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CANADA

FINANCIAL SYSTEM STABILITY ASSESSMENT

June 2019

This Financial System Stability Assessment paper on Canada was prepared by a staff team of the International Monetary Fund as background documentation for the periodic consultation with Canada. It is based on the information available at the time it was completed on June 6, 2019.

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International Monetary Fund
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KEY ISSUES

Context: Canada has enjoyed favorable macroeconomic outcomes over the past decades, and its vibrant financial system continues to grow robustly. However, macrofinancial vulnerabilities—notably, elevated household debt and housing market imbalances—remain substantial, posing financial stability concerns. Various parts of the financial system are directly exposed to the housing market and/or linked through housing finance. The low interest rate environment also contributes to rising risk-taking in nonbank financial sectors. Canada's financial system's intra-system and cross-border interconnectedness have increased.

Findings: The financial system would be able to manage severe macrofinancial shocks. Major deposit-taking institutions would remain resilient, but mortgage insurers would need additional capital in a severe adverse scenario. Housing finance is broadly resilient, notwithstanding some weaknesses in the small non-prime mortgage lending segment. There are emerging vulnerabilities, stemming from banks' external, foreign-currency funding, extensive use of derivatives, rising risk-taking by life insurers, pension funds and other nonbanks, and potential cross-border spillovers. Financial sector oversight is high quality, and safety net arrangements are robust. Inter-agency coordination and cooperation works well at the federal level and among provincial authorities, but the federal-provincial nexus needs further improvement. While macroprudential measures deployed by the federal authorities have helped reduce macrofinancial vulnerabilities, strengthening institutional arrangements for systemic risk oversight is essential to ensure the capacity to manage systemic threats going forward. System-wide crisis preparedness needs to be further developed.

Policies: While banks' overall capital buffers are adequate, additional required capital for mortgage exposures, along with measures to increase risk-based differentiation in mortgage pricing, would be desirable. This would help ensure adequate through-the-cycle buffers, improve mortgage risk-pricing, and limit procyclical effects induced by housing market corrections. Enhanced monitoring of emerging vulnerabilities is warranted. The capacity to conduct Canada-wide surveillance should be strengthened, supported by continued efforts to address data gaps. A federal-provincial platform to discuss systemic risk issues and formulate policy responses should be established. System-wide contingency plans, including how to provide market-wide liquidity support, should be put in place.

Approved By
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Prepared By
Monetary and Capital Markets Department

This report is based on the work of the Financial Sector Assessment Program (FSAP) mission that visited Canada in October 22–November 14, 2018 and February 6–26, 2019. The FSAP findings were discussed with the authorities during the Article IV Consultation mission in May 2019.

- The FSAP team was led by Ghiath Shabsigh (Mission Chief) and Phakawa Jeasakul (Deputy Mission Chief), and included Adrian Alter, Farid Jimmy Boumediene, Mark Buessing-Loercks, Dirk Jan Grolleman, Henry Hoyle, Tanai Khiaonarong, Darryl King, Dimitrios Laliotis, and Peter Windsor (all MCM); Jose Garrido (LEG), Troy Matheson (WHD), and Toby Fiennes, Jennifer Long, and David Scott (all IMF external experts). Natalia Naryshkina and Andre Vasquez (both MCM) provided excellent administrative support.
- The mission met Minister Bill Morneau, Department of Finance (DOF); Governor Stephen Poloz, Bank of Canada (BOC); Associate Deputy Minister Rob Stewart, DOF; Superintendent Jeremy Rudin, Office of the Superintendent of Financial Institutions (OSFI); President and Chief Executive Officer (CEO) Peter Routledge, Canada Deposit Insurance Corporation (CDIC); President and CEO Louis Morisset, Autorité des marchés financiers (AMF), Québec; Chair and CEO Stan Magidson, Alberta Securities Commission; Chair and CEO Brenda Leong, British Columbia Securities Commission (BCSC); Chair and CEO Maureen Jensen, Ontario Securities Commission (OSC); Acting Superintendent Frank Chong, Financial Institutions Commission (FICOM), British Columbia; Senior Deputy Governor Carolyn Wilkins, BOC; Assistant Deputy Minister Leah Anderson, DOF; and other senior officials at these and other agencies.
- FSAPs assess the stability of the financial system as a whole and not that of individual institutions. They are intended to help countries identify key sources of systemic risk in the financial sector and implement policies to enhance its resilience to shocks and contagion. Certain categories of risk affecting financial institutions, such as operational or legal risk, or risk related to fraud, are not covered in FSAPs.
- Canada is deemed by the Fund to have a systemically important financial sector according to Mandatory Financial Stability Assessments Under the Financial Sector Assessment Program—Update (11/18/2013), and the stability assessment under this FSAP is part of bilateral surveillance under Article IV of the Fund's Articles of Agreement.
- This report was prepared by Ghiath Shabsigh and Phakawa Jeasakul, with contributions from the Canada FSAP team. It is based on the information available at the time it was completed on May 17, 2019.

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Glossary

AMF	Autorité des marchés financiers
AML/CFT	Anti-Money Laundering/Combating the Financing of Terrorism
AUM	Assets under Management
BCBS	Basel Committee on Banking Supervision
BCP	Basel Core Principles for Effective Banking Supervision
BCSC	British Columbia Securities Commission
BOC	Bank of Canada
CCMRS	Cooperative Capital Markets Regulatory System
CCP	Central Counterparty
CCyB	Countercyclical Capital Buffer
CDIC	Canada Deposit Insurance Corporation
CEO	Chief Executive Officer
CET1	Common Equity Tier-1
CFIML	Captive Financial Institutions and Money Lenders
CFT	Combating the Financing of Terrorism
CMHC	Canada Mortgage and Housing Corporation
CMRA	Capital Markets Regulatory Authority
CPMI	Committee on Payments and Market Infrastructures
CSA	Canadian Securities Administrators
DIS	Deposit Insurance System
DOF	Department of Finance
DSB	Domestic Stability Buffer
D-SIB	Domestic Systemically Important Bank
D-SIFI	Domestic Systemically Important Financial Institution
EBITDA	Earnings before Interest, Taxes, Depreciation and Amortization
ELA	Emergency Liquidity Assistance
FATF	Financial Action Task Force
FCAC	Financial Consumer Agency of Canada
FICOM	Financial Institutions Commission (of British Columbia)
FISC	Financial Institutions Supervisory Committee
FMI	Financial Market Infrastructure
FSAP	Financial Sector Assessment Program
FSB	Financial Stability Board
FSRA	Financial Services Regulatory Authority (of Ontario)
GDP	Gross Domestic Product
GFC	Global Financial Crisis

HELOC	Home Equity Line of Credit
HOA	Heads of Agencies Committee
ICP	Insurance Core Principles
IFRS	International Financial Reporting Standards
IOSCO	International Organization of Securities Commissions
LCR	Liquidity Coverage Ratio
LGD	Loss Given Default
LICAT	Life Insurance Capital Adequacy Test
LTV	Loan-to-Value
MBS	Mortgage-Backed Securities
MCT	Minimum Capital Test
MICAT	Mortgage Insurance Capital Adequacy Test
MoF	Minister of Finance
MoU	Memorandum of Understanding
NHA	National Housing Act
NPL	Nonperforming Loan
OECD	Organization for Economic Cooperation and Development
OSC	Ontario Securities Commission
OSFI	Office of the Superintendent of Financial Institutions
OTC	Over-the-Counter
PD	Probability of Default
PFMI	Principles for Financial Market Infrastructures
RAM	Risk Assessment Matrix
RTGS	Real-Time Gross Settlement
SAC	Senior Advisory Committee
VASP	Virtual Assets Service Provider

EXECUTIVE SUMMARY

The financial system's performance has been strong. The banking sector has enjoyed solid profitability and sizeable capital buffers. The insurance sector has remained financially sound even in the low interest rate environment. Other nonbank sectors have grown considerably, with pension funds and mutual funds dominating the institutional and retail asset management landscape. System-wide liquidity conditions are stable. Major banks, life insurers and pension funds have expanded their footprints abroad. Canada has strong financial linkages with the United States.

Macrofinancial vulnerabilities—notably, elevated household indebtedness and housing market imbalances—remain substantial, posing financial stability concerns. During the decades-long credit upcycle, low interest rates and low capital charges for mortgage lending, together with policies promoting housing affordability, have fueled borrowing to finance home purchases in the face of rapidly rising house prices. Downside risk to house prices in the medium term are sizeable given existing overvaluation, and Canada-specific housing finance characteristics may amplify procyclical effects of falling house prices due to borrowers' refinancing pressures and lenders' sudden adoption of risk-based mortgage pricing. During severe downturns, the household sector would be affected, with a significant increase in debt belonging to financially weak households, while the corporate sector would remain more robust.

The financial system would be able to manage severe macrofinancial shocks, but mortgage insurers would probably need additional capital. In a severe adverse scenario, major deposit-taking institutions would be able to rebuild their capital positions to meet the regulatory requirements. These institutions also hold sufficient liquidity buffers to withstand sizeable funding outflows. By contrast, mortgage insurers would face some capital shortfalls. Nevertheless, financial stability implications are limited given the government's backstopping of mortgage insurance contracts. Large life insurers appear somewhat exposed to financial market stress and lower interest rates. Housing finance is broadly resilient, but the non-prime mortgage lending segment, albeit small, shows some vulnerabilities.

Additional required capital for mortgage exposures, along with measures to increase risk-based differentiation in mortgage pricing, are desirable. While banks' overall capital buffers are adequate, lenders' risk weights for mortgage exposures should be higher. Mortgage insurers' capital requirements should also be tightened. In addition to properly accounting for through-the-cycle credit risk, these measures can help improve mortgage risk-pricing and limit procyclical effects of falling house prices. Furthermore, the policy framework for managing a housing market downturn should be developed, with the aims to facilitate necessary economic adjustments, limit moral hazard and safeguard taxpayers' interest.

Enhanced monitoring is warranted given emerging vulnerabilities. These concerns stem from banks' external, foreign-currency funding, extensive use of derivatives, rising risk-taking by life insurers, pension funds and other nonbanks, non-prime mortgage lending, and potential spillovers

from overseas operations and cross-border exposures. Continued efforts to address data gaps are essential to support more effective risk monitoring and analysis.

Financial sector oversight is high-quality, but there are important areas for improvement. In general, the regulatory frameworks are strong, and the supervisory approaches are well-structured and adaptive to risk profiles. Consolidated supervision also effectively captures major financial institutions' overseas operations. Nevertheless, cooperation between federal and provincial authorities should be further improved, supported by additional memorandums of understanding (MoUs). The roles and responsibilities of the authorities that oversee financial market infrastructures (FMIs) should be further clarified. Given macrofinancial vulnerabilities, the regulatory and supervisory frameworks of deposit-taking institutions regarding credit risk related to real estate exposures should be strengthened. Furthermore, the Cooperative Capital Markets Regulatory System (CCMRS) initiative can help overcome risks from dispersed oversight of securities markets. Other important sector-specific gaps require strengthening of insurance group-wide supervision, putting a greater emphasis on high-impact securities market intermediaries, and ensuring readiness to handle market-wide stress in securities markets.

The federal safety net is well-established and covers a substantial part of the financial system, but contingency planning and preparation can be further strengthened. The bank resolution regimes and deposit insurance systems for federal and Québec jurisdictions are generally aligned with international best practices. Recovery and resolution planning, which is advanced for major deposit-taking institutions, should be expanded. Given the likelihood of compensation to bail-in-able debt holders, the valuation framework should be further developed to increase certainty about bail-in outcomes. Depositor preference should also be adopted to facilitate resolution and minimize losses of deposit insurers. The Bank of Canada's framework for managing liquidity during stress is well-defined. However, indemnity agreements still need to be established to operationalize emergency liquidity assistance (ELA) to provincially regulated financial institutions. Contingency plans for market-wide support—particularly, intervention in securities markets and provision of foreign-currency liquidity—should be further developed.

Modernization of the financial stability architecture would help enhance systemic risk oversight and crisis preparedness. A single body in charge of systemic risk oversight would be the first-best solution. Second-best solutions include formalizing and strengthening the BOC's leading role in systemic risk surveillance and creating a federal-provincial platform to discuss systemic risk issues and formulate policy responses. For the latter, one option is to reconstitute the Heads of Agencies Committee (HOA). The new arrangement should be supported by a robust transparency framework. Regarding system-wide crisis preparedness, which is still missing, the Senior Advisory Committee (SAC) should oversee development and testing of contingency plans for the entire financial system, in collaboration with key provincial authorities.

Table 1. Canada: 2019 FSAP Key Recommendations	
Recommendations	**Timeframe**
Bolstering the Financial System's Resilience and Enhancing Systemic Risk Oversight	
Raise required capital for mortgage exposures at both banks and mortgage insurers to fully account for through-the-cycle credit risk; increase risk-based differentiation in mortgage pricing (OSFI, AMF; DOF)	NT; MT *
Develop the policy framework for managing a housing market downturn (DOF)	NT *
Modernize the systemic risk oversight framework, underpinned by a federal-provincial platform (potentially, HOA) to discuss systemic issues and formulate policy responses, supported by enhanced transparency (HOA, BOC)	NT *
Develop a comprehensive systemic risk surveillance framework, supported by a more unified approach to data collection; address data gaps, particularly related to cross-sectoral exposures, unregulated nonbank financial intermediation, and funding market activities (BOC, competent authorities, DOF, provincial governments)	NT/MT *
Enhance risk monitoring of banks' funding, risk-taking by nonbanks, housing finance-related vulnerabilities, and cross-border and intra-system interconnectedness; carry out Canada-wide surveillance in key sectors such as deposit-taking and insurance (BOC lead; HOA, SAC; OSFI, AMF)	NT *
Strengthen oversight of large public pension funds, and increase transparency of their financial disclosures (DOF, provincial governments)	NT
Improving Financial Sector Oversight	
Strengthen autonomy and governance of financial sector authorities, including BOC and OSFI (powers), and FICOM (overall); clarify the roles and responsibilities of the authorities in charge of overseeing systemically important FMIs (DOF, provincial governments; BOC; AMF, BCSC, OSC)	MT
Complete the Cooperative Capital Markets Regulatory System initiative (DOF, provincial governments)	MT
Enhance inter-agency cooperation, particularly between federal and provincial authorities, with additional MoUs (OSFI, AMF, other relevant provincial authorities)	NT *
Address shortcomings in the regulatory and supervisory frameworks related to credit risk of mortgage exposures; adopt a common framework to monitor forborne exposures in all jurisdictions (OSFI, AMF, other provincial credit union supervisors)	NT
Strengthen legal foundation underpinning insurance group-wide supervision; apply the regulatory framework more consistently to group-side supervision (OSFI, AMF; DOF, Québec government)	NT
Complete reforms in the areas of OTC derivatives and duties towards clients; increase the focus of oversight on high-impact firms; ensure the capacity to handle market-wide stress (CSA, relevant provincial governments)	NT
Strengthening Crisis Management and Safety Net	
Task the SAC with the responsibility of overseeing Canada-wide crisis preparedness, thus performing the roles of the coordination body at the federal level and the federal coordinator with key provincial authorities; strengthen CDIC's operational independence (MoF; SAC; DOF)	NT *
Expand recovery planning to all deposit-taking institutions and resolution planning to those performing critical functions; strengthen resolution powers; further develop the valuation framework for compensation; adopt depositor preference (OSFI; AMF and CDIC; DOF and Québec government)	NT
Operationalize ELA with key provinces; improve testing to ensure smooth ELA operations (BOC; British Columbia, Ontario and Québec governments)	NT *
Further develop contingency plans for market-wide liquidity support, particularly intervention in securities markets and foreign-currency liquidity provision (BOC; DOF, provincial governments)	NT *
Note: Institutions in the parenthesis are the agencies with leading responsibilities. The * denotes macro-critical. In terms of the timeframe, NT and MT stand for near-term (within one year) and medium-term (within 2–3 years).	

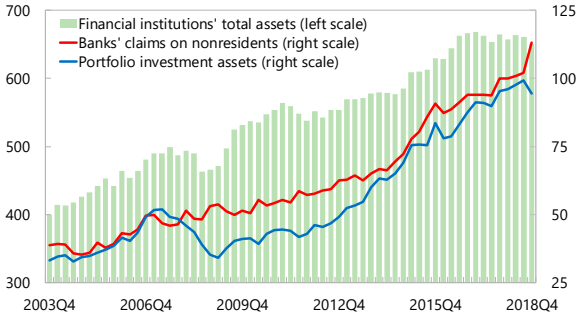
MACROFINANCIAL CONTEXT

A. Financial System Structure

1. Canada has one of the largest and most developed financial systems in the world (Figure 1, Table 3). As of end-2018, total assets of financial institutions reached US$10.2 trillion or 626 percent of GDP, and outstanding debt securities and stock market capitalization amounted to US$2.2 and US$1.9 trillion, or 133 and 119 percent of GDP, respectively. Deposit-taking institutions, pension funds, mutual funds, and insurers dominate the financial system, accounting for about 45, 18, 17, and 13 percent of financial institutions' total assets, respectively. Each segment of Canada's financial system—deposit-taking, insurance, pension, asset management, and capital markets—is among the largest in the world in nominal terms.

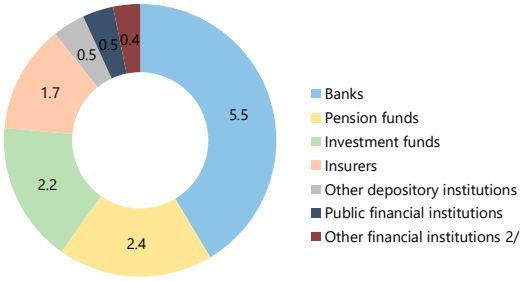
2. The financial system has enjoyed solid overall growth and international expansion since the 2014 FSAP. Total assets of financial institutions have increased by 31 percent (since end-2013), underpinned by robust assets growth of banking sector, mutual funds and pension funds. Overall banking sector growth is partly driven by the expansion of U.S. operations, with total claims on nonresidents increasing to 41 percent of banking sector assets (from 31 percent). Royal Bank of Canada became a global systemically important bank in 2017. Mutual funds and pension funds have also expanded their cross-border investment, driving Canada's international portfolio investment assets to 95 percent of GDP (from 60 percent). Domestically, banks finance about two-thirds of private sector credit, while bond issuance and nonbanks are important alternative funding sources.

Financial System: Size and Internationalization, 2003-18
(In percent of GDP)



Source: Bank of Canda; IMF, Internationall Financial Statistics and World Economic Outlook database; Haver Analytics.

Composition of Financial Institutions' Total Assets, 2017[1]
(In trillions of Canadian dollar)



Source: IMF staff estimate based on data from Canadian authorities, FSB, Haver Analytics and OSFI.
1/ Based on consolidated balance sheet basis.
2/ Excluding captive financial institutions and money lenders.

3. The financial system is highly concentrated. The six largest banks and Québec's major credit cooperative group—designated as domestic systemically important financial institutions (D-SIFIs)—account for about 90 percent of deposit-taking sector assets, while the three largest life insurers account for about 70 percent of total net premiums. These banks and life insurers, together with large public pension funds, are globally active and systemically relevant for Canada's financial system. Major banks' main businesses comprise retail and wholesale banking, wealth management, and capital markets; their subsidiaries are among leading securities market intermediaries and asset managers.

4. Financial markets also provide an important venue for public and private sector financing. While bond markets continue to expand by about 39 percent since end-2013, Canadian corporates and financial institutions have increasingly issued debt internationally, driving up the share of foreign-currency debt securities from 26 percent to 34 percent. The public debt market also comprises provincial debt securities and government-guaranteed mortgage-backed securities (MBS), which jointly account for two-third of public debt instruments. Other core funding markets include money markets (repo, securities lending, and bankers' acceptances) and foreign-exchange markets (spot and swap).

5. The government plays a central role in housing finance. The government provides mortgage insurance through CMHC and backstops private insurers' mortgage insurance (subject to 10 percent deductibles). Furthermore, CMHC provides a timely payment guarantee for securitization of qualifying insured mortgages. As of 2018Q3, insured mortgages and government-guaranteed MBS (i.e., National Housing Act (NHA) MBS) amounted to Can$723 and Can$485 billion, respectively.

B. Macrofinancial Conditions

6. The economy regained momentum following a slowdown driven by low oil prices (Figure 2, Table 4). Canada has enjoyed macroeconomic stability since the global financial crisis (GFC). Amidst a sharp decline in oil prices, real GDP growth moderated significantly in 2015, with resource-rich provinces being particularly hard hit. The economy recovered during 2016–17, led by robust private consumption, and performed well in the first three quarters of 2018. With weak performance in recent quarters, real GDP growth is projected to be at 1.5 percent in 2019 before picking up to 1.9 percent in 2020, respectively. The medium-term outlook looks less promising, with growth expected to slow to around 1.6 percent by 2024, reflecting longstanding structural problems related to low labor productivity growth, population aging, and deteriorating international competitiveness.

7. Financial conditions remain loose due to still favorable pricing of risk. In response to rising inflationary pressures, the Bank of Canada (BOC) initiated a tightening cycle in mid-2017, with five rounds to rate hikes. More recently, the BOC has communicated that an accommodative monetary policy stance is warranted. Long-term bond yields have subsequently declined following the rise during the tightening phase. Despite some bouts of market volatility in recent months, overall pricing of risk, which captures term and credit premiums, remains near historical lows.

8. Credit growth has moderated in line with the softening housing market due to monetary tightening and prudential measures. As of 2019Q1, credit growth moderated to 4.8 percent year-on-year. Several rounds of policy measures have successfully reduced insured mortgage lending and improved credit quality, with the share of banks' new lending to highly indebted borrowers falling sharply. Meanwhile, house prices have been broadly stable in the past couple years, and housing market-related activities—including construction, inventory and sales, and mortgage lending—have also moderated. However, home equity lines of credit (HELOCs) have

grown rapidly, some of which feature interest-only payment. Borrowers may utilize available credit lines to satisfy the loan-to-value (LTV) requirements when obtaining new mortgages, consolidate existing higher-cost debt, or meet regular payments on other loans.

RISK AND VULNERABILITY ASSESSMENT

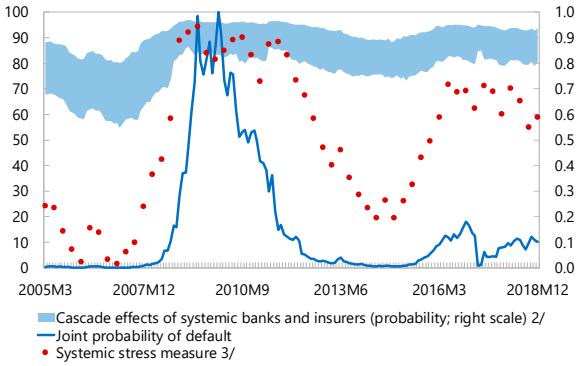
A. Overview

9. Elevated household indebtedness and housing market imbalances continue to pose financial stability concerns. During the decades-long credit upcycle, low interest rates and low capital charges for mortgage lending, together with policies promoting housing affordability, have fueled borrowing to finance home purchases in the face of rapidly rising house prices. Risk mispricing has contributed to debt accumulation among financially weak households, with problems more exacerbated in regions experiencing larger housing market imbalances. During severe downturns, Canada-specific housing finance characteristics may amplify procyclical effects of falling house prices, and the impact on growth could be protracted due to household balance sheet adjustments.

10. Market data suggests that systemic stress of financial institutions is low. Based on the market-based analysis of 19 large financial institutions as of December 2018, the probability that several financial institutions experience distress simultaneously was near historical lows. The systemic stress measure, which captures the number of institutions potentially becoming distressed and the system-wide expected loss, has been broadly stable over the past few years. Nevertheless, potential contagion effects appear to have risen over the past decade, reflecting interconnectedness among financial institutions and/or growing common exposures to the housing market.

Market Perception of Systemic Stress, 2005-18[1]

Index between 0 and 100, representing from low to high systemic stress



Sources: Bloomberg; Moody's Analytics; and IMF staff estimates.

1/ The analysis is based on the "Surveillance of Systemic Risk and Interconnectedness" approach. See Segoviano and Goodhart (IMF WP/09/4) and Technical Note on Systemic Risk and Interconnectedness Analysis, 2016 United Kingdom FSAP (IMF Country Report No. 16/164). The sample includes 10 depoit-taking institutions, 7 insurers, and 2 other nonbank entities.
2/ Cascade effects capture the probability that at least another institution become distressed given than a particular institution became distressed.
3/ The systemic stress measure comprises (i) number of institutions to become distressed given than at least one became distressed; and (ii) expected loss related to the 1st-percentile tail risk. Both indicators are combined based on their percentile ranking.

11. The financial system would be able to manage severe macrofinancial shocks, but additional required capital for mortgage exposures would help improve its resilience. While major deposit-taking institutions would remain resilient, mortgage insurers would be vulnerable. Furthermore, larger capital buffers to account for potential sharp deterioration of credit quality of mortgage exposure during severe downturns, along with measures to improve mortgage risk-pricing, can help moderate procyclical effects driven by housing market corrections. The non-prime mortgage lending segment, albeit small, shows some vulnerabilities. Existing government support, which underpins the overall

robustness of housing finance, should be guided by a policy framework that achieves proper risk-pricing and promotes financial stability.

12. Vulnerabilities are emerging due to rising risk-taking by nonbanks and increased interconnectedness, warranting enhanced monitoring. In response to the low interest rate environment, institutional and retail investors are taking greater risks to achieve higher returns, contributing to compressed risk premiums. The rapid unwinding of these investment positions could amplify market volatility. Furthermore, Canada's financial system continues to evolve rapidly, with complexity and interconnectedness potentially masking vulnerabilities and amplifying spillovers.

B. Key Macrofinancial Risks and Vulnerabilities

13. Macrofinancial vulnerabilities have declined recently but are still substantial. Given relatively limited fiscal and external vulnerabilities (Figure 3), financial stability risks remain heightened mainly due to:[1]

- **High household indebtedness (Figure 4).** Household debt reached 96 percent of GDP at end-2018. Canadian households are among the most indebted in advanced economies. Their debt-servicing obligations, already relatively large, could increase as interest rates rise. Households as a whole have large buffers, with net wealth of 489 percent of GDP. However, the share of debt belonging to households with excessive indebtedness or weak debt-servicing capacity exist has increased significantly over the past decade.

- **Persistent housing market imbalances (Figure 5).** Overvalued house prices (relative to fundamentals such as income or rent) continue to underpin the imbalances. House price-at-risk analysis suggests that house price overvaluation and tight financial conditions have contributed to downside risk to house prices. Based on current macrofinancial conditions, a large housing market correction in the medium term is possible. With a 5 percent probability, average real house price could fall by at least 12 percent year-on-year over the next three years, with potential larger price declines in major cities such as Toronto and Vancouver.

- **Growing corporate debt (Figure 6).** Corporate debt has risen rapidly to 111 percent of GDP at end-2018, largely driven by debt issuance (including in foreign currency) and non-mortgage borrowing. Overall profitability has recovered from the economic slowdown, but firms in the oil and gas and mining sectors continue enduring weak earnings. The rapid increase in debt of firms in the real estate sector raises a concern, especially given their weak income growth. The share of debt belonging to financially weak firms (with publicly available financial statements) is small.

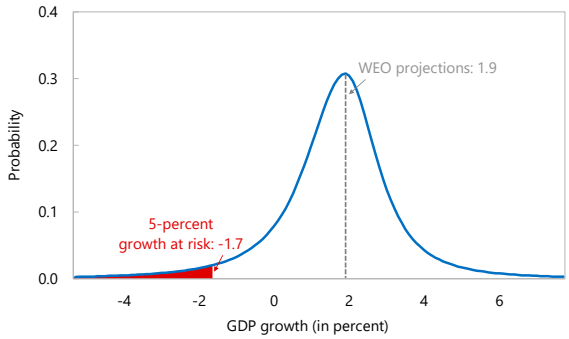
14. Growth-at-risk analysis points to substantial downside risk to growth due to significant macrofinancial vulnerabilities. Growth-at-risk analysis provides a distribution of real GDP growth forecasts conditional on financial conditions and macrofinancial vulnerabilities, the

[1] See Appendix II for the methodologal details of macrofinancial vulnerabilities analysis.

latter capturing corporate and household sector vulnerabilities, housing market imbalances, and credit-to-GDP gap. As of 2018Q3, the analysis suggests a 5 percent probability that real GDP growth would be -1.7 percent or less over the next year, and -1.6 percent (annualized) over the next three years. Downside risk to growth has declined over the past year due some reductions in housing market imbalances and credit-to-GDP gap.

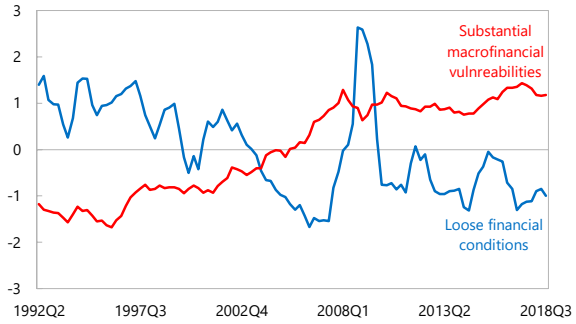
Distribution of GDP Growth Forecasts, 2018Q3

Based on growth over the next 4 quarters; annualized



Source: IMF staff estimates.

Financial Conditions and Macrofinancial Vulnerabilities, 1992-2018



Source: IMF staff estimates based on data from Haver Analytics.

15. Canada's financial system faces a confluence of domestic and external risk factors that could amplify existing financial sector vulnerabilities (Table 2). The key external risks are tighter global financial conditions, significant slowdowns in the euro area and China, and rising protectionism and retreat from multilateralism. On the domestic front, a sharp house price correction could occur on the back of rising unemployment and higher funding costs. Cyber-attacks could also pose significant risk to the financial system.

