BANK OF CANADA
BANQUE DU CANADA

Financial System Review

June 2018

Canada's Financial System

The financial system and the economy

- A stable and efficient financial system is essential for sustained economic growth and rising living standards.
- The ability of households and firms to channel savings into productive investments and manage the associated risks with confidence is one of the fundamental building blocks of our economy.

Systemic risk

- Financial system vulnerabilities are pre-existing conditions that can amplify or propagate shocks. Examples include high leverage and asset price misalignments, as well as maturity and funding mismatches. The interaction between vulnerabilities and triggers can lead to the realization of risks that can impair the financial system and harm the economy.
- Actions to reduce vulnerabilities and increase the resilience of the financial system help reduce systemic risk and support financial stability.

The role of the Bank of Canada

- As part of its commitment to promote the economic and financial welfare of Canada, the Bank of Canada actively fosters a stable and efficient financial system.
- The Bank does this by providing central banking services, including various liquidity and lender-of-last-resort facilities, overseeing key Canadian financial market infrastructures, conducting and publishing analyses and research, and helping to develop and implement policy.
- The Bank collaborates with international, federal and provincial authorities to achieve its financial system goals.

The Financial System Review

- In the *Financial System Review* (FSR), the Bank analyzes the resilience of the Canadian financial system. The first section of the FSR summarizes the judgment of the Bank of Canada's Governing Council on the main vulnerabilities and risks to financial stability. It also highlights the efforts of authorities to mitigate those risks.
- Financial and macroeconomic stability are interrelated. The FSR's assessment of financial risks is therefore presented in the context of the Bank's assessment of macroeconomic conditions, as given in its *Monetary Policy Report*.
- The FSR also presents staff analysis of the financial system and policies to support its resilience. More generally, the FSR promotes informed discussion on all aspects of the financial system. The *Financial System Review* is available on the Bank of Canada's website at bankofcanada.ca.

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The Assessment of Vulnerabilities and Risks section is a product of the Governing Council of the Bank of Canada: Stephen S. Poloz, Carolyn A. Wilkins, Timothy Lane, Lawrence Schembri, Lynn Patterson and Sylvain Leduc.

This report includes data received up to May 31, 2018.

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Assessment of Vulnerabilities and Risks

Elevated household indebtedness, housing market imbalances and the potential for cyber attacks to disrupt the highly interconnected financial system remain the key vulnerabilities affecting the Canadian financial system. While there are some continued signs of easing, household vulnerabilities remain elevated and are expected to persist for some time.

The Canadian economy is operating close to its potential. Labour income growth is solid, supporting households' ability to service their outstanding debt, albeit in an environment of rising global interest rates.

As anticipated in the November 2017 *Financial System Review* (FSR), monetary, macroprudential and other policy measures have led to a slowing in household credit growth and have moderated activity in the housing market. Tightened mortgage standards are also improving the quality of new mortgage lending, leading to fewer households becoming highly indebted. Although the market for single-family homes in Toronto has cooled, imbalances in condominium markets have continued to grow, particularly in Vancouver and Toronto and their surrounding regions.

Cyber attacks and other operational-risk incidents could seriously disrupt the financial system if they propagated widely or undermined confidence. Collective actions to improve cyber defences and recovery planning will help reduce the potential impact of such incidents.

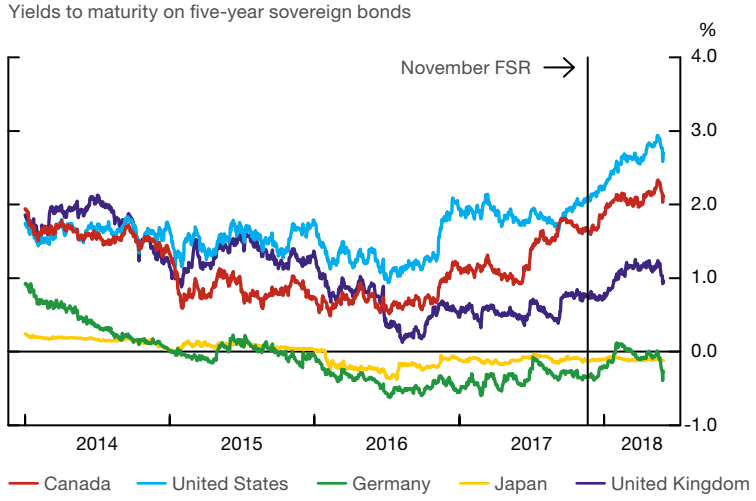
The overall risk to the financial system is broadly unchanged since November 2017. Elevated financial vulnerabilities have the potential to amplify the effects of adverse shocks on the economy and the financial system. But the Canadian financial system is resilient, and its ability to manage negative shocks is being further improved by new policy measures.

Macrofinancial conditions

Solid economic growth has led interest rates in Canada and some other advanced economies to rise from historically low levels (**Chart 1**). Over the past year, yields on US five-year sovereign bonds have risen by as much as 119 basis points and are currently about 95 basis points higher than a year ago. Sovereign yields in Canada have risen by a similar amount, contributing to higher bank funding costs.

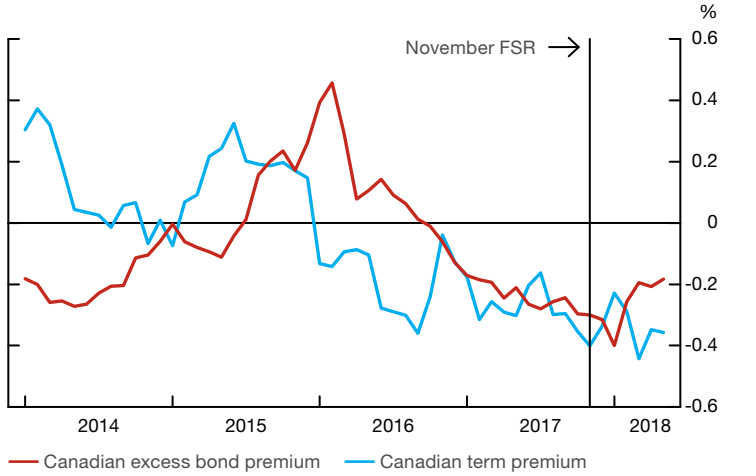
Chart 1: Government bond yields have increased in most advanced economies

Yields to maturity on five-year sovereign bonds



Source: Bloomberg Finance L.P. Last observation: May 31, 2018

Chart 2: Canadian bond premiums remain low



Note: The excess bond premium captures compensation for risk beyond expected default and provides a measure of investor sentiment or risk preference in the corporate bond market. The term premium is the estimated term-structure risk-premium component from yields on 10-year zero-coupon government bonds.

Sources: Bank of America Merrill Lynch, Bloomberg Finance L.P. and Bank of Canada calculations Last observation: May 2018

Consequently, five-year fixed mortgage rates have increased by about 110 basis points, while rates for new variable mortgages rose by close to 40 basis points. Since the implementation of new mortgage standards, non-price lending conditions for mortgages and home equity lines of credit have also tightened.

Equity volatility has returned to its post-crisis average after a sharp repricing in February. Some risk premiums have also begun to edge up, partly due to geopolitical developments. In addition, financial stress is developing in some emerging-market economies (EMEs), particularly those with high levels of foreign currency debt and weaker current account positions. However, asset valuations are still elevated and risk premiums remain at low levels across a number of asset classes, including bonds (**Chart 2**).

Key vulnerabilities in the Canadian financial system

Vulnerability 1: Elevated level of Canadian household indebtedness

Strong income gains, a significant slowing in household credit growth and improvements in credit quality have begun to ease the vulnerability associated with high household indebtedness. But even as conditions slowly improve, the sheer size of the outstanding debt means that the vulnerability will likely persist at an elevated level for some time.

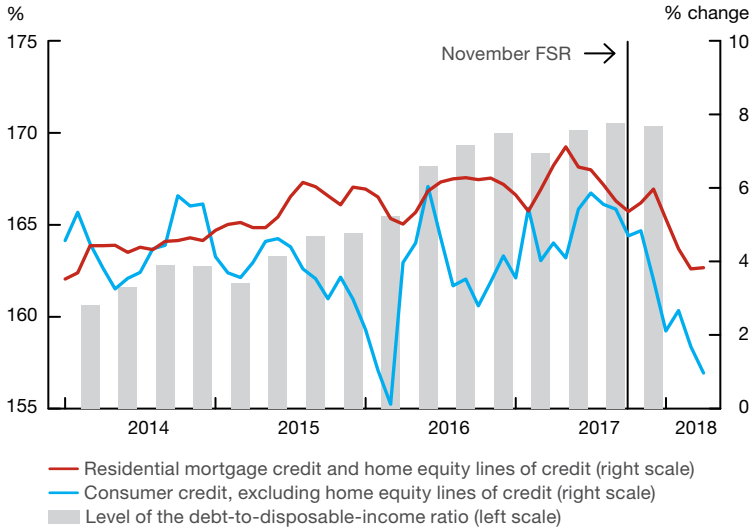
As expected, higher interest rates and policy measures related to mortgage financing and housing are restraining credit growth. The quality of new mortgage debt has continued to improve because of tightened mortgage underwriting standards. However, it is too early to assess the full effects of the most recent changes on new lending, including the volume of credit activity migrating to credit unions and private lenders. Higher overall debt levels make existing mortgage holders more sensitive to interest rate increases. The pace of rate increases will depend on domestic monetary policy and global market forces. The ability of households to manage payment increases associated with higher rates will also depend on the pace of income growth.

Household credit growth has slowed, but indebtedness remains high

The ratio of household debt to disposable income was near 170 per cent at the end of 2017 and is likely to have declined slightly in the first quarter of 2018. Growth in residential mortgages and home equity lines of credit slowed in the first four months of the year, in line with weaker home sales and slower house price growth (**Chart 3** and **Vulnerability 2**). The pace of other consumer borrowing, which makes up the remaining 15 per cent of outstanding household debt, has also slowed.

Auto loans, which represent around 40 per cent of this other consumer credit, grew by 5.5 per cent in 2017. Households have been taking longer to pay down their auto loans. As a result, car values often depreciate faster than loan principals: around one-third of consumers trading in their old car for a new one owe

Chart 3: Household credit growth slowed in recent months



Note: Growth rates in credit are in three-month seasonally adjusted annualized terms. The consumer credit series excludes one-off events, such as the reclassification of institutions between sectors. The November FSR line is placed to indicate the most recent data available at the time of the report, not the publication date.

Sources: Statistics Canada and Bank of Canada calculations

Last observations: credit series, April 2018; debt-to-disposable-income, 2017Q4

more than their old car is worth.[1] High auto debt would be more of a concern if loans were increasingly going to riskier, non-prime borrowers, or if borrowers were experiencing difficulties making payments. But the share of loans going to non-prime borrowers has remained stable, at roughly 22 per cent.[2] The rate of non-prime auto loans falling into payment arrears also remains modest, with only a slight increase from 0.7 to 0.9 per cent over 2017.

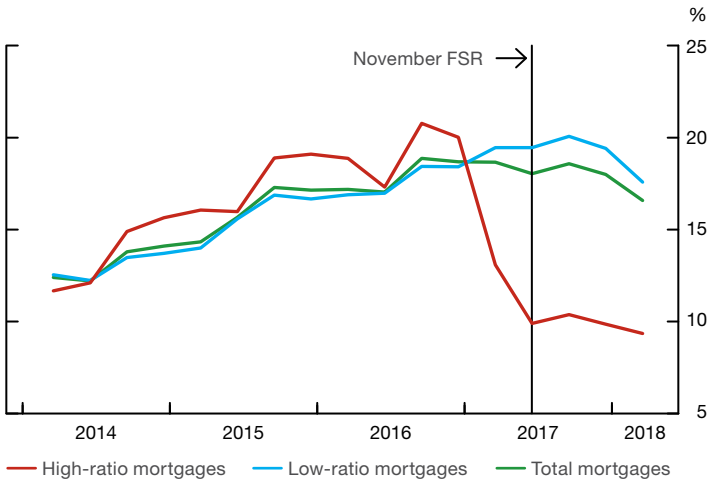
Tightened standards continue to improve the quality of mortgage lending

Tightened mortgage underwriting standards have reduced the maximum size of loans that borrowers can obtain at a given level of income (**Box 1**). In the autumn of 2016, changes to mortgage insurance rules made all high-ratio mortgages (those with a loan-to-value ratio above 80 per cent) subject to a mortgage interest rate stress test. This requirement cut in half the proportion of new high-ratio borrowers who take on mortgage debt in excess of 450 per cent of their gross income (**Chart 4**). Looking at total mortgages, the share of these highly indebted households in new mortgage lending stopped rising and even declined slightly beginning in late 2017. The 2016 changes have also led to a reduction in the proportion of new low-ratio mortgages with an amortization period longer than 25 years.[3]

The updated Guideline B-20, which took effect at the beginning of 2018, tightened standards for low-ratio mortgages.[4] The guideline is dampening credit growth and improving the quality of new mortgage lending, especially

Chart 4: Fewer mortgages are going to highly indebted borrowers

Share of new mortgages with loan-to-income ratios greater than 450 per cent



Note: Data include purchases and refinances originated by federally regulated financial institutions. For high-ratio mortgages, the share with high loan-to-income ratios is larger than in previous issues of the FSR because the mortgage insurance premium is now included in the loan amount. The November FSR line is placed to indicate the most recent data available at the time of the report, not the publication date.

Sources: Department of Finance Canada, regulatory filings of Canadian banks and Bank of Canada calculations

Last observation: 2018Q1

1 The risks posed to households by auto loans, especially loans with extended terms, are discussed in Financial Consumer Agency of Canada, "Auto Finance: Market Trends" (March 2016).

2 This analysis of auto loans is based on Bank of Canada calculations using data from TransUnion and regulatory filings of Canadian banks. Loans to borrowers with credit scores less than 680 are considered non-prime for this analysis.

3 The 2016 changes to the mortgage insurance rules applied, for the first time, the same underwriting rules to low-ratio portfolio-insured mortgages as those that had previously applied only to high-ratio mortgages. This includes a maximum 25-year amortization period.

4 See "Final Revised Guideline B-20: Residential Mortgage Underwriting Practices and Procedures" (from the Office of the Superintendent of Financial Institutions), which was published in October 2017. The revisions to the guideline are intended to reinforce a strong and prudent regulatory regime for residential mortgage underwriting in Canada.

Box 1

Mortgage interest rate stress tests

Canadian financial institutions generally have robust underwriting practices for mortgages. More recently, federally mandated mortgage interest rate stress tests were introduced to help ensure that borrowers can adjust to future increases in their mortgage rates.

To qualify for a mortgage, borrowers typically need to demonstrate that their debt payments and other housing-related costs will not account for too large a share of their income. A borrower's ability to pay is assessed by calculating a debt-service ratio and comparing it with a maximum allowable value.[1] To meet the stress test, a borrower's debt-service ratio is calculated using a higher mortgage rate than the rate the lender will charge. The stress test affects only the maximum loan that a borrower can qualify for at a given level of income; it does not change the size of the borrower's payments. Table 1-A provides an example of how the stress test constrains mortgage size.[2]

Before 2016, federally mandated stress tests applied only to mortgages with variable rates or with fixed terms of less than five years. Starting in the autumn of 2016, federal authorities extended stress tests to cover almost all mortgages—first through changes to mortgage insurance rules and then through an updated mortgage underwriting guideline for banks (Chart 1-A).

Banks can make some exceptions to provide low-ratio loans to borrowers with high housing equity or financial wealth. In addition, the federally mandated stress tests do not extend to mortgages from non-federally regulated lenders unless those loans are subject to mortgage insurance rules.

