 on Investment Funds (NI 81–102) is the main regulatory framework for open-end mutual funds. It covers operational requirements and includes restrictions on short-sales, limits to ownership concentration and leverage, restrictions on the use of derivatives, and regulations limiting a fund's ability to undertake securities-financing transactions. From the perspectives that 85 percent of mutual fund assets are managed by mutual fund managers based in Ontario, the Ontario Securities Commission (OSC) is the most important provincial securities regulator.

53. The Canadian investment fund industry is large relative to GDP (as reflected in Table 5). However, it is still comparatively small (when compared to the United States) and, due to the high number of funds, individual funds do not play a major role as investors in Canadian core funding markets. The investment fund industry in Canada holds 17 percent of financial institutions' total assets in Canada. Balanced funds, investing in in a mix of stocks and bonds as well as funds that invest in a mix of separate stand-alone funds, represent the most important type of fund. Money market funds, in turn, play a minor role in Canada. Of note, some U.S. domiciled mutual funds investing in Canadian bond markets are overall larger than respective Canadian funds.

[20] Banks may "issue" NHA-MBS, which are then not sold to investors, but retained on their balance sheet to transform pools of residential mortgages into HQLA Level 1 assets. As a result, the share of NHA-MBS neither sold to CHT, nor retained on banks' balance sheet, but sold to investors is rather small (below 5 percent). This may also explain the comparatively low secondary market liquidity of NHA-MBS.

[21] According to the LAR guideline, the NCCF-metric "measures an institution's detailed cash flows to capture the risk posed by funding mismatches between assets and liabilities. … The NCCF measures an institution's net cumulative cash flow… and should help identify gaps between contractual inflows and outflows for various time bands over and up to a 12-month time horizon."

However, these U.S. funds hold comparatively low amounts of Canadian fixed income assets in their portfolio.

Table 5. Canada: Investment Fund Industry
Based on net assets[1] (in billions of Canadian dollar)

Asset Class	August 2019	July 2018	December 2017	August 2017
Long-term Funds				
Balanced [2]	788.20	785.00	766.10	736.30
Equity	516.40	512.00	484.30	451.60
Bond	188.30	187.90	187.70	185.80
Specialty	17.20	16.90	14.70	13.00
Total Long-term Funds	1,510.10	1,501.80	1,452.80	1,386.70
Total Money-market Funds	25.50	25.30	24.20	24.10
Total Industry	1,535.60	1,527.10	1,477.00	1,410.80
Total Industry/ GDP (in percent)	72	71	69	66

Source: The Investment Funds Institute of Canada (IFIC), August 2018
1/ Net assets refer to assets under management and consider/deduct liabilities, e.g., due to redemptions to fund holders.
2/ Includes funds that invest in a mix of stocks and bonds as well as funds that invest in a mix of separate stand-alone funds.

54. The individual size of mutual funds and in particular fixed income funds in Canada is relatively small. As a result, individual funds do not play a dominant role, neither in markets they invest in, nor are they dominant when compared to other mutual funds investing in Canada. Notably, several mutual funds are managed by and affiliated with large banks in Canada (D-SIBs); deposit-taking institutions are sponsors for funds accounting for about half of all mutual fund assets in Canada.

55. The relevant regulation (NI 81–102) limits for mutual funds leveraging and investment in illiquid assets.[22,23] It specifies that cash borrowings and the provision of security interest over any of its portfolio assets must not exceed 5 percent of the fund's assets. Of note, leverage restriction includes limits on derivatives exposures, short-selling and securities financing transactions. As a result, large fixed income mutual funds have leverage ratios of below 1 percent. Illiquid assets should not represent more than 10 percent of the fund's net asset value (NAV). Both elements should limit funding and liquidity vulnerabilities for investment funds in Canada. Concentration restrictions exist. In addition, regulation allows for suspension of redemptions to mitigate run risk for mutual funds. An investment fund may—upon approval of the regulator—

[22] Illiquid assets are defined as "a portfolio asset that cannot be readily disposed of through market facilities on which public quotations in common use are widely available" or "a restricted security for which the resale is prohibited".