Table 2. Canada: FSAP Risk Assessment Matrix (RAM)

Source of risks	Likelihood	Expected impact
Sharp tightening of global financial conditions, with bouts of large market volatility, against the backdrop of (i) monetary policy normalization in the U.S. and other major advanced economies, (ii) increasingly stretched valuations across asset classes, and (iii) aggressive risk-taking behavior that may not be sufficiently monitored given multiple authorities in charge	Low/ Medium	**Medium** Decompression of risk premiums prompts a worldwide decline in asset prices, leading to: • Tightening of liquidity conditions and increase in funding costs given Canada' strong financial linkages with the U.S. and the global financial system, affecting both financial institutions and borrowers • Moderating economic activity in Canada and the U.S., contributing to deterioration in banks' asset quality Losses on investment portfolios, weakening solvency of some financial institutions, and triggering portfolio reallocations that affect asset prices

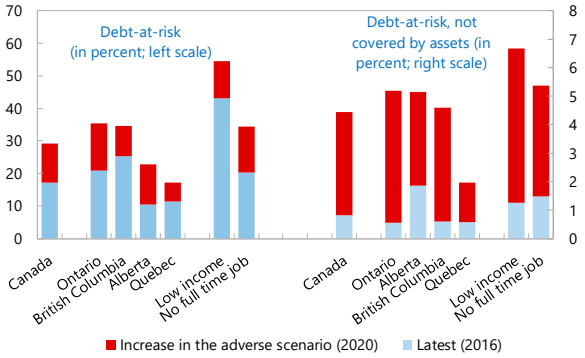
Table 2. Canada: FSAP Risk Assessment Matrix (RAM) (concluded)		
Source of risks	**Likelihood**	**Expected impact**
Weaker-than-expected global growth • Structurally weak growth in key advanced economies due to failures to address crisis legacies and undertake structural reforms • Significant China slowdown and its spillovers, stemming from disorderly deleveraging in the near term and insufficient progress in rebalancing that would further increase financial imbalances over the medium term • Rising protectionism, retreat from multilateralism, and policy uncertainty, undermining trade, capital and labor flows, sentiment, and growth	High Medium High	**High** Canada's economy is affected by weaker global growth and reduced cross-border activities, leading to: • Impaired debt-servicing capacity of corporates and households, raising banks' nonperforming assets • Financial difficulty faced by firms with cross-border operations, with spillovers to the financial system Weaker global growth, especially together with spillovers from China, also depresses commodity prices, leading to: • Growing vulnerabilities in the commodity-related sector • Reduction in investment, job and real income, especially in resources-rich provinces, with knock-on effects on credit quality Spillovers to regional housing markets, resulting in negative macrofinancial feedback loops that heighten financial stability concerns and weaken provincial public finance
Sharp house price correction on the back of rising unemployment and higher funding costs, setting off negative feedback loops that weaken domestic demand and heighten financial stability concerns given high household debt	Medium	**High** Adverse macrofinancial effects from housing market adjustments lead to: • Deteriorating asset quality, particularly related to mortgage lending and real estate financing • Rippled effects in financial markets that fund mortgage lending Increase in the government's contingent liabilities through claims on mortgage insurance
Cyber-attacks on the interconnected financial system, triggering systemic financial instability or disrupting socio-economic activities	Medium	**Medium** Successful cyber-attacks on a key financial institution could spread widely, but the situation appears manageable given robust financial market infrastructures (FMIs)
The RAM shows events that could materially alter the baseline. The relative likelihood is the staff's subjective assessment of the risks surrounding the baseline ("low" is meant to indicate a probability below 10 percent, "medium" a probability between 10 and 30 percent, and "high" a probability between 30 and 50 percent). The RAM reflects staff views on the source of risks and overall level of concern as of the time of discussions with the authorities. Non-mutually exclusive risks may interact and materialize jointly.		

16. The adverse scenario assumes a severe recession that would occur concurrently with significant financial stress and a sharp housing market correction (Figure 7, Table 5). The initial trigger are disruptions in international trade and global production chains, followed by disorderly financial market adjustments. Tightening global financial conditions would then set off global housing market and credit cycle downturns. Given domestic macrofinancial vulnerabilities, these external shocks would result in a sharp housing market correction, along with significant financial stress and large currency depreciation, in Canada. This perfect storm would cause a snapback of interest rates, as monetary policy would be tightened initially to stabilize inflation expectations and

loosened in later years given recession-induced deflationary effects. The scenario envisages cumulative real GDP growth of -2 percent (annualized) during 2019–21; growth-at-risk analysis suggests that the likelihood of such a severe growth outcome is 3.8 percent.

17. The household sector is exposed to severe macrofinancial shocks, while the corporate sector is more robust. In the adverse scenario, the share of household debt-at-risk would increase to 29 percent, up from 17 percent in 2016. Sizeable debt-at-risk not covered by assets suggests material financial stability implications. Fragility is more pronounced for households in British Columbia and Ontario due to higher indebtedness and larger housing market imbalances. In contrast, the share of corporate debt-at-risk would increase to 8 percent, up from 5 percent in 2018, with firms in the utilities and materials sectors among the most vulnerable. While their debt-servicing capacity is weak, only few of these financially weak firms would have solvency problems.

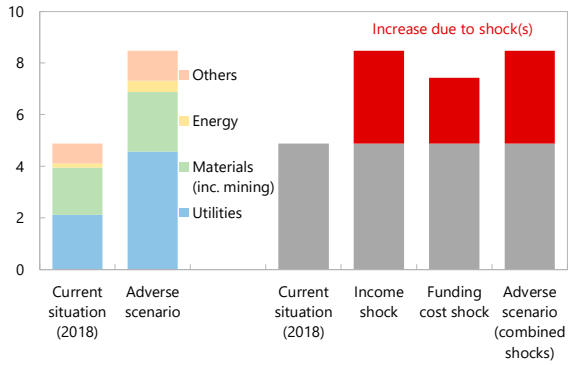
Household Debt-at-Risk
(In percent of total debt)



Sources: Statistics Canada, Survey of Financial Security; and IMF staff estimates.

Note: Financially weak households are defined as households whose debt-servicing obligation is larger than 40 percent of disposable income. Debt of these financially weak households is considered at risk. The sensitivity analysis assumes a decline in income by 15 percent, an increase in interest rates up to 230 basis points (depending on the renewal profile of borrowers), and a decline in house prices by 40 percent.

Corporate Debt-at-Risk
(In percent of total debt; based on firms with publicly available financial statements)



Sources: CapitalIQ; and IMF staff estimates.

Note: Financially weak firms are defined as firms whose earnings before interest, tax, depreciation and amortization (EBITDA) is less than interest expense (including capitalized interest). Debt of these financially weak firms is considered at risk. The sensitivity analysis assumes income shock (i.e., 25 percent decline in EBITDA) and funding cost shock (i.e., 5 percentage points increase).

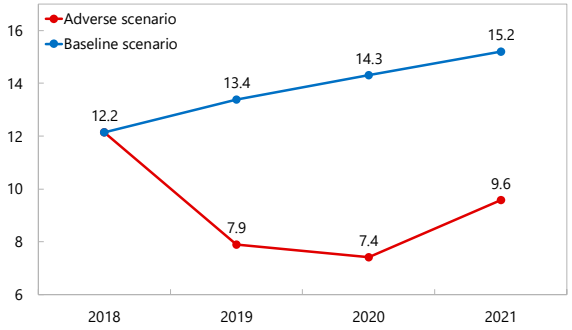
C. Banking Sector

18. The banking sector's performance is strong, with solid profitability and sizeable capital buffers (Figure 8, Table 6). Banks have steadily improved their capitalization, benefiting from their robust revenue-generating capacity based on universal banking even in the low interest rate environment. Credit-related impairments have been remarkably low. Large banks have established their footprints overseas, particularly in the United States, and thus become exposed to macrofinancial conditions in those markets. Going forward, the sector's ability to continue growing domestically while maintaining high profit margins and low capital charges from mortgage lending could be more difficult given market saturation. Banks' funding appears diversified, largely comprising retail and wholesale deposits. However, banks have increasingly relied on foreign-currency funding (slightly more than half of total funding) mainly to fund their international operations and to a smaller extent their domestic activities. Derivatives-related liabilities are sizeable and have contributed to volatile liquidity profiles.

19. Smaller deposit-taking institutions show some vulnerabilities. Some banks rely on less stable brokered deposits. Credit unions' loan books are concentrated in residential mortgages, and hence could be hard hit following a significant decline in house prices.

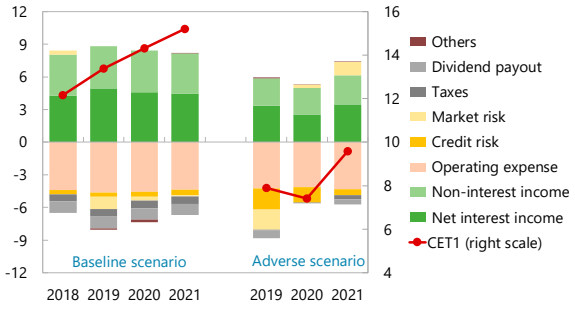
20. D-SIFIs appear resilient to severe macrofinancial shocks (Figure 9).[2] Based on the stress tests that covered six domestic systemically important banks (D-SIBs) and Québec's D-SIFI, the solid revenue-generating capacity would contribute to an upward trajectory of capital ratios in the baseline. In the adverse scenario, the aggregate common equity tier-1 (CET1) capital ratio would decline by 4.8 percentage points to 7.4 percent in 2020 before recovering to 9.6 percent in 2021. During the stress testing horizon, most entities would tap into capital conservation buffers, therefore subject to dividend restrictions. By 2021, all entities would meet the regulatory minimums (including D-SIFI capital surcharges). Larger credit-related impairments, lower net interest income and non-interest income, and increased risk-weighted assets would contribute to a larger capital depletion in the adverse scenario than in the baseline. Staff stress test results are largely aligned with BOC results.

Common Equity Tier-1 Capital, 2018-21
(In percent of risk-weighted assets)



Source: IMF staff estimates.

Contribution to Common Equity Tier-1 (CET1) Capital, 2018-21
(In percent of risk-weighted assets)



Source: IMF staff estimates.

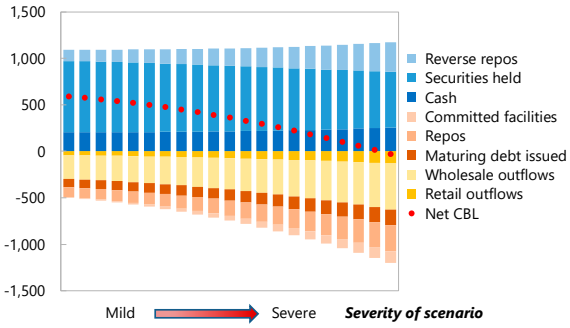
21. The capital dynamics would be largely driven by credit risk. In the adverse scenario, cumulative credit-related impairments would reduce aggregate capital ratios by 4.4 percentage points. Underlying credit quality would also deteriorate significantly, raising risk-weighted assets and thus reducing aggregate capital ratios by 0.8 percentage points.

22. However, additional losses could materialize due to Canada-specific features that were not fully captured in the abovementioned results. The sizeable undrawn exposures in the banking book, including HELOCs, could be drawn at time of stress, resulting in additional credit-related impairments of Can$18.5 billion (0.9 percent of risk-weighted assets) according to sensitivity analysis. Similarly, if lenders adopt a more dynamic risk-based pricing of mortgage spreads by charging larger spreads for financially weaker borrowers, additional credit-related impairments would amount to around Can$14.5 billion.

[2] See Appendix III for the methodological details for all stress tests (banks, insurers and investment funds).

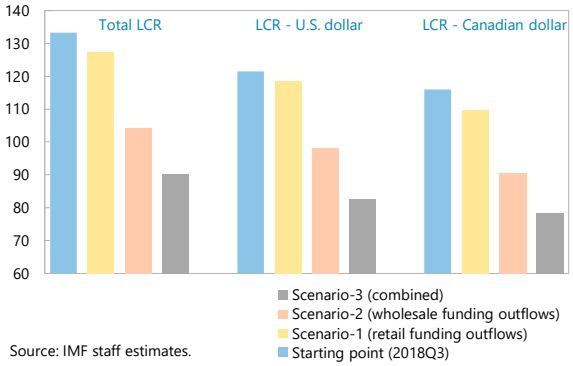
23. D-SIFIs appears to hold sufficient liquidity buffers to withstand sizeable funding outflows. The cash-flow analysis identifies small liquidity shortfalls for some entities under severe scenarios,[3] with aggregate shortfalls amounting up to Can$91 billion. The exercise suggests that a large funding outflow would be needed to generate a liquidity shortfall. The Liquidity Coverage Ratio (LCR) tests confirm similar findings. D-SIFIs would be able to manage large outflows from either retail or wholesale funding segments separately, including by significant currencies. However, certain vulnerabilities exist. Counterparty risk could be material given the sizeable repo books and derivatives exposures (e.g., currency swaps and total return swaps); the latter, potentially associated with complex bank-specific risk profiles, was not assessed due to data limitation.

Counterbalancing Capacity and Funding Outflows, 2018Q3
(In billions of Canadian dollar)



Source: IMF staff estimates.

Liquidity Coverage Ratio (LCR), 2018Q3
(In percent)



Source: IMF staff estimates.

D. Insurance Sector

24. The insurance sector's performance has been strong even in a low interest rate environment (Figure 10, Table 6).[4] Return on equity remains stable for the life and mortgage insurance sectors but has declined for the property-and-casualty insurance sector in recent years. Overall, insurers in all sectors maintain strong solvency positions, holding some capital buffers in excess of the supervisory targets. Following the expansion of their business abroad, the three large life insurers have increasingly relied on earnings from their overseas operations (more than half of their net premiums).

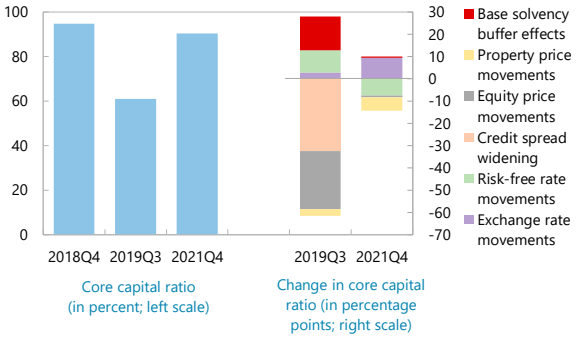
25. Large life insurers are somewhat exposed to financial market stress and lower interest rates. The stress tests covered the five largest life insurers and assessed the sensitivity of their solvency to macrofinancial conditions in 2019Q3 (most severe financial market stress) and 2021Q4 (lowest interest rates) in the adverse scenario. In 2019Q3, the aggregate core capital ratio would decline by 34 percentage points to 61 percent, largely driven by the impact of widening credit spreads and falling equity prices. Essentially, life insurers hold a sizeable amount of low-rated and unrated bonds. Some entities would see their capital ratios below the regulatory minimums. In 2021Q4, the aggregate core capital ratio would fall marginally by 5 percentage points. However, life

[3] The horizon of stress events would be 3 months. Under the most severe scenario, funding outflows would amount to Can$1.1 trillion (nearly 20 percent of total assets).

[4] The discussion only covers federally regulated insurers.

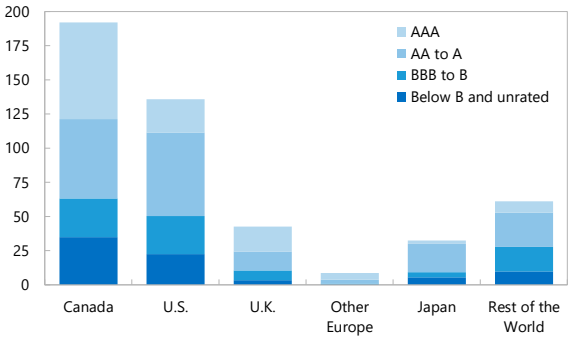
insurers' solvency would be hit harder in a more sustained low interest environment. For example, a downward parallel shift in the risk-free yield curve by one percentage point would reduce the core capital ratio by 40 percentage points.

Core Capital Ratio and Its Drivers, 2018-21
Based on Life Insurance Capital Adequacy Test (LICAT)



Source: IMF staff estimates.

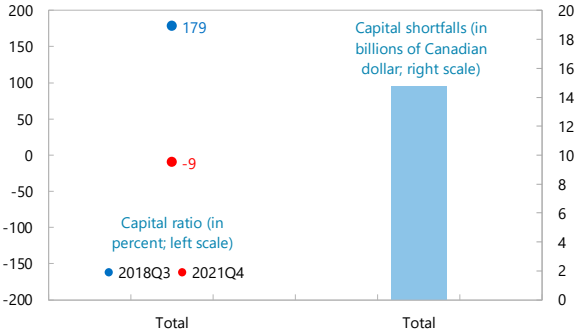
Life Insurers' Holding of Debt Securities, 2018
(In billions of Canadina dollar; based on five largest life insurers)



Sources: AMF; OSFI; and IMF staff calculations.

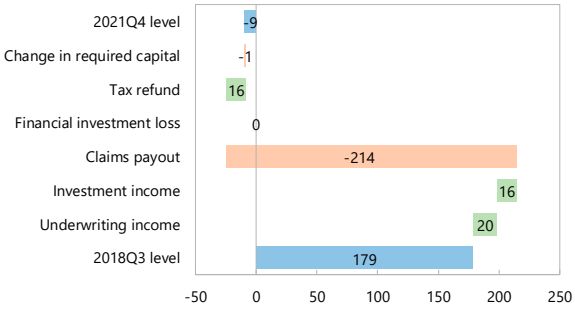
26. Mortgage insurers are vulnerable to severe macroeconomic downturns with significant house price declines. Based on the stress tests that covered all three mortgage insurers, cumulative insurance claims would amount to Can$25 billion, consistent with credit losses of banks' insured mortgage portfolios, in the adverse scenario. Mortgage insurers would need additional capital of Can$15 billion to meet the supervisory solvency target, half of which is for one insurer.

Capital Ratio and Capital Shortfalls, 2018-21
Based on Mortgage Insurance Capital Adequacy Test (MICAT)



Source: IMF staff estimates.

Dynamics of Capital Ratio in the Adverse Scenario, 2018-21
Based on the Mortgage Insurance Capital Adequacy Test (MICAT)
(In percent of 2018Q4 required capital)



Source: IMF staff estimates.

27. Required capital for insured mortgages may not sufficiently reflect potential deterioration of credit quality during severe downturns. The seven D-SIFIs currently have capital buffers for insured mortgage exposures equivalent to 0.17 percent of outstanding insured mortgages. Accounting for mortgage insurers' required capital for insurance risk, system-wide capital buffers would amount to 1.96 percent. In adverse scenario, these buffers should go up to 4.32 percent. This would imply additional capital need of Can$28 billion to cover expected and unexpected losses for insured mortgage exposures.

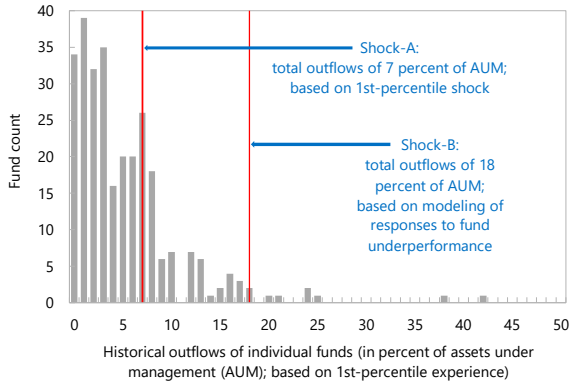
E. Risk-Taking in Nonbanks and Markets

28. The nonbank sector (excluding insurance) has grown considerably in recent years. Pension funds and mutual funds dominate the institutional and retail asset management landscape, respectively. Other investment funds and special purpose vehicles have a relatively small footprint but are growing rapidly. Together, investment funds have been the main driver for the strong growth of FSB-defined "nonbank financial intermediation", which reached Can$2 trillion at end-2017. Furthermore, captive financial institutions and money lenders are sizeable (Can$3.3 trillion).

29. Risk-taking of institutional investors is rising, and valuations of certain asset classes are stretched (Figures 11 and 12). Pension funds and other liability-driven institutional investors have increasingly used complex derivatives and borrowing-based strategies (including short-term repos), resulting in increased leverage and liquidity risk. Pension funds have also increased their exposures to illiquid asset classes such as real estate, private equity, and private credit, which typically contain significant additional unreported leverage and contingent liquidity risk. Fixed-income and real estate asset valuations are stretched, while dependence on foreign investors for non-government bond market funding has increased significantly. In the event of market stress, rising liquidity and valuation risks could magnify losses and market volatility, while a retreat of foreign investors could tighten financial conditions sharply.

30. Liquidity risk has increased at fixed income-focused mutual funds, potentially resulting in large-scale redemptions during stress. Mutual funds covered by the stress tests have increased their allocation to higher-duration and lower-rated non-government bonds. Large redemptions (1st-percentile shock) would trigger fund outflows of 7 percent of assets under management (AUM). The BOC framework, which incorporates the assumption that investor redemptions are more sensitive to fund underperformance, suggests fund outflows of 18 percent of AUM following a parallel increase in government bond yields by 100 basis points. A forced liquidation of non-government bonds would amount to 5 percent of that market, resulting in a widening of liquidity risk premium by 93 basis points, less than the stress level observed during the GFC.

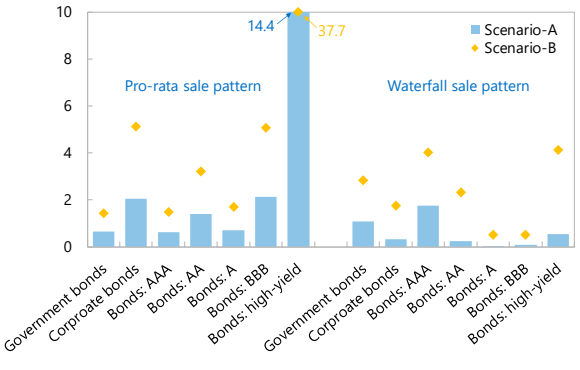
Historical Fund Outflows and Scenario Redemption Shocks



Sources: Canadian authorities; Morningstar; and IMF staff estimates.

Bond Sales to Meet Redemptions

(In percent of outstanding bonds o the same type)



Sources: Canadian authorities; Morningstar; and IMF staff estimates.

Note: Pro rata sale means that investment funds would maintain the same aset allocation. Waterfall means that investment funds would first sell most liquid assets.

F. Systemic Liquidity

31. System-wide liquidity conditions are stable, and money and public debt markets are functioning well (Figure 13). System-wide liquidity is underpinned by the comprehensive BOC's framework for market operations and liquidity provision in normal times. The resilience of core funding markets benefits from the predominance of secured transactions in money markets. 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 during market stress. Foreign exchange markets are liquid. The authorities are working on a transition towards an improved risk-free benchmark in line with IOSCO standards.

32. The BOC's collateral framework needs improvement, particularly in light of greater demand for collateral going forward. The BOC should improve its capacity to price collateral, including the use of theoretical models, and update its valuation of banks' loan portfolios more frequently. Theoretical valuation is crucial in situations where secondary market liquidity is low, as is the case for some assets in normal times (e.g., NHA MBS) or more generally during market stress. Furthermore, 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, warranting enhanced monitoring of collateral availability.

33. The resilience of foreign exchange markets is increasingly important given the growing reliance on external, foreign-currency funding. Since end-2013, external debt liabilities to GDP have increased by 37 percentage points, driven by banks (two-thirds) and other non-government entities (one-third). The latter reflects bond issuances by Canadian entities in international markets. Banks have increasingly relied on external funding (Can$1.1 trillion at end-2018), two-thirds of which are short-term. Although banks appear to have sufficient liquidity buffers, including in foreign currency (paragraph 23), global financial market disruptions could still affect their ability to fund their activities. Adequate liquidity in foreign exchange markets—particularly for cross-currency swaps—becomes increasingly important so that banks and nonbanks can continue to manage risks effectively.

G. Housing Finance

34. Housing finance is broadly resilient, but pockets of vulnerabilities exist (Figures 14 and 15). Mortgage finance is dominated by D-SIFIs and supported by the government via mortgage insurance, securitization guarantees, and other policies. With a market share of about 70 percent, D-SIFIs focus on prime borrowers, and their lending is backed by their strong balance sheets. The smaller (uninsured) non-prime lending segment is largely served by smaller banks and prudentially unregulated lenders, which are comparatively less resilient. Some of these lenders rely on less stable, higher-cost funding such as brokered deposits or redeemable equity, and their lending is concentrated in regions with large housing market imbalances. Market concerns about the business model of non-prime lending were manifested by the liquidity crisis at a mid-sized deposit-taking institution in 2017.

35. The cost of prime mortgage financing is low and little differentiated, with credit risk being underpriced in some segments. Various government policies aiming at ensuring housing affordability contribute to low mortgage financing costs.[5] Capital charges for uninsured mortgage lending are low and do not fully reflect through-the-cycle credit risk. The long period of benign macrofinancial conditions contributes to lenders' assessment of risk in their lending as extremely low, justifying minimal capital and mostly uniform pricing offered to borrowers. For insured mortgages, costs faced by riskier borrowers are compressed by mortgage insurers' practice of insuring loans that fund insurance premiums (up to 4 percent of principal).[6] Consequently, borrowing costs for riskier borrowers are near risk-free levels, increasing debt accumulation among such borrowers and intensifying aggressive lending competition. Credit spreads of prime mortgage lending have narrowed in recent years, undermining the impact of macroprudential policy tightening.

36. Aspects of Canada's mortgage finance may amplify procyclical effects of falling house prices during severe downturns. Core lenders focus on low-risk mortgage lending. In response to deteriorating household debt-servicing capacity, they may constrain new lending or renewals of maturing mortgages (typically, 5-years contractual maturity and 25-years amortization period), potentially adding pressures on the housing market. Alternatively, a sudden adoption of risk-based pricing to accommodate financially weak borrowers might amplify household debt-servicing fragility (paragraph 22). Furthermore, lenders' ability to restructure loans by extending the amortization schedule could be constrained given the fact that remaining amortization of mortgages mostly exceeds 20 years. Rising losses and tighter funding conditions at weaker lenders might impair the flow of credit to non-prime borrowers who could similarly face refinancing pressure due to their shorter-maturity mortgages (typically, 1–2 years).

H. Interconnectedness

37. Various parts of the financial system are directly exposed to the housing market and/or linked through housing finance. Total residential and nonresidential mortgage credit amounted to Can$1.8 trillion, or 81 percent of GDP, at end-2018. Mortgage credit is provided by banks (69 percent) and other financial institutions; households are the main borrowers (81 percent), followed by corporates. Life insurers and pension funds have increased their investment in commercial real estate, while financial institutions hold around Can$180 billion in NHA MBS. The government's central role in housing finance fortifies the financial-sovereign nexus. In the adverse scenario, the government would need to pay out claims and/or provide capital or other support up to Can$15 billion related to mortgage insurance.

38. Increased intra-system and cross-border interconnectedness appears to generate larger spillover effects (Figures 16 and 17). The banking, insurance and asset management sectors have significantly expanded their cross-border activities and overseas operations over the

[5] For example, NHA MBS, though not being traded actively, are Level-1 high-quality liquid assets.

[6] These loans are provided by the lenders on the same terms as the mortgages.

past decade. Canada also mainly relies on international central counterparties (CCPs). Canada's international banking and portfolio investment linkages are predominantly with the United States. The financial system's growing internationalization while yielding risk diversification makes Canada more exposed to macrofinancial developments abroad. Market-based analysis suggests rising inward and outward spillovers through stock and bond markets.[7] Meanwhile, cross-sectoral exposures have risen, mainly through the use of repos and derivatives (also relevant for the cross-border dimension), increasing complexity and interconnectedness within the financial system. While unsecured interbank credit is relatively small, banks and pension funds are actively trading in the repo market. Distress at one of the D-SIBs would likely generate strong contagion to the rest of the financial system.

I. Policy Measures to Bolster Financial Stability

39. Additional required capital for mortgage exposures, along with measures to increase risk-based differentiation in mortgage pricing, are desirable. While overall banks' capital buffers are adequate, severe macrofinancial shocks might create capital shortfalls at mortgage insurers. The capital requirements for mortgage exposures at lenders and mortgage insurers should be tightened to properly account for through-the-cycle credit risk that may exceed Canadian historical experience. Larger required capital would also help incentivize mortgage pricing that better differentiates borrowers' risk profiles. For lenders, this could be accomplished by higher risk weights (e.g., through prudential adjustments to credit risk modeling). For mortgage insurers, their required capital should be enough to absorb tail-risk shocks (e.g., the FSAP adverse scenario). In addition, risk-based pricing of insured mortgages should be improved by increasing the risk sensitivity of insurers' capital requirements or guarantee fees paid to the government and limiting insurance coverage of loans that fund insurance premiums.

40. Enhanced risk monitoring is essential especially in the areas of emerging vulnerabilities. These include (i) banks' external, foreign-currency funding, (ii) extensive use of derivatives, (iii) rising risk-taking by life insurers, pension funds and other nonbanks, (iv) non-prime mortgage lending outside the regulatory perimeter and HELOCs, and (v) spillovers from overseas operations and cross-border exposures. Continued efforts to address data gaps—particularly related to cross-sectoral exposures, unregulated nonbank financial intermediation, and funding market activities (e.g. securities lending)—would help gather a more complete picture of risk buildups.

41. The top-down stress testing capacity for banks and insurers should be enhanced. A priority should be given to further development of the BOC's bank solvency stress testing framework; the lack of granular data impedes the ability to project key financial items by significant geographies.

42. Given their systemic relevance, strengthening oversight of large public pension funds, would be helpful. Increasing the detail, standardization, and reporting frequency of financial

[7] See Appendix IV for the methodological details of interconnectedness analysis.

disclosures, as well as introducing standardized liquidity stress testing requirements, would improve risk monitoring and assessment.

43. The policy framework for managing a housing market downturn should be developed. Such policy responses should provide effective countercyclical support for the economy and financially distressed households while allowing economic adjustments, limiting moral hazard and safeguarding taxpayers' interest. One option would be to create a professionally managed government-sponsored mortgage reinsurance fund, which could be funded by existing guarantee fees. The government should also limit the use of portfolio insurance as a crisis management tool, except at punitive premiums. The perception that this tool is an option for future downturns may interfere with risk-pricing of uninsured mortgages. In addition, an appropriate level of exposures to mortgage insurance should be identified, and mechanisms should be put in place to ensure that the exposures remain within those limits.

FINANCIAL STABILITY ARCHITECTURE

A. Institutional Setting

44. Financial sector oversight is the responsibility of multiple federal and provincial authorities. The lion's share of financial institutions (particularly, banks and insurers) are federally regulated, while securities markets are overseen by provincial authorities. Some D-SIFIs are provincially regulated; e.g., Autorité des marchés financiers (AMF) supervises Québec's major credit cooperative group. Other deposit-taking institutions (loan and trust companies, and credit unions), insurers and private pension funds can be licensed and regulated under federal or provincial regimes. At the federal level, the Office of the Superintendent of Financial Institutions (OSFI) is responsible for prudential oversight of federally regulated financial institutions. Conduct oversight of banking business is under responsibility of the Financial Consumer Agency of Canada (FCAC), while the BOC, the DOF and three provincial securities regulators share responsibility of overseeing financial market infrastructures (FMIs) "designated" as systemically important (or as prominent payment systems). The remaining responsibilities lie with provincial authorities, including prudential oversight of provincially regulated financial institutions and conduct oversight of all nonbanking businesses. Each province/territory can set its own regulatory and supervisory frameworks. Public pension funds have independent governance structures.

45. A substantial part of the financial system is covered by federal crisis management and safety net arrangements that are well-established. By law, the Minister of Finance (MoF) has the mandate of maintaining overall financial stability in Canada. At the federal level, multiple agencies are involved in crisis management and safety net, including the BOC, the Canada Deposit Insurance Corporation (CDIC), the DOF and OSFI. CDIC is the resolution authority for its member deposit-taking institutions and the federal deposit insurance system (DIS) administrator. The BOC will soon become the resolution authority for domestic designated FMIs. Each province/territory has its own crisis management and safety net arrangements.