Table 1-A: Effects of the mortgage interest rate stress test
Example for a median-income borrower

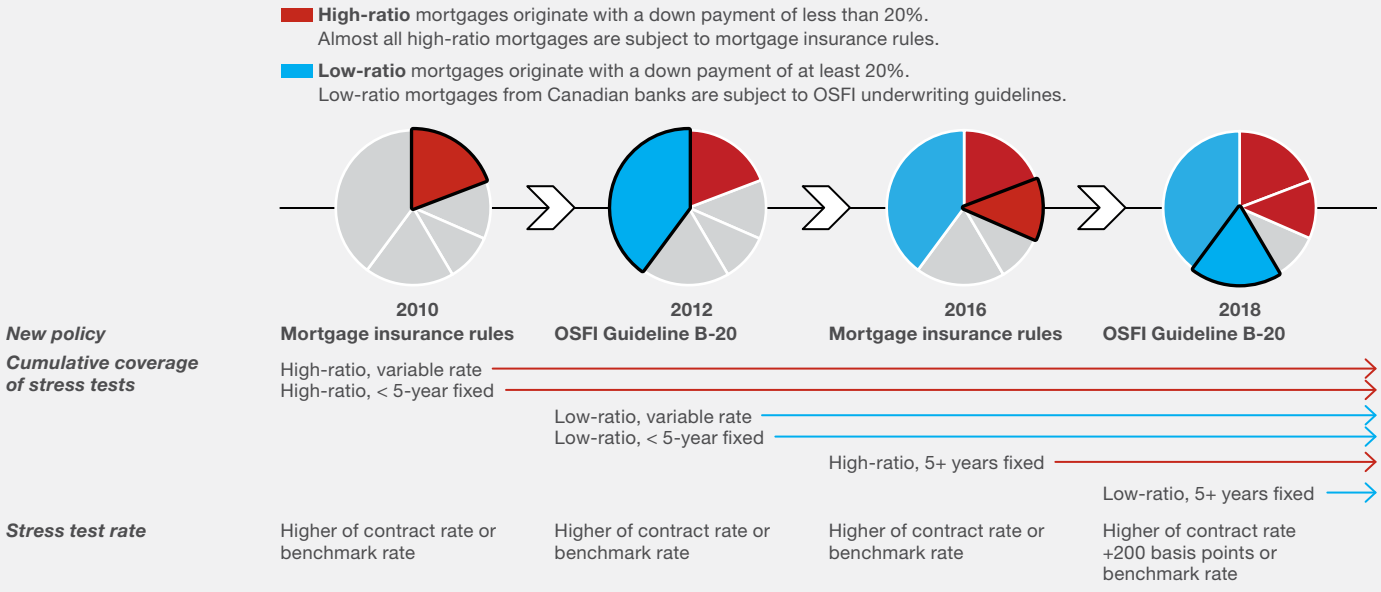
	No stress test	With Guideline B-20 stress test
Household income	$98,000	
Mortgage type	Uninsured, 5-year, fixed-rate, 25-year amortization period	
Qualifying rate	3.69%	5.69%
Maximum loan size	$455,000	$373,000
Maximum loan-to-income ratio	465%	380%

Note: The income and the non-mortgage debt-service expense used in these calculations are based on the median characteristics of mortgage borrowers nationally in 2017. The qualifying rate in the "no-stress-test" example is based on prevailing five-year fixed mortgage rates for low-ratio mortgages from national mortgage brokers. Thresholds for the gross debt-service ratio and total debt-service ratio of 39 per cent and 44 per cent, respectively, are applied, although individual lenders can set their own thresholds.

1 For information on how debt-service ratios are calculated, see Canada Mortgage and Housing Corporation, "Calculating GDS/TDS."

2 Other mortgage underwriting criteria, such as credit history, characteristics of the property and the size of the down payment, can also constrain mortgage size. Borrowers could stretch their borrowing capacity by choosing a mortgage with a longer amortization period.

Chart 1-A: A timeline for stress test implementation



Benchmark rate used for stress testing
The benchmark rate is the mode (most common value) of 5-year mortgage rates posted by the Big Six Canadian banks. The Bank of Canada calculates this rate.

Note: The share of mortgages affected by each change is estimated using the flow of mortgages from Canadian banks averaged over the period since 2010. The unaffected share is approximated as the residual of total mortgage credit. A small proportion of low-ratio mortgages are insured at origination and therefore subject to mortgage insurance underwriting standards. As of 2016, portfolio-insured low-ratio mortgages are also subject to the same mortgage insurance underwriting standards. Mortgage insurance rules are set by the Department of Finance Canada. OSFI stands for the Office of the Superintendent of Financial Institutions.

in regions with the highest house prices. For example, because of the new mortgage interest rate stress test, the size of a 5-year, fixed-rate mortgage with a 25-year amortization that a median-income borrower in Canada can qualify for dropped by about $82,000 to $373,000 (**Box 1**). The stress test will have more significant effects in markets such as the Greater Toronto Area (GTA) and Greater Vancouver Area (GVA), where house prices are higher relative to incomes and low-ratio mortgages are more common.

Due to transitional factors, it is too early to observe the full effects of the updated Guideline B-20 in data on low-ratio mortgages used for purchases. Some borrowers who were concerned that they would not qualify under the new guideline likely chose to advance their borrowing decisions and took out loans near the end of 2017. As well, some of the mortgages that originated in the first quarter of 2018 had already been pre-approved under the old guideline. As a result, the share of highly indebted borrowers in new mortgages used for purchases dropped only slightly in the first quarter.

The low-ratio data also include mortgage refinancing transactions, which are less likely to have been affected by these transitory factors. Therefore, a higher portion of refinancing loans were probably approved under the new guideline. Among refinances, the share of highly indebted households dropped by around 2.5 percentage points in the first quarter. This suggests that a larger decline in the share of these borrowers in purchases should be evident once pre-approvals from 2017 have expired.

Table 1 shows some of the data sources the Bank of Canada uses to monitor the mortgage market. It indicates when data will be available for the second quarter of 2018. From the second quarter onward, data will be less affected by transitional factors.

The updated Guideline B-20 is expected to weigh on economic activity, subtracting about 0.2 per cent from the level of gross domestic product (GDP) by the end of 2019. Considerable uncertainty around its ultimate impact on economic activity and mortgage quality remains, since the effects depend not only on how borrowers and lenders choose to adapt to the new conditions, but also on other developments in housing markets and the broader economy.

Table 1: A variety of data sources is required to assess the quality of lending

Source	Type of data	Coverage	Date 2018Q2 data are available
Regulatory filings of Canadian banks	Loan-level data describing the characteristics of mortgage originations and renewals, including household income and asset values	Federally regulated lenders	September
Canada Mortgage and Housing Corporation	Aggregate and loan-level data similar to regulatory filings of Canadian banks	Participants in government securitization programs, including credit unions	Late 2018
Teranet	Land registry data from Ontario, including loan sizes, property values and interest rates	All mortgage lenders in Ontario, including private lenders	July
TransUnion	Anonymized household credit data on outstanding loans and payment histories	Most Canadian lenders	September

Migration of mortgage lending warrants monitoring

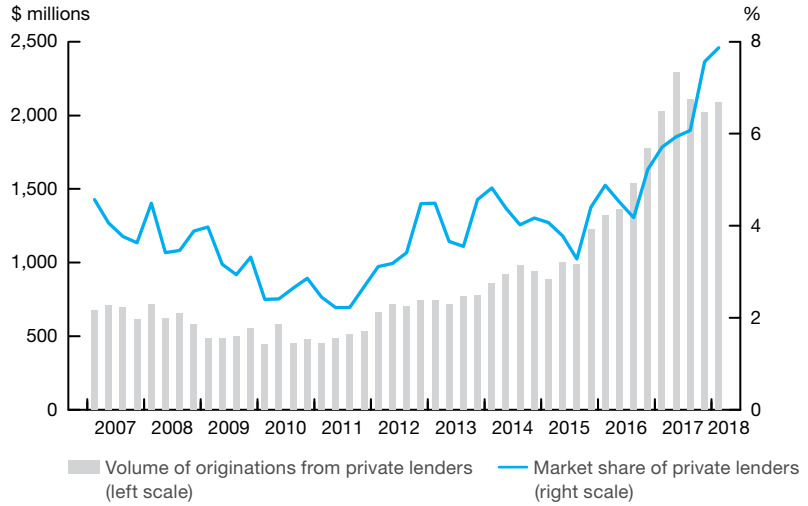
Borrowers who want a larger loan than they qualify for under Guideline B-20 may seek out other lenders, such as credit unions and private lenders, who are not always subject to federal mortgage standards. This could make the new guideline less effective in mitigating the vulnerability for the financial system as a whole.

Credit unions are regulated under provincial rules, and only their insured mortgages are subject to federally mandated stress tests. Among provincial authorities, so far only the Quebec Autorité des marchés financiers requires caisses populaires to apply an equivalent mortgage interest rate stress test. Elsewhere, some credit unions are voluntarily using stress tests similar to those mandated in the federal standards.

Borrowers could also turn to less-regulated private mortgage lenders, such as mortgage investment companies. In 2015 and 2016, the volume of new private lending in the GTA increased in line with overall growth in the market.[5] Since 2017, the volume of private lending has been relatively stable, at a little more than $2 billion per quarter (**Chart 5**), while other sources of lending have declined. The market share of private lending has therefore climbed to nearly 8 per cent of new mortgages in the GTA. This share overstates the importance of private lenders, however, because their loans have shorter terms compared with those of other lenders. As discussed in the November 2017 FSR, to increase their activity substantially, private lenders would need to further develop their lending channels and operational capabilities, and, most importantly, they would have to materially expand their funding sources.

Chart 5: In the Greater Toronto Area, the volume of private lending has been stable for the past year

Mortgage originations weighted by dollar value



Note: Originations include purchases, refinances and second mortgages. Mortgage finance companies are not considered private lenders. Volume is seasonally adjusted.

Sources: Teranet and Bank of Canada calculations Last observation: 2018Q1

5 Current data limitations restrict this analysis to Ontario. Mortgage finance companies are not included in this category because most of their lending is subject to federally mandated mortgage underwriting standards.

Forthcoming data for the second quarter will help improve understanding of the extent of potential movement to non-federally regulated lenders (**Table 1**). Some of the data will come from the approved issuer data reporting framework recently established by the Canada Mortgage and Housing Corporation. The framework will help monitor mortgage underwriting practices.

Assessing mortgage holders' ability to manage higher rates

Higher levels of debt mean that interest rate increases will have a larger effect on households' financial positions and consumption spending than they had in the past.[6] Existing borrowers are affected by interest rate increases when their mortgage comes up for renewal if it has a fixed rate or immediately if their mortgage has a variable rate.[7] With variable-rate and renewals of fixed-rate mortgages combined, just under half of existing mortgage holders in any given year (or a little more than half if home equity lines of credit are included) are affected by rate increases.[8] The proportion of mortgage borrowers subject to interest rate risk each year has been relatively constant over the past six years.

Most existing mortgage holders have not borrowed the maximum amount they can obtain and therefore likely have some room to manage higher mortgage payments. In addition, households with variable-rate mortgages or fixed-rate mortgages with terms of less than five years have already been subject to a stress test (**Box 1**). Because they passed the test, they should be able to manage somewhat higher interest rates. The exception would be households that have experienced declines in income or substantially increased their other borrowing since qualifying for their mortgage.

Around 45 per cent of outstanding mortgages are five-year, fixed-rate mortgages and roughly 20 per cent of these come up for renewal each year. Homeowners with these mortgages were not subject to stress tests until recently, and some of them may have difficulty managing an increase in payments when they renew their mortgages. The effect of an interest rate increase on these households will depend on the level of their debt and income.

For illustration purposes, assume that the mortgage rates of borrowers renewing in 2019 are 100 basis points higher than the rates they paid at origination in 2014.[9] Assume also that, in 2020, rates for renewers are 200 basis points higher than the rates they paid at origination in 2015. To assess how this will affect households whose *income stays constant*, consider the size of mortgage payments relative to income—the debt-service ratio (DSR). In 2019, more than 90 per cent of the five-year fixed-rate borrowers would face increases in their DSR of less than 3 percentage points (**Table 2**). In 2020, when borrowers face a larger hypothetical interest rate increase, 46 per cent of borrowers would have increases in their DSR of less than 3 percentage points and close to 20 per cent of borrowers would have increases in their DSR exceeding 5 percentage points.

However, in the time between when these borrowers took out their mortgage and when they renew, many will likely be earning a higher income. Over the past five years, nominal labour income for the average Canadian

6 See the April 2018 Bank of Canada *Monetary Policy Report*.

7 Some variable-rate mortgages have fixed payments. As interest rates increase, more of the payment is devoted to interest and less to principal. Borrowers with these mortgages are protected from an immediate cash flow shock but will face a higher principal amount when their mortgage comes up for renewal.

8 The difference between interest rate risk and renewal risk for mortgages is discussed in O. Bilyk, C. MacDonald and B. Peterson, "Interest Rate and Renewal Risk for Mortgages," Bank of Canada Staff Analytical Note No. 2018-18 (June 2018).

9 Full loan-level data are available from regulatory filings of Canadian banks starting only in 2014. Five-year mortgages originated in that year will be up for renewal in 2019.

Table 2: Potential increase in housing debt-service ratios at renewal
Percentage of five-year fixed-rate mortgage borrowers

Renewal year	Hypothetical mortgage rate increase at renewal	Increase in debt-service ratio between origination and renewal, assuming no increase in nominal income			
		<1 pps	1–3 pps	3–5 pps	>5 pps
2019	+100 basis points	27%	67%	6%	0%
2020	+200 basis points	9%	37%	35%	19%

Note: Calculations include purchases and refinances. The debt-service ratio is the ratio of mortgage payments to pre-tax income. Amortization remains constant. pps = percentage points
Sources: Regulatory filings of Canadian banks and Bank of Canada calculations

worker has cumulatively increased by about 11 per cent. Income growth will nevertheless vary across individual households. Those who experience smaller income gains will have more difficulty making the higher mortgage payments, especially households that have high debt relative to income.

Vulnerability 2: Imbalances in the Canadian housing market

Led by strength in Toronto and Vancouver and their surrounding areas, the average home price in Canada has risen significantly in recent years.[10] Over the past year, however, declining affordability, together with monetary, macroprudential and housing policy measures, has weighed on housing markets. As a result, growth in the average home price in Canada has slowed sharply, led by declines in the price of homes in the GTA.

In Toronto and Vancouver and their surrounding areas, the market for single-family homes has cooled, while condominium prices have continued to grow at a rapid pace. Economic fundamentals are driving these changes, but speculative activity may also be supporting strong price gains in condominiums.

Overall, the vulnerability associated with imbalances in the Canadian housing market shows some signs of lessening but remains elevated.