[23] Of note, NI 81-102 has been updated recently to cover more broadly *alternative mutual funds* which are allowed to follow short selling and derivative strategies, and increased leverage.

suspend redemption to security holders. Money market funds are obliged to apply fair value valuation, which reduces run risks.

56. The Canadian pension funds sector, slightly larger than the mutual fund sector, is closely interconnected with other financial institutions in Canada. Public pension funds in Canada were set up on the basis of federal or provincial legislation, specifying their mandate, oversight and governance. Managing the funds of public pension plans, these funds follow a long-term investment strategy, are highly rated and are not susceptible to a run, as outflows are based on pension payouts. At the same time, pension funds play a considerable role as institutional investors in Canadian securities markets and as counterparty in Canadian repo markets (net borrowers) and derivative markets. In contrast to the mutual fund sector, this segment is rather concentrated, with the largest ten pension plans managing 35 percent of pension assets. As a result, impact of individual funds as investors in securities markets is comparatively higher. However, group behavior could have a large impact on securities markets.

C. Assessment and Recommendations

57. LCR levels and results of the liquidity stress testing in domestic and foreign currency reveal that banks are overall resilient to liquidity shocks in Canadian dollar or U.S. dollar. Based on bank liquidity stress test results, large banks (only captured in the exercise) hold sufficient liquidity buffers to withstand severe funding shocks in total and by significant currencies. That's said, it is still very important that liquidity in foreign exchange markets remains adequate—particularly for cross-currency swaps that are key instruments for financial institutions to manage foreign-currency funding—so that banks and nonbanks can continue to effectively manage risks.

58. The envisaged changes to the LAR guideline should overall improve the set of liquidity requirements and thereby contribute positively to financial stability. The more granular treatment of deposits and application of higher run-off rates should allow for improved liquidity monitoring and stress testing, and help banks enhance their resiliency to short-term liquidity stresses. The introduction of the LAM should improve OSFI's monitoring capabilities and should provide timely information on unexpected changes in amounts and structure of deposits and associated liquidity risks.

59. The mutual fund sector currently appears to pose little systemic liquidity risk, although liquidity risk has increased for funds with fixed income focus.[24] Vulnerabilities are contained given the size and structure of the Canadian mutual fund sector, and the sound regulatory regime, which further limits liquidity risk (triggered by maturity transformation). However, monitoring of this sector remains relevant given that liquidity risk has increased at mutual funds with a fixed-income focus, potentially triggered by large-scale redemption during stress.

[24] For more detailed discussion on stress testing for banks and nonbanks, see Technical Note on Stress Testing and Financial Stability Analysis in the context of the 2019 Canada FSAP.

60. The pension fund sector though more closely interconnected with the financial sector is not prone to substantive systemic liquidity risk. Pension funds as borrower in the repo market may be impacted by stress in the repo market segment and possibly be forced to sell assets, with negative impact on asset prices. At the same time, pension funds are not susceptible to runs and have long-term investment horizon, limiting their contribution to systemic liquidity risk. However, pension funds' increased overall size, their increased risk taking and their strong interconnectedness with other key participants in core funding markets require close monitoring.

MEASURES TO DEAL WITH MARKET STRESS

A. Overview

61. Liquidity stress events can be considered within a matrix which covers the type of event—idiosyncratic or systemic—and whether stress is in domestic or foreign currency (Table 6). Idiosyncratic events are dealt with traditional lender of last resort actions—herein after referred to ELA—whereas general disruptions to the pricing and distribution of liquidity across the financial sector including in securities markets, require a different approach and set of responses.

Table 6. Canada: Liquidity Events and Instruments

	Idiosyncratic—ELA	**Systemic**
Canadian dollar	Financial institutions—ELA policy updated 2015 Financial Markets Infrastructures—ELA policy updated 2015	***Institutions*** Term Repo Operations Contingent Term Repo Facility
		Markets Direct Intervention in securities markets: BOC, DOF, provincial governments
Foreign currency	Updated ELA policy includes provision in foreign exchange	None specifically articulated

62. Over recent years the BOC has updated its ELA policy and introduced new instruments to deal with idiosyncratic liquidity events in Canadian dollar. Less clear is the authorities' approach to dealing with stress in securities markets where such markets are systemic because of their importance for funding banks or financing housing loans, or perhaps because of asset concentrations in investment funds. Canadian banks have a sizeable portion of their balance sheets in foreign currency. While the results from the liquidity stress tests suggest that most foreign-currency assets are matched with stable funding sources in subsidiaries, if Canadian banks were to be frozen out of foreign-currency funding markets, financial stability risks could rise. While it can lend ELA in foreign currencies to address idiosyncratic, the BOC has not articulated specific measures to deal with systemic disruption to foreign-currency funding markets, for example, through market-wide foreign-currency liquidity support.