46. There are several inter-agency coordination forums for financial sector oversight and safety net. At the federal level, the Senior Advisory Committee (SAC) is the main forum to discuss financial sector policy issues and address systemic matters, including crisis preparedness. The Financial Institution Supervisory Committee (FISC) is the forum to exchange information related to supervision of federally regulated financial institutions and deal with institution-specific problems (i.e., early intervention). On resolution, the CDIC's Board is the decision-making body of CDIC, while the BOC chairs the committee for coordinating resolution of designated FMIs. Provincial authorities also set up four associations along the line of sectoral competency. These associations mainly serve as platforms for exchanging information and coordinating policy development. The only federal-provincial forum is the Heads of Agencies Committee (HOA) for coordination largely on issues related to securities markets.

Inter-agency Committees at the Federal Level

Committee	Statutory	BOC	CDIC	DOF	FCAC	OSFI
CDIC's Board	Yes	o	**O**	o	o	o
Committee for resolution of designated FMIs	Yes	**O**	o	o		o
Financial Institutions Supervisory Committee (FISC)	Yes	o	o	o	o	**O**
Heads of Agencies Committee (HOA) 1/	No	**O**		o		o
Senior Advisory Committee (SAC)	No	o	o	**O**	o	o

Notation: **O** indicates chair; o indicates member.

1/ Membership also includes four provincial securities commissions—Alberta Securities Commission, AMF, British Columbia Securities Commission, and Ontario Securities Commission.

47. The responsibility for systemic risk oversight is not explicitly assigned to any specific body. At the federal level, the BOC albeit with no explicit mandate plays a leading role in systemic risk surveillance; policy discussion takes place at the SAC, which in turn provides advice to the MoF. Powers over macroprudential tools lie with the Department of Finance (DOF) and OSFI. Systemic risk oversight at the federal level appears adequately effective, in part due to strong collegial culture and inter-agency cooperation. However, such effectiveness becomes less apparent at the provincial level or with respect to federal-provincial collaboration on these issues.

B. Systemic Risk Oversight

48. The current arrangement seems to have worked well, but an institutional modernization is essential to ensure effective systemic risk oversight going forward. The financial system has been evolving rapidly, with new exposures and instruments, complex interconnectedness, and fintech developments blurring traditional financial sector boundaries. Significant vulnerabilities are emerging in nonbank financial sectors. The prolonged period of benign macrofinancial conditions may have masked important gaps that could undermine policy responses at time of stress. The spread of systemic risk oversight responsibilities over multiple government layers and across sectoral boundaries has prevented the development of comprehensive Canada-wide framework for systemic risk surveillance and mitigation. These factors call for concerted efforts to modernize the current arrangement to overcome data gaps, enhance the surveillance capacity, develop and implement policies more inclusively and effectively, and increase policy transparency.

49. Steps can be taken to improve the current system with a more formalized arrangement for systemic risk oversight. Establishing a single body with a clear mandate and appropriate powers remains a preferred recommendation, but incremental improvements within the current framework can be made. First, the BOC should lead systemic risk surveillance in cooperation

with relevant authorities. A more unified approach to data collection needs to be developed to support Canada-wide surveillance. The BOC should report risk assessments to the existing inter-agency bodies and in its Financial System Review. Second, there should be a federal-provincial platform to discuss systemic risk issues and formulate policy responses. The HOA could be one option. To perform this function effectively, the HOA needs to redefine its terms of reference and expand its membership to include all relevant provincial prudential regulators. Third, while the existing competent authorities remain responsible for implementing policies within their respective mandates, the HOA should have the ability to make recommendations to all relevant authorities on a "comply or explain" basis, or similar arrangements, to strike a right balance between enhancing accountability and respecting autonomy. Fourth, a robust transparency framework should be adopted, including agencies' roles and responsibilities, risk assessments, and policy decisions and actions.

50. Over time, the authorities should review whether systemic risk oversight under the HOA leadership with no statutory mandate is adequate. One potential challenge is that systemic threats may emerge beyond the existing competent authorities' remit. The envisaged Capital Markets Stability Act, which would consolidate responsibilities at a single body, can further strengthen monitoring and managing systemic risk in capital markets. This can support the development of a more complete macroprudential policy framework for nonbanks.

C. Crisis Management

51. Canada-wide crisis preparedness should be further strengthened. Since the last FSAP, federal authorities, the Canada Securities Administrators (CSA) and AMF have individually continued upgrading their contingency plans and running exercises to test their readiness. Coordination between federal and provincial authorities has also improved, with the BOC and CDIC entering new memorandums of understanding (MoUs) with key provincial authorities. Nevertheless, no single body is in charge of Canada-wide crisis preparedness. To further strengthen the existing arrangements, the SAC should play a key role in overseeing crisis preparedness at the federal level, with the objective of developing a comprehensive, functioning integrated plan. The SAC should also act as the federal coordinator with key provincial authorities to carry out Canada-wide contingency planning and testing exercises. While continuing to serve as an advisory body to the MoF, the SAC should adopt written terms of reference to clarify its roles and increase its accountability. Additional federal-provincial MoUs, particularly with OSFI, should be put in place.

D. Macroprudential Policy

52. Macroprudential policy at the federal level has been effective, but better coordination is essential given multiple provincial authorities' ownership of prudential tools. The federal toolkit has a broad coverage of the financial system. OSFI can issue guidelines setting prudential capital and liquidity requirements for banks, while the DOF can modify the mortgage insurance rules that prescribe limits on Canada-wide insured mortgages. The financial stability mandate should be further strengthened given the MoF's other objectives (e.g. housing affordability). Nevertheless, non-negligible parts of the financial system lie outside the federal perimeter, including Québec's D-SIFI. Federal-provincial coordination is thus critical to limit policy leakages. Furthermore, the British Columbia and Ontario governments have implemented housing market measures that constitute as capital flow management measures.[8]

53. The current macroprudential stance is broadly adequate given declining macrofinancial vulnerabilities (Table 7). The revision of OSFI's B-20 guidelines, with similar measures adopted in Alberta, Québec and Saskatchewan, appears to have improved the underwriting standards of uninsured mortgages. However, additional measures seem warranted to handle a shift in risky mortgage origination to nonbanks and limit vulnerabilities arising from HELOCs. OSFI also introduced the domestic stability buffer (DSB), essentially a systemic risk buffer to improve the resilience of D-SIBs. Announced in December 2018, the increase in the DSB by 25 basis points to 1.75 percent of total risk-weights assets will come into effect in April 2019. The use of DSB, which essentially performs the same function as the countercyclical capital buffer (CCyB), could be made Pillar 1 (currently, Pillar 2) and extended to other deposit-taking institutions.[9]

FINANCIAL SECTOR OVERSIGHT

A. Institutional and Cross-cutting Issues

54. OSFI's powers and governance should be further strengthened. Although the statutory framework provides OSFI with comprehensive powers and operational flexibility, it lacks the authority to issue its own legally enforceable regulations. So far, OSFI has relied on the use of guidelines backed by enforceable instruments, which are accepted by regulated entities as equivalent. As the use of guidelines may not work effectively in a less benign environment, the authorities should strengthen the direct enforceability of guidelines. Furthermore, the MoF can override the prudential judgement of OSFI in some key areas (e.g., licensing and fit and proper determination). The supervisory framework could be stronger—particularly, OSFI's decision to reject

[8] These tax measures are targeted at nonresident buyers or existing homeowners and should be replaced with broad-based tax measures that address speculative activities more generally, consistent with the IMF's Institutional View on the Liberalization and Management of Capital Flows.

[9] For the federal regime, the CCyB is applicable to all deposit-taking institutions, calibrated based on exposures in Canada, and considered as Pillar 1 measure. The DSB only applies to D-SIBs as a Pillar 2 measure but captures total exposures.

a transaction on prudential grounds should not be overridden by the MoF except under exceptional circumstances and with full public disclosure.

55. Institutional reforms of some key provincial authorities are under way, with an aim to improve the effectiveness of financial sector oversight. In Ontario, the Financial Services Regulatory Authority (FSRA) was recently created. In British Columbia, the government announced its intention to strengthen the Financial Institutions Commission (FICOM)'s autonomy and governance.

56. Coordination and cooperation work well between federal authorities and between provincial authorities, but the federal-provincial nexus needs further enhancement. Many well-functioning coordination mechanisms are in place, including the SAC and the FISC at the federal level, as well as the associations of sectoral provincial authorities such as the CSA which effectively coordinates oversight of securities markets. Cooperation between federal and provincial authorities has also improved in recent years. Nonetheless, MoUs still do not exist between OSFI and provincial authorities, constraining information exchange and policy coordination. The authorities should explore how to remove barriers that prevent close and meaningful cooperation.

57. The CCMRS initiative should be completed to overcome risks from dispersed oversight of securities markets. The CCMRS envisages a single Capital Markets Regulatory Authority (CMRA) responsible for oversight of securities markets in participating provincial jurisdictions and systemic risk surveillance and mitigation for Canada-wide securities markets. Following the recent Supreme Court's ruling that removed legal obstacles, this initiative should be moved forward as a priority. As with any significant organizational change, managing transition risks properly is key to retain the strengths of the existing arrangements. Given the current incomplete participation of provinces/territories in the CCMRS, mechanisms to ensure effective cooperation between the envisaged CMRA and provincial securities regulators are needed.

58. The authorities have been proactive in monitoring fintech developments. The BOC has conducted fintech research to assess the impact on the financial system and the central bank's core functions. The DOF has led efforts to establish a new retail payments oversight framework and review the prospects for open banking. The HOA's working group on crypto-assets was created to monitor activities with the aim of developing a consistent regulatory framework.

B. Deposit-taking Regulation and Supervision

59. OSFI's banking supervision remains effective with a high level of compliance with the Basel Core Principles for Effective Banking Supervision (BCP). OSFI takes a conservative, risk-based approach to supervision that reflects the nature, size, complexity and risk profile of institutions. Its supervisory approach is well-structured and forward-looking, has solid foundation for consolidated and cross-border supervision, and appears adaptive to changing conditions. In addition to its close collaboration with relevant foreign supervisors, OSFI regularly conducts on-site inspections of significant overseas operations. OSFI's primary focus on consolidated supervision should be complemented by better monitoring material licensed entities' credit and liquidity risks.

Furthermore, OSFI emphasizes the accountability of the board and management for the overall soundness of institutions. However, its informal approach that expects institutions to keep OSFI informed whenever issues arise may not work well when the system comes under stress.

60. AMF is able to maintain high regulatory and supervisory standards, but FICOM has struggled to perform its role effectively. AMF adheres to the BCP and aligns its regulatory framework with the federal regime to ensure a level-playing field. The dominance of Québec's D-SIFI limits AMF's benchmarking ability. FICOM lacks operational independence and sufficient resources. While its supervisory practices are sound, FICOM has not been able to introduce formal Basel III requirements. The proposed legislative change (paragraph 55) would help address these weaknesses.

61. Aspects of the regulatory and supervisory frameworks for credit risk, particularly related to real estate exposures, should be enhanced. Risk weights for insured mortgage exposures seem too low and do not account for important exclusions—e.g., earthquake damages—from insurance coverage. Standardized risk weights are zero, while most major banks' internal ratings-based models using the probability of default (PD) substitution approach do not properly account for these exclusions. The loss given default (LGD) adjustment approach is more appropriate. Pillar 2 capital-add on could be considered to support more prudent credit loss provisioning given that expected life-time credit losses for mortgages (per IFRS 9) are based on contractual maturity rather than amortization period.[10] A common framework to monitor forborne exposures (e.g., definition and regulatory reporting)—aligned with the BCBS's guidance—should be adopted across all jurisdictions in Canada. This will help improve risk monitoring given the importance of debt restructuring for managing problem real estate exposures.

62. Other regulatory shortcomings should also be addressed. Regarding liquidity risk, the LCR frameworks should be reviewed to appropriately reflect roll-over of maturing mortgages,[11] and OSFI's guideline on asset pledging should ensure sufficient unencumbered assets to support the claim of depositors. The frameworks around significant influence, large exposures and related parties (mostly their definitions) needs to be strengthened.

C. Insurance Regulation and Supervision

63. Insurance supervision at OSFI and AMF is high-quality, in line with the Insurance Core Principles (ICP). Both employ a risk-based supervisory approach that is well-structured to escalate supervisory intensity commensurate with firms' risk profiles. A joint OSFI-AMF benchmarking exercise can help ensure the consistency of supervisory intensity between the two major supervisors

[10] Assuming amortization period instead, additional credit-related impairments would reduce the CET1 capital ratio by 26 basis points in the adverse scenario.

[11] Assuming a complete renewal of credit facilities in the retail segment, the LCRs of D-SIFIs would drop by few percentage points.

in Canada. In preparation for the new accounting standards (IFRS 17), OSFI and AMF should carefully consider how risk margins interact with the regulatory solvency framework for life insurers.

64. Group-wide supervision needs improvement in legal foundation and consistency of application. With no legal powers over unregulated holding companies, both OSFI and AMF rely on voluntary agreements with the companies (i.e., undertakings) to be able to obtain information and apply prudential requirements for the insurance groups. For life insurance, OSFI should discourage holding companies from issuing senior debt and passing such proceeds to operating entities to be used as available capital; this issue arises due to different capital requirements between consolidated insurance groups and operating entities.

65. A greater emphasis on solo supervision would be beneficial, enabling Canada-wide surveillance of the insurance industry. OSFI and AMF focus on comprehensive consolidated supervision that accounts for significant activities both in Canada and abroad. For the three largest life insurers, OSFI has regularly engaged with relevant foreign supervisors and conducted on-site inspections of international businesses. Given the life insurance market structure, capital and disclosure requirements at the solo level could be useful. Canada-wide surveillance, currently missing, will enhance risk monitoring and identification.

66. Conduct oversight has improved, but property and casualty insurance exhibits certain issues that should be addressed. Regarding conduct oversight, the creation of Ontario's FSRA appears to address many recommendations of the 2014 FSAP's ICP assessment. Ongoing federal-provincial work should continue to address potential systemic risk arising from earthquakes. Regarding the auto insurance industry, it is important to strike a right balance among ensuring insurance affordability, providing sufficient compensations to accident victims and maintaining prudentially sound insurers.

D. Oversight of Securities Market Intermediaries

67. Oversight of market intermediaries is high-quality in line with the IOSCO Objectives and Principles. Legal foundation underpinning securities regulation is generally strong. Ongoing reforms in the areas of conduct of business of over-the-counter (OTC) derivatives and duties towards clients should be completed. Under the auspice of the CSA, the regulatory frameworks are mostly harmonized across provinces. However, removal of the "northwest exemption" for the exempt market dealer category in Alberta, the inclusion of Ontario in the existing passporting regime, and extension of statutory automatic reciprocal recognition of regulatory enforcement orders to British Columbia and Ontario would further promoting efficiency. Stronger investor protection can be achieved through giving the Ombudsman for Banking Services and Investments binding jurisdiction on firms.

68. Oversight of overall securities markets can benefit from more effective risk identification and mitigation. For risk identification, a greater focus on systemic risk (in addition to regulatory risk) and Canada-wide perspectives would be useful. These efforts should be supported by a strategic plan to consolidate data collection and strengthen technical expertise. The ability to

undertake measures to mitigate identified risks in a timely manner is also critical in light of the dispersed oversight structure. As market activities continue to evolve, a periodical review of the regulatory perimeter should be conducted to ensure the effectiveness of the regulatory regimes.

69. A greater emphasis on high-impact firms, together with additional efforts to ensure continued smooth market functioning and effective inter-agency collaboration for enforcement, would be beneficial. Oversight of market intermediaries is structured and well-focused on the riskiness of firms (i.e., the PD dimension), but expectations for high-impact firms should be set to appropriately reflect their potential larger market impacts. Building on the recently developed market disruption plan, the authorities should conduct market-wide crisis simulation exercises and ensure adequate expertise in cyber resiliency. The authorities should also deploy a full range of enforcement tools to constitute an effective deterrent and enhance collaboration with other law enforcement bodies to ensure successful enforcement actions.

E. Oversight of FMIs

70. Oversight of FMIs is high-quality, but the roles and responsibilities of the BOC and the three provincial securities regulators should be further clarified. FMIs are expected to meet risk-management standards consistent with the Principles for Financial Market Infrastructures (PFMI); the CPMI-IOSCO monitoring showed complete and consistent implementation of the PFMI. Oversight of FMIs is sufficiently resourced, and the BOC defines its policies through its guidelines and annual oversight reports. Notwithstanding the existing MoU, a joint oversight framework (similar to the joint OSFI-CDIC Guide to Intervention) should be developed to clearly outline the division of roles and responsibilities.

71. The current oversight approach can benefit from the use of assessment ratings, backed by stronger enforcement powers available to the BOC. The use of ratings for designated FMIs and their critical service providers will increase transparency, thus enhancing effectiveness of moral suasion. In addition, the BOC should have stronger authority to use its directive powers to ensure effective enforcement on necessary corrective actions.

72. Further enhancement in managing liquidity and operational risks will help ensure the robust functioning of FMIs. FMIs have been operating normally. Improvements in cyber resiliency should continue in line with international guidance, and compliance to endpoint security should be tightened by self-attestations and audits of FMI participants. Liquidity risk management needs further improvement, particularly regarding CDSX.[12] With the move towards the RTGS environment, an assessment should be performed on intraday liquidity risk of wholesale payment system participants under market-wide stress.

[12] CDSX is a central securities depository, securities settlement system and CCP.

F. Financial Integrity

73. The anti-money laundering and combating the financing of terrorism (AML/CFT) framework is comprehensive but requires additional efforts to be fully effective. The 2016 IMF assessment highlighted that Canada's AML/CFT framework achieves satisfactory results in several areas, such as supervision, but requires major improvements in others, notably with respect to the real estate sector, casinos, the legal profession, and beneficial ownership transparency. Progress has since been made, including by strengthening supervision of the real estate sector, bringing online casinos into the AML/CFT framework, tightening requirements related to politically-exposed persons, prohibiting bearer shares, and initiating an update of the money laundering and terrorist financing risk assessment.

74. Ongoing efforts should continue, particularly with respect to beneficial ownership transparency, the legal profession, virtual assets service providers (VASPs), and the real estate sector. Information on the beneficial ownership of legal entities and arrangements should be made readily accessible to the authorities. The legal profession and VASPs should be subject to AML/CFT requirements and monitoring in line with the FATF standards. In addition, given the real estate sector's ongoing high-risk status, its supervision should be further strengthened.

SAFETY NET

A. Bank Resolution and Deposit Insurance

75. The bank resolution regimes are generally compliant with the Key Attributes of Effective Resolution Regimes, but there are areas for improvement. At the federal level, CDIC should have greater operational independence in applying resolution tools as certain decisions currently require formal authorization. The resolution regime should be strengthened with additional powers (e.g., interference with contracts, write-down of liabilities and claw-back of remuneration) and extended to cover foreign bank branches and banks' unregulated subsidiaries. The federal bail-in regime was introduced and is only applicable to D-SIBs, with holders of bail-in-able debt at the same ranking as other senior unsecured creditors. Procedures should be put in place to allow the bail-in powers to apply to any bank deemed systemically significant or critical at the point of failure based on the prevailing circumstances. Given the likelihood of compensation to bail-in-able debt holders, the valuation framework should be further developed to increase certainty about bail-in outcomes. Furthermore, depositor preference should be adopted to facilitate applying certain resolution tools (e.g., bridge bank or purchase and assumption) and minimize the DIS's losses. The bank liquidation regime is outdated and should be modernized. For Québec, issues related to resolution powers, bail-in and depositor preference are similarly relevant.

76. Early intervention is well-established, but recovery and resolution planning should be expanded to cover all existing gaps. At the federal level, OSFI and CDIC developed a joint Guide to Intervention to set out coordinated guidelines for the use of intervention powers; AMF has a similar framework. Recovery and resolution planning for D-SIBs is advanced, and good progress has

been made regarding Québec's D-SIFI. Cooperation mechanisms with relevant foreign authorities, including crisis management groups, are in place. However, OSFI's recovery planning should be expanded to all entities, and its guideline on recovery planning should be published. Similarly, CDIC should expand resolution planning to cover deposit-taking institutions that perform critical functions (e.g., custody). Furthermore, the FISC should oversee group-wide resolution planning (still nonexistent) for significant insurance groups with deposit-taking business.

77. The federal DIS is largely aligned with the Core Principles for Effective Deposit Insurance Systems; provincial DISs vary markedly, especially in terms of coverage. Recent changes introduced to the federal DIS are positive, although the increased scope of coverage will likely result in a delay in arriving at CDIC's targeted ex-ante funding. Québec's DIS is similar to the federal system. Some provincial DISs provide unlimited coverage of deposits, potentially creating distortions on competition in normal times and undermining provincial public finances during crises.

78. Arrangements for funding in resolution appear robust at the federal level. Beside CDIC's funding, the authorities have access to other ample funding from the government (under the MoF's discretion). The BOC can also provide liquidity funding to support effective recovery and orderly resolution. For Québec, arrangements for backstop funding in resolution should be formalized. Indemnity agreements between the BOC and provinces still need to be established to operationalize emergency liquidity assistance (ELA).[13]

B. Liquidity Provision

79. The BOC's framework for managing liquidity during stress is well-defined and transparent, but contingency plans for market-wide liquidity support should be further developed. The BOC can provide bilateral liquidity support, including in foreign currency, to eligible financial institutions and FMIs. The ELA framework was amended to accept mortgages as collateral and clarify the eligibility criteria for provincially regulated entities, including the need for provincial indemnity. The BOC has also developed a framework to provide market-wide liquidity support to financial institutions. However, contingency plans for intervention in securities markets and provision of foreign-currency liquidity should be further developed. During the GFC, the federal and three provincial governments provided support to securities markets, but the BOC did not purchase assets outright. A unified framework should thus be developed. Given the growing reliance on external, foreign-currency funding of Canadian financial institutions and other entities, the BOC and the DOF should jointly develop a strategy to handle systemic stress in foreign-currency funding, taking into account of readily available foreign reserves and standing bilateral currency swap agreements with other major central banks.

80. Additional preparatory works would help ensure smooth ELA operations. In addition to provincial indemnity agreements (paragraph 78), MoUs between the BOC and provincial authorities (particularly, British Columbia and Ontario) should be put in place to facilitate information sharing for ELA operations. In terms of preparedness, the BOC should expand its ELA simulation exercises to

[13] ELA refers to the BOC's emergency lending assistance.

involve a broader set of financial institutions (including provincially regulated entities) and mobilize non-standard collateral (e.g., mortgages). Such exercises should also feature the interaction among relevant business units within the BOC as well as with inter-agency bodies (e.g., the FISC and the SAC) to ensure effective information sharing and decision-making.

C. Other Safety Net

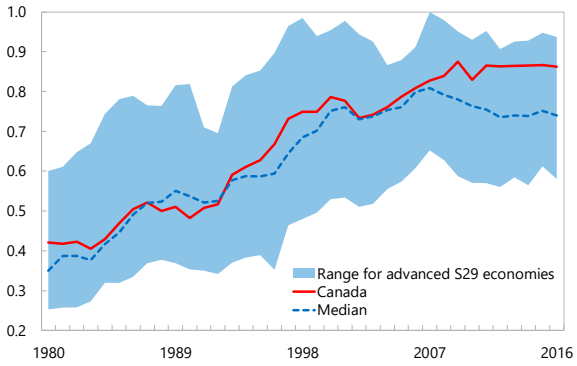
81. FMIs have developed and tested recovery plans, while the BOC will be responsible for resolution planning. The forthcoming resolution regime (pending adoption of regulations) aims at maintaining FMIs' critical services and minimizing potential loss of public funds.

Figure 1. Canada: Financial System Structure

Canada's financial system is well developed based on the combined metrics of depth, access and efficiency.[1]

Financial Development Index, 1980-2016

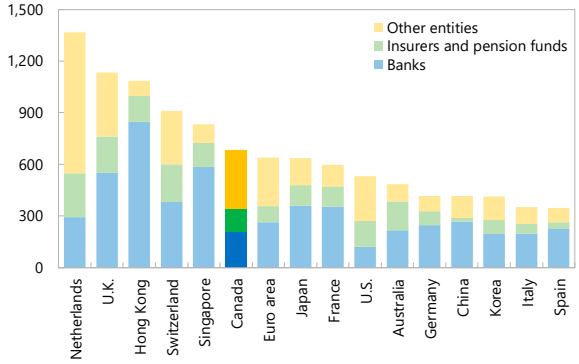
Value between 0 and 1, with the higher value, the more developed financial system



The financial system is large, with banks, investment funds and pension funds dominating the landscape.

Total Assets of Financial Institutions, 2017

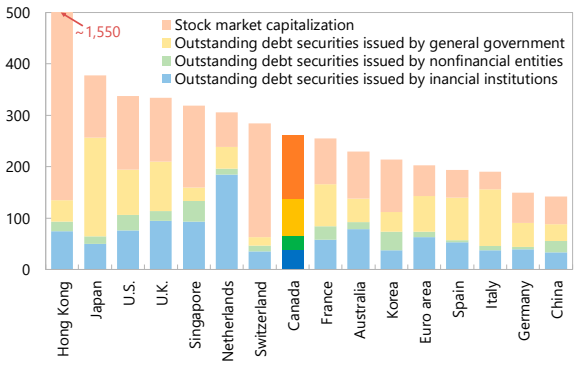
(In percent of GDP)



The bond and stock markets are deep, serving as important venues for governments, financial institutions, and nonfinancial entities to raise funding.

Value of Financial Markets, 2018Q1

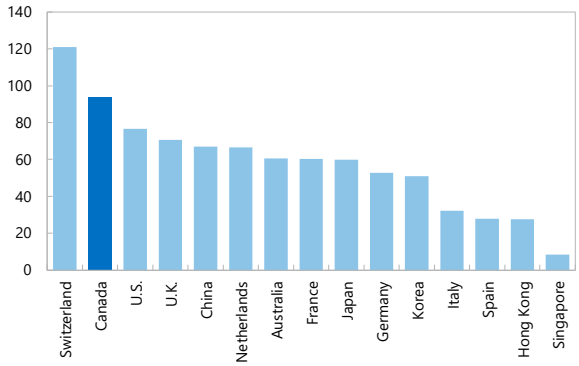
(In percent of GDP)



Nonbank financial intermediation is relatively large, but mainly comprises collective investment schemes susceptible to run.

Nonbank Financial Intermediation, 2017

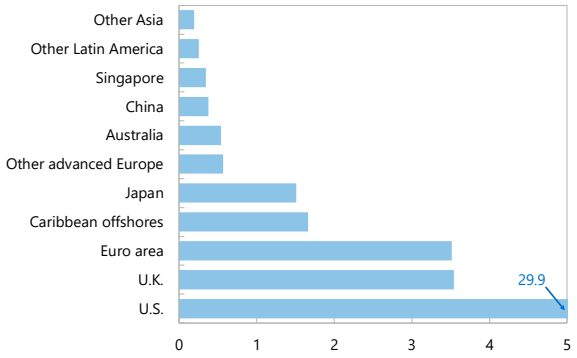
Based on the FSB's "narrow measure" of "shadow banking" (in percent of GDP)



Canadian banks have significant exposures to the United States due to their overseas operations via subsidiaries and branches.

Banking Sector's Overseas Exposures, 2018Q4

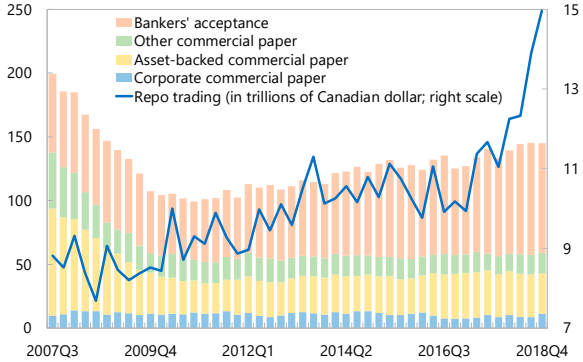
(In percent of total claims; based on the ultimate risk basis)



The money market continues to function well, though asset-backed commercial paper activity not fully recovering to the pre-2008 level.

Selected Outstanding Money Market Instruments, 2007-18

(In billions of Canadian dollar)



Sources: Bank of Canada; Bloomberg; FSB, Global Monitoring Report on Non-Bank Financial Intermediation 2018; Haver Analytics; IMF, Financial Development Index database and World Economic Outlook database; and IMF staff calculations.

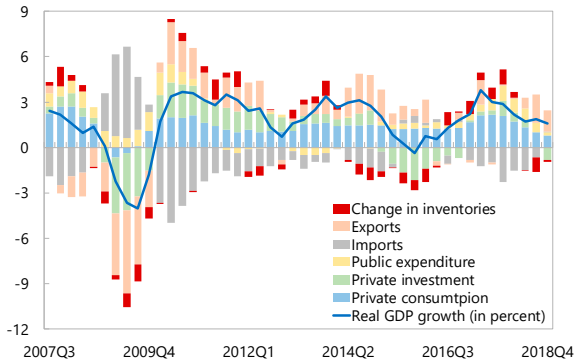
1/ For more details about the financial development index, see IMF SDN/15/08 and IMF WP/16/5.

Figure 2. Canada: Macrofinancial Developments

The Canadian economy has been very resilient since the global financial crisis, …

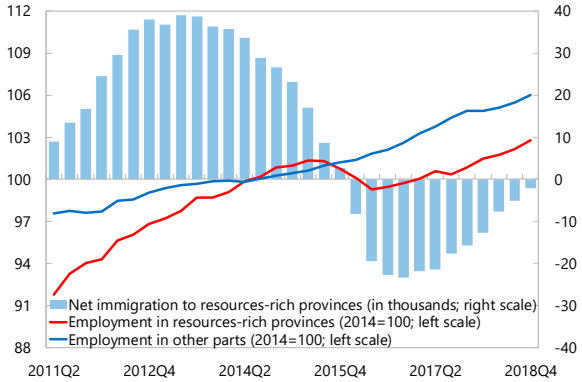
Contribution to Real GDP Growth, 2007-18

(In percentage points; year-on-year)



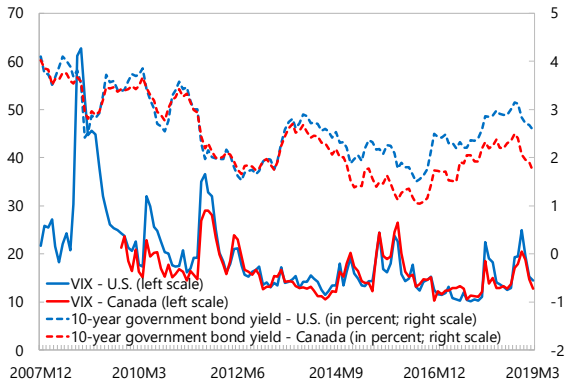
Resources-rich provinces were disproportionately affected, with the recovery partly benefiting from internal labor mobility.