National house price growth has slowed markedly

House price growth in Canada was strong for several years, peaking in early 2017. Employment gains, increased immigration and low interest rates have boosted demand, while geographic constraints and land-use regulations have limited the supply of new single-family homes, particularly in some of Canada's large urban centres. Speculative behaviour also contributed to higher prices in some key markets, as have higher building fees and taxes.[11]

Since last year, however, declining affordability, tighter mortgage underwriting standards and higher interest rates have weighed on housing demand and price growth, especially for more expensive homes. Taxes on non-residents have also dampened demand and overall market sentiment. Foreign buyer activity in the Greater Golden Horseshoe has been lower since the Ontario Fair Housing Plan was implemented in April 2017.[12] In February 2018, British Columbia raised its foreign buyers' tax from 15 per cent to 20 per cent and expanded the coverage to some areas

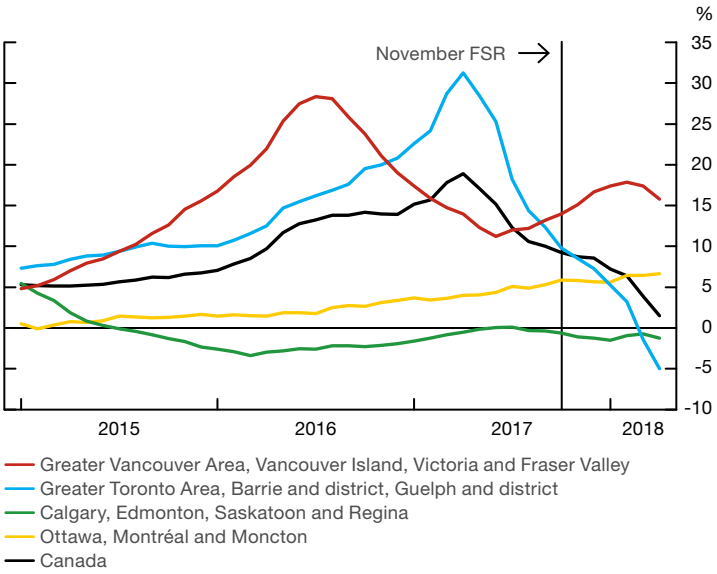
10 Quality-adjusted benchmark prices from the Canadian Real Estate Association MLS Home Price Index are used.

11 An analysis of building fees in the Toronto region is available in Altus Group Economic Consulting, *Government Charges and Fees on New Homes in the Greater Toronto Area* (May 2, 2018), a study prepared for the Building Industry and Land Development Association. See also B. Dachis and V. Thivierge, "Through the Roof: The High Cost of Barriers to Building New Housing in Canadian Municipalities," C. D. Howe Institute Commentary No. 513 (May 2018).

12 The Greater Golden Horseshoe is a region of Southern Ontario encompassing the Greater Toronto Area and surrounding municipalities. It includes around 9 million residents.

Chart 6: Toronto-area prices have continued to slow national house price growth

Year-over-year growth in quality-adjusted benchmark prices



Note: The lines represent averages of quality-adjusted prices weighted by the population of the corresponding census metropolitan areas as defined by Statistics Canada. The November FSR line is placed to indicate the most recent data available at the time of the report, not the publication date.

Sources: Canadian Real Estate Association, Statistics Canada and Bank of Canada calculations

Last observation: April 2018

outside of Vancouver.[13] From the strong levels observed in early 2017, national resales are declining on a year-over-year basis. Going forward, solid labour income growth and immigration should support a pickup in housing activity.

Overall, growth in national house prices is down from its peak of just under 20 per cent on a year-over-year basis in April 2017 to about 1.5 per cent one year later. Slower national price growth was driven by price declines in the GTA and its surrounding areas (**Chart 6**). In the GVA and nearby areas, the rebound in price growth that began in mid-2017 has started to reverse amid fewer resales.

Housing markets in energy-producing regions remain soft. In Calgary, for example, house prices have been stable after recovering from the 2014–15 oil price shock. Sales are down considerably from last year, however, while active listings are rising.

In contrast, prices in some other housing markets, such as Montréal, have remained on a modest upward trajectory. In these markets, the recent momentum has followed years of relative price stability.

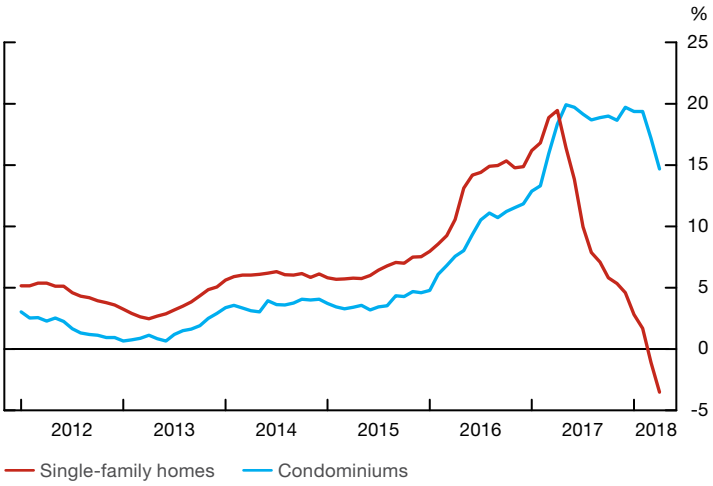
Markets for single-family homes have cooled, while condominium markets remain strong

Between 2012 and 2017, increases in the prices of single-family homes outpaced the prices of condominiums, with supply constraints playing an important role (**Chart 7**). In fact, neighbourhoods in Vancouver and Toronto with the least construction of new single-family homes recorded the largest price gains.

13 British Columbia also announced a new tax, effective in autumn 2018, on individuals who own homes in British Columbia but do not pay income taxes there.

Chart 7: Prices for single-family homes grew faster than condominium prices in Canada until early 2017

Year-over-year growth in national quality-adjusted benchmark prices



Sources: Canadian Real Estate Association and Bank of Canada calculations Last observation: April 2018

Since 2017, however, the trend has reversed, driven mainly by changes in the Toronto and Vancouver areas. High prices for single-family homes and recent policy changes have led to a shift in demand away from single-family homes to less-expensive dwellings, including condominiums. As a result, growth in the prices of single-family homes has slowed markedly (**Chart 8**). In the GTA, single-family house prices have returned to early 2017 levels. Market sentiment deteriorated, reducing investor demand and exacerbating the fall in the prices of single-family homes (**Chart 9**).

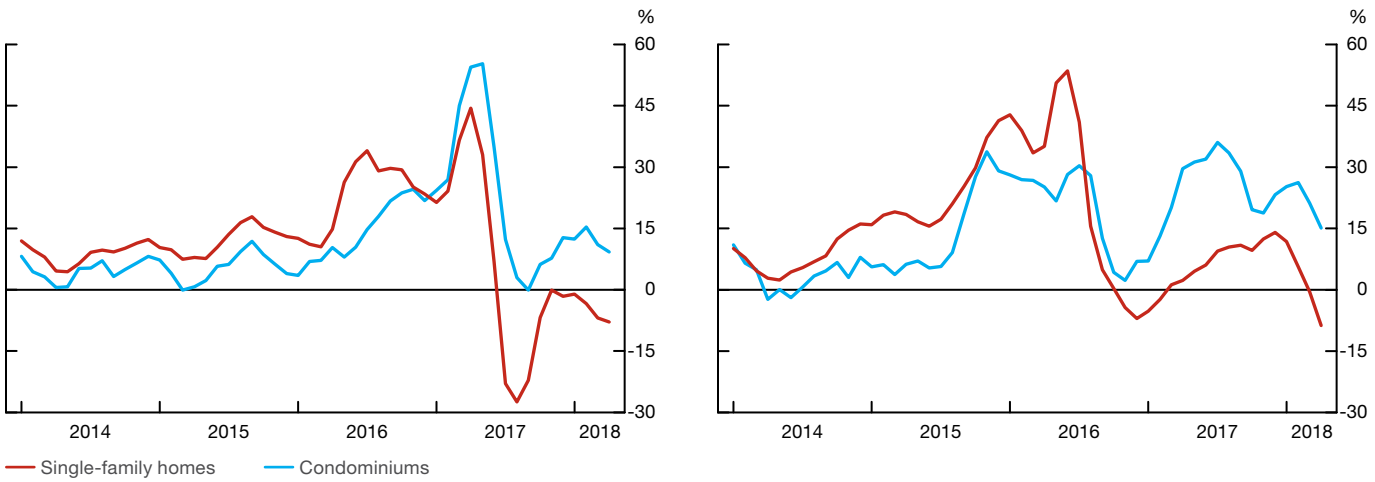
Condominium prices have grown rapidly in the GTA and the GVA (**Chart 8**). Growth in condominium prices in cities surrounding the GVA has been especially strong, with increases reaching 30 per cent in Victoria and 60 per cent in the Fraser Valley on a three-month annualized basis.

Chart 8: Markets for single-family homes in the Toronto and Vancouver areas have softened

Three-month seasonally adjusted annualized growth in quality-adjusted benchmark prices

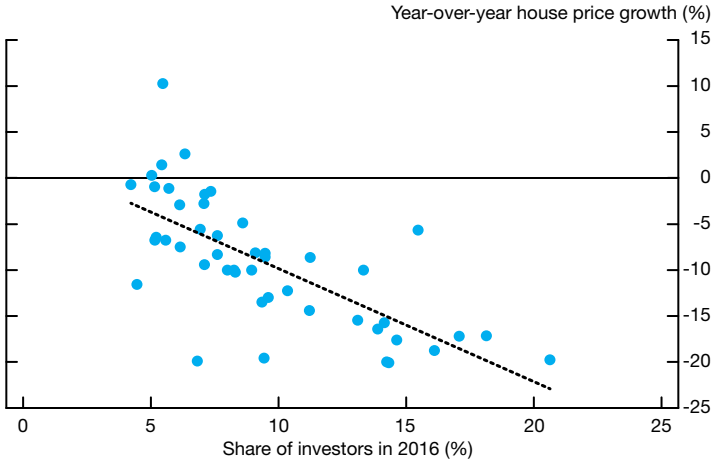
a. Greater Toronto Area

b. Greater Vancouver Area



Sources: Canadian Real Estate Association and Bank of Canada calculations Last observation: April 2018

Chart 9: House prices declined the most in Toronto neighbourhoods where investor presence was the largest



Note: The share of investors is calculated as the percentage of freehold homes sold through the Multiple Listing Service that were immediately listed for rent through the same system. House price growth is for quality-adjusted benchmark prices of single detached homes.

Sources: Realosophy Realty Inc., Toronto Real Estate Board and Bank of Canada calculations

Last observation: April 2018

Completed and unsold condominium inventories remain low in both the GTA and the GVA due, in part, to persistent construction delays.[14, 15] Nonetheless, the number of condominiums under construction is at or near record highs in both cities, suggesting that it may be difficult to sustain the recent pace of price gains over the longer term.

There is also evidence that speculative activity may be supporting the growth in condominium prices in the resale market. An analysis by the Toronto real estate firm Realosophy found an upswing in activity by investors who were buying condominiums and then renting them out within the same year.[16] This greater activity—even as carrying costs (including mortgage payments, property taxes and maintenance fees) have increasingly exceeded rental revenue—suggests that investors have been counting on a continuation of large price increases. Prices that are inflated because of these types of expectations tend to be more sensitive to adverse shocks. If expectations reverse and prices recede, speculators may quickly sell their assets, which could lead to large, rapid price declines, with adverse consequences for the rest of the market.

14 Condominium completions dropped to a five-year low of 13,513 units in 2017—8,121 fewer units than the 21,634 units scheduled for delivery at the beginning of the year. For more on this issue, see "Think Construction Is High Now Just Wait…," Urbanation (March 26, 2018).

15 Evidence from the Canada Mortgage and Housing Corporation's Starts and Completions Survey suggests that the average time it takes to build a condominium in Toronto has expanded from 19 months in 2004 to 29 months in 2017. The longer average construction time can be attributed to factors such as an increase in the average height of condominium buildings, labour shortages and new land-use regulations. In Vancouver, the time to build increased from 17 months to 20 months.

16 The Realosophy results are based on data from Urbanation Inc. and are cited in J. Pasalis, *A Sticky End: Lessons Learned from Toronto's 2017 Real Estate Bubble*, Realosophy Realty Inc. Brokerage (April 2018). For a related discussion about the new condominium market, see S. Hildebrand and B. Tal, "A Window into the World of Condo Investors," Urbanation and the Canadian Imperial Bank of Commerce (April 6, 2018).

Vulnerability 3: Cyber threats, operational risks and financial interconnections

A successful cyber attack or other operational incident at a financial institution or market infrastructure that propagates across the financial system could interrupt the delivery of crucial financial services. The interconnections that make this possible are a structural feature of the financial system and are essential to its efficient functioning. But these interconnections also mean that cyber attacks and other operational incidents extend beyond the concern of any single entity. Ongoing collaboration among public and private stakeholders is therefore crucial for addressing evolving cyber and operational vulnerabilities.

Attempted cyber attacks are frequent and come from a variety of sources. Financial institutions have made significant investments in capabilities for defending against attacks, as well as for identifying and containing successful breaches. If the breach is not contained, a successful cyber attack could affect the broader financial system through direct or indirect links. A successful attack could also undermine confidence in the financial system. For example, concerns about the integrity of financial data, including its destruction or modification, could affect confidence.

Sophisticated attack tools are becoming more widely available as attackers collaborate to increase their capabilities. At the same time, growing demand for skilled cyber security personnel is outstripping supply. To combat this, financial institutions and authorities are building collaborative responses to potential threats. A greater pooling of defensive resources increases the overall protection of the system.

The Bank is collaborating to strengthen the financial system's capacity to recover from cyber attacks

Even as defensive capacity improves across the financial system, some attacks will inevitably succeed. Having strong recovery plans can help to quickly restore financial system functioning and prevent a loss in confidence. For the Bank, this means both augmenting its own cyber defences and investing in operational redundancies.[17]

The Bank is also responsible for overseeing payment clearing and settlement systems. For example, it ensures that appropriate cyber security tools and practices are in place at systemically important financial market infrastructures. Beyond reinforcing the infrastructures themselves, the Bank is collaborating with the Big Six Canadian banks and Payments Canada to create a collaborative plan for a rapid recovery should a key participant in the wholesale payments system be affected by a serious cyber security event.[18]

Since cyber threats cut across mandates, jurisdictions and borders, the Bank continues to collaborate domestically and internationally. The Bank is working closely with our partners to implement the new National Cyber Security Strategy recently announced by the federal government. The Bank participates in the G7 Cyber Expert Group, as well as the SWIFT Global Oversight College and groups organized by the Bank for International Settlements. In May 2018, the governors of major central banks endorsed the strategy adopted by the Committee on Payments and

17 See F. Dinis, "Strengthening Our Cyber Defences" (remarks to Payments Canada, Toronto, Ontario, May 9, 2018).

18 The Big Six Canadian banks are the Bank of Montreal, Bank of Nova Scotia, Canadian Imperial Bank of Commerce, National Bank of Canada, Royal Bank of Canada and Toronto-Dominion Bank.

Market Infrastructures to reduce the risk of fraud in wholesale payments. The strategy proposes to go beyond the system operators to focus on the banks, financial market infrastructures and other financial institutions that are participants in wholesale payment systems.[19]

Other vulnerabilities

Beyond the key vulnerabilities discussed above, the Bank monitors and assesses other vulnerabilities across the entire financial system, including those related to financial institutions, markets and non-bank credit intermediation. This section highlights a few specific areas that have been the focus of recent attention. Although these are not considered key vulnerabilities, the Bank continues to examine data and develop new analysis as part of its ongoing monitoring.

Funding profiles of some small and medium-sized banks

Some small and medium-sized banks focus on uninsured mortgage lending, often to non-traditional borrowers. A significant proportion of funding for these monoline banks has come from brokered deposits—bank deposits placed by third parties. Most brokered deposits are sourced through investment dealers owned by large banks. The experience of Home Capital in 2017 was a reminder that brokered deposits can be withdrawn more quickly than traditional deposits, even though both carry deposit insurance.[20] A few monoline banks have launched online deposit-taking platforms to diversify their deposit base and to reach retail depositors directly rather than through brokers.