B. Institutional Arrangements[25]

63. The institutional framework in Canada for crisis management, including responding to liquidity stress, is complex and fragmented, though has worked well overall. Several agencies have responsibility for financial stability under the leadership of the Minister of Finance. In addition to the Minister of Finance, the BOC, and provincial governments have mandates allowing for intervention to provide liquidity support. OSFI and the Canada Deposit Insurance Corporation (CDIC) also play a crucial role in crucial in assessing recovery and resolution plans for federally regulated financial institutions. Liquidity support can be provided (by the Minister of Finance, BOC, and provincial governments) in three circumstances:[26] (i) to support recovery for individual institutions, (ii) to support a resolution strategy for individual institutions, or (iii) to maintain financial stability more broadly.

64. Several coordinating committees exist. The Financial Institutions Supervisory Committee (FISC), chaired by the Superintendent of Financial Institutions, facilitates consultation and exchange of information on matters relating to the supervision of federally regulated financial institutions and Deal with institution-specific problems. The Senior Advisory Committee (SAC) is the main forum to discuss financial sector policy issues and address systemic matters, including crisis preparedness, at the federal level.

C. Idiosyncratic Liquidity Support in Canadian Dollar: Framework

65. The BOC's ELA is a collateralized loan to an eligible financial institution or financial market infrastructure (FMI) that is experiencing liquidity difficulty. Section 18(h) of the Bank of Canada Act provides the BOC with legal power to make loans or advances to a financial institution, whereas (i) such loan or advance must be collateralized, (ii) must be made to a member of Payments Canada, (iii) and the duration of the loan or advance must not exceed 6 months (although loans can be renewed). Any such loan is at discretion of the BOC and at a rate not lower than the BOC's bank rate.[27] Although ELA was last extended more than 20 years ago, the BOC updated its framework in 2015.[28] The Payment, Clearing and Settlement Act in addition establishes the BOC's power to provide liquidity support to eligible FMIs.

66. The BOC has specified a set of institutional eligibility criteria which specify the entities generally eligible for ELA and further describes the role that ELA can play for institutions in recovery and in resolution. In addition, the framework has distinct requirements for federally and provincially regulated financial institutions. The framework explicitly allows for ELA support to

[25] For more detailed assessment on crisis preparedness and management, see Technical Note on Bank Resolution and Crisis Management in the context of the 2019 Canada FASP.

[26] Appendix II provides a more detailed overview on the involved agencies, the facilities available and the corresponding legal basis to provide such facilities.

[27] The bank rate is the rate applied for the overnight standing lending facility.

[28] Bank of Canada Review, Autumn 2016: Recent Changes to the Bank of Canada's Emergency Lending Assistance Policy.

financial institutions and FMIs in resolution. A credible recovery and resolution framework must exist. In the case of resolution, ELA is considered as a source of funding to help support a resolution strategy that would maintain functions of the entity that are critical to financial stability and return the firm to viability. Insurance companies, mutual funds, investment dealers, foreign FMIs and foreign bank branches would not generally be eligible for ELA.

67. FMIs are considered eligible for ELA according to the BOC framework if these FMIs are Canadian-domiciled and designated for BOC oversight. These include LVTS (the wholesale payment system LVTS), CDSX (a securities settlement system, central securities depository, and CCP), and Canadian Derivatives Clearing Service (CDCS) (a CCP that clears transactions in certain fixed income securities, OTC repo agreements, OTC equity derivatives and all derivatives traded on the Montreal Exchange). The BOC framework assumes that despite the risk-management standards in line with the Principles for Financial Market Infrastructures that FMIs must adhere to, these FMIs may experience liquidity shortages under extreme scenarios such as multiple member defaults. The framework does not differentiate further across the distinct types of FMIs and the respective scenarios under which ELA could be requested.