Employment and Interprovincial Migration, 2011-18



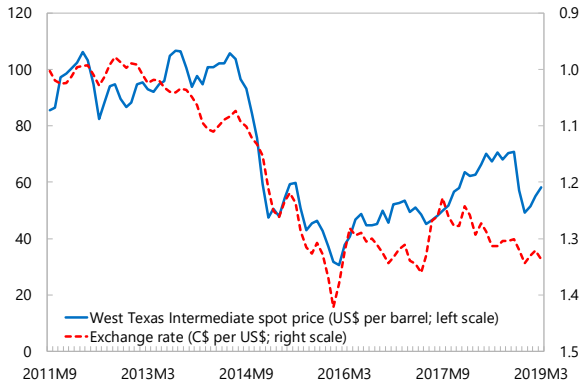
Long-term bond yields have increased since mid-2016, while market volatility has picked up more recently.

Market Volatility and Long-term Bond Yields, 2007-19



… including its adjustment to lower oil prices.

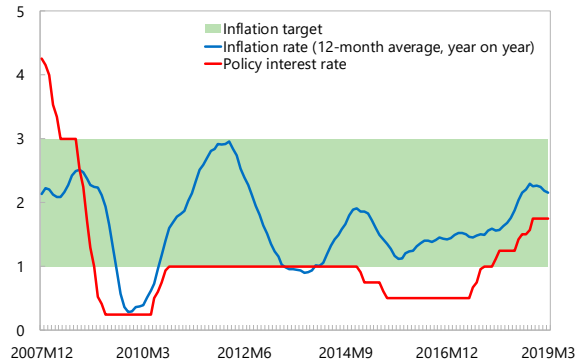
Oil Prices and Exchange Rates, 2011-19



The tightening cycle of monetary policy started, with inflation within the target band.

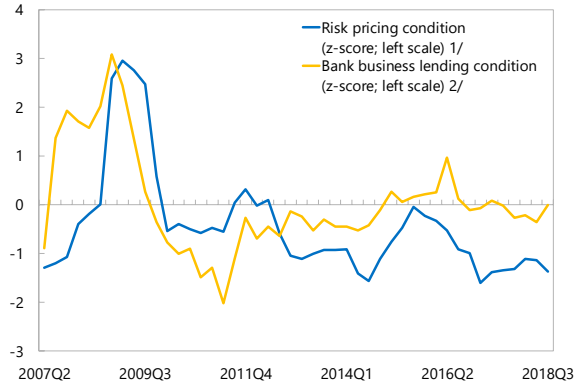
Inflation and Monetary Policy, 2007-19

(In percent)



Nonetheless, financial conditions remain loose due to still favorable risk pricing conditions.

Financial Conditions, 2007-18



Sources: Haver Analytics; and IMF staff estimates.

1/ Capturing term premiums, interbank spreads, real long-term interest rates, bond and equity returns and corresponding volatility measures, all in Canada, as well as global financial conditions.

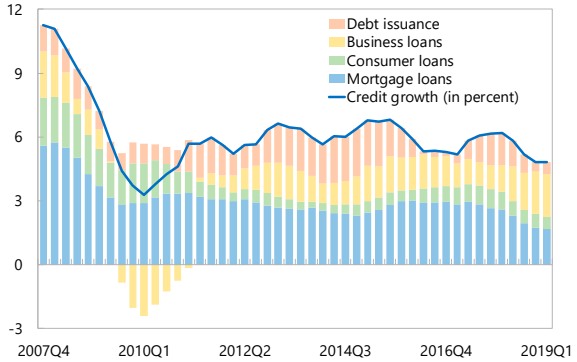
2/ Showing percentage balance, with a positive (negative) value indicating tightening (loosening) conditions.

Figure 2. Canada: Macrofinancial Developments (concluded)

Credit growth has moderated due to monetary tightening and prudential measures that curb mortgage lending, …

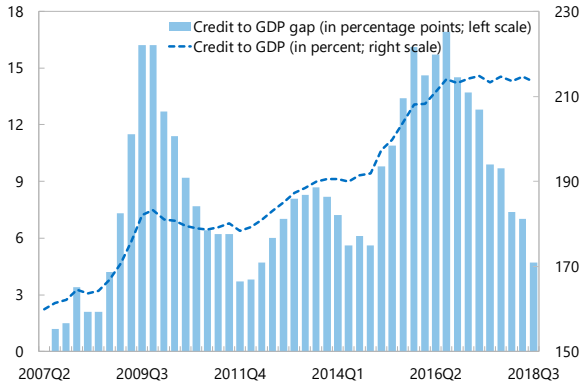
Contribution to Credit Growth, 2007-19

(In percentage points; year-on-year)



… contributing to a smaller credit-to-GDP gap.

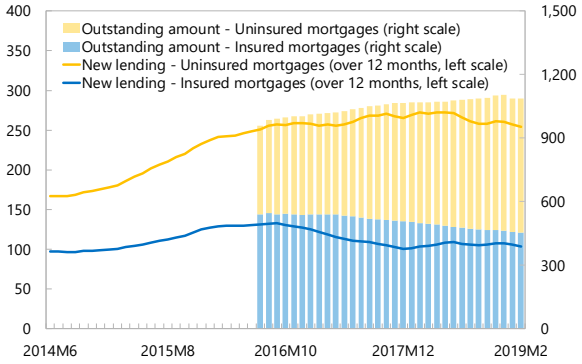
Credit to Private Nonfinancial Sectors, 2007-18



The slowdown in residential mortgage lending is largely led by the decline in insured mortgages.

Banks' Residential Mortgage Lending, 2014-18

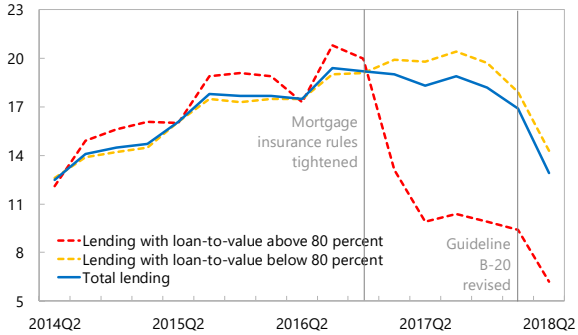
(In billions of Canadian dollar)



Credit quality of mortgage lending has improved recently, with a lower share to highly indebted borrowers.

Share of Banks' New Residential Mortgage Lending to Highly Indebted Borrowers, 2014-18

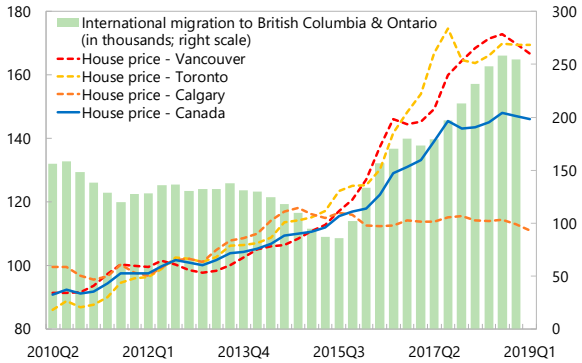
(In percent; highly indebted borrowers have loan-to-income above 450 percent)



House prices became more stabilized in the past two years. Immigrations appear to be an important driver of rapidly rising housing prices in some regions.

Housing Market Development, 2010-19

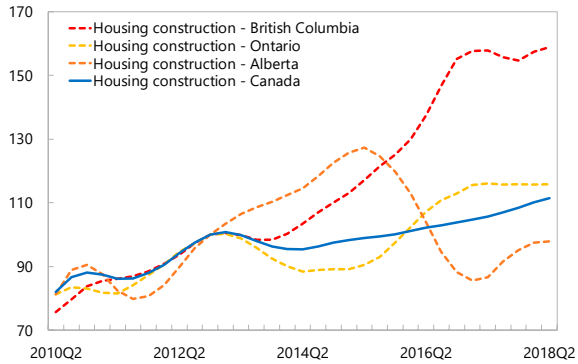
(2012=100)



A construction boom is evident in British Columbia, while Alberta saw a boom-bust cycle driven by oil prices.

Construction Activity, 2010-18

(2012=100)

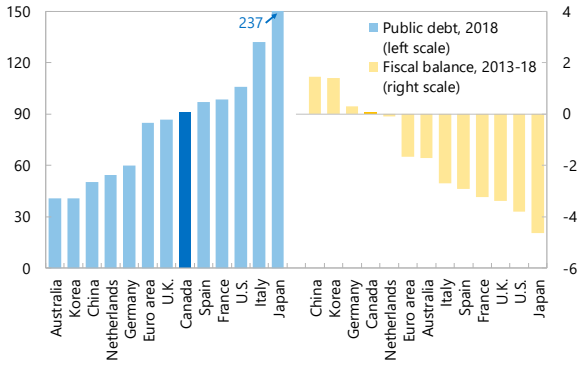


Sources: Bank of Canada, Staff Analytical Note 2018-35; Haver Analytics; and IMF staff calculations.

Figure 3. Canada: External and Fiscal Vulnerabilities

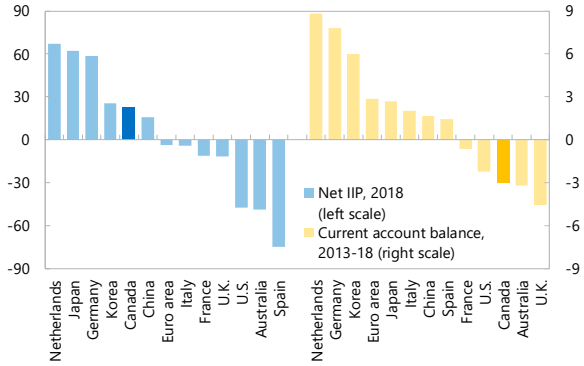
The favorable macroeconomic outcome benefits from relatively strong public finance, …

Fiscal Vulnerabilities, 2013-18
(In percent of GDP)



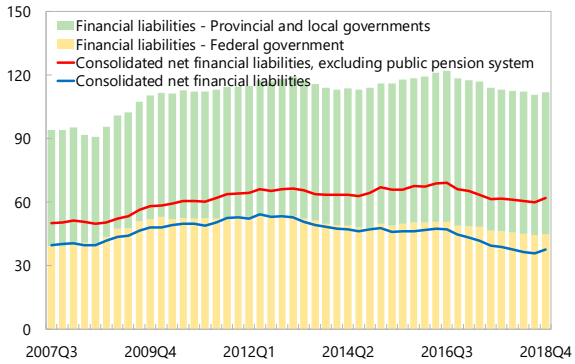
… as well as an international net creditor status. Though, the current account deficit implies the reliance of foreign funding.

External Vulnerabilities, 2013-18
(In percent of GDP)



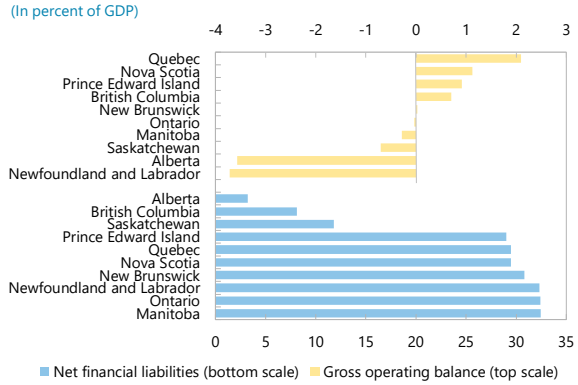
Provincial governments have substantial financial liabilities, more than the federal government.

Consolidated Public Financial Liabilities, 2007-18
(In percent of GDP)



Provincial governments' financial strength varies, potentially complicating the ability to backstop financial institutions in their respective jurisdictions.

Provincial Public Finance, 2017
(In percent of GDP)

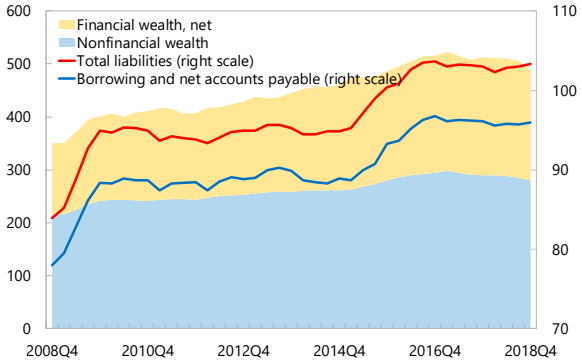


Sources: IMF, World Economic Outlook database and International Financial Statistics; and IMF staff calculations.

Figure 4. Canada: Household Financial Soundness

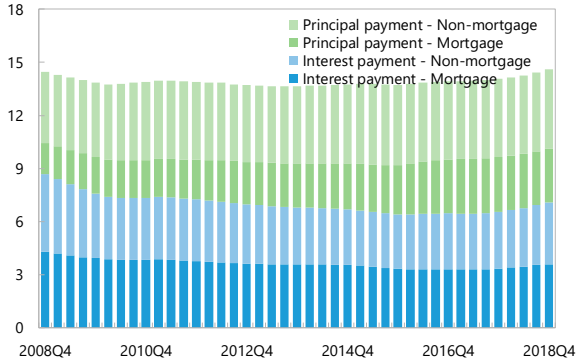
The increase in household debt is significant, albeit concurrently with the increase in household wealth.

Household Indebtedness and Wealth, 2008-18
(In percent of GDP)



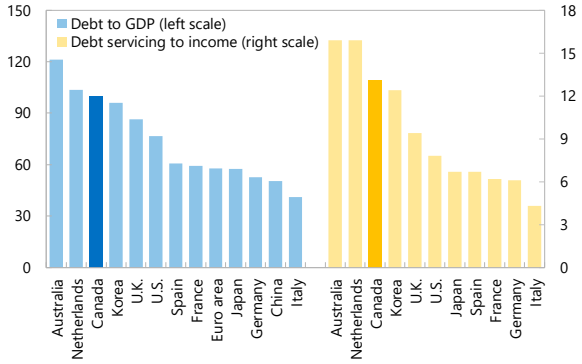
Debt servicing-to-income has been stable, though interest payment at a historically low level.

Household Debt-Servicing, 2008-18
(In percent of disposable income)



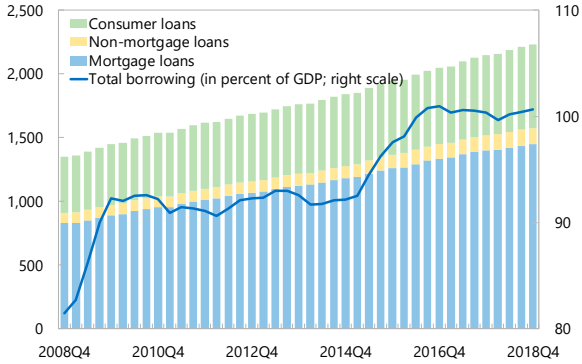
Canadian households are among the most indebted, and their servicing obligations are also relatively high.

Household Indebtedness and Debt Servicing, 2018Q2
(In percent)



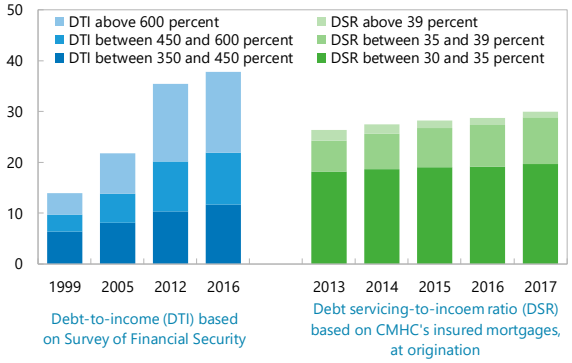
Household borrowing has been largely driven by mortgage financing in recent years.

Household Borrowing, 2008-18
(In billions of Canadian dollar)



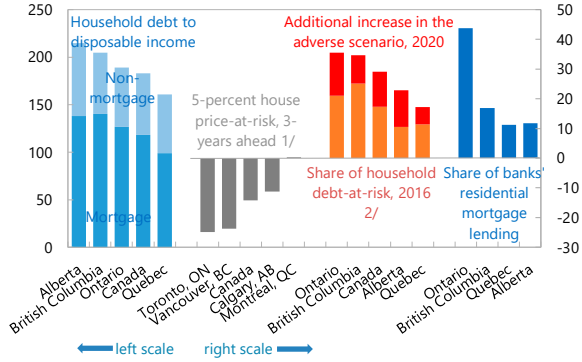
Debt of financially weak households has gained a larger share over the past decade.

Debt of Financially Weak Households, 1999-2017
(In percent of total debt)



British Columbia and Ontario face more heightened financial stability risks given their larger household debt-at-risk and downside risk to house prices.

Housing Market Related Vulnerabilities By Regions
(In percent)



Sources: CMHC; Haver Analytics; Statistics Canada, Survey of Financial Security; and IMF staff estimates.

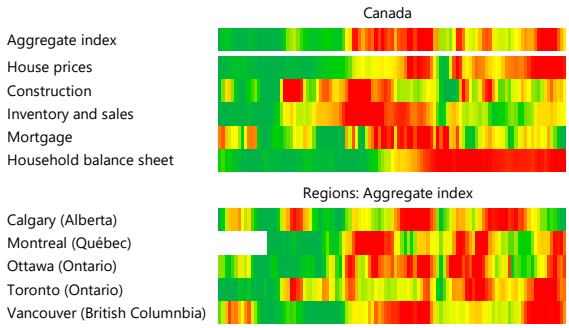
1/ The *5*-percent house price-at-risk measures a potential decline in real house prices (year-on-year) three years ahead with a *5* percent probability.
2/ Financially weak households are defined as households whose debt servicing-to-income is above 40 percent. Debt of these financially weak households is considered at risk.

Figure 5. Canada: Housing Market Developments

Housing market imbalances have been driven by over-valued house prices and household financial weaknesses.

Housing Market Imbalances, 1992-2018

Housing market imbalances index based on the z-score, comprising house prices, construction, inventory and sales, mortgage, and household balance sheet 1/

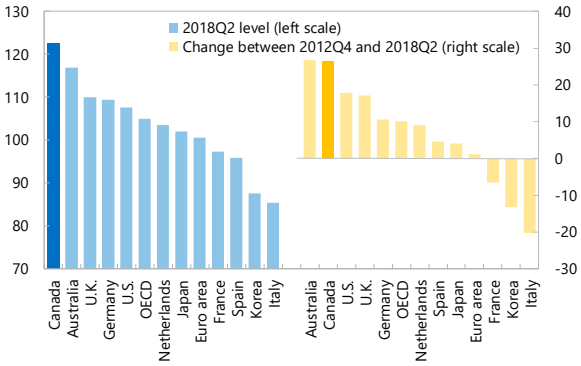


Toronto and Vancouver metro areas are overvalued based on house price-to-income indicators, broadly consistent with the structural approach assessment.[2]

House price-to-income is relatively high in Canada and has increased significantly since 2012.

House Price-to-Income in Advanced Economies, 2012-18

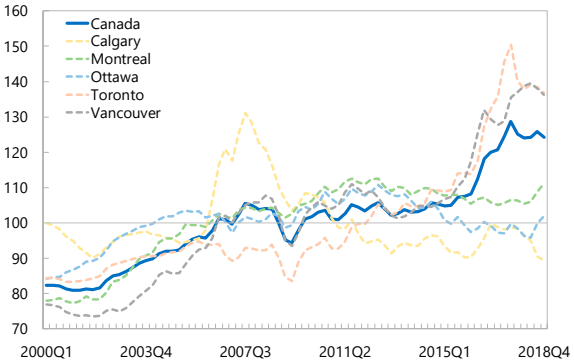
(2008-18 average=100)



House price overvaluation is the main driver for downside risk to house prices.

House Price-to-Income in Major Canadian Cities, 2000-18

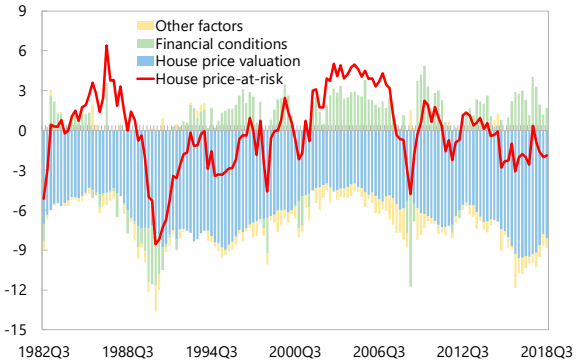
(1999-2018 average=100)



Cities where house price-to-income most misaligned (i.e., overvalued) face larger downside risk to house prices.

Driving Factors of House Price-at-Risk, 1982-2018

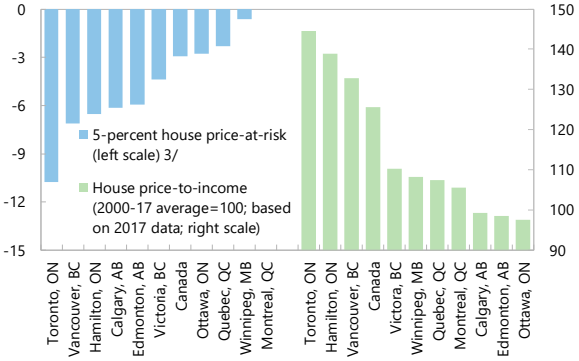
Based on 10-percent house price-at-risk over the next year (in percent) 3/



Downside risk to house prices over the medium term is particularly sizeable.

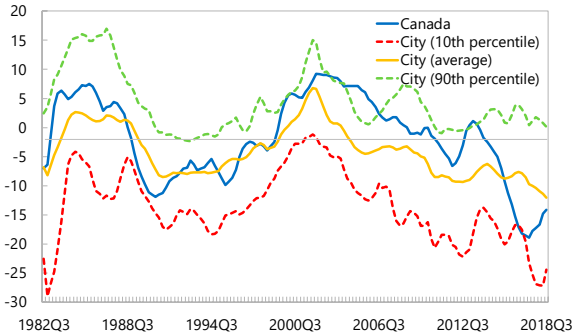
House Price-at-Risk across Cities, 2018

(In percent; showing potential price change over the next year)



Downside Risks to House Prices in the Medium Term, 1982-2018

Based on 5-percent house price-at-risk three years ahead (in percent; year-on-year) 3/



Sources: Canadian Real Estate Association; Haver Analytics; OECD; and IMF staff estimates.

1/ The housing market imbalances index comprises house prices, construction, inventory and sales, mortgage, and household balance sheet.

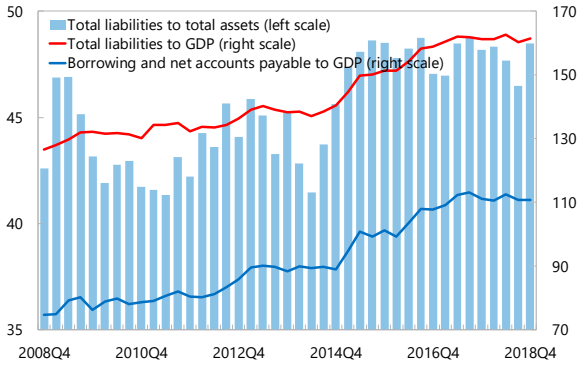
2/ For the structural approach assessment, see the Staff Report for the 2019 Article IV Consultation with Canada.

3/ The *x*-percent house price-at-risk measures a potential decline in real house prices with a *x* percent probability.

Figure 6. Canada: Corporate Financial Soundness

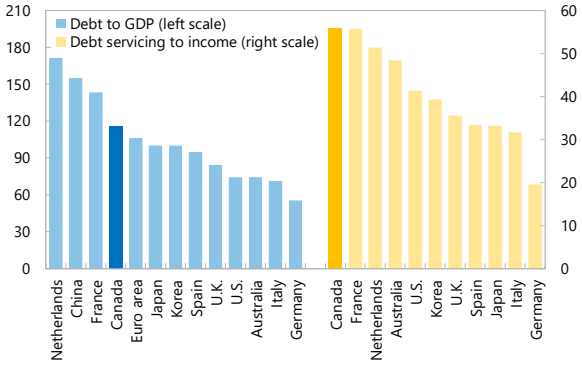
Corporates have become more indebted and leveraged.

Corporate Indebtedness and Leverage, 2008-18
(In percent)



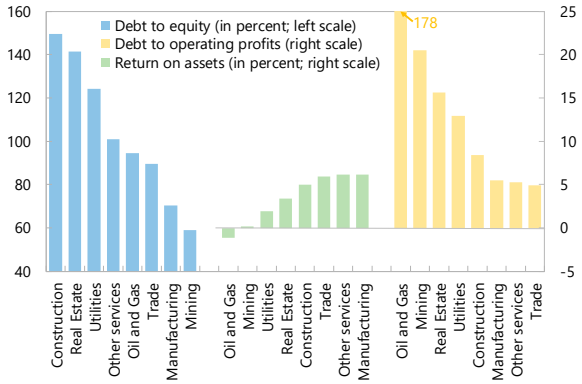
Canadian firms' servicing obligations are relatively high.

Corporate Indebtedness and Debt Servicing, 2018Q2
(In percent)



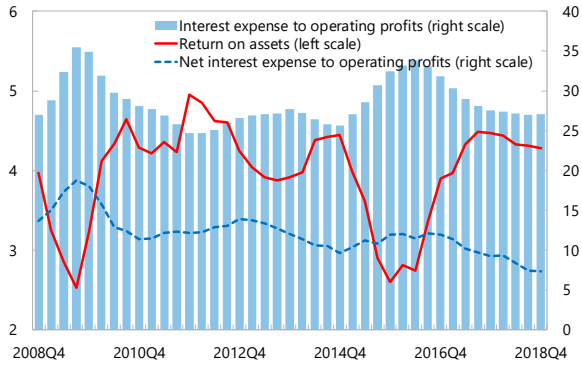
Construction and real estate firms are relatively leveraged. Meanwhile, oil and gas, and mining firms have weak earnings, aggravating their debt burden.

Corporate Leverage, Indebtedness and Profitability, 2018Q3



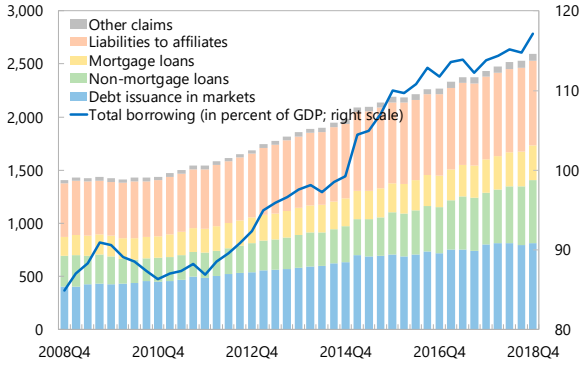
Corporate profitability has improved from the economic slowdown, with stronger debt-servicing capacity.

Profitability and Debt-Servicing, 2008-18
(In percent)



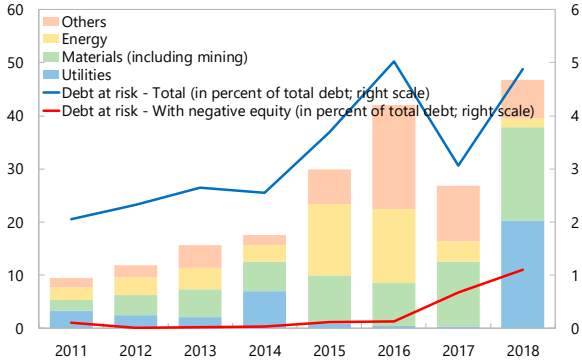
Two-fifths of corporate borrowing is in the form of liabilities to affiliates.

Corporate Borrowing, 2008-18
(In billions of Canadian dollar)



Corporate debt-at-risk, though rising, remains small, with firms in the utilities and materials sectors among the most vulnerable.

Corporate Debt-at-Risk, 2011-18 [1]
(In billions of Canadian dollar)



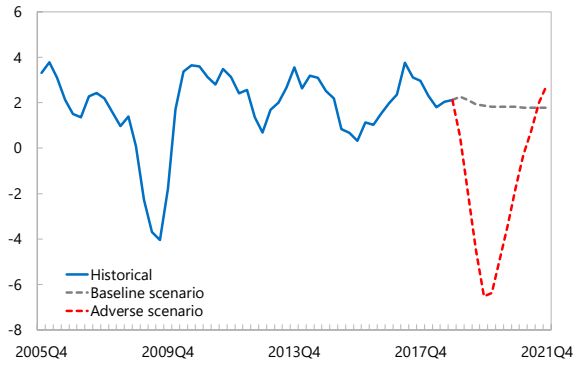
Sources: Capital IQ; Haver Analytics; and IMF staff estimates.
1/ Financially weak firms are defined as firms whose earnings before interest, tax, depreciation and amortization (EBITA) is less than interest expense (including capitalized interest). Debt of these financially weak firms is considered at risk.

Figure 7. Canada: Key Macrofinancial Variables in the Baseline and Adverse Scenarios

In an adverse scenario, Canada would experience a severe recession that occurs concurrently with significant financial stress and a sharp housing market correction.

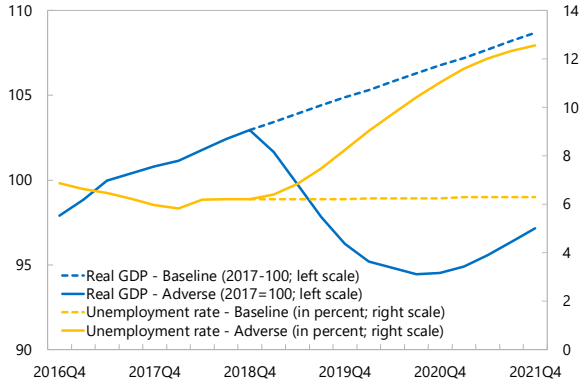
Real GDP Growth, 2005-21

(In percent; year-on-year)



Output would decline by 8 percent by end-2020, coupled with persistent, rising unemployment.

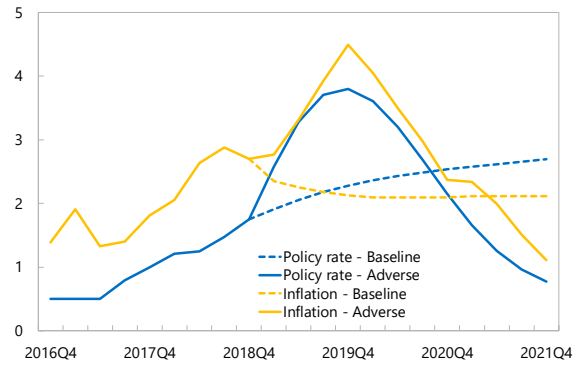
Real GDP and Unemployment Rate, 2016-21



The scenario would feature a snapback of interest rates, driven by monetary policy actions to first stabilize inflation expectations and then mitigate deflationary effects.

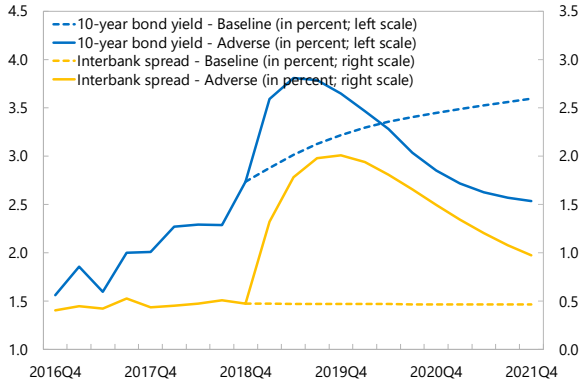
Policy Rate and Inflation, 2016-21

(In percent)



Long-term bond yields would spike in 2019, while interbank spreads would widen over a more extended period.