The funding profile of these banks will continue to be closely monitored. Although these institutions are small, concerns associated with one could spread to other, similar institutions and possibly to the wider banking system. This underscores the need to further develop more stable funding sources for mortgage lending. Covered bond programs might be able to fulfill part of that need, but they are not currently economical for small banks.[21] Another option is private-label residential mortgage-backed securities.[22]

Reliance of Canadian banks on foreign funding

Access to global financial markets can help strengthen banks' funding profiles. Foreign funding allows banks to diversify their funding sources and, in many instances, obtain lower-cost funding. It also allows banks to expand their foreign holdings and diversify business lines and revenue streams. Canadian banks have primarily used foreign funding to support growth in foreign assets.

However, approximately $190 billion (about 7 per cent of total Canadian-dollar bank assets) is converted into Canadian dollars and used to fund lending in Canada. This use of foreign funding has supported lower

19 See Committee on Payments and Market Infrastructures, "Reducing the Risk of Wholesale Payments Fraud Related to Endpoint Security," Bank for International Settlements CPMI Paper No. 178 (May 8, 2018).

20 See Box 1 in the June 2017 *Financial System Review*.

21 See the report by T. Ahnert, "Covered Bonds as a Source of Funding for Banks' Mortgage Portfolios," in this issue.

22 Since 2014, there have been three issuances of private-label residential mortgage-backed securities. For background information on the market, see A. Mordel and N. Stephens, "Residential Mortgage Securitization in Canada: A Review," Bank of Canada *Financial System Review* (December 2015): 39–48.

borrowing costs and contributed to an increase in overall indebtedness in Canada.[23] A sharp rise in the cost of foreign funding for Canadian banks, if it occurred, would result in a narrowing of funding options. This could then raise borrowing costs for Canadian banks, with the higher costs in turn likely passed on to households, businesses and institutions.

Growth of corporate bond mutual funds and exchange-traded funds

In an environment of low interest rates, some investors have been taking on more risk to boost returns. In fixed-income markets, this search for yield has been characterized by greater demand for corporate bonds and bonds with longer maturities. It has fostered a rise in the number and size of corporate bond exchange-traded funds (ETFs) and corporate bond mutual funds.[24]

Canadian corporate bond mutual funds have grown to around $118 billion in assets under management, from $46 billion at the end of 2007; this represents just over 20 per cent of the total corporate bond market in Canada. Corporate bond ETFs have also grown significantly in Canada over the same period, reaching about $19 billion at the end of 2017.

Both mutual funds and ETFs can be managed actively or passively. Actively managed funds try to outperform benchmarks, whereas passively managed funds typically track the returns of a market index. If investors decided to exit the sector during a period of stress, passive bond funds could mechanically sell corporate bonds to meet investor redemptions. Active bond fund managers have more discretion on how to meet liquidity needs, but they would also likely sell some corporate bonds in addition to their liquid asset holdings.[25]

Simultaneous portfolio rebalancing across funds during a stress period could amplify declines in asset valuations and market liquidity. There are several mitigating factors, however. A significant share of corporate bonds is held outside of these funds. Further, global and domestic authorities have strengthened regulatory guidance, particularly that related to the funds' leverage, concentration limits and liquidity management.[26] Authorities continue to monitor the risk-management strategies of bond mutual funds and ETFs.

Indebtedness of non-financial corporations

Non-financial corporate debt relative to income has been growing rapidly in recent years.[27] Sectoral analysis indicates that the rise in indebtedness has been driven largely by firms in the oil and mining industries (**Chart 10a**).[28]

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23 See G. Bruneau, M. Leboeuf and G. Nolin, "Canada's International Investment Position: Benefits and Potential Vulnerabilities," Bank of Canada *Financial System Review* (June 2017): 43–57.

24 For more information, see R. Arora, N. Merali and G. Ouellet Leblanc, "Did Canadian Corporate Bond Funds Increase Their Exposures to Risks?" Bank of Canada Staff Analytical Note No. 2018-7 (March 2018).

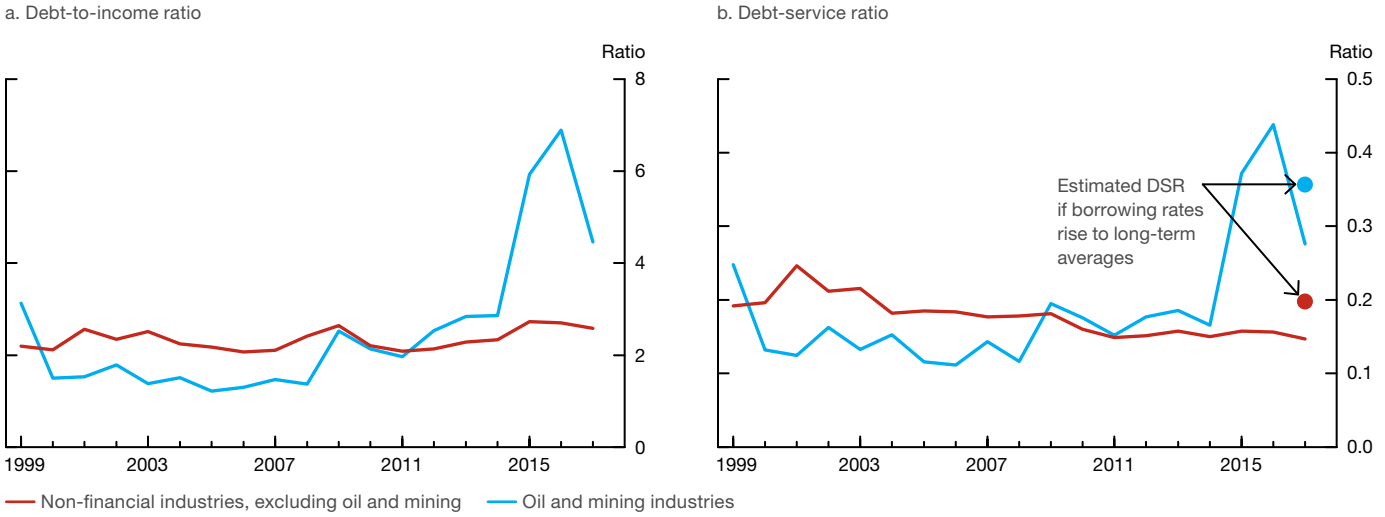
25 An empirical model of this behaviour is described in R. Arora and G. Ouellet Leblanc, "How Do Canadian Corporate Bond Mutual Funds Meet Investor Redemptions?" Bank of Canada Staff Analytical Note No. 2018-14 (May 2018).

26 See, for example, Financial Stability Board, "Policy Recommendations to Address Structural Vulnerabilities from Asset Management Activities" (January 12, 2017). In the Canadian context, an example of securities regulations can be found in "OSC Staff Notice 81-727 Report on Staff's Continuous Disclosure Review of Mutual Fund Practices Relating to Portfolio Liquidity."

27 Growth in non-financial corporate debt has been the main driver of recent increases in Canada's credit-to-GDP gap. The Bank for International Settlements has pointed to the credit-to-GDP gap as a measure of the potential for stress in the banking system. For further details, see T. Duprey, T. Grieder and D. Hogg, "Recent Evolution of Canada's Credit-to-GDP Gap: Measurement and Interpretation," Bank of Canada Staff Analytical Note No. 2017-25 (December 2017).

28 The real estate, auto leasing and financial services industries are excluded from the analysis.

Chart 10: The level of indebtedness is stable in most industries



Note: The debt-to-income ratio is defined as debt divided by earnings before interest, tax, depreciation and amortization. The debt-service ratio (DSR) is defined as interest payments divided by earnings before interest, tax, depreciation and amortization. Debt includes all interest-bearing borrowings obtained from non-affiliated companies.

Sources: Statistics Canada Quarterly Financial Statistics for Enterprises and Bank of Canada calculations

Last observation: 2017

The oil and mining industries combined accounted for around one-fifth of non-financial corporate debt in 2017. The large increase in debt relative to income in these industries reflects both higher debt and a sharp decline in income due to lower commodity prices. Income has recovered somewhat but remains low.

Beyond these two industries, aggregate indebtedness is within ranges typical for the past 20 years. Further, the levels of cash holdings are rising, suggesting that firms have adequate financial flexibility. Even if interest rates return to their long-term average, debt-service ratios will likely remain within historical ranges (**Chart 10b**). In addition, there is no evidence of an increase in the share of debt held by firms with distressed balance sheets.[29]

Crypto assets

Crypto assets are used to transfer value through electronic platforms. Bitcoin is the most well known, but there are more than 1,600 crypto assets with a wide variety of designs and purposes. Although they are sometimes referred to as cryptocurrencies, crypto assets do not perform the key functions of money: they are currently quite poor media of exchange, stores of value and units of account.[30] Crypto assets are built on a distributed ledger technology that has the potential to bring efficiency benefits to the financial system, but they also pose new risks.

The total worldwide market value of all crypto assets peaked at above $1 trillion at the beginning of 2018 but has declined substantially since.[31] This value is small compared with a worldwide equity market capitalization of well over

29 T. Grieder and M. Lipsitz, "Measuring Vulnerabilities in the Non-Financial Corporate Sector Using Industry- and Firm-Level Data," Bank of Canada Staff Analytical Note No. 2018-17 (June 2018).

30 See C. A. Wilkins, "Financial Stability: Taking Care of Unfinished Business" (remarks at the Rotman School of Management conference, Toronto, Ontario, March 22, 2018); and S. S. Poloz, "Three Things Keeping Me Awake at Night" (remarks at the Canadian Club Toronto, Toronto, Ontario, December 14, 2017).

31 Source: coinmarketcap.com. All figures are expressed in Canadian dollars.

$75 trillion. But the market capitalization of crypto assets grew rapidly through 2017, and the daily transaction volume is now more than 75 times higher than in early 2017, reaching more than $25 billion per day.

Financial institutions participating in the Bank of Canada's Financial System Survey report negligible investments in crypto assets, either for themselves or their clients.[32] But financial institutions could become exposed to crypto assets through their clients' own activities or through regulated exchanges where derivatives based on crypto assets are traded.

Crypto asset markets are evolving quickly and could have financial stability implications in the future if their size and links to the financial system continue to grow. The markets are largely unregulated in many countries and are characterized by high price volatility, fragile liquidity, and frequent fraud and cyber attacks.

The improvement of anti-money-laundering and anti-terrorist-financing rules continues to be a priority. Authorities have also been moving to strengthen policies related to the effects of crypto assets on consumer and investor protection, market integrity and tax evasion. A coherent and internationally aligned set of policies to control risks stemming from crypto assets is essential.

The Bank is chairing a group at the Financial Stability Board that is monitoring financial innovations, including crypto assets, in the context of assessing financial system vulnerabilities. The Bank also participates in the Basel Committee on Banking Supervision discussions on the implications of crypto assets for the banking system. Canadian authorities are contributing to the G20's work to mitigate risks posed by crypto assets without discouraging innovation. At a recent G7 meeting, finance ministers and central bank governors agreed that international coordination is needed to ensure that regulatory actions are effective in a globally interconnected financial system. In addition, the Canadian Securities Administrators is providing guidance on the applicability of securities law and warning of risks in these markets.[33]

Key risks

Table 3 shows the risk scenarios for the Canadian financial system. Its purpose is to identify the most important downside risks rather than all possible negative scenarios. Each risk includes a rating based on Governing Council's judgment regarding the probability of the risk occurring and the expected severity of the impact on the Canadian financial system. The overall risk to the financial system remains broadly unchanged from the November Report. A new methodology called "GDP at risk" helps assess the impact of financial system risks on the economy (**Box 2**).

The risk of "stress emanating from China or other emerging-market economies" is no longer presented as a separate risk scenario, as it was in the November 2017 FSR. Instead, financial system stress in China or other EMEs has been incorporated as a potential trigger for risks 1 and 3. This better reflects the indirect transmission channels from risks in China to Canada and does not affect the overall assessment of risks to the Canadian financial system.

32 See the report by G. Bédard-Pagé, I. Christensen, S. Kinnear and M. Leboeuf, "The Bank of Canada's Financial System Survey," in this issue.

33 See "Cryptocurrency Offerings," CSA Staff Notice 46-307 (August 24, 2017); and "Canadian Securities Regulators Remind Investors of Inherent Risks Associated with Cryptocurrency Futures Contracts," press release (December 18, 2017). The International Organization of Securities Commissions is also addressing cross-border issues stemming from crypto assets that could affect investor or consumer protection.

Table 3: Key risks to the stability of the Canadian financial system

Risk scenarios	Ratings and developments since the November 2017 *Financial System Review*
Risk 1: A severe nationwide recession leading to a rise in financial stress	**Elevated but decreasing**
▪ A large, persistent negative foreign demand shock affects Canada. One possibility is a severe recession in China or a sharp rise in global protectionism, which triggers weaker global growth. ▪ A foreign demand shock could lead to a severe recession in Canada, with a sharp rise in unemployment nationwide and a correction in house prices. ▪ Household and housing market vulnerabilities interact to create stress on lenders and the broader financial system.	▪ Economic performance in Canada and abroad has been strong. ▪ Solid job growth and higher wages have enhanced the resilience of Canadian households. ▪ Stronger mortgage underwriting standards and higher interest rates have slowed household credit growth. The updates to Guideline B-20 will also help reduce the creation of highly indebted households. ▪ The stock of household debt remains high and is expected to be elevated for some time.
Risk 2: A house price correction in overheated markets	**Moderate**
▪ Significant house price corrections occur in Toronto and Vancouver and their surrounding areas, with modest direct spillovers to other housing markets. ▪ Residential investment and related consumption fall dramatically in affected regions. ▪ Lender balance sheets deteriorate and credit conditions tighten.	▪ Growth in home prices has slowed markedly over the past year. Resales are also down, but activity is expected to pick up. ▪ Price declines for single-family homes in Toronto have unwound increases from early 2017. In contrast, the growth in condominium prices in Toronto and Vancouver has been strong, and there is evidence of speculative activity.
Risk 3: A sharp increase in long-term interest rates driven by higher global risk premiums	**Moderate but increasing**
▪ Higher global risk premiums are triggered by abrupt market reactions to (i) an unanticipated change in economic policies or (ii) an unexpected increase in inflation prospects. Financial contagion affects a wide range of asset classes. ▪ The resulting collapse in valuations puts many financial institutions under stress, amplified by past risk-taking in the non-bank financial sector.	▪ Major global central banks are gradually withdrawing monetary stimulus, or plan to do so. ▪ Despite gradual increases in global policy rates, risk premiums remain low. ▪ Financial stress is developing in some emerging-market economies, but contagion has so far been limited. ▪ Liquidity mismatch by investment funds could amplify shocks.

Risk ratings:	Low	Moderate	Elevated	High	Very high

The Bank also solicits the views of financial system participants through its Financial System Survey, discussed in a report in this issue. Canadian financial system participants identified the risks of a cyber attack, a geo-political event and a pronounced decline in property prices as among the most important risks to their firms' own activities and the broader financial system.

Assessing financial system resilience

Financial system resilience refers to the system's capacity to withstand and quickly recover from a wide array of shocks. The Bank of Canada is well placed to conduct an overall assessment of this resilience because of its system-wide perspective and the link between this analysis and its other mandates.[34] The Bank provides liquidity to the financial system, oversees payment clearing and settlement systems, and develops and implements monetary policy. This section discusses some of the tools the Bank uses to assess financial system resilience. Although the section focuses on the banking sector, the Bank conducts resilience assessment broadly across the financial system, including non-bank credit intermediation.

34 See D. Lombardi and L. Schembri, "Reinventing the Role of Central Banks in Financial Stability," *Bank of Canada Review* (Autumn 2016): 1–11.