68. Additional eligibility requirements exist for provincially regulated financial institutions. In addition to being members of the Payments Canada and having a credible recovery and resolution framework, provincially regulated deposit-taking institutions must also be considered to be "important to the stability of the broader financial system." The BOC assesses whether a distress would impair economic activity in the region or could spread through national networks or infrastructures. Further, ELA is provided only where an indemnity is provided by the provincial government.[29]

69. Collateral eligible for ELA comprises a broad set of marketable and non-marketable assets that goes beyond the scope of the collateral accepted for BOC's standing liquidity facility. More recently, BOC has conducted extensive conceptual, legal and procedural work to facilitate the acceptance of mortgage loans as collateral, thereby substantively increasing the amount of eligible ELA collateral available to financial institutions. Mortgage loans can be transferred in several ways, via an assignment of mortgage loan portfolios (requiring amendments to the Bank of Canada Act, December 2017), a title custodian and direct registration.

[29] The guarantee should protect the BOC against potential losses in case that the financial institution defaults and that collateral provided by the financial institution turns out to be insufficient.

D. Idiosyncratic Liquidity Support in Canadian Dollar: Assessment and Recommendations

70. While the BOC has established a credible ELA framework, further work may be needed on preparedness, which is being contemplated. The BOC conducted an ELA simulation in late 2017, which featured an extension of a small loan to D-SIBs against marketable collateral. Further tests can be undertaken to include broadening the counterparties, expanding the range of collateral, and testing coordination within the BOC and with other agencies.[30]

- **Broadening the range of financial institutions:** The BOC may want to conduct such tests also with selected mid-sized banks and possibly large provincially regulated financial institutions.
- **Simulating procedures related to the mobilization of non-standard ELA collateral:** Such simulation should include mobilization and legal transfer of non-standard ELA collateral (such assets could include e.g., mortgage loan portfolios, or equities), collateral eligibility assessment by the BOC, and the pricing and haircut determination of such collateral.
- **Simulating the interaction not only of relevant BOC business areas but also interaction with the relevant agencies:** Such interaction (with FISC; and CDIC, DOF, and OSFI) could include the elements of information sharing, coordination, and decision making.

71. The BOC should intensify the monitoring available standard and ELA-eligible collateral, in particular for the D-SIBs. An institution's access to central bank liquidity is ultimately constrained by the amount of eligible collateral it holds. A good understanding of collateral eligible for ELA available to banks (unencumbered) should feed into an early warning system that may indicate situations of liquidity stress.[31]

72. Further engagement may be necessary with provincial regulators and governments to ensure clarity around the BOC's position on providing ELA to provincially regulated institutions. The key issues here are for the BOC to: (i) further clarify how they assess a provincially regulated institution's importance to the "stability of the broader financial system," and (ii) continue its efforts to establish indemnity agreements with relevant provinces and to continue arranging Memorandums of Understandings (MoUs) with provincial authorities to facilitate information sharing.

73. Further specification may be necessary related to ELA to FMIs. Whereas the likelihood for ELA requests are remote for most types of FMIs, a case can be made for a CCP and its eligibility

[30] Notably, such tests should not violate the core principle that ELA is provided as full discretion of the BOC. Participating financial institutions or FMIs should not assume that a successful participation in such tests leads to a right to receive ELA.

[31] It is noted that monitoring of available collateral eligible for ELA is more important for financial institutions than e.g. CCPs, which also in case of liquidity stress—occurring in case of a default of a member—-should hold collateral of high quality.

for ELA. The BOC may receive and assess a request for ELA in a case of a default of one or multiple CCP member(s) particularly if the CCP is unable to re-establish a matched book in a timely manner and/or if the CCP is temporarily unable to liquidate collateral without considerable price/market distortions. For the other FMIs, i.e., the payment systems, and the securities settlement system/central securities depository, a scenario for a temporary liquidity need is less obvious.