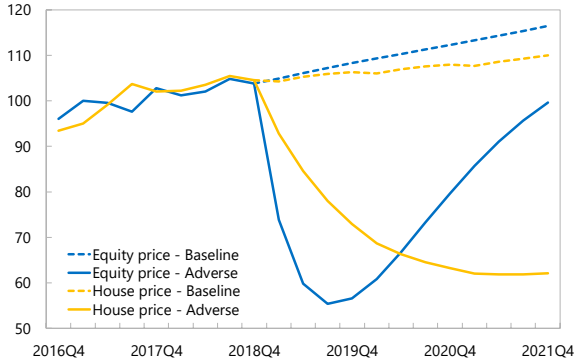
10-year Bond Yield and Interbank Spread, 2016-21



The stock market would suffer a sizeable loss, while the housing market would witness a sustained decline in house prices by about 40 percent.

Equity Price and House Price, 2016-21

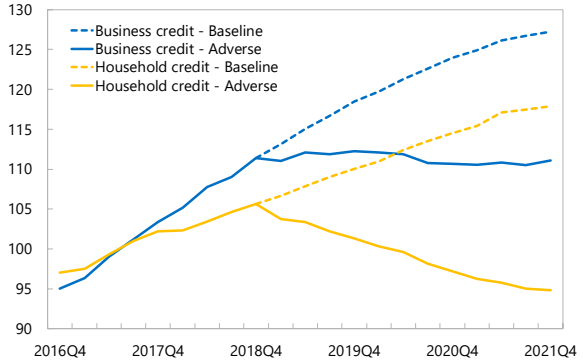
(2017=100)



Credit would contract, led by a significant decline in banks' mortgage lending.

Business Credit and Household Credit, 2016-21

(2017=100)

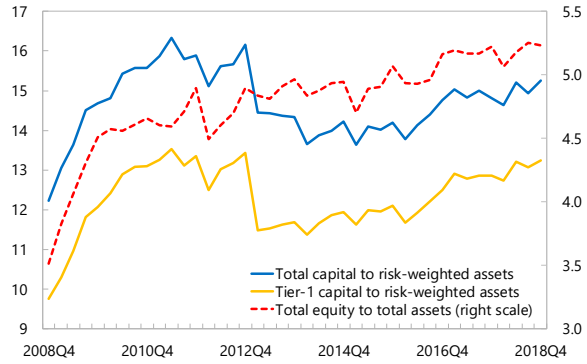


Sources: Haver Analytics; IMF, World Economic Outlook database; and IMF staff estimates.

Figure 8. Canada: Banking Sector Performance[1]

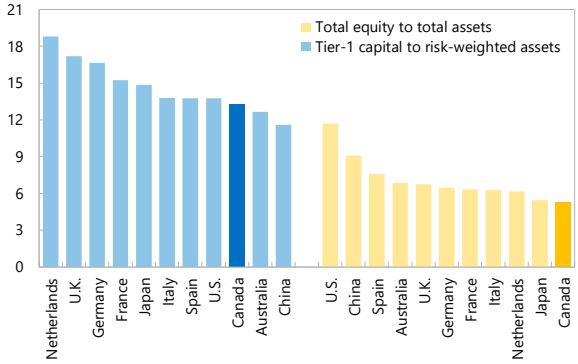
Canadian banks continue to strengthen their capitalization, ...

Capital Adequacy and Leverage, 2008-18
(In percent)



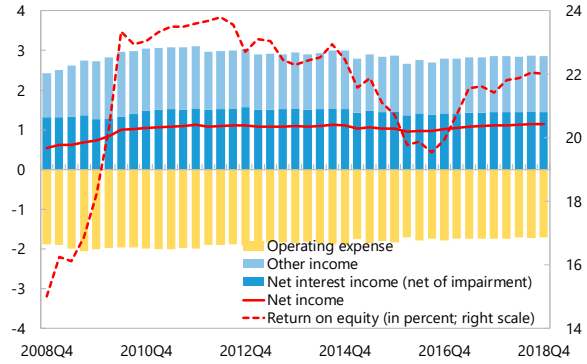
... but they are still more leveraged and have lower risk weight density.

Capital Adequacy and Leverage, 2018Q4 or Latest
(In percent)



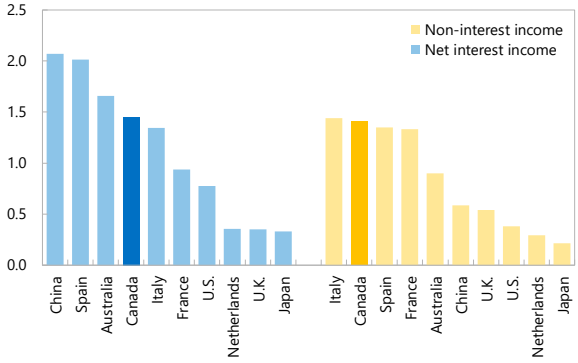
Profitability has been robust, with the return on equity well above the cost of capital, ...

Profitability and Composition of Net Income, 2008-18
(In percent of total assets)



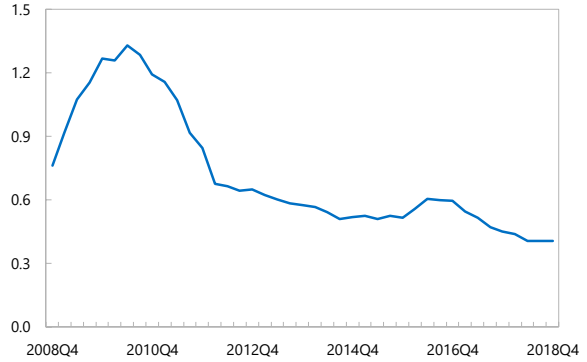
... supported by relatively strong net interest income and non-interest income.

Earnings, 2018Q4 or Latest
(In percent of total assets)



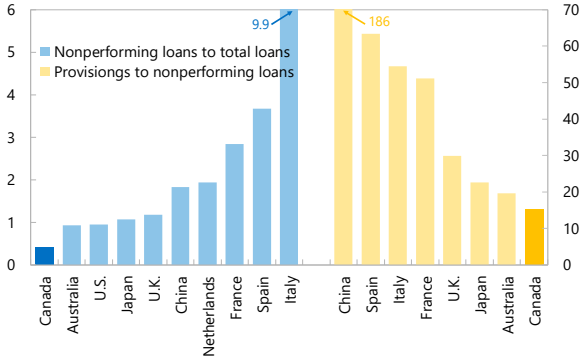
Nonperforming loans (NPLs) have fallen slightly as the economy's adjustment to low oil prices was complete.

Asset Quality, 2008-18
Nonperforming loans in percent of total loans



Canadian banks have a relatively small amount of NPLs, but their provisioning coverage is low, in part reflecting low historical loss rates.

Asset Quality and Provisioning, 2018Q4 or Latest
(In percent)



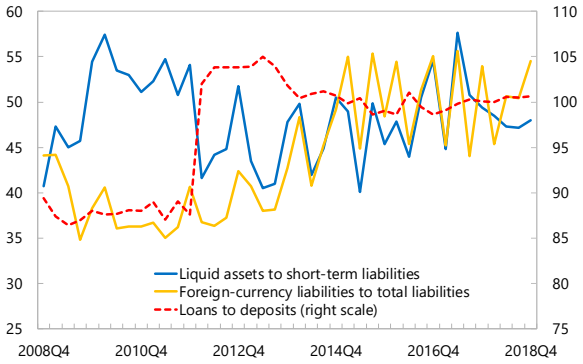
Sources: IMF, Financial Soundness Indicators database; and IMF staff calculations.

1/ For Canada, figures only represent federally regulated banks.

Figure 8. Canada: Banking Sector Performance[1] (concluded)

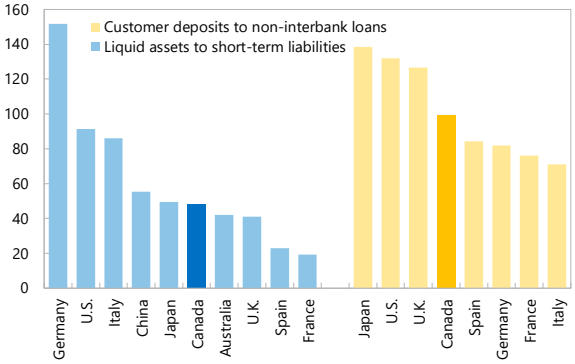
Liquidity profile seems quite volatile in recent years, while Canadian banks manage to raise deposit to finance loans.

Liquidity and Funding Profiles, 2008-18
(In percent)



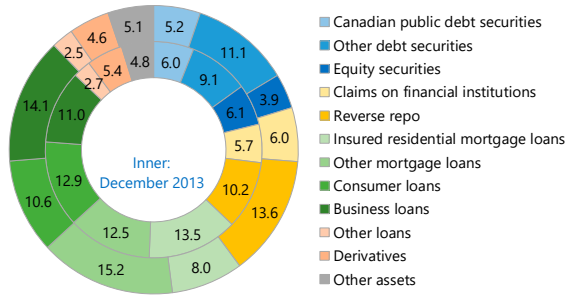
Canadian banks' liquidity buffers are broadly in line with their peers.

Liquidity and Funding Profiles, 2018Q4 or Latest
(In percent)



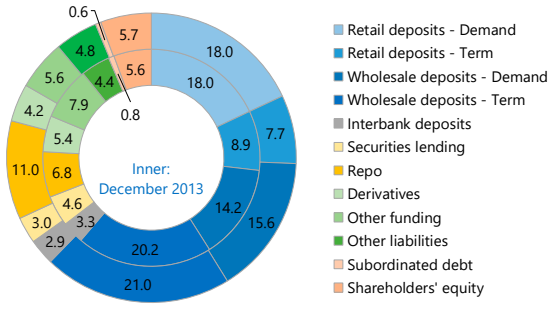
Banks have expanded lending in reverse repo, uninsured mortgages, and business loans.

Composition of Banks' Assets, 2013-18
(In percent of total assets)



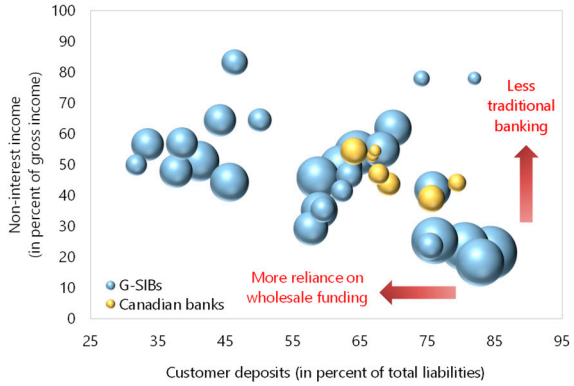
While more than two-thirds of bank funding is deposits, about 60 percent of deposits are wholesale.

Composition of Banks' Liabilities and Equity, 2013-18
(In percent of total assets)



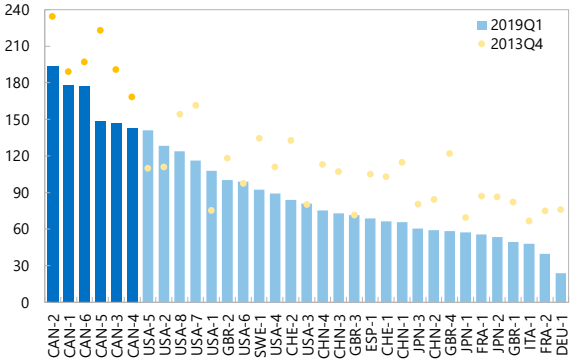
Large Canadian banks have thrived on their universal banking business and retail funding.

Banking Business Model, 2018



Canadian banks' strong earnings underpin favorable market valuation of their share prices.

Price-to-Book Value, 2013-19
(In percent)



Sources: IMF, Financial Soundness Indicators database; OSFI; SNL; and IMF staff calculations.

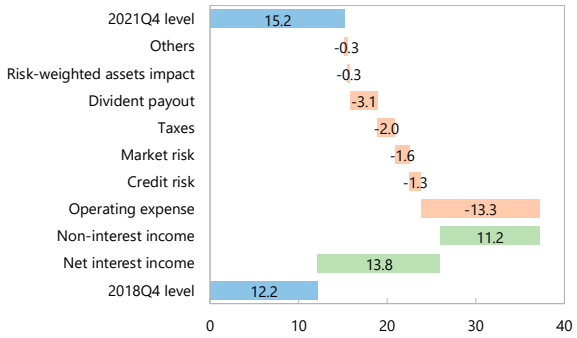
1/ For Canada, figures only represent federally regulated banks.

Figure 9. Canada: Bank Solvency Stress Test Results

In the baseline, the solid revenue-generating capacity would underpin the continued buildup of capital buffers.

Dynamics of Commone Equity Tier-1 Capital Ratio in the Baseline Scenario, 2018-21

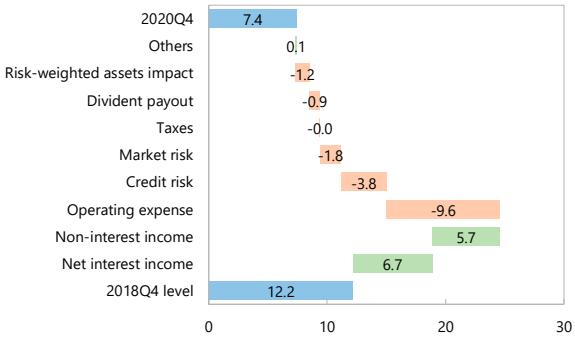
(In percent of 2018Q4 risk-weighted assets)



In the adverse scenario, credit and market losses would drive the decline in capital.

Dynamics of Commone Equity Tier-1 Capital Ratio in the Adverse Scenario, 2018-20

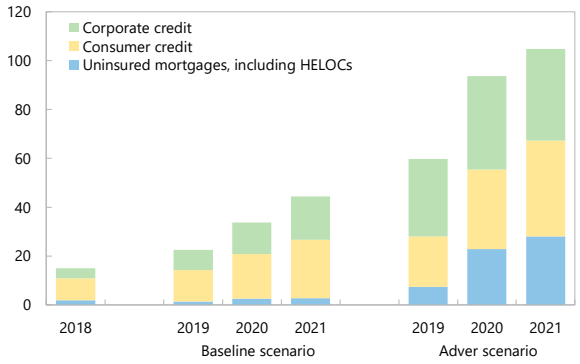
(In percent of 2018Q4 risk-weighted assets)



Credit-related impairments would increase significantly in the adverse scenario, especially for mortgage exposures, on the back of substantial expected loss.

Credit-related Impairments, 2018-21

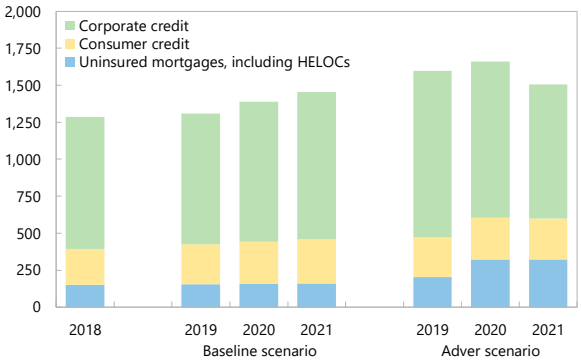
(In billions of Canadian dollar)



Risk-weighted assets for mortgage exposures would increase significantly as well, reflecting higher unexpected loss due to deterioration of underlying credit quality.

Risk-weighted Assets for Credit Risk, 2018-21

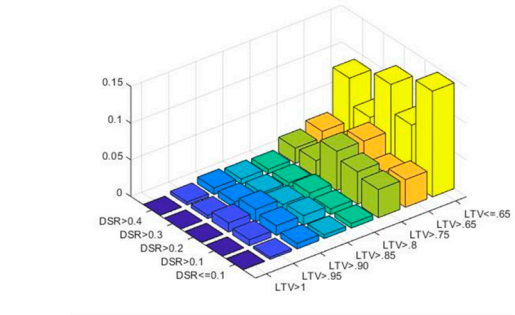
(In billions of Canadian dollar)



For mortgage exposures, through-the-cycle credit risk appears material. Even though their underlying credit quality looks good at the moment, …

Pre-Stress Credit Quality of Mortgages

(In percent of total)

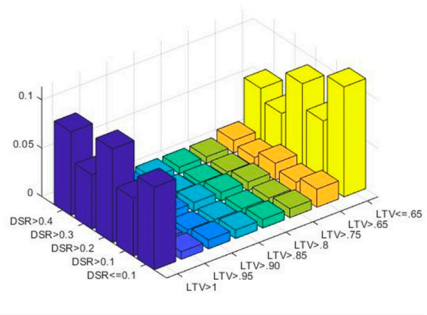


Note: LTV = loan-to-value; DSR = debt-servicing ratio.

… it could deteriorate significantly in the adverse scenario.

Post-Stress Credit Quality of Mortgages

(In percent of total)



Note: LTV = loan-to-value; DSR = debt-servicing ratio.

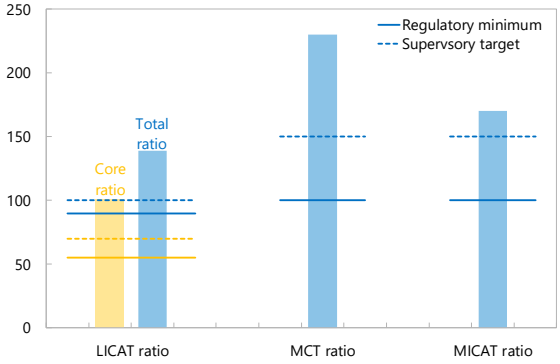
Source: IMF staff estimates.

Figure 10. Canada: Insurance Sector Performance

Insurers are well-capitalized under the new more risk-sensitive capital regimes.

Capital Adequacy, 2018Q4 [1,2]

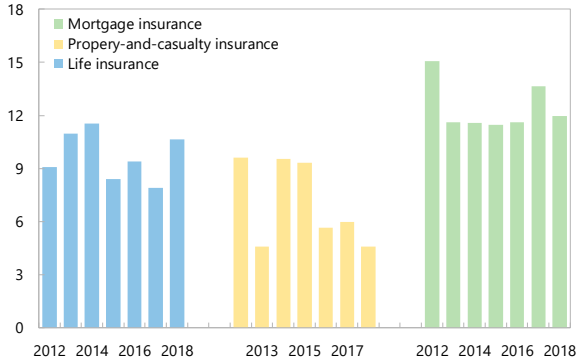
(In percent)



Profitability of property-and-casualty insurers appears low.

Profitability, 2012-18 [1]

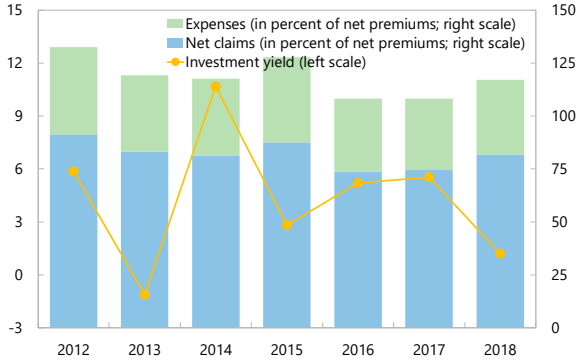
(In percent; based on return on equity)



For life insurers, net claims and expenses have exceeded net premiums, while investment yield has varied markedly.

Life Insurers' Earnings, 2012-18 [1]

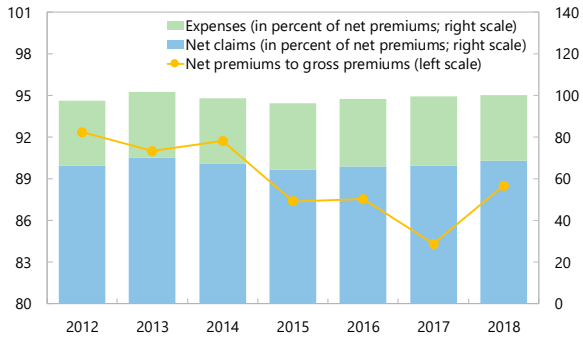
(In percent; based on Canadian and foreign insurers)



For property-and-casualty insurers, net claims and expenses have been roughly equal to net premiums.

Property-and-Casualty Insurers' Earnings and Reinsurance, 2012-18

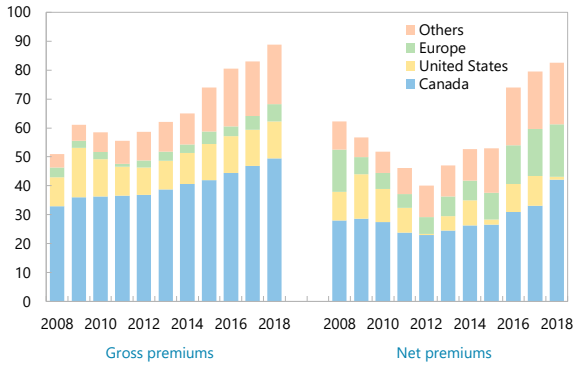
(In percent; based on Canadian insurers)



Life insurers have significantly expanded their overseas operations, particularly in Asia, in recent years.

Life Insurers' Premiums by Regions, 2008-18 [1]

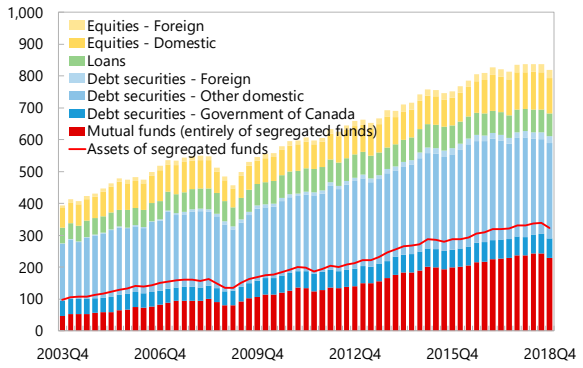
(In billions of Canadian dollar)



Non-government debt securities represent a significant class of assets held by insurers. Over time, segregated funds have become more important.

Insurers' Holding of Financial Assets, 2013-18 [3]

(In billions of Canadian dollar)



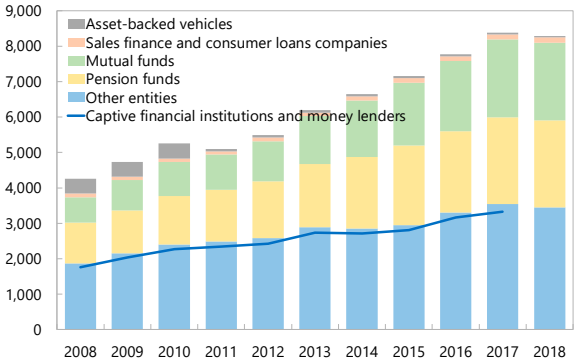
Sources: Haver Analytics; OSFI; and IMF staff calculations.

1/ Based on consolidated balance sheets of federally regulated insurers.
2/ LICAT stands for Life Insurance Capital Adequacy Test; MCT stands for Minimum Capital Test; and MICAT stands for Mortgage Insurance Capital Adequacy Test.
3/ Based on National Balance Sheet Accounts, effectively reflecting total insurance operations in Canada.

Figure 11. Canada: Risks from Nonbank Financial Sectors

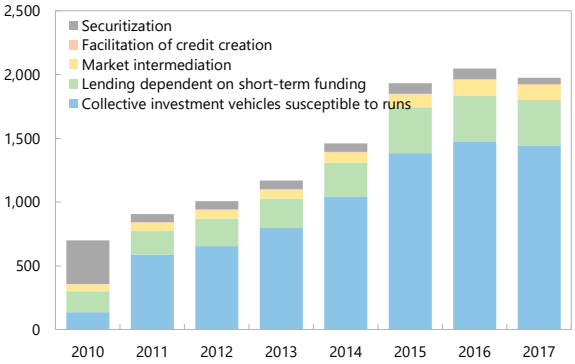
Pension funds and mutual funds dominate the institutional and retail asset management landscape.

Total Assets of Nonbanks, 2008-18
(In billions of Canadian dollar; excluding insuers)



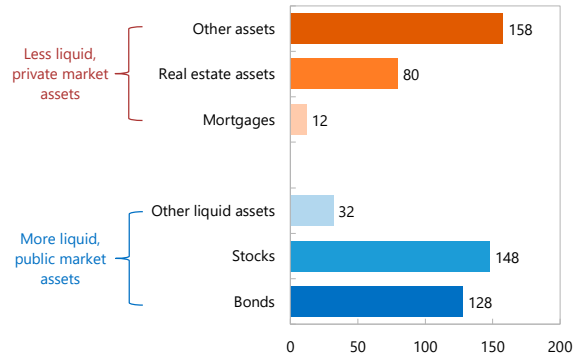
Mutual funds susceptible to runs account for the majority of "shadow banking" activity.[1]

Total Assets of Nonbank Financial Intermediation, 2010-17
(In billions of Canadian dollar; based on the FSB definition)



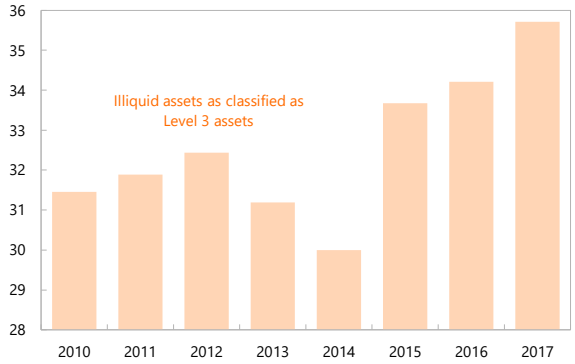
Pension funds have rapidly increased their exposures to real estate, private equity, and other illiquid assets…

Contribution to Growth of Pension Funds' Assets, 2013-18
(In billions of Canadian dollar; based on change during 2013Q4-2018Q3)



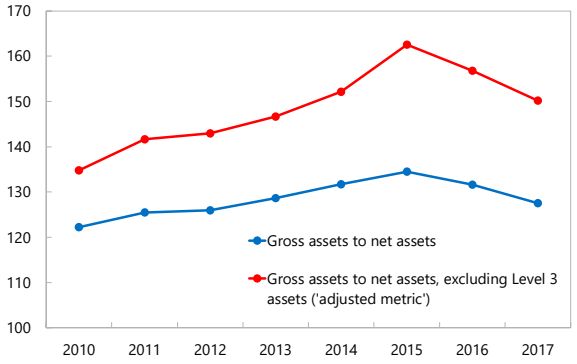
…increasing their allocation to more complex, illiquid assets, particularly at large public pension funds.

Pension Funds' Level 3 Assets, 2010-17
(In percent of total gross assets; based on six major pension funds)



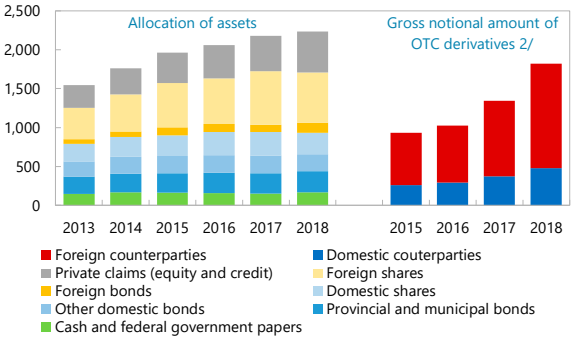
Pension funds' leverage is considerable when adjusting for their alternative investments, which are illiquid and carry separate, undisclosed leverage.

Pension Funds' Reported Leverage, 2007-17
(In percent; based on six major public pension funds)



Pension funds have increased exposures to foreign equities and private claims, as well as used more over-the-counter (OTC) derivatives especially with foreign counterparts.

Pension Funds' Holding of Assets and Use of OTC Derivatives, 2013-18
(In billions of Canadian dollar)



Sources: Canadian authorities; FSB, Global Monitoring Report on Non-Bank Financial Intermediation 2018; Haver Analytics; Pension funds, various annual reports; and IMF staff calculations.

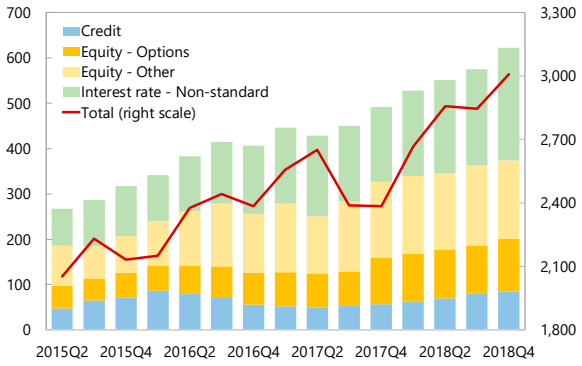
1/ Figures exclude bank-owned brokers-dealers and National Housing Act mortgage-backed securities.
2/ Based on OTC derivatives positions reported to trade repositories. One-fifth of exposures to foreign counterparties are with central counterparties (CCPs).

Figure 11. Canada: Risks from Nonbank Financial Sectors (concluded)

Institutional investors are increasingly use credit and equity OTC derivatives, potentially adding leverage and liquidity risks.

Institutional Investors' OTC Derivative Positions, 2015-18 [1]

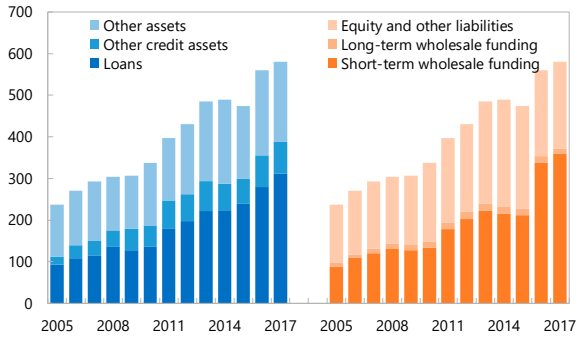
(In billions of Canadian dollar; based on gross notional position)



Brokers-dealers' lending and short-term wholesale funding has grown rapidly, supporting market risk-taking.

Brokers-Dealers' Lending and Short-term Wholesale Funding, 2005-17

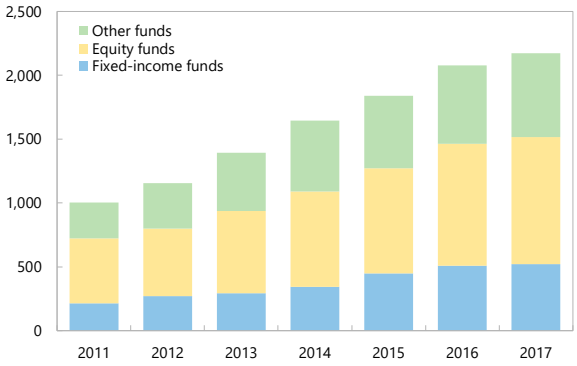
(In billions of Canadian dollar)



Bond funds have grown rapidly along with the overall mutual fund sector, creating maturity mismatch.