Box 2

Introducing "GDP at risk"

In assessments of financial system risks, considering the range of possible economic outcomes is as important as looking at the most likely path for the economy. Lower interest rates, for example, boost expected economic growth in the short run, but can also lead to a buildup in financial system vulnerabilities by increasing indebtedness. When vulnerabilities in the economy are elevated, adverse shocks can have a larger negative impact on gross domestic product (GDP). For example, if households cannot service their debt when their income falls or financial conditions tighten, larger downside risks to GDP can materialize.

Chart 2-A illustrates how statistical tools can be used to model the impact of increased vulnerabilities, such as indebtedness, on possible outcomes for GDP growth. Greater indebtedness increases median GDP growth, but also amplifies downside risks.

The downside risks to GDP can be summarized using GDP at risk.[1] This is a measure of the worst-case scenario for GDP growth: the rate of GDP growth over one year that should be exceeded in all but the worst 5 per cent of possible outcomes (i.e., the fifth percentile of GDP growth). Financial system vulnerabilities make the worst-case outcome for GDP growth even worse.

GDP at risk is influenced by both macroeconomic performance and financial vulnerabilities (Chart 2-B). For example, GDP at risk worsened in 2015, mostly because of the macroeconomic implications of the oil price shock. But in the period since 2016, the growth in household indebtedness and housing market imbalances has weighed on GDP at risk, even while macroeconomic performance has improved.

By constraining vulnerabilities, financial sector policy may improve GDP at risk. For example, recent policy actions are expected to slow the accumulation of household debt and dampen house price growth. These macroprudential policies tend to reduce median GDP growth, but they should also reduce the chances of a severe contraction of GDP, as measured by GDP at risk. Analyzing policy changes in this framework helps in understanding and quantifying economic and financial stability trade-offs.[2]

Chart 2-A: Financial system vulnerabilities increase downside GDP risks

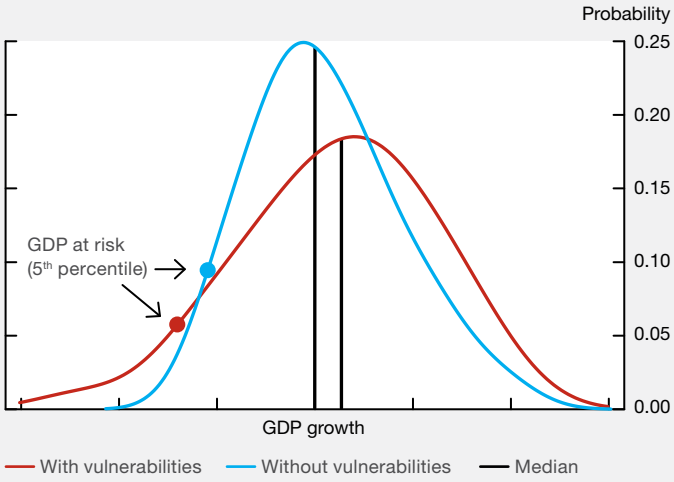
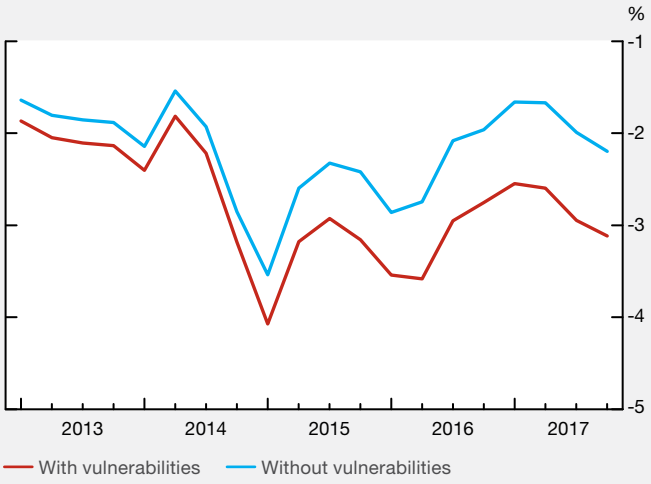


Chart 2-B: Financial vulnerabilities have contributed increasingly to GDP at risk

One-year-ahead forecast of the 5th percentile of GDP growth



Source: Bank of Canada calculations Last observation: 2017Q4

1 T. Adrian, N. Boyarchenko and D. Giannone, "Vulnerable Growth," *American Economic Review* (forthcoming).

2 This framework is discussed in T. Duprey and A. Ueberfeldt, "How to Manage Macroeconomic and Financial Stability Risks: A New Framework," Bank of Canada Staff Analytical Note No. 2018-11 (May 2018).

Table 4: Measures of banking system resilience

	Big Six banks			Smaller banks		
	April 2017	April 2018	Regulatory minimum	March/ April 2017	March/ April 2018	Regulatory minimum
Common equity Tier 1 capital ratio	11.2	11.4	8	12.6	13.4	7
Basel III leverage ratio	4.2	4.3	3	5.9	6.1	3
Liquidity Coverage Ratio	133	137	100			

Note: All figures are expressed as percentages. Smaller banks consist of Canadian Western Bank, Equitable Bank, HSBC Bank Canada, Home Trust Company, Laurentian Bank of Canada and Manulife Bank. Aggregate ratios are calculated as simple averages. For the common equity Tier 1 capital ratio and the Basel III leverage ratio, the Superintendent of Financial Institutions may set higher target capital ratios for individual institutions or groups of institutions where circumstances warrant.

Source: Regulatory filings of Canadian banks

Canadian banks maintain strong capital and liquidity buffers. Their regulatory capital and liquidity ratios have been stable over the past year, with the Big Six and smaller banks maintaining healthy buffers over the regulatory minimums (**Table 4**). The equity capital of the Big Six banks trades at a significant premium to its book value. This reflects market expectations of the future profitability of the banks, which can change quickly in the face of significant financial or economic shocks. Certain smaller banks have market values of equity capital below their book values, reflecting lingering market concerns about their future profitability.

More broadly, participants in the Bank of Canada's Financial System Survey were asked about their confidence in the Canadian financial system if a large shock were to materialize. Most survey participants remain confident in the current resilience of the financial system.

Safeguarding the financial system

The Bank of Canada collaborates with global and domestic authorities to foster a stable and efficient financial system in Canada. This includes measures to increase the resilience of financial institutions and financial market infrastructures and to promote the continuous functioning of core funding markets. In addition to policy measures discussed in the vulnerabilities section in this issue, notable developments have contributed to the efficiency and stability of the broader financial system.

Modernizing the Canadian payments system

The current core payment systems operated by Payments Canada—the Large Value Transfer System (LVTS) and the Automated Clearing Settlement System (ACSS)—together process nearly all electronic payments that occur among financial institutions in Canada. Actions to modernize these systems to keep up with end-user needs and to adopt the latest technologies are outlined by Payments Canada in its *Modernization Target State* document.[35] The Bank of Canada is involved in this multi-year project as the authority responsible for ensuring that risks are being adequately controlled in core payment systems.

The LVTS will be replaced by Lynx, which will be designed to have the same resiliency characteristics, but with improved ability to support new developments such as liquidity saving mechanisms. Lynx will be a real-time gross settlement system, a framework that has been widely adopted

35 See Payments Canada, *Modernization Target State: Summary of the Key Requirements, Conceptual End State, Integrated Work Plan and Benefits of the Modernization Program* (December 2017).

internationally. It will eliminate credit risk among financial institutions, thereby reducing the potential for adverse behaviour by participants during a financial crisis as concerns about other financial institutions arise.

The ACSS will be replaced by the Settlement Optimization Engine, which will continue to process routine and scheduled payments such as cheques, bills and payrolls. The system will be designed with enhanced risk-management functions and improved efficiency of payments processing for financial institutions. A second system called Real-Time Rail is being developed with a focus on new, faster ways to make payments, which facilitates increased competition and fosters innovation. The Bank also intends to consider revisions to its settlement account policy that would broaden access and support these efforts while minimizing risks to the payment system.[36]

Examining interest rate benchmarks for Canada

Financial benchmarks are an important part of the financial system architecture, since they are often used to determine the value or payment of a variety of financial contracts.[37] Since the global financial crisis, international authorities have taken a number of steps to bolster the integrity of core benchmarks in response to concerns about the governance and robustness of benchmarks.

In conjunction with global efforts, the Canadian Alternative Reference Rate Working Group was formed in March 2018, under the auspices of the Canadian Fixed-Income Forum.[38] This group will analyze the need to identify and develop a risk-free term interest rate benchmark to complement the existing Canadian Dollar Offered Rate. The goal is to ensure that benchmarks reflect market conditions and support price discovery within a strong governance framework.

Moving toward ending too-big-to-fail

Implicit government guarantees create incentives for excessive risk-taking and distort prices and resource allocation, potentially increasing the likelihood of bailouts from taxpayers. Staff analysis estimates that this too-big-to-fail subsidy reduces the cost of borrowing for Canada's Big Six banks[39] by 22 to 26 basis points, equivalent to annual savings of $559 million to $713 million.[40]

Under a new bank bail-in regime, certain bondholders will be expected to share in the losses incurred in a bank resolution.[41] Senior unsecured bonds will be converted into equity to recapitalize a failing bank and help restore its viability. This will reduce the probability of future public bailouts and improve incentives in bank funding markets. The bail-in regime is an important part of a broader recovery and resolution approach that allows the government

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36 Access policies are discussed in Department of Finance Canada, "Consultation on the Review of the *Canadian Payments Act*" (May 25, 2018).

37 For more on benchmarks in Canada and other key jurisdictions, see T. Thorn and H. Vikstedt, "Reforming Financial Benchmarks: An International Perspective," Bank of Canada *Financial System Review* (June 2014): 45–51.

38 More information on the working group can be found on the Bank's website.

39 In March 2013, the Office of the Superintendent of Financial Institutions designated the Big Six Canadian banks as "domestic systemically important banks."

40 These estimates are based on the ratings uplift determined by Moody's and Standard & Poor's on the banks' senior unsecured debt obligations. See P. Palhau Mora, "The 'Too Big to Fail' Subsidy in Canada: Some Estimates," Bank of Canada Staff Working Paper No. 2018-9 (February 2018), for a comprehensive discussion of the too-big-to-fail issue and estimates of implicit subsidies in Canada.

41 See Department of Finance Canada, "Government of Canada Adopts Regulations to Support a Sound and Resilient Financial System" (April 18, 2018).

to credibly commit to not rescue a systemically important bank that is in distress. It will apply to senior obligations of the Big Six Canadian banks and comes into force in September 2018.

Continuing work to increase the use of the repo central counterparty

In April, the Canadian Derivatives Clearing Corporation launched a new direct-clearing model that enables the most active buy-side participants in the repo market to centrally clear fixed-income and repo transactions as direct central counterparty (CCP) participants. This service will allow a group of public sector pension funds, which account for a substantial part of buy-side activity in the Canadian repo market, to gain direct access to the CCP. The new service enhances the resilience of this core funding market by mitigating counterparty credit risk.[42] Since other types of buy-side participants are not eligible for this service, part of the repo market will, for the moment, continue to be settled on a bilateral basis.

Ensuring critical financial market infrastructures operate continuously

Financial market infrastructures (FMIs) provide critical payment clearing and settlement services. For the financial system to operate effectively, FMIs that pose systemic or payment system risk must be able to deliver their services regardless of the circumstances. To that end, the Bank of Canada and other financial sector authorities have developed a resolution regime that will preserve financial stability, maintain critical services and minimize public exposure to loss in the highly unlikely event of an FMI failure. The Government of Canada proposed that the Bank be the resolution authority for Canadian FMIs that pose systemic or payment risk. The Bank will coordinate FMI resolution planning with provincial and federal authorities. This important new responsibility is discussed in the report, "Establishing a Resolution Regime for Canada's Financial Market Infrastructures," in this issue.

42 The systemic risk-management benefits of central clearing for this market are discussed in P. Chatterjee, L. Embree and P. Youngman, "Reducing Systemic Risk: Canada's New Central Counterparty for the Fixed-Income Market," Bank of Canada *Financial System Review* (June 2012): 43–49. The benefits of expanded direct clearing are discussed in A. Côté, "Toward a Stronger Financial Market Infrastructure for Canada: Taking Stock" (remarks to the Association for Financial Professionals of Canada, Montreal Chapter, Montréal, Quebec, March 26, 2013).

Reports

Reports present work by Bank of Canada staff on specific financial sector policies and on facets of the financial system's structure and functioning. They are written with the goal of promoting informed public discussion on all aspects of the financial system.

Introduction

This issue of the *Financial System Review* features three reports.

Establishing a Resolution Regime for Canada's Financial Market Infrastructures, by Elizabeth Woodman, Lucia Chung and Nikil Chande, highlights how an effective resolution regime promotes financial stability. It does this by ensuring that financial market infrastructures (FMIs) would be able to continue to provide their critical functions during a period of stress when an FMI's own recovery measures were failing. The report explains the Bank of Canada's new role as the resolution authority for FMIs, which will further bolster financial system resilience.

In **Covered Bonds as a Source of Funding for Banks' Mortgage Portfolios**, Toni Ahnert traces developments in the Canadian covered bond market. Covered bonds could be a valuable way to provide a stable and diverse source of funding, particularly for smaller banks. However, higher issuance could increase banks' vulnerability to liquidity stress, with implications for the broader financial system. The author argues that these benefits and challenges can be balanced in a well-designed policy framework.

The Bank of Canada's Financial System Survey, by Guillaume Bédard-Pagé, Ian Christensen, Scott Kinnear and Maxime Leboeuf, presents the details of a new semi-annual survey that will improve the Bank of Canada's surveillance across the financial system and deepen efforts to engage with financial system participants. The survey collects expert opinions on the risks to and resilience of the Canadian financial system as well as on emerging trends and financial innovations. The report presents an overview of the survey and provides high-level results from the spring 2018 survey.

Establishing a Resolution Regime for Canada's Financial Market Infrastructures

Elizabeth Woodman, Lucia Chung and Nikil Chande

- The continuous operation of financial market infrastructures (FMIs), including payment clearing and settlement systems, is crucial to the Canadian financial system and the economy more broadly.
- The Bank of Canada, in cooperation with federal and provincial authorities, has developed a resolution regime for FMIs that will protect critical services and avoid the need for a public bailout in the highly unlikely event of an FMI failure.
- This work is part of the G20 commitment to establish effective resolution regimes for systemically important institutions such as banks, insurance companies and FMIs.
- The Bank will become the resolution authority for FMIs. It will coordinate FMI resolution planning in normal times with provincial and federal authorities. Should a crisis materialize with an FMI, the Bank will take timely actions to preserve financial stability.
- Developing appropriate mechanisms to facilitate coordination both before and after a resolution event, as well as sharing sensitive information among authorities, will be a priority.

Introduction

Financial market infrastructures (FMIs) are the backbone of the financial system, providing essential payment clearing and settlement services to their participants, who are primarily large financial institutions. FMIs provide the infrastructure through which consumers and firms safely and efficiently purchase goods and services, make financial investments, manage risks and transfer funds. Certain FMIs are critical to the stability of the Canadian financial system and the functioning of the economy. If such an FMI were to fail, it could impair the functioning of financial markets, the ability of other financial institutions to carry out their business activities and the ability of Canadians to make or receive timely payments.

The Governor of the Bank of Canada has designated the most critical FMIs as systemically important. This means they are subject to oversight by the Bank to ensure they are adequately controlling the risk they pose to the

Box 1

Which financial market infrastructures have been designated, and what is their role?