E. System-wide Liquidity Support in Canadian Dollar: Framework

74. The BOC has a well-defined strategy for dealing with system-wide liquidity stress. The BOC have a variety of options that include increasing settlement balances, conducting buyback operations, lending to a broader range of financial institutions (beyond LVTS participants), and outright purchases of securities. In determining the type and extent of such support, the BOC is guided by five principles.[32] The liquidity support measures should be: (i) targeted to the market failure, (ii) graduated to the severity of the problem, (iii) well-designed, (iv) non-distortionary using market determined prices where possible, and (v) mitigating moral hazard.

Institutions

75. The term repo operation (TRO) is scalable and can therefore be used also to counter system-wide liquidity stress. The TRO has been implemented and is activated also in normal times with the objectives to: (i) to increase flexibility in the management of the domestic assets on the BOC balance sheet, (ii) promote the orderly functioning of financial markets, and (iii) provide information on conditions in short-term funding markets. The counterparties are currently primary dealers but can be broadened in stress situations. The operations use a multiple-price auction mechanism with securities offered for one and three-month maturities. The eligible collateral are Canadian dollar marketable securities directly issued by or explicitly guaranteed by the GoC or by a provincial government. Similarly, eligible collateral can be broadened in times of liquidity stress. In addition to expansions in counterparty and collateral, the TRO can be expanded in size, terms and frequency.

76. The contingent term repo facility (CTRF) can be activated in times of liquidity stress, although it is yet to be used. The CTRF differs from the TRO insofar as it is only available during times of stress and can be offered to broader range of counterparts providing they meet the following criteria; they would need to demonstrate significant activity in Canadian money and/or bond markets, be subject to federal or provincial regulation and meet any other conditions set by the BOC. When activated, the CTRF is a standing facility which provides liquidity on a bilateral basis at a set interest rate against eligible collateral determined at the time of offering.

[32] See "Framework for Market Operations and Liquidity Provision," https://www.bankofcanada.ca/markets/market-operations-liquidity-provision/framework-market-operations-liquidity-provision/.

Markets

77. During the GFC the DOF and three provincial governments provided support to securities markets, but the BOC did not intervene directly. With the banking sector accounting for only around 40 percent of the financial sector assets and the dominant securitized funding in housing finance, well-functioning markets are a vital component of financial stability. As some key securities markets experienced stress during the GFC, the authorities provided an effective response to support market functioning. The DOF provided funding for key financial institutions, thereby supporting (indirectly) also the securitized mortgage market,[33] while three provincial governments provided support to ABCP Markets. The BOC did not purchase securities outright during this period, although it has explicit powers to do so.

F. System-wide Liquidity Support in Canadian Dollar: Assessment and Recommendations

78. The BOC's legal capacity to provide system-wide liquidity support is broad. Section 18(g) of the Bank of Canada Act provides that, "in the event that the Governor is of the opinion that there is a severe and unusual stress on a financial market or the financial system, the Bank of Canada may buy and sell from or to any person any securities and any other financial instruments, to the extent determined necessary by the Governor," implying that no restrictions exits with regard to the universe of eligible securities or markets and with regard to eligible counterparties for such support transactions.

79. The BOC's two lending instruments are well-designed to counter system-wide liquidity stress.

- **The use of TRO in normal times serves several purposes**, one of which is to have an instrument already in play that can easily be scaled up in response to broad-based liquidity stress. One challenge in using this instrument is that the BOC must estimate the magnitude of liquidity required given that it is issued through competitive price-based auctions. Estimating the appropriate magnitude may be difficult in times of stress although additional auctions can be conducted, adding liquidity until such time as funding markets begin to normalize.

- **The CTRF is an appropriate instrument to address systemic liquidity stress.** The CTRF can be used where the TRO may not have been successful in arresting system-wide liquid stress or where more urgent and direct actions are required. The nature of this instrument allows for a

[33] Two federal programs are noted. First, the federal government conducted the Insured Mortgage Purchase Program (IMPP) involving the direct purchase of NHA MBS. See "Improving the Resilience of Core Funding Markets:" BOC Review December 2009. In addition, the Canadian Lenders Assurance Facility and the Canadian Life Insurers Assurance Facility were offered to Canada's deposit taking institutions and life insurers in order to permit these eligible financial institutions to access additional funding through the issuance of government-guaranteed term debt of up to three years maturity in exchange for paying a market-based guarantee fee to the federal government. None of these two facilities was used.

more targeted response to liquidity problems regarding counterparties, collateral and price. By setting the interest rate on the CTRF the BOC does not need to estimate the quantity of liquidity required to alleviate the stress; however, a challenge remains to set an appropriate interest rate.