Mutual Funds' Assets under Management, 2011-17

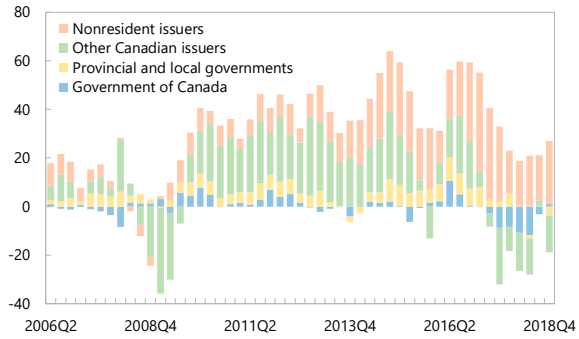
(In billions of Canadian dollar)



The increase in bond holdings is owing to corporate and foreign bonds.

Change in Mutual Funds' Holding of Debt Securities, 2006-18

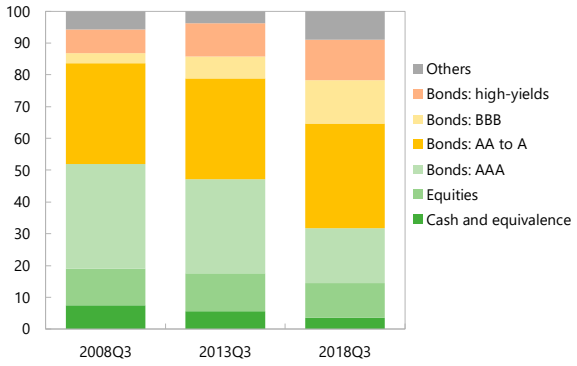
(In billions of Canadian dollar; year-on-year)



Canadian bond-focused funds have increased credit and liquidity risks, while decreasing their share of cash …

Fixed-Income Mutual Funds' Holding of Assets, 2008-18

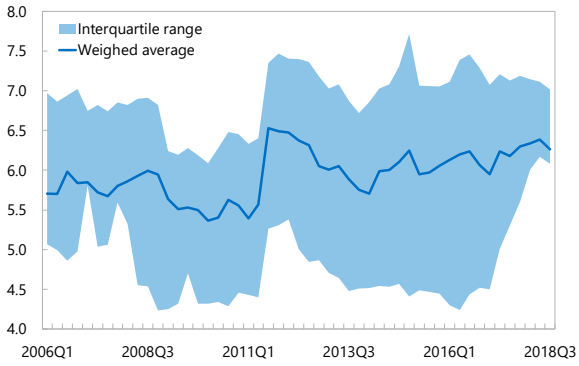
(In percent; based on fixed income-focused funds)



… and increasing the duration of their fixed income portfolios, raising sensitivity to interest rate shocks.

Fixed-Income Mutual Funds' Fund Duration, 2006-18

(In number of years; based on fixed income-focused funds)



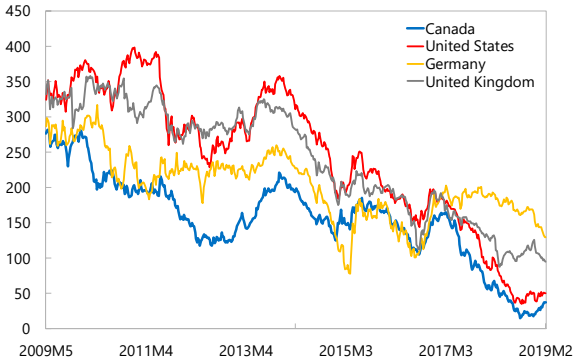
Sources: Canadian authorities; Haver Analytics; Morningstar; and IMF staff estimates.

1/ Institutional investors include pension funds, investment funds, and market intermediaries.

Figure 12. Canada: Asset Price Valuations[1]

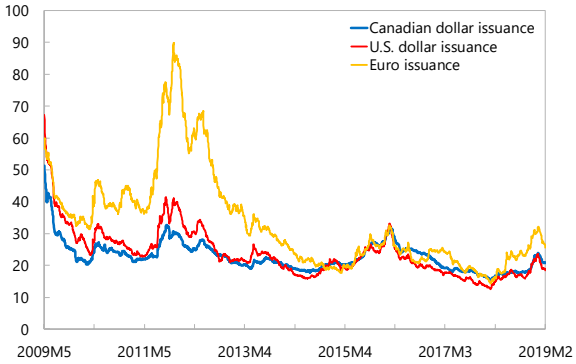
Canadian government bond yield curves are flatter than those of market peers, reflecting demand for long-term safe assets.

Government Bond: Yield Curve Slope, 2009-19
(In bais points; based on difference between 30-year and 2-year bonds)



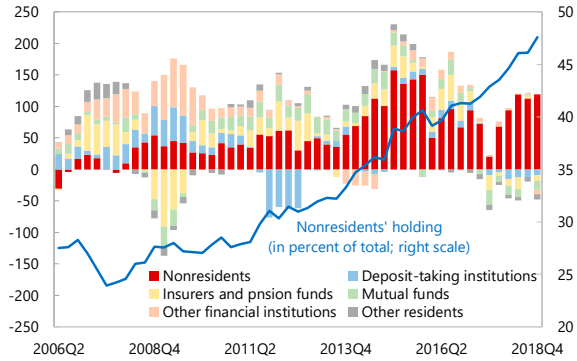
Corporate bond spreads are near historical lows.

Corporate Bond: Duration-adjusted Spreads, 2009-19
(In bais points)



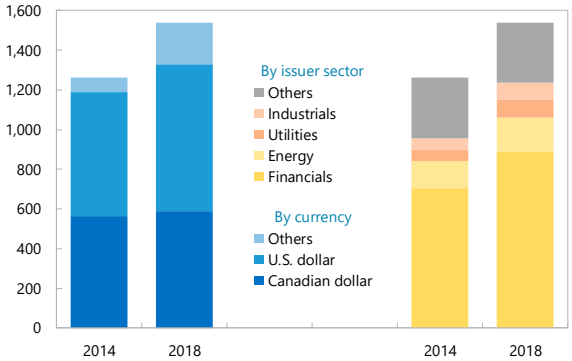
Corporate bond issuance has overwhelmingly relied on nonresidents' demand …

Change in Investors' Holding of Corporate Bonds, 2006-18
(In billions of Canadian dollar; year-on-year)



… and has been largely issued in foreign currencies, predominantly by financial institutions.

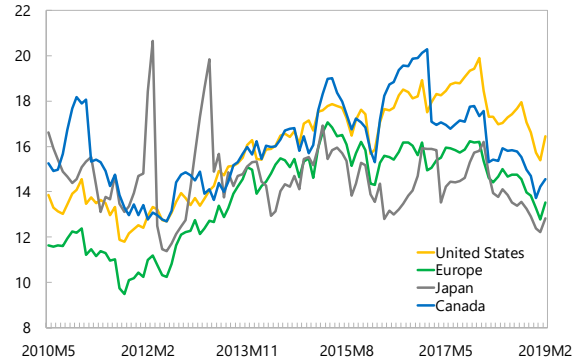
Outstanding Corporate Bonds, 20014-18
(In billions of Canadian dollar)



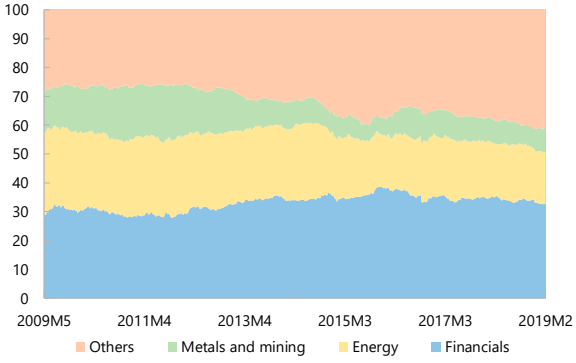
Equity valuations are closer to historical norms …

… reflecting the weight of mature, established industries, which have not seen stretched valuations globally.

Equity: Forward Price-to-Earnings, 2010-19
(In multiples)



Toronto Stock Exchange: Market Capitalization, 2009-19
(In percent of total)



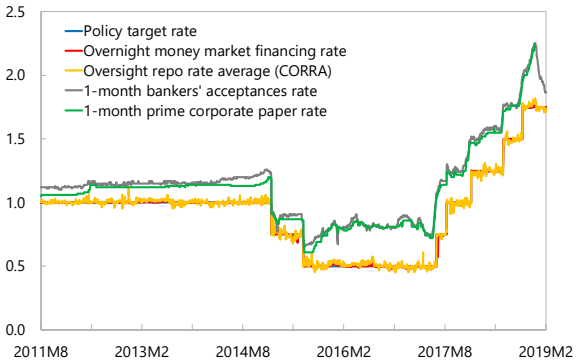
Sources: Bloomberg; Haver Analytics; IMF staff calculations.

1/ In this figure, corporate bonds refer to debt securities issued by non-government entities, including both nonfinancial firms and financial institutions.

Figure 13. Canada: Systemic Liquidity

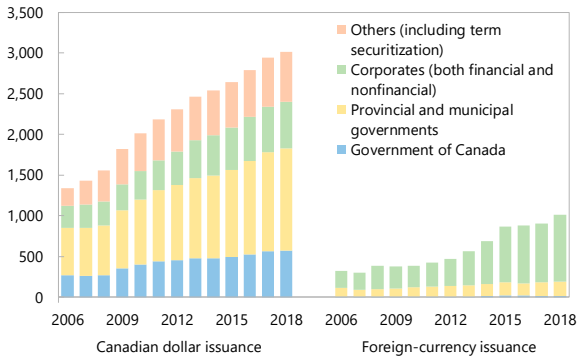
Bank of Canada's market operations have effectively influenced money market rates, which have closely followed the policy target rate.

Money Market Rates, 2011-19
(In percent)



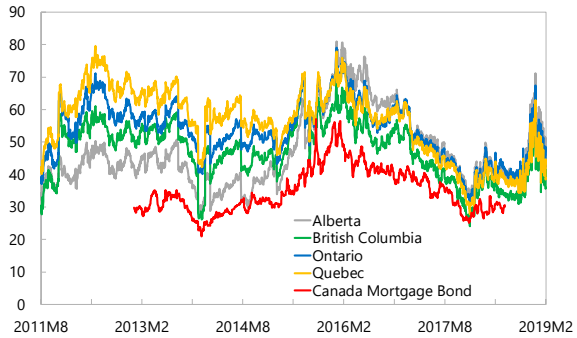
Provincial government bonds account for a larger market share. Corporates have increasingly issued bonds in foreign currency as well.

Outstanding Debt Securities, 2006-18
(In billions of Canadian dollar)



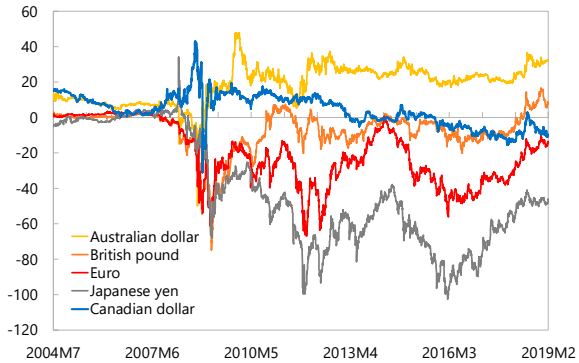
Spreads of provincial and Canada Mortgage Bond papers could widen considerably during market stress.

Spreads of Provincial Bonds and Canada Mortgage Bond, 2011-19
(In basis points; relative to Government of Canada bond, based on 5-year bonds)



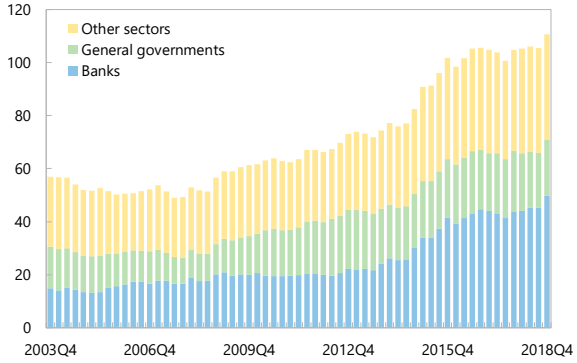
Cross-currency swaps for Canadian dollar have been generally liquid.

Cross-Currency Swaps vis-à-vis U.S. Dollar, 2004-19
(In basis points)



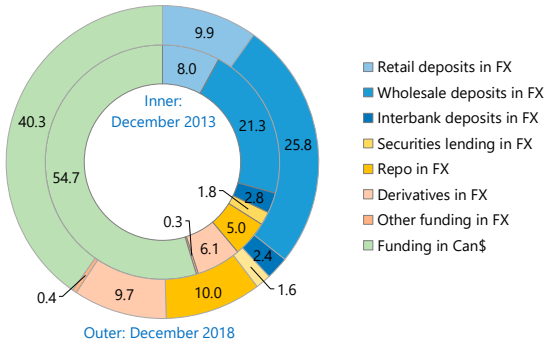
Banks, as well as nonfinancial firms, have increasingly relied on external funding.

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



Banks' foreign-currency funding has increased significantly, largely in the form of wholesale funding.

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

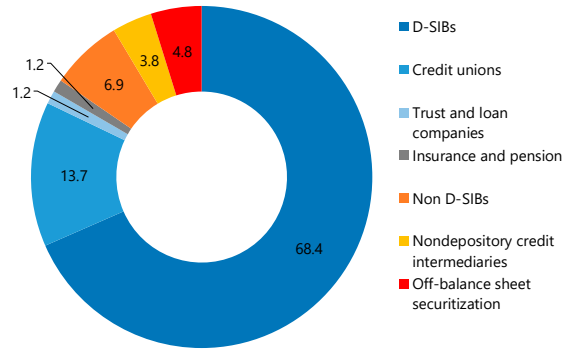


Sources: Bloomberg; Canadian authorities; Haver Analytics; OSFI; and IMF staff calculations.

Figure 14. Canada: Housing Finance

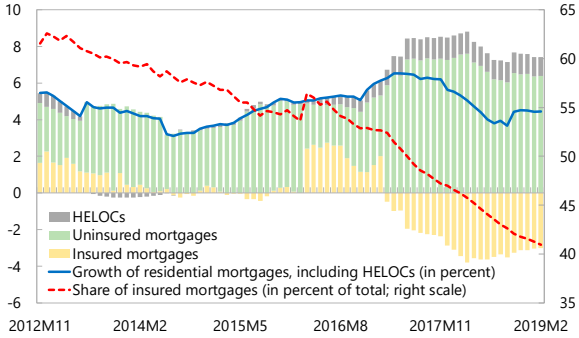
D-SIBs, along with credit unions, dominate mortgage lending in Canada.

Residential Mortgage Loans by Holders, 2018Q3
(In percent of total)



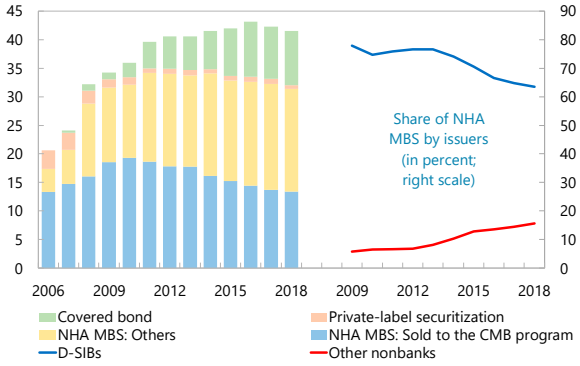
Insured mortgage lending has declined; growth HELOCs has been strong in recent years.

Contribution to Growth of Banks' Residential Mortgage Lending, 2013-19
(In percentage points)



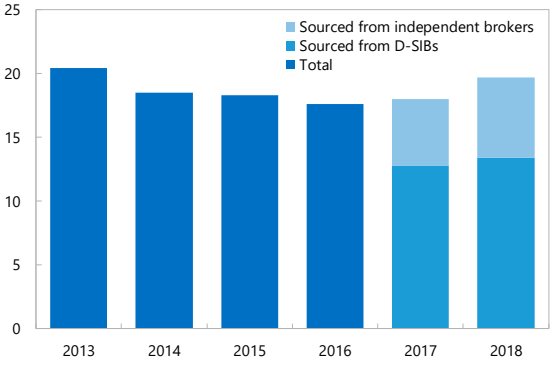
NHA MBS became an important funding source, partly reflecting the larger role of nonbank lenders in directly financing insured mortgages via the NHA MBS program. D-SIFIs have issued more covered bonds in recent years, …

Market-Based Funding for Mortgage Lending, 2005-18
(In percent of mortgage lending)



… while some smaller banks have funding vulnerabilities, with their dependence on less stable brokered deposits.

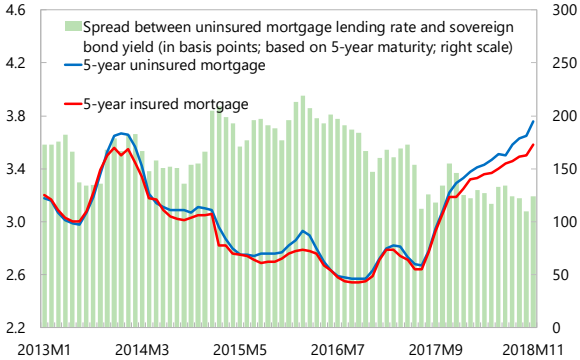
Small and Mid-sized Banks' Brokered Deposits, 2013-18
(In percent of total funding)



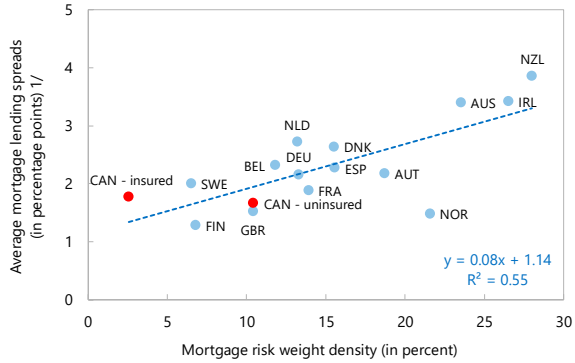
The cost of prime mortgages is low and little differentiated by borrower' risk profiles.

Larger capital buffers for mortgage exposures seem to support risk-based pricing of mortgages, which appears more limited in Canada.

Residential Morgage Lending Rates, 2013-18
(In percent)



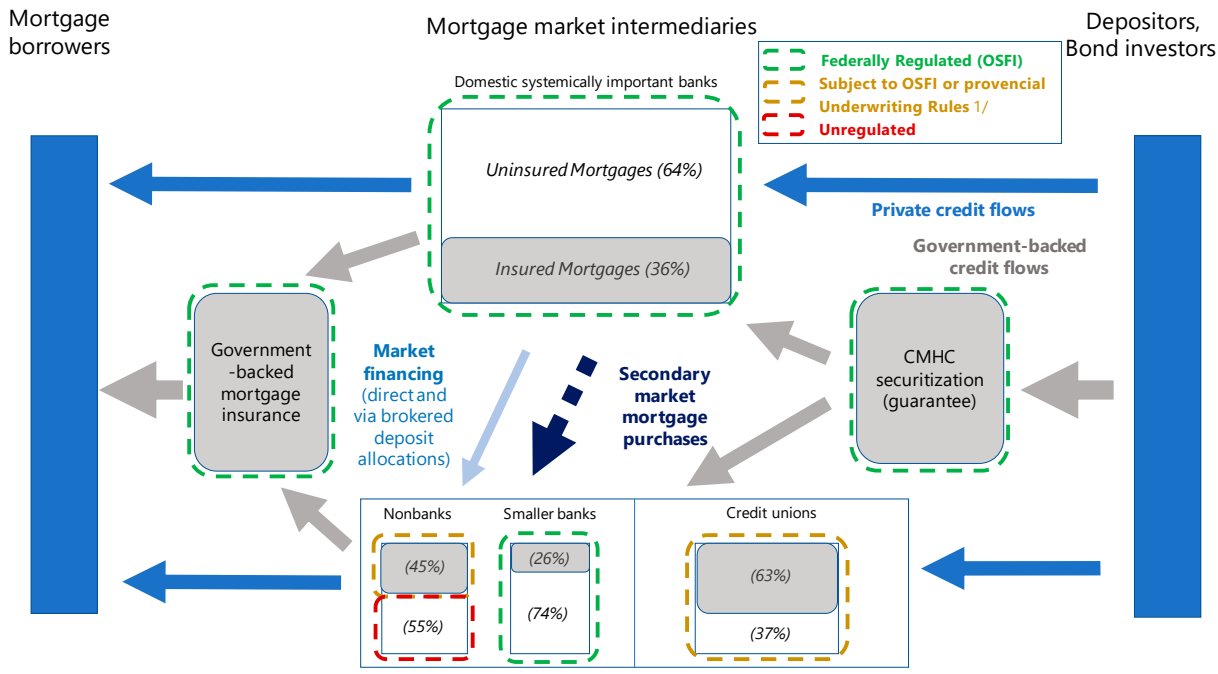
Mortgage Risk Weight Density and Mortgage Lending Spreads, 2018



Sources: Bank of Canada; Canadian authorities; Banks, various financial statements; CMHC; European Banking Authority; Haver Analytics; Statistics Canada; and IMF staff estimates.

1/ Based on difference between new lending rate and 3-month money market rate.

Figure 15. Canada: Mortgage Financing Ecosystem



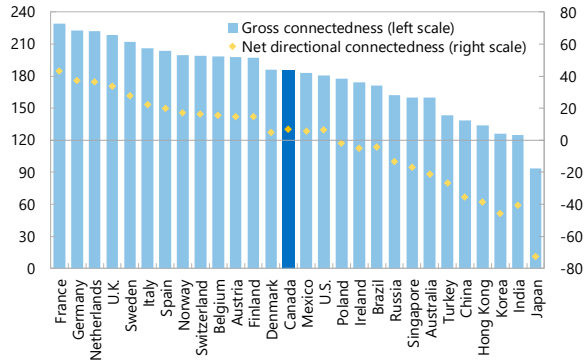
1/ Only some provinces have underwriting rules.

Figure 16. Canada: Cross-Border Interconnectedness[1]

Canada faces substantial cross-border spillovers in equity markets, among the highest of non-European countries, …

Overall Cross-Border Spillovers in Equity Markets, 2013-19

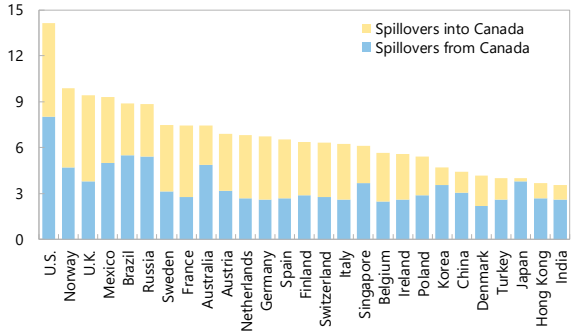
Based on total equity return



… and such spillovers are greater with respect to the United States and some large emerging markets.

Cross-Border Spillovers in Equity Markets vis-à-vis Canada, 2013-19

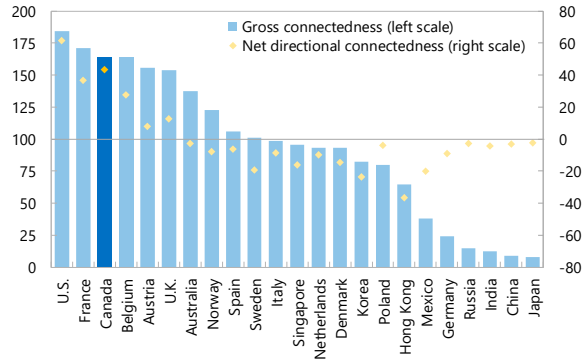
Based on total equity return



Canada is a major contributor of spillovers in bond markets to the rest of the world, …

Overall Cross-Border Spillovers in Bond Markets, 2013-19

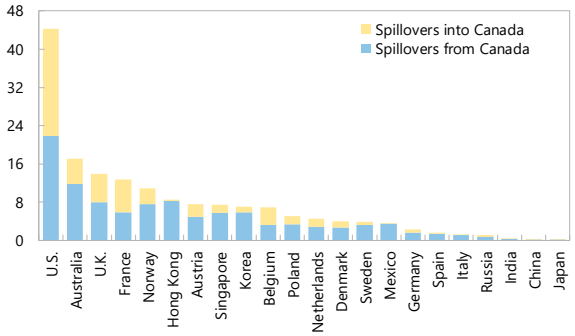
Based on 10-year government bond yields



Canada and U.S. bond markets are closely linked.

Cross-Border Spillovers in Bond Markets vis-à-vis Canada, 2013-19

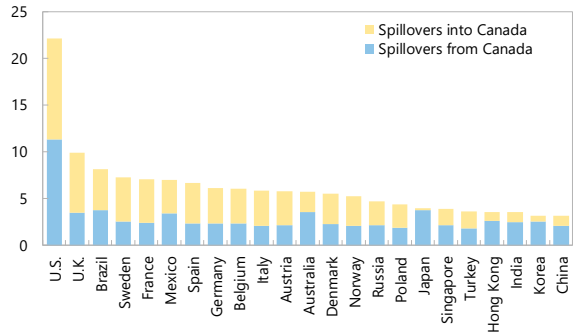
Based on 10-year government bond yields



Similarly, Canadian and U.S. banks appear to exhibit the strongest tie.

Cross-Border Spillovers among Banks vis-à-vis Canada, 2013-19

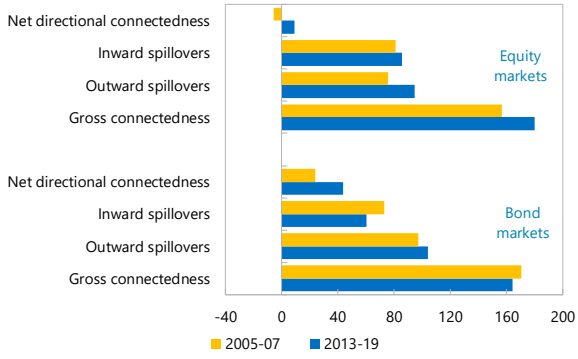
Based on stock market returns for the banking sector



Cross-border spillovers have increased for Canada after the global financial crisis.

Canada: Change in Cross-Border Spillovers, 2005-19

Based on total equity returns and 10-year government bond yields



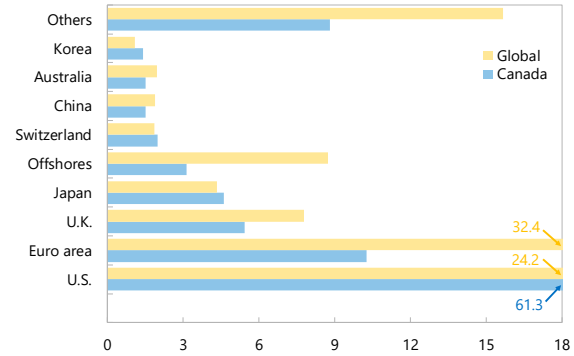
Sources: Bloomberg; Datastream; and IMF staff estimates.

1/ The analysis is based on Diebold and Yilmaz (2014). See Appendix IV for more details. Gross interconnectedness captures both outward spillovers from the country and inwards spillovers into the country. Net directional connectedness is the difference between outward spillovers and inward spillovers; a positive number implies that the country is the net contributor of spillovers into the system.

Figure 17. Canada: International Portfolio Investment

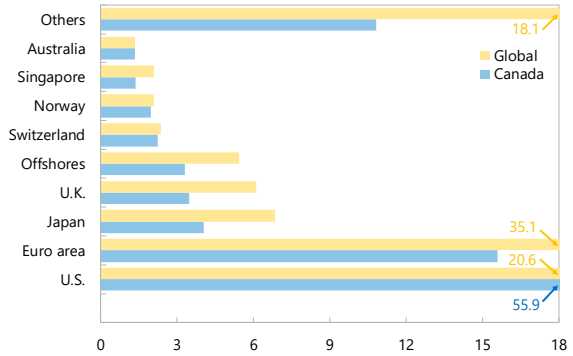
Canada's portfolio investment claims on the United States far exceeds the average global asset allocation.

International Portfolio Investment Assets, 2017
(In percent of total)



The United States is the leading portfolio investor in Canada, followed by the euro area.

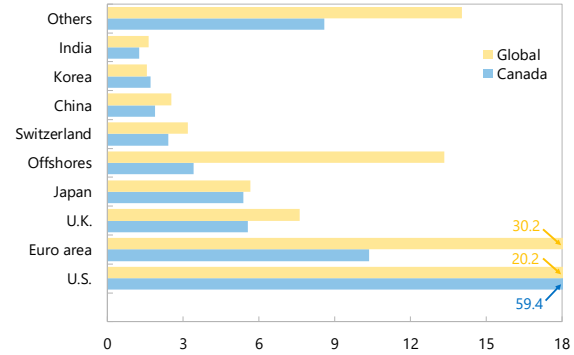
International Portfolio Investment Liabilities, 2017
(In percent of total)



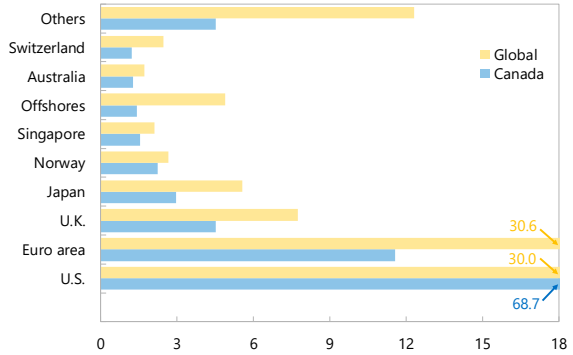
Canada mainly holds equities in the United States, the euro area, the United Kingdom and Japan.

These same countries are also major equity investors in Canada, though their investments (except the United States) lower than the average global asset allocation.

International Equity Portfolio Investment Assets, 2017
(In percent of total)



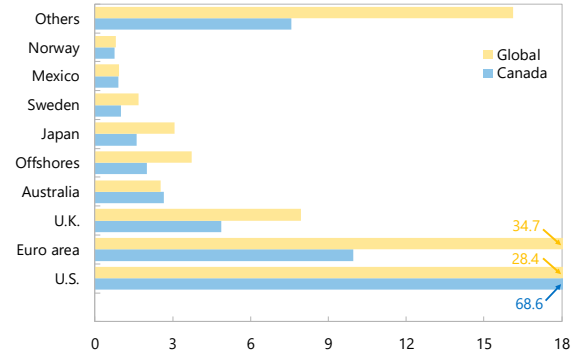
International Equity Portfolio Investment Liabilities, 2017
(In percent of total)



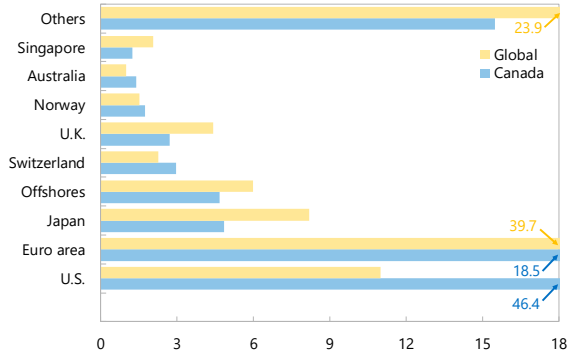
Canada mainly holds debt securities in the United Sates, the euro area and the United Kingdom, …

… while major debt investors in Canada are the United States and the euro area

International Debt Portfolio Investment Assets, 2017
(In percent of total)



International Debt Portfolio Investment Liabilities, 2017
(In percent of total)



Sources: IMF, Coordinated Portfolio Investment Survey database; and IMF staff calculations.