Under the *Payment Clearing and Settlement Act*, the Governor of the Bank of Canada can designate a financial market infrastructure (FMI) for oversight by the Bank if it has the potential to pose systemic risk or payments system risk.[1]

The Governor has, to date, designated for oversight three domestic systemically important FMIs and one domestic prominent payment system. They are the following:

- Large Value Transfer System (LVTS), the only system for settling large-value and time-critical Canadian-dollar payments, operated by Payments Canada;
- CDSX, the only system that settles securities and maintains a central securities depository, operated by the Canadian Depository for Securities Limited;
- Canadian Derivatives Clearing Service (CDCS), a central counterparty that clears transactions in certain fixed-income securities, over-the-counter (OTC) repurchase agreements, OTC equity derivatives and all derivatives traded on the Montréal Exchange, operated by the Canadian Derivatives Clearing Corporation; and
- Automated Clearing Settlement System (ACSS), a retail payment system for cheques, direct deposits and pre-authorized debits, and the only designated prominent payment system. It is also operated by Payments Canada.[2]

The Bank has also designated as systemically important two foreign-domiciled FMIs that Canadian financial institutions critically rely on to conduct their business. They are the following:

- CLS Bank, a global payment system that settles foreign exchange transactions, operated by CLS Group; and
- SwapClear, a global central counterparty for interest rate swaps and other over-the-counter derivatives denominated in 18 currencies, operated by LCH.Clearnet Ltd.

Table 1-A: Canadian payments and securities in each of the designated FMIs

FMI	Daily average volume of 2017	Daily average value of 2017
LVTS	36,000	$173 billion
CDSX	1.7 million	$541 billion
CDCS	390,000[a]	$161 billion[a]
ACSS	30 million	$28 billion
CLS Bank	39,000[b]	$199 billion[b]
SwapClear	$100 billion[c]	$12.1 trillion[d]

a. Includes daily average repurchase agreements activity of 1.4 thousand in volume and $27 billion in value.
b. Captures only the activity denominated in Canadian dollars during the main session.
c. Estimate derived from monthly volume of swaps cleared and denominated in Canadian dollar.
d. Notional outstanding for swaps denominated in Canadian dollars, as at year-end.

1 For definitions of systemic risk and payments system risk, see "Regulatory Oversight of Designated Clearing and Settlement Systems" on the Bank's website.

2 In May 2016, the Bank designated ACSS as having the potential to pose payments system risk. The press release is available on the Bank's website.

financial system and the economy.[1] Prominent payment systems, while not systemically important, are also critical for economic activity in Canada. They are designated by the Governor for oversight by the Bank if their disruption or failure has the potential to pose risks to Canadian economic activity and therefore affect general confidence in the payments system. **Box 1** describes the FMIs that have been designated by the Bank.

Although highly unlikely, an FMI could fail despite this oversight. To mitigate the impact of such a failure, the Bank of Canada, in cooperation with federal and provincial authorities, has worked to develop a policy framework for a Canadian resolution regime for FMIs. The purpose of a resolution regime is to ensure that tools are available to continue offering the critical services normally provided by the FMI and prevent systemic disruption to the financial system in the remote event of an FMI failure. In its 2017 budget, the federal government proposed to introduce legislative amendments to the *Payment Clearing and Settlement Act* to implement the regime and allow the Bank to intervene if an FMI were to fail. The amendments to the legislation

1 For more information, see "Regulatory Oversight of Designated Clearing and Settlement Systems" on the Bank's website.

were drafted in consultation with key stakeholders and included in the 2018 federal budget. Once approved by Parliament, the amendments will provide the Bank of Canada with a new mandate to act as the resolution authority for Canadian FMIs.

FMI resolution is part of the package of G20 financial sector reforms. In 2011, the Government of Canada endorsed reforms to develop and implement effective resolution regimes for systemically important institutions such as banks, insurance companies and FMIs (Lai and Mordel 2012).[2] The Financial Stability Board (FSB) established guidance on the essential elements authorities should consider when building their national resolution regimes (FSB 2014, 2017). The main features of the Canadian FMI resolution regime described in this report have been developed in line with this international guidance, in a manner appropriate to the Canadian context and taking into account the comments received from key stakeholders during consultations.

This report explains the importance of a resolution regime for Canadian FMIs. It also describes the main features of an effective regime, including the types of FMIs to which it would apply, governance arrangements, legislative powers and tools, and funding. We conclude by briefly laying out the next steps.

The need for a resolution regime

FMIs that are designed and operated well contribute to financial stability by supporting the continuous functioning of payment systems and financial markets, which is especially important in times of severe financial stress. Central counterparties (CCPs), for example, act as intermediaries in a trade, guaranteeing that all the obligations of the trade will be honoured, even if one participant defaults. This helps prevent a market freeze in the presence of heightened counterparty risk. FMIs also reduce uncertainty in times of stress by having robust and transparent default management mechanisms in place.

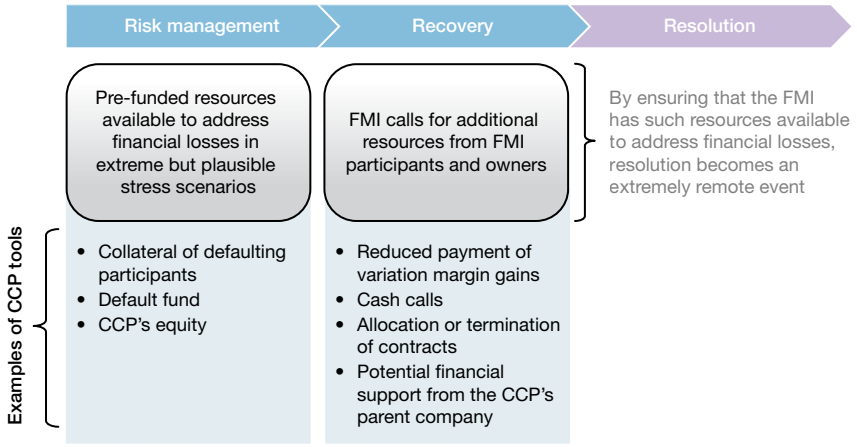
FMIs have been designed to play a central role in the financial system. However, if a systemically important FMI should fail, a disruption in its critical services could lead to significant adverse effects on the functioning of the financial system and economic activity in Canada. These FMIs are typically large, lack substitutes in the markets they serve, and have strong links to banks and other financial institutions, including other FMIs. For example, if a major payment system should fail, basic financial transactions could become difficult or impossible, and this would have a severe adverse economic impact. Furthermore, the systemic importance and the extent of risks associated with the failure of certain FMIs are growing. The greater use of central clearing, including mandatory clearing of standardized over-the-counter derivatives, is leading to a significant increase in the volume of trades cleared and creating much larger exposures for certain CCPs to manage (Mueller and Usche 2016).

Consequently, it is important for these FMIs to have robust risk controls in place that allow them to operate safely, both in normal times and during times of severe financial or operational stress.

2 To date, of the G20 jurisdictions, only Australia has proposed to establish a regime specifically tailored for FMIs. The European Union and the United Kingdom have, or have proposed, a resolution regime applicable for central counterparties rather than all types of FMIs. Other jurisdictions have either chosen to have a resolution regime applicable to banks and FMIs (United States, Singapore and Hong Kong) or have additional resolution-type tools available as an extension of FMI oversight (New Zealand).

As part of the Bank's oversight, designated FMIs are required to meet the Bank's standards for addressing financial, operational and business risk (McVanel and Murray 2012). These standards fully encompass the international standards, the *Principles for Financial Market Infrastructures*, established by the Committee on Payments and Market Infrastructures and the International Organization of Securities Commissions (CPMI-IOSCO). The FMI must operate with controls to allow it to effectively manage its risks under a variety of scenarios designed to incorporate extreme but plausible stress events, including the default of its largest participant. Designated FMIs are also required to develop a recovery plan that includes tools that would allow the FMI to access additional financial resources, if this were to become necessary. For example, a CCP must have **robust risk-management** controls that cover expected losses and liquidity shortfalls with a very high degree of confidence. Pre-funded resources should be in place to cover the losses arising from the default of the single largest participant. If these resources are exhausted, the CCP will implement its recovery plan and call on its participants to contribute additional resources, as defined in this plan, and may also contribute additional resources itself (**Figure 1**).

Figure 1: Tools available to help a financial market infrastructure manage risk



Thus, the likelihood of an FMI failing is remote. Historically, there have been very few failures of an FMI, and these have mainly been failures of CCPs. Since 1974 there have been only three such events worldwide (Bignon and Vuillemey 2017).

Nevertheless, it remains possible that a designated FMI may find itself in a situation in which neither its risk-management actions nor its recovery plan are adequate to allow it to continue operating without disrupting the financial system. Scenarios that could potentially trigger an FMI failure include multiple participant defaults within a short period, a material loss of confidence in the FMI, a severe operational failure that cannot be resolved through business continuity arrangements, or a failure of the FMI's parent company.

If an FMI were to become non-viable without a specialized resolution regime, there would be two unattractive choices: it would either be wound down through existing corporate bankruptcy procedures or rescued through a public bailout. Existing bankruptcy procedures are not designed to protect the stability of the financial system when a systemically important institution fails. They would likely not prevent a loss of crucial services to the financial system, which would result in the transmission of financial stress to market

participants and amplify the adverse effect of the FMI's failure on the financial system and the economy. Consequently, there may be an expectation that government intervention in the form of a public guarantee or bailout using taxpayer dollars would be forthcoming to prevent severe financial system disruptions. The absence of a resolution regime could therefore reduce the incentives for FMIs and their participants to appropriately manage their risks, creating moral hazard and a potential significant cost to taxpayers.

The main policy objectives of the regime are to maintain the critical services of an FMI, to promote financial stability and to minimize potential taxpayer exposure to loss. Although the regime shares common elements with Canada's resolution regime for systemically important Canadian financial institutions, it is tailored with specific features to reflect the unique role, structure and business model of FMIs.[3]

Main features of the resolution regime

Scope

All domestic designated FMIs would be included in the scope of the regime. These include the three FMIs that are designated as systemically important and ACSS, a prominent payments system. Domestic FMIs that have not been designated by the Bank are outside of the scope of the regime because their failure is less likely to cause a major disruption to the stability of the Canadian financial system. If these FMIs were unable to recover from a shock, they would be wound down or restructured under existing corporate bankruptcy procedures.

Foreign-domiciled FMIs designated to have the potential to pose systemic risk to the Canadian financial system are also out of the scope of the proposed regime. This currently includes LCH.Clearnet's SwapClear service and CLS Bank (Chande et al. 2012; Miller and Northcott 2002). Crisis management groups (CMGs) established for these FMIs are expected to set out the process for co-operation and information sharing among the home resolution authority and host jurisdictions, such as Canada, in which the FMI is systemically important.[4, 5] The CMG arrangements would apply to both a resolution event and to resolution planning. The Bank plans to work with the resolution authority and the CMG of the foreign FMIs the Bank has designated to ensure that the appropriate measures are established to effectively resolve these FMIs without creating risks to financial stability in Canada.

Governance

Transparent and effective governance arrangements are a cornerstone of a credible resolution regime and provide legal certainty to designated FMIs and their participants about how a resolution would be carried out in practice. These arrangements define the roles of Canadian authorities, establish the process by which key decisions are made, and provide a mechanism for co-operation and information sharing both in normal times and during a resolution.

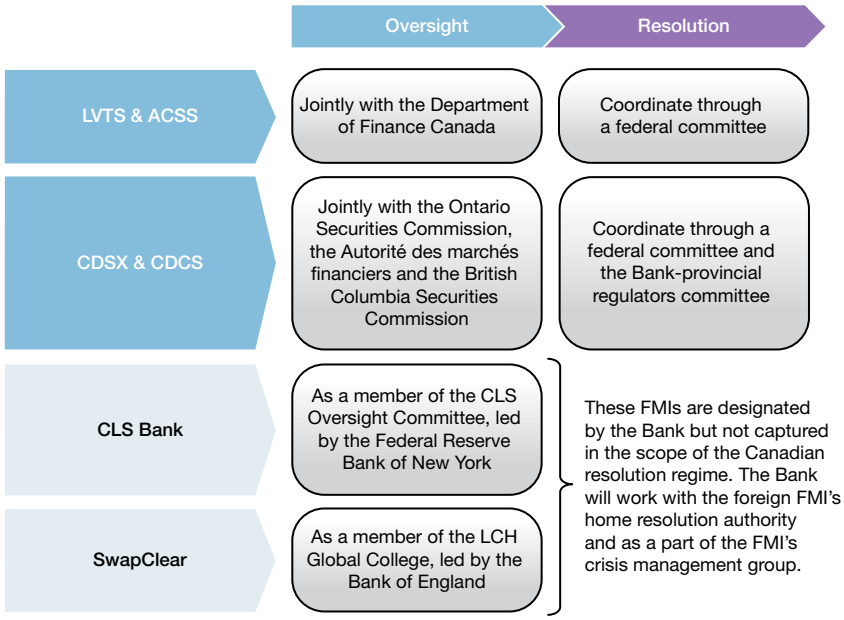
3 See Hughes and Manning (2015) and Cox and Steigerwald (2017) for a discussion of important differences between CCPs and banks that need to be considered when designing a resolution regime for CCPs.

4 If an FMI is systemically important in more than one jurisdiction, authorities should establish cross-border crisis management groups or, alternatively, equivalent arrangements based on Responsibility E of the CPMI-IOSCO *Principles for Financial Market Infrastructures* that are consistent with the FSB Key Attributes of Effective Resolution Regimes for Financial Institutions.

5 The home resolution authority for the FMI decides membership of the CMG, which should include authorities, both domestic and foreign, that can play a material role in planning for and executing a resolution of the FMI.

As the FMI resolution authority, the Bank would assume the lead role, in consultation with key stakeholders, for taking actions to resolve a failing FMI. The Bank is well placed to take on this role. As the overseer of all designated FMIs, the Bank has extensive knowledge and expertise specific to designated FMIs, including familiarity with their rules and operations. This expertise is important because the transition from recovery to resolution may take place on very short notice. The Bank would need to implement resolution actions quickly, including stepping in and overseeing the execution of the FMI's rules and meeting daily payment and settlement deadlines. The Bank's mandate to promote the safety, soundness and efficiency of the Canadian financial system provides it with the expertise to quickly assess the financial stability implications of an FMI failure and any actions that it takes to resolve the FMI. Importantly, the Bank would be able to leverage well-established oversight relationships with provincial market regulators and the supervisory authorities of foreign-domiciled FMIs as well as FMIs themselves (**Figure 2**).

Figure 2: The Bank of Canada co-operates with various authorities with respect to the oversight and resolution of financial market infrastructures



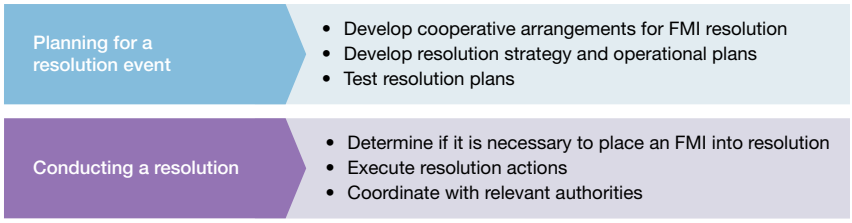
Having one institution responsible for both oversight and resolution might not be optimal if doing so distorts the incentives to invoke resolution powers when required. This might happen if, for example, the oversight authority believed that triggering resolution would be an admission of failure to effectively oversee an FMI. However, if an FMI were to fail, there would likely be little scope for such regulatory forbearance. A failure to make a timely decision to place an FMI into resolution would, in most cases, mean that critical payment and settlement deadlines would not be met, directly affecting all FMI participants and causing contagion to the broader financial system. Nevertheless, it is important for the Bank to mitigate the possibility of inappropriate regulatory forbearance through internal governance

arrangements that support, to the extent possible and appropriate, a separation of oversight and resolution responsibilities. Like Canada, many other jurisdictions have combined FMI oversight and resolution in one institution.[6]

The Bank's role as the resolution authority

Under the proposed resolution regime, the Bank will have new authorities and responsibilities under the *Payment Clearing and Settlement Act*, both in normal times and during a resolution of an FMI. Broadly, these responsibilities are related to either preparing for or conducting a resolution (**Figure 3**).