80. It is uncertain how stress in securities markets will be dealt with in the future which calls for clarity about the responsibility for monitoring securities markets and a framework for intervention.[34] With financial stability responsibilities fragmented and overlapping, further institutional coordination is needed to ensure adequate monitoring of key markets. It is noted that the BOC has identified core funding markets and is monitoring closely these markets, which would inform market intervention. More detailed consideration should be given to developing further and complete a framework for intervention in securities markets that should generally incorporate all the following elements:

- Articulating the objectives of interventions, related mainly to preserving financial stability;
- Identifying the markets that are assessed as most important for preserving financial stability;
- Identifying the potential triggers for intervention;
- Establishing principles for the design of programs (much has already been laid out by the BOC with regard to its liquidity program);
- Addressing other issues related to implementation, such as coordination with other crisis management actions, transparency, and communication.

G. Liquidity Support in Foreign Currency: Framework

Idiosyncratic Liquidity Support

81. Changes to the BOC's ELA framework in 2015 allowed for the BOC to extend ELA in foreign currency under some circumstances. In case a financial institution is experiencing liquidity problems with obtaining foreign-currency funding, it is assumed that the financial institution potentially can borrow Canadian dollar from the BOC through the ELA arrangements and then swap the Canadian dollar into the desired currency. Nevertheless, the BOC's ELA framework now also allows to provide ELA in foreign currency in case relevant foreign exchange markets become under stress.

82. The ELA framework also foresees that the BOC could provide foreign-currency ELA to FMIs. Such support could for example be warranted to prevent an eligible FMI from failing to meet its foreign-currency obligations.

[34] See King and others (2017), "Central Bank Emergency Support for Securities Markets" (IMF WP/17/152).

System-wide Liquidity Support

83. There are no specific arrangements for providing system-wide liquidity support in foreign currency. At the same time, banks rely heavily on funding in foreign currency. Slightly more than half of bank funding is denominated in foreign currency (mainly U.S. dollar). Wholesale funding in foreign currency on average represents 22 percent of total funding. Freezes in foreign-currency funding markets are very rare although during and since the GFC some institutions—e.g., in Europe—have experienced difficulties in accessing U.S. dollar funding, also because money market turbulences spilled over to FX swap and cross-currency swap markets. As a result, central banks provided liquidity in foreign currency (U.S. dollar) to alleviate liquidity stress.[35]

84. The provision of foreign currency funding is—whether in the form of idiosyncratic or system-wide liquidity support—contingent upon access to foreign-currency funding. The BOC's ability to respond is determined by the level of Canada's foreign reserves and its access to foreign currency swap lines with foreign central banks.

- **The BOC may intervene[36] in the foreign exchange markets on behalf of the federal government to counter disruptive short-term movements in the Canadian dollar.** Canada's current policy is to intervene in foreign exchange markets on a discretionary, rather than systematic, basis and only in exceptional circumstances. Such interventions would be conducted by the BOC, acting as agent for the federal government, using the government's holdings of foreign currencies in the Exchange Fund Account (EFA),[37] which contains reserves of US$72 billion (5 percent of GDP).[38] An asset-liability matching framework is in place, also aiming at limiting the exposure to interest rate, exchange rate and liquidity risk. The reserves are diversified across currencies, with more than half being held in U.S. dollar. Minimum requirements on liquidity of reserves apply; the reserve assets are funded mainly through cross-currency swaps (US$60 billion) and through the issuance of foreign denominated debt (US$12 billion).[39]

- **The BOC did enter into bilateral, standing currency swap agreements with other major central banks during the crisis, however these were never drawn.** In concrete, standing swap agreements were established with the central banks in the euro area, Japan, Korea, Switzerland the United Kingdom, and the United States.