Table 3. Canada: Financial System Structure

	In billion Canadian dollars					In percent of GDP				In percent of total assets				Global ranking
	2008	2009	2013	2017	2018H1	2009	2013	2017	2018H1	2009	2013	2017	2018H1	2017
Financial institutions 1/														
Total assets	7,572	8,198	10,709	13,737	13,962	522	563	641	630	100.0	100.0	100.0	100.0	9th
Depository institutions	2,587	2,607	3,570	4,381	4,475	166	188	205	202	31.8	33.3	31.9	32.1	8th
Chartered banks	2,283	2,289	3,159	3,872	3,939	146	166	181	178	27.9	29.5	28.2	28.2	...
Other depository institutions	304	318	411	509	537	20	22	24	24	3.9	3.8	3.7	3.8	...
Insurance companies	537	586	778	958	975	37	41	45	44	7.1	7.3	7.0	7.0	9th
Life insurance	417	466	635	789	805	30	33	37	36	5.7	5.9	5.7	5.8	...
o/w: Segregated funds	136	170	246	332	338	11	13	16	15	2.1	2.3	2.4	2.4	...
Property and casualty insurance	121	120	142	169	170	8	7	8	8	1.5	1.3	1.2	1.2	...
Pension funds	1,149	1,212	1,775	2,443	2,532	77	93	114	114	14.8	16.6	17.8	18.1	5th
o/w: Social security	143	158	287	489	524	10	15	23	24	1.9	2.7	3.6	3.8	...
Public financial institutions	304	402	431	480	495	26	23	22	22	4.9	4.0	3.5	3.5	5th
Other financial institutions	3,139	3,550	4,443	5,965	6,008	226	234	279	271	43.3	41.5	43.4	43.0	6th
Mutual funds	713	856	1,359	2,211	2,259	54	71	103	102	10.4	12.7	16.1	16.2	...
o/w: Money market funds	78	61	32	30	31	4	2	1	1	0.7	0.3	0.2	0.2	...
Securities firms 2/	67	57	81	117	120	4	4	5	5	0.7	0.8	0.9	0.9	...
Finance companies	111	96	95	144	151	6	5	7	7	1.2	0.9	1.0	1.1	...
Financial vehicle entities	413	421	72	46	44	27	4	2	2	5.1	0.7	0.3	0.3	...
Other financial institutions 3/	1,835	2,120	2,835	3,448	3,434	135	149	161	155	25.9	26.5	25.1	24.6	...
Nonbank financial intermediation 4/														
Total assets	...	...	1,168	1,974	...	...	61	92	...	...	10.9	14.4	...	9th
Financial markets														
Outstanding debt securities	1,282	1,371	1,813	2,883	2,935	87	95	135	132	...	...	...	...	8th
Government	828	945	1,229	1,356	1,367	60	65	63	62	...	...	...	...	8th
Financial institutions	312	266	337	1,112	1,138	17	18	52	51	...	...	...	...	13th
Others	142	160	247	415	429	10	13	19	19	...	...	...	...	7th
Stock market capitalization	1,256	1,758	2,246	2,971	2,989	112	118	139	135	...	...	...	...	9th
Memo items														
Total assets 5/														
Deposit-taking sector 6/	...	...	4,278	5,799	6,047	...	...	...	...		100.0	100.0	100.0	...
o/w: Six largest banks	...	...	3,727	5,097	5,490	...	...	...	...	...	87.1	87.9	90.8	...
o/w: Québec credit cooperative	...	...	212	275	290	...	...	...	...	...	5.0	4.7	4.8	...
Life insurance sector 6/	...	...	1,179	1,548	1,590	...	...	...	...		100.0	100.0	100.0	...
o/w: Three largest life insurers	...	...	1,039	1,418	1,456	...	...	...	...	...	88.1	91.6	91.6	...
CMHC	...	...	270	267	268	...	...	...	...	...	...	...	...	...

Sources: FSB, Global Monitoring Report on Non-Bank Financial Intermediation 2018; IMF, World Economic Outlook database; Haver Analytics; SNL; and IMF staff estimates.

1/ Based on National Balance Sheet Accounts, thus not reflecting consolidated balance sheets of financial institutions that have overseas operations. This statistical concept is different from the above text chart, which is based on the consolidated balance sheet basis (a typical FSAP approach).
2/ Only including securities firms (e.g. brokers-dealers) that are not part of banking groups.
3/ Including captive financial institutions and money lenders (CFIMLs), which are largely set up for financial management, asset restructuring and fund-raising purposes to channel funds within the corporations. In 2017, CFIMLs' total assets amounted to Can$3.3 trillion.
4/ Based on the FSB's definition. In 2017, 73 percent of nonbank financial intermediation was related to collective investment schemes with features that make them susceptible to runs, and 18 percent was related to credit provision that is dependent on short-term funding.
5/ Based on consolidated balance sheet basis.
6/ Only representing regulated entities in federal and Québec jurisdictions.

Table 4. Canada: Selected Economic Indicators

(Percentage change, unless otherwise indicated)

Nominal GDP (2018): C$ 2,217 billion (US$ 1,711 billion)
GDP per capita (2018): US$ 46,243
Main exports: Oil and gas, autos and auto parts, gold, lumber, copper.

Quota: SDR 11,023.9 million
Population (2018): 37.0 million

					Projections	
	2015	2016	2017	2018	2019	2020
Output and Demand						
Real GDP	0.7	1.1	3.0	1.8	1.5	1.9
Total domestic demand	-0.1	0.7	3.9	1.7	0.6	1.8
Private consumption	2.3	2.2	3.5	2.1	0.8	1.4
Total investment	-6.8	-4.4	6.5	-0.1	0.5	3.8
Net exports, contribution to growth	0.9	0.4	-1.1	0.1	0.8	0.1
Unemployment and Inflation						
Unemployment rate (average, in percent)	6.9	7.0	6.3	5.8	5.9	6.0
CPI inflation (average)	1.1	1.4	1.6	2.2	1.7	1.9
Saving and Investment (in percent of GDP)						
Gross national saving	20.3	19.7	20.7	20.4	19.8	20.5
General government	3.8	3.7	3.8	3.5	3.2	3.1
Private	16.5	16.0	16.9	16.8	16.6	17.4
Personal	5.4	3.9	3.8	2.5	4.9	5.2
Business	11.0	12.1	13.1	14.3	11.7	12.3
Gross domestic investment	23.8	22.9	23.5	23.0	22.9	23.3
General Government Fiscal Indicators (in percent of GDP)						
Revenue	40.0	40.1	39.9	40.1	39.8	39.9
Expenditures	40.0	40.6	40.3	40.6	40.6	40.7
Overall balance	-0.1	-0.4	-0.3	-0.4	-0.8	-0.8
Gross Debt	91.3	91.8	90.1	89.7	87.5	84.9
Net debt 3/	28.5	28.8	27.6	26.8	26.7	25.9
Money and Credit (average, in percent))						
Household credit growth	4.9	5.5	5.5	4.0	3.0	7.2
Business credit growth	9.3	5.3	8.2	6.5	3.6	4.2
Three-months treasury bill	0.5	0.5	0.7	1.4	1.7	1.9
Ten-years government bond yield	1.5	1.3	1.8	2.3	2.3	2.5
Balance of Payments						
Current account balance (in percent of GDP)	-3.5	-3.2	-2.8	-2.6	-3.1	-2.9
Merchandise Trade balance (in percent of GDP)	-1.2	-1.3	-1.2	-1.0	-1.8	-1.6
Export volume (percentage change)	3.4	0.6	0.7	3.1	2.5	2.6
Import volume (percentage change)	0.3	-0.4	4.7	3.3	0.0	2.1
Terms of trade	-7.1	-1.2	3.3	0.3	-4.6	0.4

Sources: Haver Analytics; and IMF staff estimates.

Table 5. Selected Economies: Key Macrofinancial Variables in the Baseline and Adverse Scenarios

(In percent; unless indicated otherwise)

	Baseline					Adverse		
	2017	2018	2019	2020	2021	2019	2020	2021
Canada								
Real GDP growth	3.0	2.1	2.0	1.8	1.8	-3.1	-4.2	1.3
Inflation rate (CPI)	1.6	2.6	2.2	2.1	2.1	3.6	3.2	1.7
Unemployment rate	6.3	6.1	6.2	6.2	6.3	7.2	10.1	12.1
Exchange rate (CAD per USD)	1.30	1.29	1.28	1.25	1.22	1.52	1.55	1.47
Equity price (2017=100)	100	103	107	111	115	61	70	93
House price (2017=100)	100	104	105	107	109	82	66	62
Bank of Canada policy rate	0.7	1.4	2.1	2.5	2.6	3.3	2.9	1.2
3-month government bond yield	0.7	1.4	2.1	2.4	2.6	3.5	3.0	1.2
10-year government bond yield	1.9	2.4	3.1	3.4	3.5	3.7	3.2	2.6
Interbank spread (in percentage points) 1/	0.5	0.5	0.5	0.5	0.5	1.8	1.7	1.2
5-year mortgage rate	3.8	4.4	5.1	5.4	5.5	5.9	6.0	5.0
Prime business lending rate	2.9	3.6	4.3	4.6	4.8	5.2	5.3	4.2
Business credit growth	8.8	7.8	6.3	4.6	2.6	0.8	-1.4	0.4
Household credit growth	5.3	3.4	4.1	4.1	3.0	-4.1	-4.2	-2.5
United States								
Real GDP growth	2.2	2.9	2.5	1.8	1.7	-2.4	-2.9	3.3
Inflation rate	2.1	2.4	2.1	2.3	2.2	2.6	1.5	-0.3
Unemployment rate	4.4	3.8	3.5	3.4	3.6	4.6	7.3	8.8
Equity price (2017=100)	100	113	118	123	127	75	84	109
House price (2017=100)	100	107	114	120	125	103	103	105
Federal Fund rate	1.0	1.8	3.0	3.6	3.2	3.6	2.6	1.1
Interbank spread (in percentage points) 1/	0.3	0.5	0.2	0.1	0.1	1.3	1.1	0.6
10-year government bond yield	2.3	2.9	3.5	3.8	3.7	3.7	3.2	2.5
Euro Area								
Real GDP growth	2.5	2.0	1.9	1.7	1.6	-2.1	-2.3	1.7
Equity price (2017=100)	100	102	105	109	113	67	75	97
Interbank spread (in percentage points) 1/	-0.3	-0.3	-0.2	0.0	0.0	1.1	1.2	0.6
10-year government bond yield	1.2	1.3	1.5	1.9	2.2	2.1	1.8	1.5
Japan								
Real GDP growth	1.7	1.1	0.9	0.3	0.7	-2.9	-3.3	0.9
Equity price (2017=100)	100	111	113	116	118	73	80	102
Interbank spread (in percentage points) 1/	0.1	0.1	0.0	0.0	0.0	1.1	1.0	0.5
10-year government bond yield	0.1	0.1	0.2	0.3	0.4	0.5	0.1	-0.4
United Kingdom								
Real GDP growth	1.7	1.4	1.5	1.5	1.6	-3.0	-2.8	2.5
Equity price (2017=100)	100	102	105	108	111	66	73	94
Interbank spread (in percentage points) 1/	0.1	0.1	0.2	0.2	0.2	1.3	1.2	0.6
10-year government bond yield	1.2	1.5	1.9	2.0	2.1	2.2	1.5	1.0
China								
Real GDP growth	6.9	6.6	6.2	6.2	6.0	0.9	1.5	7.0
Global								
Real GDP growth	3.2	3.2	3.0	2.9	2.9	-1.5	-1.4	3.9
Commodity price - Energy (2017=100)	100	131	128	122	117	133	87	55
Commodity price - Non-energy (2017=100)	100	103	102	102	103	101	85	71

Source: IMF staff estimates.

1/ Interbank spread is defined as the difference between interbank rate and policy rate.

Table 6. Canada: Financial Soundness Indicators

(In percent)

	2012	2013	2014	2015	2016	2017	2018
Banks							
Capital adequacy and leverage							
Total capital to risk-weighted assets	16.2	14.3	14.2	14.2	14.8	14.8	15.2
Tier-1 capital to risk-weighted assets	13.4	11.7	11.9	12.1	12.5	12.9	13.2
Total equity to total assets	4.9	5.0	4.9	5.1	5.2	5.2	5.2
Asset quality							
Nonperforming loans to total loans	0.7	0.6	0.5	0.5	0.6	0.4	0.4
Provisions to nonperforming loans	22.3	16.3	17.5	17.3	16.7	15.1	...
Profitability and earnings							
Return on assets	1.1	1.1	1.1	1.0	1.0	1.1	1.2
Return on equity	22.7	22.3	22.5	20.7	19.9	21.4	22.0
Net interest income to total asets	1.6	1.5	1.5	1.5	1.4	1.4	1.5
Other income to total assets	1.5	1.4	1.5	1.4	1.4	1.4	1.4
Liquidity and funding							
Liquid assets to short-term liabilities	51.8	47.8	50.5	45.4	54.6	49.4	48.0
Loans to deposits	103.8	101.8	100.7	99.0	98.6	100.1	100.6
Liquid assets to total assets	11.9	11.3	11.0	11.5	10.9	10.7	10.5
Foreign-currency liabilities to total liabilities	42.4	42.7	49.2	48.4	55.0	54.0	54.5
Life insurers 1/							
Capital adequacy 2/							
LICAT total ratio	...	...	...	...	...	...	138.9
LICAT core ratio	...	...	...	...	...	...	101.1
Profitability and earnings							
Return on equity	9.1	11.0	11.6	8.4	9.4	7.9	10.6
Net claims to net premiums 3/	91.3	83.2	81.3	87.6	73.7	74.5	81.8
Expenses to net premiums 4/	41.3	36.1	36.4	40.2	34.5	33.7	35.3
Investment income to investment assets 3/	5.9	-1.1	10.7	2.8	5.2	5.5	1.2
Property and casualty insurers 1/							
Capital adequacy 2/							
MCT ratio	...	...	...	250.3	252.4	234.3	230.0
Profitability and earnings							
Return on equity	9.6	4.6	9.5	9.3	5.6	6.0	4.6
Net claims to net premiums 3/	65.2	69.0	67.0	63.8	68.1	64.2	68.4
Expenses to net premiums 3/	30.6	30.7	31.1	31.6	32.1	33.1	31.3
Reinsurance							
Net premiums to gross premiums 3/	93.6	92.4	92.6	88.8	89.1	85.7	89.9
Corporate sector							
Debt to GDP 4/	85.8	88.4	89.0	101.2	107.7	111.1	110.8
Total liabilities to total assets	44.1	45.2	45.6	48.5	47.1	48.2	48.5
Net interest expense to operating profits	14.0	12.0	9.7	12.0	12.0	9.3	7.3
Return on assets	4.3	3.9	4.4	2.6	3.9	4.5	4.3
Household sector							
Debt to GDP 4/	88.8	89.9	88.9	93.2	96.8	96.1	95.9
Total liabilities to total assets	18.1	17.6	17.1	17.1	16.7	16.7	17.4
Debt-servicing to income	13.7	13.6	13.8	13.7	13.9	14.1	14.6

Sources: Haver Analytics; IMF, Financial Soundness Indicators; OSFI; and IMF staff calculations.

1/ Based on federally regulated entities. Unless indicated otherwise, including only Canadian entities.
2/ LICAT stands for Life Insurance Capital Adequacy Test, and MCT stands for Minimum Capital Test.
3/ Including also foreign entities operating in Canada.
4/ Based on total borrowing and net accounts payable.

Table 7. Canada: Recent Macroprudential and Housing Finance-related Measures		
Date	**Agency**	**Measures**
Macroprudential Measures Since the 2014 FSAP		
April 2019	OSFI	The domestic stability buffer increased to 1.75 percent of risk-weighted assets.
July 2018	OSFI	The domestic stability buffer at 1.5 percent of risk-weighted assets was formally introduced. This Pillar 2 measure had been in place but was not publicly announced.
January 2018	OSFI	B-20 Guideline was revised, among others, to include a requirement to stress test the debt-servicing capacity of uninsured mortgage borrowers and disallow arranging mortgages secured by the same property to circumvent the maximum loan-to-value (LTV) limit. Lenders were also required to establish appropriate LTV limits that reflect macroeconomic and housing market conditions and place restrictions on certain lending arrangements that are designed to circumvent LTV limits. Alberta, Québec and Saskatchewan subsequently implemented similar stress-testing requirement measures, which came in effect in March 2018, May 2018 and July 2019, respectively.
November 2016	DOF	The eligibility requirements for low-LTV mortgage insurance became the same as those for high-LTV mortgage insurance. Effectively, certain types of mortgages were no longer eligible for mortgage insurance (e.g., cash-out refinance, mortgages with amortization above 25 years, mortgages for investment properties) and low-LTV insured mortgage borrowers were subject to the stress testing requirement.
October 2016	DOF	The requirement to stress-test the debt-servicing capacity was extended to all high-LTV insured mortgage borrowers.
February 2016	DOF	The minimum down payment increased from 5 to 10 percent for the portion of a property price above Can$500,000. The minimum 5 percent down payment for properties up to Can$500,000 remained unchanged.
Housing Finance-related Measures Since the 2014 FSAP		
January 2018	CMHC	Guarantee fees for National Housing Act mortgage-backed securities (NHA MBS) were raised from 80 to 100 basis points for annual guarantees in excess of Can$9 billion.
January 2018	British Columbia government	The property transfer tax on foreign buyers in Vancouver was increased to 20 percent, and its geographic coverage was also expanded. A speculation and vacancy tax on homeowners (both foreign and domestic) who do not pay income taxes in British Columbia was introduced, in the range between 0.5 and 2 percent.
November 2017	City of Vancouver government	The Vancouver 10-year Housing Strategy was announced, along with its 3-year action plan, including references to potential changes to real estate-related taxes and restrictions on property ownership.
April 2017	Ontario government	The Housing Fair Plan was announced, including measures to cool off the housing market, contain rent increases, curb speculative transactions, and boost housing supply. Specific measures included a 15 percent speculation tax on nonresident home buyers in the Greater Golden Horseshoe area.

Table 7. Canada: Recent Macroprudential and Housing Finance-related Measures (concluded)

Date	Agency	Measures
Housing Finance-related Measures Since the 2014 FSAP		
March 2017	CMHC	Mortgage insurance premiums were raised.
January 2017	OSFI	A risk-based solvency framework for federally regulated mortgage insurers ("Advisory") was introduced, raising capital requirements for mortgage insurance.
January 2017	Ontario government	The maximum land transfer tax refund was doubled to eligible first-time home buyers to Can$4,000.
October 2016	DOF	A capital gain tax exemption for the principle residence was introduced. Individuals who were not Canadian residents in the year the property was acquired are not eligible.
August 2016	British Columbia government	A 15 percent property transfer tax on foreign buyers in Vancouver.
July 2016	DOF	Portfolio mortgage insurance was restricted only to facilitate NHA MBS (rather than private-label securitization or capital relief).
July 2016	CMHC	Guarantee fees for NHA MBS and Canada Mortgage Bond were raised to encourage development of private market funding alternatives.
June 2015	CMHC	Mortgage insurance premiums were raised.
June 2015	OSFI	B-21 Guideline was issued to outline the underwriting practices and procedures of residential mortgage insurance.
May 2015	Legislature	The Protection of Residential Mortgage of Hypothecary Insurance Act was amended to prohibit the substitution of loans in portfolio insurance pools.
May 2014	CMHC	Mortgage insurance premiums were raised.

Note: Date indicates when the measures became in effect, unless indicated otherwise.
Sources: Canadian authorities; and IMF, various staff reports for Article IV Consultation with Canada.

Appendix I. Progress on Implementing the 2014 FSAP Recommendations

Some progress on has been made in implementing the recommendations of the 2014 FSAP, but key governance and institutional issues remain unaddressed. OSFI's practice of using guidelines and its approach to group-wide insurance supervision remain unchanged. The authorities disagreed with the need to formalize the arrangement for systemic risk oversight and system-wide crisis preparedness. Efforts have been made to improve data collection and close data gaps, but the lack of a comprehensive framework is a challenge to systemic risk monitoring and analysis. Table I.1 summarizes progress on implementing the 2014 FSAP's key recommendations.

Table I.1. Canada: Progress on Implementing the 2014 FSAP Recommendations

Recommendation	Implementation progress
Expand financial sector data collection and dissemination with a view to enhancing coverage, regularity, and availability of time-series to facilitate analysis.	**Partially implemented; in progress.** The authorities have undertaken various initiatives to enhance the data collection efforts and close data gaps. Main improvements are related to housing market and mortgage data. Nevertheless, no single body is able to provide data for systemic risk analysis with a complete coverage. Inadequate data for top-down stress testing remain a serious shortcoming.
Reduce the government's exposure to mortgage insurance gradually.	**Implemented; in progress.** The authorities have introduced measures that have successfully reduced the government's exposure to mortgage insurance. Insurance-in-force has declined to about Can$723 billion as of 2018Q3, from the peak of nearly Can$800 billion in 2016.
Augment OSFI's top-down stress testing framework for banks with risk-sensitive concepts of key credit risk input parameters and econometric, model-based approaches using longer time series.	**Partially implemented; in progress.** The BOC assumed the responsibility of conducting top-down bank stress testing and has continued to enhance the stress testing capability. OSFI's top-down stress testing framework mainly focuses on mortgage insurance. Nevertheless, the lack of granular data undermines the ability to perform top-down stress tests, including estimation of pre-loss income, credit loss and market loss.

Table I.1. Canada: Progress on Implementing the 2014 FSAP Recommendations (continued)	
Recommendation	**Implementation progress**
Include major regulated entities at federal and provincial level in a regular, common stress testing exercise, which would involve a degree of collaboration between relevant federal and provincial authorities.	**Partially implemented.** OSFI and the BOC have jointly conducted biannual macro stress testing exercises for banks and mortgage insurers. Macrofinancial scenarios were shared with provincial authorities, which independently carry out the exercises. Hence, all systemically important deposit-taking institutions were included in the 2017 exercise. However, stress testing results have not been published. In recent years, the BOC has provided technical assistance to a number of provincial supervisory authorities.
Equip OSFI with powers to make its own enforceable rules by administrative means, supplementing the use of guidelines and government regulations; amend legislation on statutory decisions to give OSFI sole decision-making authority on prudential criteria.	**None.** The authorities do not intend to pursue this recommendation. Authorities' response: "OSFI's guidelines are enforceable in practice because its numerous intervention powers and tools are legally enforceable. OSFI's use of guidelines provides OSFI with the ability to act independently and quickly in the face of emerging risks." The mission saw a merit of the flexibility of using guidelines but cautioned against their effectiveness in a less benign environment.
Replace certain informal and ad-hoc reporting requirements by federally regulated financial institutions with more formal requirements.	**Partially implemented.** OSFI has adopted the Regulatory Data Governance Framework for regulatory data management. In 2016, the existing ad-hoc collection of Own Risk and Solvency Assessment (ORSA) key metrics for insurers was replaced with a formal regulatory return. However, OSFI's regulatory data are mainly on the consolidated basis, with lacking consistent information by geography (e.g. Canada and other key markets). OSFI still relies on ad-hoc collection for supervisory purposes.
Adopt a transparent and consistent regulatory regime for group-wide insurance supervision; give OSFI the authority to take supervisory measures at the level of the holding company.	**None.** The authorities do not intend to pursue this recommendation. Authorities' response: "Canada is satisfied with OSFI's current approach to group-wide supervision." OSFI relies on the use of undertakings with holding companies to apply prudential requirements and seek information. The mission reiterated the importance of a more consistent regulatory regime for group-wide insurance supervision.

Table I.1. Canada: Progress on Implementing the 2014 FSAP Recommendations (continued)	
Recommendation	**Implementation progress**
Address shortcomings in risk identification and enforcement in securities regulation.	**Partially implemented.** Under the auspice of the Canadian Securities Administrators, systemic risk monitoring and analysis in securities markets have been improved. There have been some successfully prosecutions against misconduct. However, the authorities should continue deploying a full range of enforcement tools to constitute an effective deterrent. The authorities (Canada and some provinces and territories, including British Columbia and Ontario) are in the process of establishing the Cooperative Capital Markets Regulatory System. The recent Supreme Court ruling paved a way for the authorities to move this initiative forward.
Enhance supervisory cooperation among federal and provincial supervisors and subject all systemically significant financial institutions to intensive supervision.	**Partially implemented.** OSFI has increased contact with provincial supervisors with an aim to harmonize regulation and improve supervisory cooperation. The current discussions focused on delineating the key touch points between federal and provincial supervisors. OSFI and AMF have instituted a new cooperation framework whereby meetings are scheduled on a regular basis to discuss issues of mutual interest. However, the lack of memorandums of understanding (MoUs) between OSFI and provincial supervisors continues hampering information exchange and policy coordination. AMF designated the largest credit union as a systemically important financial institution. The BOC also designated systemically important financial market infrastructures (FMIs).
Provide a clear mandate to an entity (i) to monitor systemic risk to facilitate macro-prudential oversight, and (ii) to carry out system-wide crisis preparedness.	**None.** The authorities do not intend to pursue this recommendation. Authorities' response: "As noted in the previous FSAP, the regulatory and supervisory framework demonstrates strong compliance with international standards and is well coordinated across the federal oversight bodies. Responsibility for addressing systemic risk remains with the Senior Advisory Committee, a non-statutory body chaired by the Deputy Minister of Finance." Nevertheless, the new systemic risk assessment committee—a sub-committee chaired by the BOC—was set up. In recent years, the authorities have implemented measures to mitigate vulnerabilities related to the housing market. While individual agencies have conducted crisis simulation exercises, a nation-wide exercise has not been carried out.

Table I.1. Canada: Progress on Implementing the 2014 FSAP Recommendations (concluded)	
Recommendation	**Implementation progress**
Increase the ex-ante funding of CDIC and enhance its data collection and analysis of depositor profiles.	**Partially implemented; in progress.** Premium rates have been gradually increased. The current CDIC's ex ante funding is 59 basis points of insured deposits, up from 41 basis points in 2013, with a minimum target at 100 basis points.

Appendix II. Analytical Matrix for Macrofinancial Vulnerabilities Analysis

Debt-at-risk Analysis for the Corporate Sector	
Objective	- Quantify the share of financially weak nonfinancial firms, excluding real estate funds - Quantify the share of corporate debt-at-risk
Data	- Firm-level balance sheet and income statement data (Capital IQ)
Methodology	- Financially weak firms are defined as firms that have weak debt-servicing capacity and/or inadequate liquidity. - Weak debt-servicing capacity entails that earnings before interest, taxes, depreciation and amortization (EBITDA) less than interest expenses, where interest expenses also include capitalized interest). - Negative equity is defined as assets being less than liabilities. - Debt belongs to financially weak firms are considered being at risk. - Debt-at-risk not covered by assets are debt-at-risk that belongs to firms with negative equity. - Sensitivity analysis is performed to assess income and funding cost shocks, which are calibrated consistent with the adverse scenario.
Debt-at-risk Analysis for the Household Sector	
Objective	- Quantify the share of financially weak households - Quantify the share of household debt-at-risk
Data	- Household-level financial information based on representative households from the Survey of Financial Security (Statistics Canada) - The Survey of Financial Security was conducted in 1999, 2005, 2012, and 2016.
Methodology	- Financially weak households are defined as households that have excessive indebtedness, substantial debt-servicing obligations, and/or inadequate liquidity. - Excessive indebtedness entails that debt exceeds 450 percent of disposable income. - Substantial debt-servicing obligations entails that debt-servicing (principal and interest payments) exceeds 40 percent of disposable income. - Inadequate liquidity entails that liquid assets, such as cash, deposits and debt and equity securities, do not cover one month of debt-servicing obligations. - Debt belongs to financially weak households are considered being at risk. - Debt-at-risk not covered by assets are debt-at-risk that belongs to households with real estate assets less than mortgage borrowing. Real estate assets are considered with a haircut of 10 percent to capture potential recovery costs. - Sensitivity analysis is performed to assess income and funding cost shocks, which are calibrated consistent with the adverse scenario.

Indicator of Housing Market Imbalances	
Objective	- Assess the extent of housing market imbalances
Data	- Canadian Real Estate Association - Haver Analytics
Methodology	- The housing market imbalances index comprises house prices (growth of house prices; price to income; price to rent), construction (growth of real construction investment, real residential permit value, dwelling starts, dwelling under construction, and housing completion), inventory and sales (unabsorbed dwellings; sales to new listings), mortgage (growth of real total mortgage and real residential mortgage), and household balance sheet (borrowing and net accounts payable to disposable income; mortgages to nonfinancial assets). - The housing market imbalance indices are based on simple aggregation of abovementioned indicators. The indices are derived for Canada and some major cities. - For regional indices, some indicators could be based on provincial or national levels depending on data availability.
House Price-at-risk Analysis	
Objective	- Assess downside risk to future changes in house prices conditional on macrofinancial conditions, as well as city-level house price valuation and supply factors - Examine the key drivers of the tail risks to future changes in house prices
Data	- Bloomberg - Canadian Real Estate Association - Haver Analytics - IMF's International Financial Statistics - Statistics Canada
Methodology	- Based on April 2019 GFSR - Future changes in real house prices are forecasted based on the growth-at-risk framework proposed by Adrian, Boyarchenko and Giannone (2018). - The distribution of future changes in real house prices is derived by fitting a parametric skewed *t*-distribution, using predicted values of future changes in real house prices by quantiles. - The quantile regression approach is used to establish the city-level relationship between future changes in real house prices and regional factors and macrofinancial conditions. The regional factors, for example, include house price-to-income. Canada-wide macrofinancial conditions comprise financial conditions, household indebtedness and capital flows. - The analysis particularly focuses on the evolution of the tail risks—the 5-percent house price-at-risk (i.e., the 5th percentile of the fitted skewed *t*-distribution), as well as their key drivers.

Growth-at-risk Analysis	
Objective	- Quantify the impact of macrofinancial vulnerabilities on economic growth - Assess downside risk to economic growth conditional on financial conditions and macrofinancial vulnerabilities
Data	- Bloomberg - Canadian Real Estate Association - Haver Analytics - IMF's World Economic Outlook database
Methodology	- Based on Adrian, Boyarchenko and Giannone (2018), and Ananthakrishnan Prasad and others (2019) - The distribution of future real GDP growth is derived by fitting a parametric skewed *t*-distribution, using predicted values of future real GDP growth by quantiles. - The quantile regression approach is used to establish the relationship between future real GDP growth and financial conditions as well as macrofinancial vulnerabilities. - Financial conditions capture risk pricing conditions, bank lending conditions, house price growth, and global financial conditions. - Macrofinancial vulnerabilities capture corporate and household sector vulnerabilities (i.e., indebtedness, leverage and debt-servicing capacity), housing market imbalances, and credit-to-GDP gap. - The analysis particularly focuses on the evolution of the tail risks—the 5-percent growth-at-risk (i.e., the 5th percentile of the fitted skewed *t*-distribution), as well as their key drivers.