Figure 3: The Bank of Canada's responsibilities in planning for and conducting a resolution



One of the key decisions the Bank would make is to determine if, and when, it is necessary to place an FMI into resolution. The Bank would assess, among other things, whether the FMI has sufficient financial resources to be able to recover in a timely manner through its own actions, thus avoiding a disruption in the provision of its critical services. The preferred outcome is to allow an FMI to recover from a shock using its own recovery tools. But the Bank would have the flexibility to trigger a resolution before the FMI's recovery efforts have been exhausted. This might be necessary if the Bank judges that the FMI will be unsuccessful in its efforts or that allowing it to continue implementing its recovery plan threatens financial stability. To preserve financial stability, for example, the Bank might judge that it should prevent a CCP from making large funding demands on its members that could transmit financial stress.

The resolution authority must co-operate with provincial and federal authorities

The planned governance arrangements will allow the Bank to take actions that are timely, appropriate and consistent with the policy objectives of the regime. Furthermore, the Bank will communicate regularly with other authorities in the period leading up to and during the resolution of an FMI, consulting them on key decisions. These include decisions related to placing an FMI into resolution, choosing appropriate resolution tools, funding the resolution, planning for recovery of any public funds that have been used and planning for the FMI to exit from the resolution. Approval of the federal Minister of Finance will be required in several areas, including when temporary access to public funds is needed.

6 Under existing or expected authorities, the oversight and resolution of FMIs are housed under one institution in the following jurisdictions: United Kingdom (Bank of England), Australia (Reserve Bank of Australia), Singapore (Monetary Authority of Singapore), Switzerland (Swiss Financial Market Supervisory Authority), Hong Kong (Hong Kong Monetary Authority or Securities and Futures Commission, depending on the FMI) and the Netherlands (Dutch National Bank).

To support consultation, coordination and information sharing, two parallel and equally important committees will need to be established: one with provincial market regulators and another with federal authorities. The former will include provincial market regulators that have joint oversight responsibilities with the Bank over designated FMIs; currently these FMIs are CDSX and the Canadian Derivatives Clearing Service (CDCS, **Figure 2**). The federal committee will be chaired by the Governor of the Bank and include the Department of Finance Canada, the Office of the Superintendent of Financial Institutions (OSFI) and the Canada Deposit Insurance Corporation (CDIC) as members.

The Bank will be required to communicate with both committees on key decisions. For example, one scenario that could trigger an FMI's entry into resolution is the failure of one or more of the largest banks that are participants of the FMI. This would require close co-operation with the authorities responsible for the resolution and supervision of federally regulated financial institutions, CDIC and OSFI respectively. Furthermore, the Bank will need to rely on the knowledge and expertise of provincial market regulators of jointly regulated FMIs to play a key role in developing resolution strategies, testing operational plans and providing advice on returning the FMI back to long-term viability. The Bank is working with these regulators to establish a memorandum of understanding that will address resolution-specific aspects of co-operation and information sharing.

Legislative powers and tools

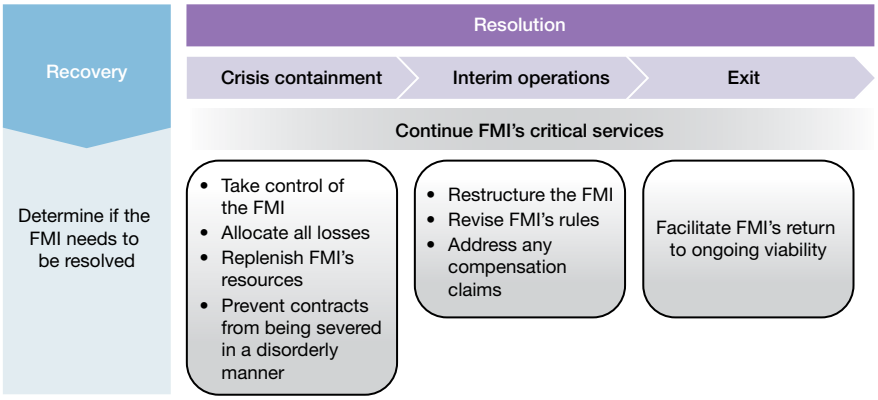
A set of powers and tools will enable the Bank to take the necessary actions to resolve the FMI in a manner that achieves the objectives of the regime. The Bank will be able to place an FMI into resolution and take control of it. Taking control of the FMI means that all the legal powers and authorities of the FMI operator's board of directors and senior management would be transferred to the Bank for the duration of the resolution process. The Bank will therefore have broad powers to direct the operations of the FMI and take resolution actions, including selling any assets of the FMI that are not essential to its core operations; restructuring the FMI, if necessary; and selling the FMI to return it to the private sector.

Some powers are needed to support the Bank's efforts to effectively resolve the FMI. As soon as an FMI enters resolution, there would be a temporary stay on some of the rights of participants and critical service providers to terminate contracts early. For FMIs that are corporate subsidiaries, this would ensure that services critical to the FMI's core functions continue to be provided by the FMI's parent. To effectively resolve a CCP, it is important that participants do not exercise their rights to terminate and close out positions before the CCP can manage the default of a participant. This is a process that the Bank may be required to implement in resolution if the CCP's attempts to do so are unsuccessful.

The powers and tools available to the Bank will allow it to take timely actions to achieve several broad outcomes:

- continue to provide the FMI's critical payment clearing and settlement services to its participants and the financial system more broadly;
- facilitate the timely settlement of obligations of the FMI;
- allocate any losses that have not yet been covered, whether this is due to the default of one or more participants or otherwise; and
- replenish the FMI's resources to meet its regulatory requirements.

Figure 4: Key actions taken by the Bank throughout a resolution event



Once the crisis has been contained and the FMI has been stabilized, the Bank would begin to facilitate the FMI's return to viability, which would include evaluating options for returning the FMI to independent operation and ending resolution. **Figure 4** illustrates the stylized phases of resolution and some of the actions that the Bank could take. Some actions, such as making changes to the FMI's rules, would not be necessary in all resolution scenarios.

To allocate any uncovered losses and replenish the FMI's financial resources, the Bank would first look to the FMI's existing risk-management and recovery tools, as set out in the FMI's rules. In addition, FMI participants and owners would know exactly how losses will be allocated *ex ante* because such arrangements are prescribed in the FMI's rules.

Nevertheless, there may be circumstances under which this approach may exacerbate stress and threaten financial stability, making it necessary for the Bank to deviate from the FMI's rules. In this case, the Bank would be required to compensate any creditors, including FMI participants and owners, who were worse off than they would have been had the FMI been liquidated through bankruptcy, assuming the full application of the FMI's rules and arrangements for loss allocation.

Funding

For resolution of an FMI to be effective, the Bank will need to have reliable and timely access to sufficient financial resources to cover the costs of resolution. The funding strategy must be designed in a manner that upholds the financial stability objectives of resolution, does not undermine pre-resolution risk management and recovery, supports the continuous delivery of critical payment clearing and settlement services, and can be implemented without exposing taxpayers to loss.

To address the costs of resolution, the Bank will rely primarily on the FMI's funding arrangements in its rules and recovery plan, which provide it with the legal right to generate resources from FMI participants and owners. However, additional costs may be incurred in resolution that go beyond the types of costs for which FMIs are required to have funds. For example, the Bank may need to hire a valuation expert to assess any compensation claims or a third-party agent to assist in the sale of the FMI. Furthermore, particularly when multiple participants default, it may not be possible to ask FMI participants to mobilize resources as prescribed in the FMI rules in a timely manner without jeopardizing their viability and worsening financial stability.

If it becomes necessary to address these resolution costs, the Bank will have access to a loan from the Government of Canada. To repay the loan, the Bank will have powers to develop and enforce an *ex post* repayment mechanism to recoup public funds used for resolution purposes. Repayment would occur over time and in a manner that supports financial stability. If the FMI is facing a liquidity crisis, the FMI could rely on the Bank's Emergency Lending Assistance (ELA), which the Bank could decide to provide to a designated FMI as a last resort if the FMI has sufficient collateral. Although ELA could be an alternative to the temporary use of public funds, it is unlikely that an FMI entering resolution would have much collateral left to pledge to the Bank.

Canadian authorities considered creating a resolution fund that industry stakeholders would contribute to before resolution. However, designated FMIs already have significant loss-absorbing capacity for risk management and recovery. Authorities therefore concluded that asking market participants to set aside additional funds for such a remote event would be economically inefficient.

Efforts to establish and operationalize the regime in Canada continue

A credible FMI resolution regime enhances financial stability in several ways. It ensures that critical services normally provided by a failing FMI continue to be delivered even in times of severe market stress, and it strengthens incentives for FMIs and their participants to adequately manage risk. It also provides transparency and certainty to the industry on how the potential failure of an FMI would be handled by, and coordinated across, various federal and provincial authorities.

To move this regime forward, the federal government has proposed legislation for the resolution regime for Canadian FMIs. Further work is required to develop associated regulations. Once the legislation is approved by Parliament, regulations will be drafted and the regime would formally come into effect.

To implement the regime, the Bank must establish the governance arrangements with provincial market regulators and federal authorities. The governance arrangements should include an agreement to co-operate with regulators and authorities to develop credible resolution plans for each domestic designated system and to resolve an FMI under tight timelines if resolution becomes necessary. The Bank also will need to publish a guideline on FMI resolution and develop a set of policies that clarify key aspects of this regime, including the Bank's role as the resolution authority and how resolution powers and tools may be implemented under various circumstances. As part of operationalizing the regime within the Bank, sound procedures will need to be established so the Bank is fully prepared to implement resolution actions in times of crisis.

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Covered Bonds as a Source of Funding for Banks' Mortgage Portfolios

Toni Ahnert

- Covered bonds funded only about 3 per cent of the assets of the largest banks and 9 per cent of Canadian mortgages in 2017. Instead, banks have been relying primarily on relatively cheap government-guaranteed mortgage funding options.
- An increasing portion of mortgages are uninsured and not eligible for government-guaranteed funding, creating the need for alternative funding sources. Covered bonds may fill part of this need, helping to generate a diversified and stable funding mix for mortgages.
- Overcollateralization requirements and dynamic replenishment of the collateral pool can increase risks to unsecured creditors. This could add to the fragility of a bank in the face of negative shocks, with potential spillovers to other parts of the financial system.
- Several policy tools are available to help balance the costs and benefits of covered bonds. These include simple issuance caps and adjustments to the pricing of deposit insurance premiums, as well as other types of prudential regulation.

Introduction

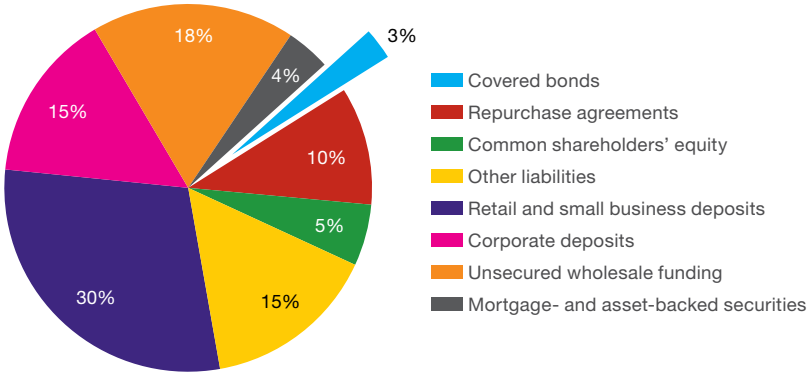
Banks' choices for funding mortgages and other business activities have an important effect on how efficiently they provide banking services and how effectively they manage risks to their own business and to the financial system. Canadian banks typically use a broad array of funding sources, including equity, deposits and wholesale funding instruments (**Chart 1**).[1]

The terms of funding sources differ, ranging from short-term deposits and money market instruments to longer-term funding, including covered bonds and 5- and 10-year debentures. It is important that the terms of funding instruments match the terms of the assets they are funding to minimize the liquidity and interest rate risks of maturity transformation. Around half of Canadian mortgages have terms of 3 to 5 years, creating a demand for funding instruments with similar terms.

1 See Truno et al. (2017) for a broader discussion of Canadian bank funding.

Chart 1: Covered bonds make up a small slice of the funding of the Big Six banks

Total funding is Can$6,097 billion



Note: The Big Six Canadian banks are the Royal Bank of Canada, Toronto-Dominion Bank, Bank of Nova Scotia, Bank of Montreal, Canadian Imperial Bank of Commerce and National Bank of Canada.

Source: Regulatory filings of Canadian banks Last observation: December 2017

Some sources of longer-term funding, including covered bonds, are secured, that is, backed by specific collateral. Other instruments are unsecured, meaning they are backed only by the general creditworthiness of the issuer. In choosing between secured and unsecured funding sources, banks face a trade-off. Secured funding is generally safer for the investor and can therefore be obtained less expensively by the issuer. But the additional safety of secured funding results in a bank's risks being more concentrated on unsecured investors. For example, unsecured investors face potentially lower recovery rates should the bank default, since some assets are reserved for secured investors. This can result in higher costs for unsecured funding. It could also make the bank more sensitive to adverse shocks. The greater concentration of risk on unsecured investors may make it more likely, for example, that they would withdraw funding if negative information about a bank's asset values was revealed. A bank with a large amount of secured funding may therefore face a higher probability of runs on its unsecured funding.

Banks should recognize this potential for fragility and incorporate it in their decision making by choosing a moderate amount of secured funding that is appropriate for the riskiness of their assets. But fragility can also trigger potential negative spillovers to other parts of the financial system. Policy and regulation are therefore needed to balance the costs and benefits of the choice of funding sources for the entire financial system.

In Canada, banks rely on secured funding provided by *National Housing Act* Mortgage-Backed Securities (NHA MBS) to provide low-cost term funding for insured mortgages. This funding is guaranteed by the federal government. But, by tightening mortgage insurance policies, the government has increased the use of uninsured mortgages, which are not eligible for NHA MBS. Thus, it is also necessary to consider options for funding non-government-backed, uninsured mortgages. Mordel and Stephens (2015) discuss other secured funding options for uninsured mortgages, including private-label securitizations.

Covered bonds are another low-cost option for fulfilling the demand for non-government-backed mortgage funding. From a financial stability perspective, they provide stable funding over terms that match Canadian mortgage lending. But if covered bonds are used excessively, they may create fragility by increasing risks to unsecured investors.

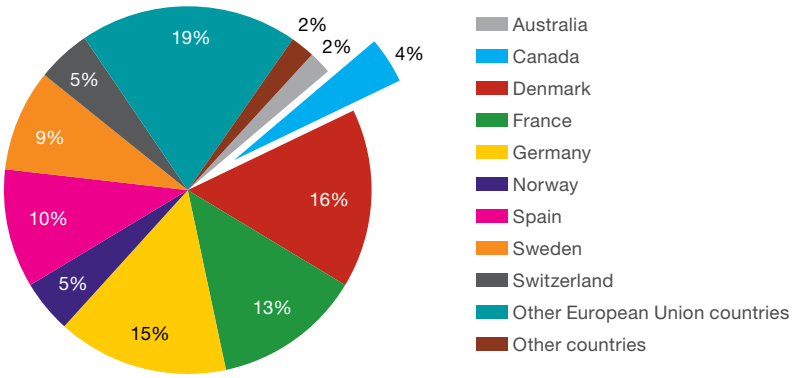
The next section discusses the origins and mechanics of covered bonds. Information on the characteristics of the Canadian and global covered bond markets follows. A framework for analyzing the costs and benefits of covered bonds is then presented, based on research by Ahnert et al. (2017). Finally, various policy options to balance those factors are examined.