[35] The Eurosystem, e.g., expanded its set of liquidity operations in December 2007 on the basis of swap arrangements with the Federal Reserve and provided U.S. dollar funding to its counterparties. See "Measures designed to address elevated pressures in short-term funding markets", ECB, December 2007.

[36] Of note, the BOC has not intervened in the FX market to support the Canadian dollar since 1998.

[37] See "Report on the Management of Canada's Official International Reserves April 1, 2017–March 31, 2018," as published by the DOF.

[38] The intervention policy foresees a minimum level of liquid international reserves of 3 percent of nominal GDP.

[39] This includes global bonds, Canada bills and notes, and euro medium-term notes.

H. Liquidity Support in Foreign Currency: Assessment and Recommendations

85. Whereas the legal framework is in place to provide support in foreign currency, little preparation seems to have been carried out to provide such funding in idiosyncratic or system-wide events. The BOC could expand ongoing planning and testing exercises for ELA with authorities and counterparties and include ELA lending in foreign currency. In addition, preparatory work could be performed to respond to systemic issues in foreign-currency funding markets. Such work could assess how to provide foreign-currency funding via the TRO. Relatedly, the BOC could also assess how to broaden the set of eligible collateral and accept additional foreign-currency denominated securities.

86. The BOC and the DOF manage the comparatively modest amount of international reserves in a sophisticated manner.[40] The BOC's recourse and timely access to these government reserves should be ensured legally and procedurally in case market stress would warrant the provision of liquidity support in foreign currency. The asset-liability matching framework is sophisticated; however, the reliance on cross currency swaps as a means of funding has increased over time. Access to this source of funding may be impaired and less reliable in times of market stress in foreign-currency markets. This form of liquidity risk is partially mitigated due to the minimum liquidity requirements applied to the assets in the reserve portfolio. However, it requires close monitoring and reflection in the asset-liability matching framework.

[40] Canada's foreign exchange reserves represent a share of 5 percent of its GDP, compared to about 13 per cent of GDP for other advanced economies and 20 per cent for emerging-market economies (10-year average).

Appendix I. Overview of Agencies' Liquidity Facilities and Legal Basis

Agency	Facilities	Legal Basis
Bank of Canada	Emergency liquidity assistance (ELA), known as Emergency Lending Assessing in Canada	Pursuant to s. 18(h) of the Bank of Canada Act at the discretion of the Governor. Pursuant to s. 7 of the Payment Clearing and Settlement Act
	Extraordinary Market-Wide Facilities (MWF)	Pursuant to s. 18(g) of the Bank of Canada Act at the discretion of the Governor.
	Bilateral liquidity swap facilities with other central banks	Bank of Canada Act—Implementation of the bilateral currency swap arrangement is conditional on both central banks' mutual acceptance for the need to provide foreign currency in their respective jurisdictions.
Minister of Finance	Exchange Fund Account	Currency Act—Part II
	Securities purchase programs—Insured Mortgage Purchase Program (IMPP)	Increase to CMHC Borrowing Authority or use of s. 60.2 of the Financial Administration Act (both of which require Governor-in-Council & Ministerial approval).
	Securities purchase programs—Canadian Secured Credit Facility (CSCF)	Governor-in-Council and Minister of Finance (pursuant to s. 60.2(2)(a) of the FAA), in consultation with the Minister of Innovation, Science and Economic Development and the Board of Business Development Bank of Canada.
	Direct lending to financial institutions	Pursuant to s. 60.2(2)(c) and s. 60.2(2)(d) of the FAA. Subject to approval by the Minister of Finance and the Governor-in-Council.
	Increase scale of CMHC securitization programs	Pursuant to s.14 of the National Housing Act.
	Loosen mortgage portfolio insurance eligibility requirements	The Minister of Finance sets eligibility conditions for mortgage insurance in regulations pursuant to the National Housing Act and Protection of Residential Mortgage and Hypothecary Act.
Minister of Finance	Government Debt Guarantees (Canadian Lenders Assurance Facility (CLAF) and the Canadian Life Insurers Facility (CLIAF))	Governor-in-Council and Minister of Finance, pursuant to s. 60.2(2)(e) of the FAA.

Source: Bank of Canada.