Appendix III. Stress Testing Matrix

Bank Solvency Stress Testing

Domain		Assumptions	
		Top-down by Bank of Canada (BOC)	**Top-down by FSAP team**
1. Institutional perimeter	Institutions included	• Seven domestic systemically important financial institutions (D-SIFIs), including six domestic systemically important banks (D-SIBs) and the credit cooperative group in Québec	
	Market share	• For six D-SIBs, about 97 percent of banking sector assets (excluding foreign bank branches) • For seven D-SIFIs, above 90 percent of total assets of deposit-taking institutions	
	Data and baseline date	• OSFI: regulatory returns and supervisory data, supplemented by ad-hoc data collection • AMF: regulatory returns • Statistics Canada: National Household Survey data • Data as of October 2018 • Scope of financial consolidation: group-wide	• OSFI: regulatory returns and supervisory data, supplemented by ad-hoc data collection • AMF: regulatory returns • Statistics Canada: National Household Survey data • Moody's Analytics: CreditEdge data on corporate default probability • Data as of October 2018 • Scope of financial consolidation: group-wide
2. Channels of risk propagation	Methodology	• Balance sheet approach • Projections of key balance sheet, income statement and capital account items • Quasi-static balance sheet assumption • Net interest income is projected based on effective interest rates for each interest-sensitive asset/liability segment. Overlays account for repricing profiles of assets and liabilities and spreads to reflect credit risk and liquidity conditions. • Non-interest income is split into market-sensitive (e.g., underwriting and wealth management fees) and non-market sensitive (e.g., deposit and loan fees) sources. Market sensitive income is projected based on the evolution of a basket of	• Balance sheet approach • Projections of key balance sheet, income statement and capital account items • Quasi-static balance sheet assumption • Net interest income is projected based on effective interest rates for each interest-sensitive asset/liability segment, together with an overlay of spreads to reflect credit risk and liquidity conditions. Pass-through constraints may be applied in parallel with the satellite projection. • Non-interest income is projected based on its sensitivity to macrofinancial conditions. • Operational expenses are kept at the same as the 2018 level but are adjusted in terms of foreign-currency composition.

Domain		Assumptions	
		Top-down by Bank of Canada (BOC)	**Top-down by FSAP team**
2. Channels of risk propagation	Methodology	asset prices. Non-market sensitive income is projected based on a fixed ratio to total loans. • Granular projections of credit risk parameters are performed, including exposures at default (EADs), probabilities of default (PDs) and losses given default (LGDs) for each asset class and geography. • Accounting provisions assumes a partial drawdown of undrawn exposures under stress. • IFRS 9 expected credit losses are projected based on a simplified approach (i.e., no projected stage transitions) that reallocates provisions toward earlier periods. • The impact on profit and loss (P&L) and other comprehensive income (OCI) due to fair value through profit or loss (FVTPL) and fair value through other comprehensive income (FVOCI) positions is estimated. • The impact of exchange rate movements on risk-weighted assets, credit losses and pre-provision net income is not assessed. • Risk weighted assets are adjusted to reflect overall asset growth and appropriate changes in the quality of credit exposures.	• Granular projections of credit risk parameters are performed, including EADs, PDs and LGDs for each asset class and geography. • IFRS 9 expected credit losses are projected in line with PDs, using a stage transition matrix. • The impact on P&L and OCI due to FVTPL and FVOCI positions is estimated. • The mark-to-market approach is used to assess the impact of exchange rates, equity prices and commodity prices on net open positions. • The consolidation of balance sheet and income statement accounts for exchange rate movements. • Risk weighted assets are adjusted to reflect overall asset growth and appropriate changes in the quality of credit and market exposures.
	Satellite models for macrofinancial linkages	• The Household Risk Assessment Model (HRAM)—is used to estimate PDs for mortgage and home equity lines of credit (HELOCs). • For other exposures, a suite of error correction models are used to project consolidated nonperforming loan ratios. Projections are then translated into PDs per geographies using expert judgement. • Error correction models are used to project effective interest rates.	• Several empirical models are used, together with the Bayesian Model Average technique, to estimate effective interest rates. Models may be bank-specific or may be adjusted for bank-specific starting points. • A simplified conservative approach is used to project non-interest income. • A structural model approach, partially relying on Monte Carlo simulations, is used to for estimate PDs and LGDs for mortgage exposures.

Domain		Assumptions	
		Top-down by Bank of Canada (BOC)	**Top-down by FSAP team**
2. Channels of risk propagation	Satellite models for macrofinancial linkages		• Several empirical models are used, together with the Bayesian Model Average technique, to point-in-time (PiT) PDs for other credit exposures. Models may be bank-specific.
3. Tail shocks	Stress test horizon	• Three years (2018Q4–2021Q4)	
	Scenario analysis	• Based on two common macrofinancial scenarios • The scenarios specify key macrofinancial variables (e.g., real GDP growth, inflation rate, unemployment rates, exchange rates, equity prices, house prices, interest rates and credit growth) for Canada and important geographies/countries, as well as global variables (e.g. commodity prices). • The baseline scenario is based on October 2018 World Economic Outlook (WEO) projections. • The adverse scenario is simulated using the Global Macrofinancial Model (GFM). The adverse scenario features a severe recession that occurs concurrently with significant financial market stress and a sharp housing market correction. The main triggers would be external developments, including global trade disruptions, tightening global financial conditions and weaker-than-expected global economic activity, as described in the Risk Assessment Matrix (RAM). The central feature of the adverse scenario is tighter-than-expected monetary policy by some major central banks in response to potential de-anchoring of inflation expectations, which would be induced by the disruption in international trade and global production chains. With disorderly monetary tightening, significant global financial market stress would set off global housing market and credit cycle downturns. The impact of these negative external shocks would then be amplified by existing macrofinancial vulnerabilities such as housing market imbalances and high household debt, resulting in a sharp housing market correction and deterioration in bank asset quality. Significant financial stress would also materialize in Canada. • Under the adverse scenario, the Canadian economy would encounter two years of output contraction (2018 and 2019), with cumulative real GDP growth of -2 percent during 2019–21, equivalent to 3 standard deviation. Based on growth-at-risk analysis, its likelihood is 3.8 percent.	
	Sensitivity analysis	• A number of sensitivity exercises surrounding the scenario analysis are explored.	• A number of sensitivity exercises surrounding the scenario analysis are explored. • Shocks to household affordability, critically affect PDs of mortgage exposures, are simulated under an alternative assumption in which higher-risk borrowers would be asked for some credit spreads to compensate banks for larger capital charges. This would amplify stress on households' affordability.

Domain		Assumptions	
		Top-down by Bank of Canada (BOC)	**Top-down by FSAP team**
3. Tail shocks	Sensitivity analysis		• Assessment of the impact on accounting lifetime expected credit loss for Stage II mortgage exposures because of a shorter contractual lifetime vs a longer average amortization lifetime. • Assessment of the relative impact on losses due to the utilization of committed credit lines in an adverse scenario with no balance sheet restrictions (impact of undrawn EADs). • Assessment of the relative impact on losses due to the utilization of committed credit lines in an adverse scenario with no balance sheet restrictions (impact of undrawn EADs). • Shocks to certain funding (e.g. interbank funding and less stable wholesale/corporate deposits) are simulated with additional spreads for banks to maintain short-term funding under increased uncertainty. • Shocks to non-interest income are simulated o capture varying degrees of market-sensitive components of non-interest income. • Credit exposure concentration risk are also assessed, taking into account of market structure specificities.
4. Risks and buffers	Risks/factors assessed (how each element is derived, assumptions)	• Credit risk captures all drawn and undrawn balances associated with on-balance sheet loan portfolios and exposures at amortization cost. • Market risk is reflected in valuation effects of FVTPL and FVOCI positions, as well as net open financial positions (i.e., currencies, equities and commodities). • Net interest income is affected by margined implied by asset-side and liability-side interest rates.	• Credit risk captures all on-balance sheet loan portfolios and exposures at amortization cost. • Market risk is reflected in valuation effects of FVTPL and FVOCI positions, as well as net open financial positions (i.e., currencies, equities, and commodities). • Net interest income is affected by margined implied by asset-side and liability-side interest rates.

Domain		Assumptions	
		Top-down by Bank of Canada (BOC)	**Top-down by FSAP team**
4. Risks and buffers	Behavioral adjustments	• On-balance sheet credit EADs evolves based on credit growth assumption in scenarios. • Off-balance sheet credit EADs associated with undrawn balances are assumed to grow in proportion with drawn balances such that utilization remains fixed. All facilities are assumed to be contractually irrevocable to extend funds in the future. • In solvency module, EADs linked to securities holdings remain constant. • In addition, the framework features the contagion module based on the MacroFinancial Risk Assessment Framework (MFRAF) that can analyze contagion effects, including interaction between solvency and liquidity conditions. • Dividends are equal to the greater of the most recent historical dividend (2018Q4) or the dividend implied by a fixed ratio of dividends to post-tax net income. Dividends are not reduced unless a breach of the capital conservation buffer occurs, at which maximum dividend payout is subject to regulatory restrictions.	• On-balance sheet credit EADs evolves broadly based on credit growth assumption in scenarios, with some adjustments reflecting the credit supply effects dynamics. • Off-balance sheet credit EADs are assumed to evolves broadly based on credit growth assumption in scenarios. Additional increases in the degree of utilization of undrawn exposures is part of the sensitivity analysis. All facilities are assumed to be contractually irrevocable to extend funds in the future. • EADs linked to securities holdings remain constant. • If relevant, maturing assets are replaced by exposures of the same type of risk. • Maturing capital instruments are generally not allowed to be renewed in the adverse scenario. Some exceptions may be granted for certain capital instruments issued in foreign currency by overseas subsidiaries in order to acknowledge the impact of foreign exchange fluctuations. • If banks' capital falls below regulatory requirements, no prompt corrective action is assumed. • Dividends anchored at the dividend level of the last fiscal year before the cut-off date are assumed to be paid by banks. When the capital conservation buffer is breached, restrictions on dividend distribution is in line with the regulatory framework.

Domain		Assumptions	
		Top-down by Bank of Canada (BOC)	**Top-down by FSAP team**
5. Regulatory and market-based standards and parameters	Calibration of risk parameters	• Scenario dependent forward paths for PiT PDs and LGDs are estimated for each asset class and geography based on historical non-performing loan ratios (for the corporate sector) or a structural model based on microsimulations using the HRAM (for the household sector). • Given the limited availability of PiT LGD data, some proxies are used. • For internal ratings-based (IRB) exposures, risk-weight assets are projected on the basis of updated regulatory through-the-cycle (TTC) PDs and downturn LGDs, using appropriate scaling multipliers from the PiT parameters.	• Scenario dependent forward paths for PiT PDs and LGDs are estimated for each asset class and geography. • Estimation of expected credit losses for mortgage exposures is based on projected distributions of debt-servicing ratio (DSR) and loan-to-value (LTV). • IFRS 9 expected credit losses are projected by estimating stage transition matrices based on projected PiT PDs and historical stage transition rates. Estimation of lifetime expected losses assume a transition to the baseline parameters after a period of 5 years. • Given the limited availability of PiT LGD data, some very basic proxies are used. • For internal ratings-based (IRB) exposures, risk-weight assets are projected on the basis of updated regulatory TTC PDs and downturn LGDs, using appropriate scaling multipliers from the PiT parameters. • For standardized approach (STA) exposures, risk-weight assets are projected on the basis of constant risk weight densities.
	Regulatory/accounting and market-based standards	• In the baseline, hurdles include the regulatory minimum, the capital conservation buffer, the D-SIFI surcharge, and the applicable countercyclical capital buffer and/or domestic stability buffer. • In the adverse scenario, hurdles include the regulatory minimum and the D-SIFI surcharge. • Hurdle rates are based on the common equity tier-1, tier-1 and total capital ratios.	
6. Reporting format for results	Output presentation	• System-wide evolution of CET1, T1 and total capital ratios. • Distribution of banks' capital positions • Contribution to key drivers to system-wide net income and capital position, including differences between the baseline scenario and the adverse scenario. • Number of institutions with capital below the hurdles, and the share of their assets • Amount of capital shortfalls	

Bank Liquidity Stress Testing

Domain		Assumptions
		Top-down by FSAP team
1. Institutional perimeter	Institutions included	• Seven domestic systemically important financial institutions (D-SIFIs), including six domestic systemically important banks (D-SIBs) and the credit cooperative group in Québec
	Market share	• For six D-SIBs, about 97 percent of banking sector assets (excluding foreign bank branches) • For seven D-SIFIs, above 90 percent of total assets of deposit-taking institutions
	Data and baseline date	• OSFI: regulatory returns based on the Liquidity Coverage Ratio (LCR) and the Net Cumulative Cash Flow (NCCF) • AMF: similar regulatory returns • Data as of September 2018 • Scope of financial consolidation: group-wide
2. Channels of risk propagation	Methodology	• The exercise is based on two types of tests—LCR test and cash-flow analysis. • The LCR test is in line with the standard Basel monitoring tool, featuring total liquidity and liquidity in all significant currencies (Canadian dollar, U.S. dollar, euro, British pound, and Japanese yen). • The cash-flow analysis analyzes the net cash balance, accounting for available unencumbered assets, contractual cash inflows and outflows, and behavioral flows. • For the cash-flow analysis, relevant second-round effects could be considered, including margin calls for existing collateral positions, central bank's liquidity provision, additional asset haircuts due to fire sales, additional repo haircuts due to more limited collateral supply, and wholesale funding market freezes as a result of banks' solvency and liquidity concerns.
	Satellite models for macrofinancial linkages	• For the cash-flow analysis, asset haircuts reflect two components: (i) shocks to interest rates and asset prices as captured the macrofinancial scenarios; and (ii) additional haircuts required by counterparties to accept specific assets as collateral for secured funding transactions.
	Stress test horizon	• For the LCR test, the stress test horizon is 30 days. • For the cash-flow analysis, the horizon of stress events would normally be 3 months. Nonetheless, a set of more persistent stress events (up to 1 year) were considered as sensitivity analysis.
3. Tail shocks	Scenario analysis	• For the LCR test, three scenarios are considered: (i) a run on retail deposits, with higher run-off rates for retail deposits; (ii) a run on wholesale funding, with higher run-off rates for corporate deposits and other wholesale funding; and (iii) a combination of runs on retail deposits and wholesale funding. • For the cash-flow analysis, a series of scenarios are considered, with a range from mild to severe liquidity conditions. The cash-flow analysis considers both funding and market liquidity risks.
	Sensitivity analysis	N/A

Domain		Assumptions
		Top-down by FSAP team
4. Risks and buffers	Risks/factors assessed (how each element is derived, assumptions)	• Funding liquidity risk is reflected in funding run-off rates and asset roll-over rates, the latter providing cash inflows related to non-renewal of maturing assets. • Market liquidity risk is reflected in asset haircuts, which could be influenced by market movements, fire sales and collateral supply constraints.
	Behavioral adjustments	• Liquidity from the central bank's emergency lending assistance (ELA) is not considered. • The cash-flow analysis may consider some behavioral assumptions about a counterparty's ability or willingness to transact based on banks' solvency and liquidity conditions.
5. Regulatory and market-based standards and parameters	Calibration of risk parameters	• The LCR tests are based on regulatory and stress parameters. • The cash-flow analysis may incorporate relevant second-round effects. • Stress funding run-off rates, asset roll-over rates, and asset haircuts are calibrated based on empirical evidence and relevant international experiences.
	Regulatory/accounting and market-based standards	• LCR per Basel III; the hurdle at 100 percent • Net cash balance for the cash-flow analysis; to pass, a non-negative net cash balance is required, where the balance reflects net cash outflows and counterbalancing capacity.
6. Reporting format for results	Output presentation	• Changes in the system-wide liquidity position, including important drivers for cash outflows, cash inflows and counterbalancing capacity • Distribution of banks' liquidity positions • Number of institutions with LCR below 100 percent and/or negative net cash balance • Amount of liquidity shortfalls, including by currencies

Life Insurance Stress Testing

Domain		Assumptions
		Top-down by FSAP team
1. Institutional perimeter	Institutions included	• Five largest life insurers, including three globally active federally regulated entities and two domestically oriented, provincially regulated entities in Québec
	Market share	• Above 90 percent of life insurers' total assets • About 80 percent of life insurers' total net premiums
	Data and baseline date	• OSFI: regulatory returns, supplemented by ad-hoc data collection • AMF: regulatory returns, supplemented by ad-hoc data collection • Data as of December 2018 • Scope of financial consolidation: group-wide
2. Channels of risk propagation	Methodology	• Balance sheet approach • Static balance sheet assumption • The exercise assesses the instantaneous impact of macrofinancial shocks on the solvency position through three main channels. • Projections of key balance sheet and capital account items by six key geographies (i.e., Canada, Europe, Japan, the United Kingdom, the United States and others) • The mark-to-market approach is used to assess the impact of macrofinancial shocks on investment portfolios, which would in turn affect available capital. • The assessment of actuarial liabilities due to changes in discount rates as a result of changes in risk-free rates, which would in turn affect available capital. • Adjustments to base solvency buffer are made to reflect changes in credit risk and market risk.
	Satellite models for macrofinancial linkages	N/A
	Stress test horizon	• Three years (2018Q4–2021Q4)
3. Tail shocks	Scenario analysis	• Based on one macrofinancial scenario—the adverse scenario • The scenarios specify key macrofinancial variables (e.g., real GDP growth, inflation rate, unemployment rates, exchange rates, equity prices, house prices, interest rates and credit growth) for Canada and important geographies/countries, as well as global variables (e.g., commodity prices).

Domain		Assumptions
		Top-down by FSAP team
3. Tail shocks	Scenario analysis	• The adverse scenario is simulated using the GFM. The adverse scenario features a severe recession that occurs concurrently with significant financial market stress and a sharp housing market correction. The main triggers would be external developments, including global trade disruptions, tightening global financial conditions and weaker-than-expected global economic activity, as described in the RAM. The central feature of the adverse scenario is tighter-than-expected monetary policy by some major central banks in response to potential de-anchoring of inflation expectations, which would be induced by the disruption in international trade and global production chains. With disorderly monetary tightening, significant global financial market stress would set off global housing market and credit cycle downturns. The impact of these negative external shocks would then be amplified by existing macrofinancial vulnerabilities such as housing market imbalances and high household debt, resulting in a sharp housing market correction and deterioration in bank asset quality. Significant financial stress would also materialize in Canada. • Under the adverse scenario, the Canadian economy would encounter two years of output contraction (2018 and 2019), with cumulative real GDP growth of -2 percent during 2019–21, equivalent to 3 standard deviation. Based on growth-at-risk analysis, its likelihood is 3.8 percent. • Given the methodological approach, the exercise considers two periods of the adverse scenario. The first period is 2019Q3, which reflects the most severe financial market stress. The second period is 2021Q4, which features the lowest interest rates.
	Sensitivity analysis	• A number of sensitivity exercises surrounding the scenario analysis are explored. In particular, alternative assumptions regarding changes in risk-free interest rates that would generate a more material impact are examined.
4. Risks and buffers	Risks/factors assessed (how each element is derived, assumptions)	• Market risk and credit risk affect the valuation of investment portfolios. • Interest rate risk, i.e., only changes in risk-free interest rates, affect actuarial liabilities.
	Behavioral adjustments	• The surplus allowance is assumed to remain proportional to the present value of liabilities.
5. Regulatory and market-based standards and parameters	Calibration of risk parameters	• Risk-free interest rates, as well as asset prices (i.e., credit spreads, equity prices, and house prices) are calibrated in line with the macrofinancial scenario. • The yield curves of risk-free interest rates, which critically determine liability-side discount rates in the exercise, are interpolated based on relevant short-term and long-term government bond yields. • Macrofinancial shocks mainly affect available capital and base solvency buffer.
	Regulatory/accounting and market-based standards	• Regulatory capital framework based on Canada's Life Insurance Capital Adequacy Test (LICAT) • Hurdle rates based on the regulatory minimums for the LICAT's core and total capital ratios at 50 percent and 90 percent, respectively.

Domain		Assumptions
		Top-down by FSAP team
5. Regulatory and market-based standards and parameters	Regulatory/accounting and market-based standards	• The total capital ratio is based on the sum of available capital (including both tier-1 and tier-2 capital), surplus allowance and eligible deposits, divided by base solvency buffer. The core capital ratio is based on the sum of tier-1 capital, surplus allowance (only 70 percent), and eligible deposits (only 70 percent), divided by base solvency buffer.
6. Reporting format for results	Output presentation	• System-wide evolution of core and total capital ratios. • Distribution of life insurers' capital positions • Contribution to key drivers to system-wide capital position • Number of institutions with capital below the hurdles, and the share of their assets • Amount of capital shortfalls

Mortgage Insurance Stress Testing

Domain		Assumptions
		Top-down by FSAP team
1. Institutional perimeter	Institutions included	• All three mortgage insurers, all federally regulated
	Market share	• 100 percent of mortgage insurers' total assets
	Data and baseline date	• OSFI: regulatory returns • CMHC: data equivalent to OSFI regulatory returns • Data as of September 2018 • Scope of financial consolidation: mortgage insurance business
2. Channels of risk propagation	Methodology	• Balance sheet approach • Projections of key balance sheet, income statement and capital account items • Passive balance sheet assumption • Premium earnings are projected in line with overall insured mortgage credit growth (based on the scenario) and adjusted to reflect institutions' behavior under stress. • Claims are projected to mirror banks' potential losses on mortgage exposures. A cross-check with estimated expected credit losses incurred by banks would be made. • Other income and expense components are projected based on their sensitivity to macrofinancial conditions. • The mark-to-market approach is used to assess the impact of macrofinancial shocks on investment portfolios, which would in turn affect available capital. • Adjustments to minimum required capital are made to reflect changes in credit risk, insurance risk, market risk and operational risk. • Insurance risk is adjusted based on LTV that reflects updated house prices (as sensitivity analysis).
	Satellite models for macrofinancial linkages	• Empirical models are used to project key components of non-premium income and expenses.
	Stress test horizon	• Three years (2018Q4–2021Q4)
3. Tail shocks	Scenario analysis	• Based on two common macrofinancial scenarios • The scenarios specify key macrofinancial variables (e.g., real GDP growth, inflation rate, unemployment rates, exchange rates, equity prices, house prices, interest rates, and credit growth) for Canada and important geographies/countries, as well as global variables (e.g., commodity prices). • The baseline scenario is based on October 2018 WEO projections.

Domain		Assumptions
		Top-down by FSAP team
3. Tail shocks	Scenario analysis	• The adverse scenario is simulated using the GFM. The adverse scenario features a severe recession that occurs concurrently with significant financial market stress and a sharp housing market correction. The main triggers would be external developments, including global trade disruptions, tightening global financial conditions and weaker-than-expected global economic activity, as described in the RAM. The central feature of the adverse scenario is tighter-than-expected monetary policy by some major central banks in response to potential de-anchoring of inflation expectations, which would be induced by the disruption in international trade and global production chains. With disorderly monetary tightening, significant global financial market stress would set off global housing market and credit cycle downturns. The impact of these negative external shocks would then be amplified by existing macrofinancial vulnerabilities such as housing market imbalances and high household debt, resulting in a sharp housing market correction and deterioration in bank asset quality. Significant financial stress would also materialize in Canada. • Under the adverse scenario, the Canadian economy would encounter two years of output contraction (2018 and 2019), with cumulative real GDP growth of -2 percent during 2019-21, equivalent to 3 standard deviation. Based on growth-at-risk analysis, its likelihood is 3.8 percent.
4. Risks and buffer	Risks/factors assessed (how each element is derived, assumptions)	• Credit and market risks affect the valuation of investment portfolios. • Insurance risk is captured in two aspects—claim payouts and minimum required capital. • New mortgage insurance business evolves in line with overall insured mortgage credit growth (based on the scenario) and institutions' behavior under stress (e.g. during the global financial crisis).
	Behavioral adjustments	• Net income, through the impact on equity, determines the overall size of investment portfolios. The asset allocation in investment portfolios remains unchanged. • If relevant, maturing assets are replaced by exposures of the same type of risk. • If mortgage insurers' capital falls below regulatory requirements, no prompt corrective action is assumed. • Dividends are paid if mortgage insurers generate positive post-tax net income and do not need additional capital.
5. Regulatory and market-based standards and parameters	Calibration of risk parameters	• Claim payouts are projected based on expected credit losses for mortgage exposures under the bank solvency stress tests. • Changes in insurance risk, which would affect minimum required capital, are estimated to reflect changes in house prices and thus changes in LTV. • The impact of relevant asset prices on investment portfolios in terms of credit and market risks (i.e., credit spreads, interest rates, equity prices) are assessed according to the macrofinancial scenarios.

Domain		Assumptions
		Top-down by FSAP team
5. Regulatory and market-based standards and parameters	Regulatory/accounting and market-based standards	• Regulatory capital framework based on Canada's Mortgage Insurance Capital Adequacy Test (MICAT) • Hurdle rates based on the supervisory target for the MICAT's capital ratio at 150 percent. • The MICAT's capital ratio is based on available capital divided by two-thirds of minimum required capital.
6. Reporting format for results	Output presentation	• System-wide evolution of MICAT ratio. • Distribution of mortgage insurers' capital positions. • Contribution to key drivers to system-wide net income and capital position, including differences between the baseline scenario and the adverse scenario. • Number of institutions with capital below the hurdles, and the share of their assets. • Amount of capital shortfalls.

Investment Fund Stress Testing

Domain		Assumptions	
		Top-down by Bank of Canada (BOC)	**Top-down by FSAP team**
1. Institutional perimeter	Institutions included	• Open-ended Canada-domiciled mutual funds with lifetime average allocations to Canadian dollar-denominated corporate bond above 20 percent and lifetime average assets under management of at least Can$50 million • Only funds with fixed income and balanced mandates • Sample funds held Can$323 billion in assets under management as of 2018Q3	
	Market share	• 19 percent of mutual funds' assets under management • Samples funds held 77 percent of corporate bonds (including both financial and nonfinancial issuers) held by mutual funds, 25 percent of outstanding Canadian corporate bonds, and 8 percent of outstanding Canadian government bonds (including subnational issuers).	
	Data and baseline date	• Morningstar: monthly fund-level assets (including the allocation) and fund flows (defined as net sales or redemptions of mutual fund shares) • Fund flow data since January 2002 • Asset holding data as of September 2018	
2. Channels of risk propagation	Methodology	• The exercise quantifies the amount of asset sales (particularly, corporate bonds) following redemption shocks. • Fund-level redemptions are calibrated by (i) assuming a duration-driven shock to fund performance based on a shift in interest rates; and (ii) estimating investors' net redemptions in response to that shock, based on an estimated sensitivity of fund flows to fund-level performance. • The exercise also quantifies the price impact on corporate bonds due to the forced sales.	• The exercise quantifies the amount of asset sales (particularly, corporate bonds) following redemption shocks. • Fund-level redemptions are calibrated based on historical fund-flows experience
	Satellite models for macrofinancial linkages	• Each fund's sensitivity is estimated based on the observed relationship between fund flows and a CAPM model-derived measure of "alpha," or fund outperformance relative to a benchmark.	N/A

Domain		Assumptions	
		Top-down by Bank of Canada (BOC)	**Top-down by FSAP team**
	Satellite models for macrofinancial linkages	• The resulting price impact on corporate bonds is estimated as a function of the balance sheet constraints and market conditions faced by broker-dealers and leveraged investors.	
	Stress test horizon	N/A	
3. Tail shocks	Scenario analysis	• A parallel increase in the yield curve by 100 basis points	• Two exogenous redemption shocks are calibrated at the fund-level using the first percentile of the historical distribution of monthly fund flows. • The first shock is based on the distribution combining all funds of a given investment mandate (i.e., fixed-income and balanced). • The second shock is based on the distribution of each individual fund.
	Sensitivity analysis	N/A	
4. Risks and buffers	Risks/factors assessed (how each element is derived, assumptions)	• Market risk affects performance of mutual funds, which in turn creates liquidity risk that entails bond sales. Then, performance of mutual funds is affected by resulting bond sales.	
	Behavioral adjustments	• Sales of corporate bonds and other assets resulting from redemptions are calculated through an assumption that fund managers liquidate fund assets on a pro-rata basis as well as a waterfall basis (i.e., based on the liquidity hierarchy).	
5. Regulatory and market-based standards and parameters	Calibration of risk parameters	• Fund-level redemptions are calibrated based on the fund-level sensitivity of net fund flows to fund performance.	
	Regulatory/accounting and market-based standards	N/A	
6. Reporting format for results	Output presentation	• Amount of forced corporate bond sales, relative to outstanding amounts of bonds and trading volumes by bond types • Resulting price impact on corporate bonds	• Amount of forced corporate bond sales, relative to outstanding amounts of bonds and trading volumes by bond types

Appendix IV. Analytical Matrix for Systemic Stress and Interconnectedness Analysis

Systemic Stress of Financial Institutions	
Objective	- Quantify the joint probability of distress among financial institutions - Measure systemic stress based on (i) number of institutions to become distressed given than at least one became distressed, and (ii) expected loss related to the 1st-percentile tail risk. - Quantify cascade effects, which capture the probability that at least another institution become distressed given than a particular institution became distressed
Data	- Expected default probability and market capitalization (Moody's Analytics) - Stock prices (Bloomberg) - Coverage: major financial institutions in Canada, including 10 deposit-taking institutions, 7 insurers, and 2 other nonbank entities.
Methodology	- Based on Segoviano and Goodhart (2009) - Conceptually, individual financial institutions' probabilities of distress are modelled to derive a joint probability of distress. Then, relationship of probabilities of distress between financial institutions can be analyzed. Furthermore, simulations were performed to estimate expected losses.
Spillovers in Bond and Equity Markets	
Objective	- Quantify the magnitude of cross-border spillovers in bond and equity markets
Data	- Daily total stock market returns, as well as stock market returns for banking and insurance (Bloomberg, Datastream) - Daily changes in 10-year government bond yields (Bloomberg, Datastream) - Coverage: 29 countries with a systemically important financial sector; from January 2005.
Methodology	- Based on Diebold and Yilmaz (2014) and April 2016 GFSR - A vector autoregression (VAR) econometric framework is used to estimate asset prices to quantify spillovers, which are captured as the fraction of the 8-day ahead forecast variance of one country's asset prices that can be accounted for by innovations in another country's asset prices. - Each VAR model includes three exogenous variables—financial conditions index (from Bloomberg), oil prices, and VIX. - The generalized variance decomposition framework, developed by Koop, Pesaran and Potter (1996) and Pesaran and Shin (1998), is used.