What are covered bonds and how do they work?

Covered bonds are senior secured tradable debt issued by banks. They originated in 18th-century Prussia following the Seven Years' War (1756–63) and in Denmark after the Fire of Copenhagen in 1795. After the devastation of war and natural catastrophe, it became difficult to convince lenders that unsecured loans needed to finance reconstruction would be repaid. In their place, secured loans set up under government rules created the trust needed to restart lending.

Over the past two centuries, the covered bond market has grown to become a cornerstone of bank funding in Europe. In North America, however, its role has traditionally been much more limited. This can be partly attributed to the availability of other inexpensive funding sources for mortgage portfolios and to the lack of specific legislative frameworks to govern covered bond issuance. However, interest in covered bonds was spurred by the 2007–09 global financial crisis, as covered bonds were considered a means of reviving mortgage finance (Paulson 2009; Soros 2010; Campbell 2013). Issuance of covered bonds has increased in the United States and Canada in the past decade, although outstanding volumes are a small fraction of total global volumes. Outstanding covered bonds worldwide were around 2.5 trillion euros at the end of 2016, with most issuance still in Europe (**Chart 2**).

Chart 2: The global covered bond market was around 2.5 trillion euros at the end of 2016, with issuers concentrated in Europe



Source: European Covered Bond Council

Last observation: December 2016

Like other forms of secured funding, covered bonds are collateralized, typically by a segregated pool of high-quality assets. The most common form of collateral both in Canada and other countries consists of residential and commercial mortgages. Covered bondholders are protected by overcollateralization, which can vary significantly across jurisdictions. For example, a cover pool of residential mortgages worth $115 is set aside to use as collateral for a covered bond offering worth $100. This pool of assets is then ring-fenced, or encumbered, and thus rendered bankruptcy-remote. In bankruptcy, covered bondholders are ensured better recovery values because they have priority access to the assets in the cover pool.

Covered bonds have some unique features that separate them from securitizations, such as residential mortgage-backed securities and other forms of asset-backed securities. First, the cover pool remains on the balance sheet of the issuing bank. Second, banks must replace non-performing assets in this pool with performing assets of equivalent value and quality to maintain the requisite collateralization. This replacement is known as "dynamic replenishment." Third, covered bondholders are protected by "dual recourse,'' whereby they have a claim on both the pool and the issuing bank upon the default of the issuer. Thus, if their preferential claim to the cover pool assets is insufficient, covered bondholders can claim the shortfall from the issuer on equal footing with unsecured creditors.

Specific legislation is crucial for developing a covered bond market, given the unique and complex legal structure of a covered bond claim (Schwarcz 2011). Upholding such a claim in a regular commercial court may be time-consuming, expensive or uncertain. However, by giving investors greater certainty in their claims, designated covered bond legislation tends to foster the development of private covered bond markets. The standardization that comes with legislation, which governs such issues as eligibility criteria for cover pool assets and minimum overcollateralization requirements, also enhances liquidity in secondary markets.

Legislation was introduced in the European Union in the 1990s that encouraged issuance from a broader set of European countries, such as France, Luxembourg and Spain (Mastroeni 2001). Canada, however, lacked a formal framework until legislation came into force in June 2012 and final rules were established by the Canada Mortgage and Housing Corporation (CMHC) in December 2012. There are currently seven registered issuers in Canada: the Big Six banks and the Fédération des caisses Desjardins du Québec. **Box 1** provides more details on the covered bond framework in Canada.

The Canadian covered bond market in a global context

Covered bonds have traditionally been most important in continental Europe; European Union countries accounted for around 83 per cent of both global covered bonds outstanding and issuance in 2016 (**Chart 2**). Other major issuers include, in descending order of outstanding covered bonds, Switzerland, Norway, Canada and Australia. While most covered bonds are large standardized public securities referred to as benchmark bonds, some countries, such as Germany and Spain, do significant amounts of private placements.

Global issuance has increased steadily since 2003, and covered bonds had relatively stable issuance throughout the global financial crisis (Wandschneider 2014). However, global issuance declined by about 40 per cent in 2013, likely driven by balance sheet deleveraging by European banks and the extraordinary monetary policy measures of the European Central Bank. Covered bond issuance has yet to regain its 2012 peak (**Chart 3**).

Box 1

The legislative and regulatory framework for covered bonds in Canada

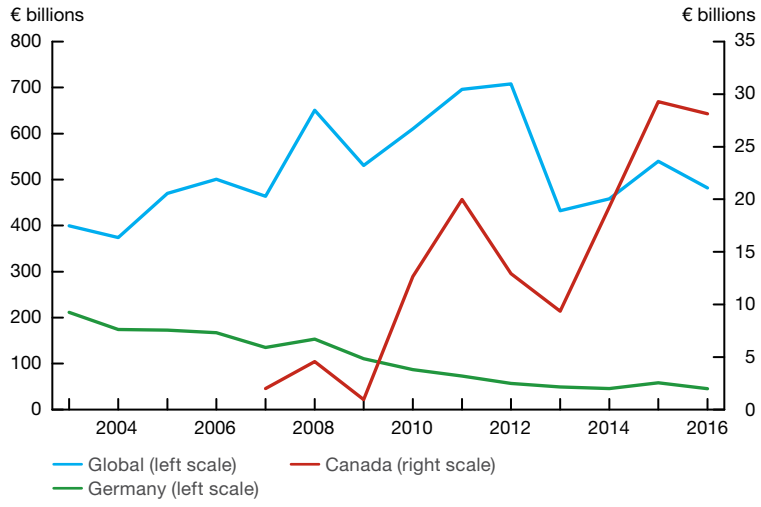
Canadian banks have issued covered bonds since 2007, with the total outstanding growing to more than $60 billion in 2012, when a specific legislative framework was introduced to govern them.[1] In 2012, the Government of Canada created federal legislation for covered bonds to support financial stability by helping banks diversify their funding sources. The 2012 federal budget amended the *National Housing Act* and gave the Canada Mortgage and Housing Corporation (CMHC) responsibility for administering covered bond programs in Canada. This framework provides for statutory bankruptcy protection for covered bond investors and promotes the appropriate disclosure requirements, as well as continuity (and ultimate repayment) of issued covered bonds. Issuers must register covered bond programs under a Canadian covered bonds registry, which the CMHC is responsible for maintaining. Banks may not issue covered bonds outside of this legislative framework, and covered bonds issued under their program must be rated by at least two rating agencies.

The primary sources of covered bond collateral are uninsured Canadian residential mortgage loans, consisting of mortgages for residential properties in Canada with a maximum loan-to-value ratio of 80 per cent at origination. Pre-legislation covered bond programs included insured mortgages, but they are no longer allowed in covered bond collateral to help reduce reliance on government-backed mortgage insurance and improve the liquidity of uninsured mortgages. The collateral pool can also include Government of Canada securities (and repos of Government of Canada securities) as "substitute assets," provided they do not exceed 10 per cent of the total collateral. The maximum asset percentage of currently registered programs ranges from 93 to 97 per cent of the total outstanding (resulting in a minimum overcollateralization of between 103 and 107.5 per cent). As of 2018, CMHC introduced a mandatory overcollateralization minimum, such that the value of the cover pool collateral assets shall be at least 103 per cent of the outstanding Canadian-dollar equivalent of the nominal amount of covered bonds outstanding at all times. Issuers are required to appoint a cover pool monitor, who is responsible for ensuring accurate disclosure and adequacy of tests for asset coverage (overcollateralization), amortization and valuation (CMHC 2017).

In addition to the requirements of the covered bond legislative framework, issuers must meet the requirements of their prudential regulators. The Office of the Superintendent of Financial Institutions sets a cap on the amount of covered bonds that can be issued by federally regulated financial institutions at 4 per cent of total assets. The Canada Deposit Insurance Corporation also considers the amount of each bank's asset encumbrance, which includes its covered bond pool, as a factor when determining deposit insurance premiums for domestic systemically important banks.

1 The initial development of the market is discussed in Gravelle and McGuiness (2008).

Chart 3: Global covered bond issuance slowed significantly in 2013 and has yet to regain its peak



Source: European Covered Bond Council

Last observation: 2016

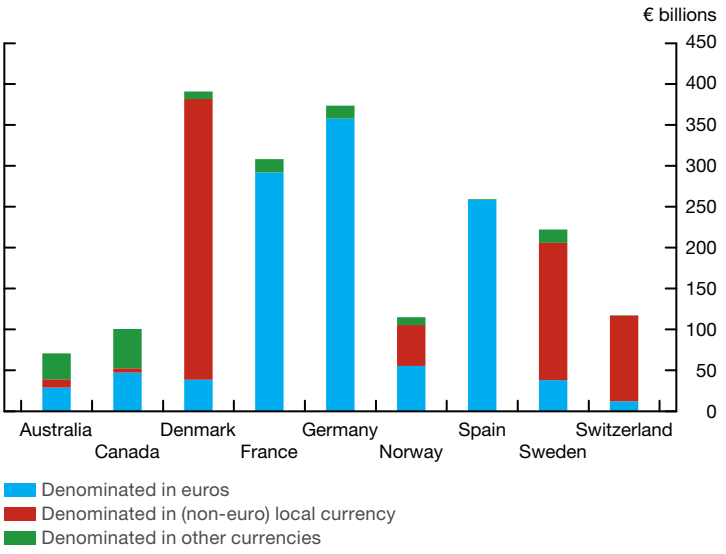
Canadian issuance has been growing since it started in 2007, with a brief slowdown in 2012 and 2013 as the new legislative framework was implemented. At the end of 2017, the Big Six Canadian banks had about Can$140 billion in covered bonds outstanding.

Since Europe represents the largest market, it is not surprising that most covered bonds are denominated in euros, even by countries outside the euro zone (**Chart 4**). The exceptions are non-euro zone European countries that sometimes issue bonds in local currency due to strong domestic demand. In Canada, few covered bonds are issued in Canadian dollars, suggesting less-liquid domestic markets. Other than euro- and Canadian-dollar-denominated issuances, Canadian covered bonds are issued mostly in US dollars, with lesser amounts in pounds sterling, Australian dollars and Swiss francs. While issuing in foreign currencies is indicative of market depth and investor base, it creates the need to include hedging strategies to manage currency risk.

Covered bond terms in Canada normally range from three to seven years (Poschmann 2015), which allows Canadian banks to match the maturity profile of fixed-rate mortgages. In addition to having a stable funding profile, covered bonds are generally low risk with high credit ratings and therefore provide a low-cost funding tool. Covered bonds usually trade at a tight spread to the risk-free asset. As can be seen in **Chart 5**, indicative funding costs show that covered bonds are less costly than non-secured funding. For example, a five-year covered bond was issued in March 2018 by a Canadian bank at a spread of around 60 basis points over Government of Canada securities, whereas deposit notes of the same maturity trade closer to a spread of 75 basis points. Canadian banks do have other sources of low-cost funding, however, such as NHA MBS and Canada Mortgage Bonds, which trade at significantly lower spreads than covered bonds due to their government guarantees.

Covered bonds make up a small but growing percentage of the mortgage funding of Canadian banks (**Chart 6**). At the end of 2017, outstanding issuance of covered bonds by the largest Canadian banks ranged from 2.9 to

Chart 4: Most covered bonds outstanding are issued in euros or a non-euro local currency



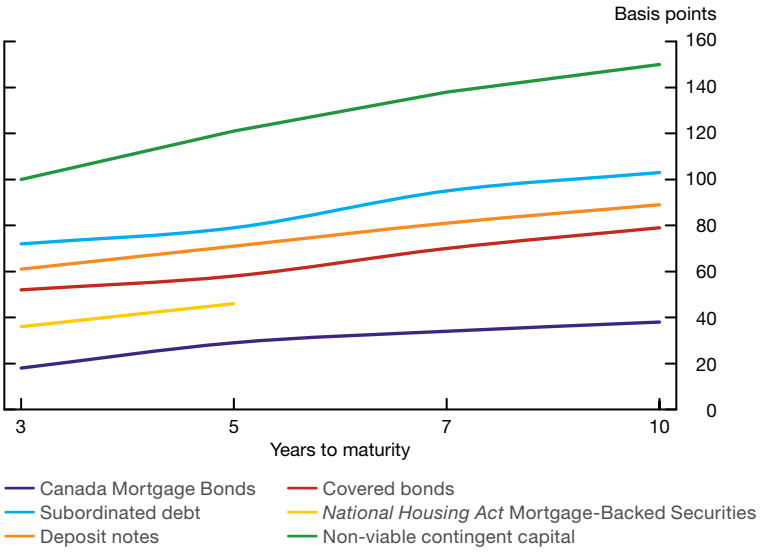
Source: European Covered Bond Council

Last observation: 2016

3.3 per cent of total assets, or about 9 per cent of total mortgages outstanding. Canadian banks could still issue more than $50 billion in additional covered bonds without breaching the cap of 4 per cent of total assets and would likely issue more if the regulatory cap was increased. The unused issuance amount is partly explained by banks' desire to retain a buffer space below the regulatory cap. The buffer gives banks the flexibility to manage fluctuations in asset levels and to issue additional covered bonds if other funding sources become less available. A higher regulatory cap would allow additional issuance while retaining a flexible buffer.

Chart 5: Covered bonds provide a source of low-cost funding

Spread over equivalent Government of Canada securities



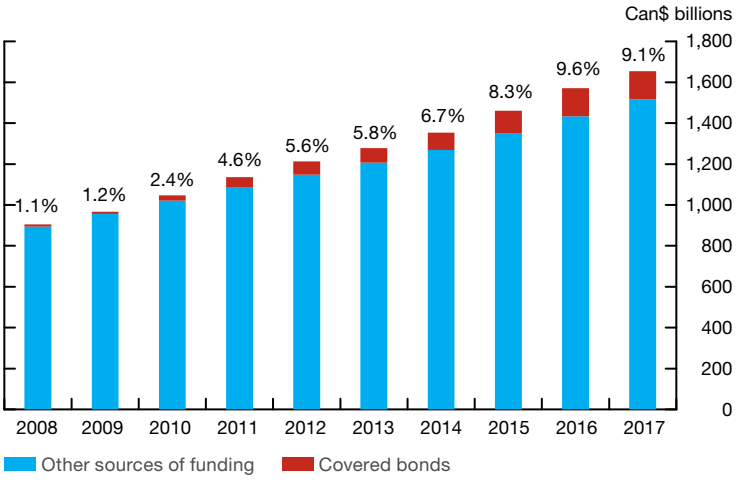
Note: Funding costs shown in the chart are exclusive of any required portfolio insurance premium, registration and administrative fees charged by the Canada Mortgage and Housing Corporation or other parties.

Source: Bank of Canada calculations based on indicative price quotes from dealers

Last observation: March 2018

Chart 6: Covered bonds funded about 9 per cent of the mortgage portfolios of banks in 2017

Total mortgages outstanding



Sources: Canada Mortgage and Housing Corporation, websites of registered issuers, regulatory filings of Canadian banks and Bank of Canada calculations

Last observation: 2017

In terms of demand, the investor base for covered bonds consists mainly of institutional investors, including pension funds and asset managers.[2] These investors are attracted by the high (usually triple-A) credit rating. Central banks also became large investors in covered bonds when these assets were designated one of the core targets under the Eurosystem's quantitative easing policy, the Covered Bond Purchase Programme. The European Banking Authority (EBA 2016) notes that central bank holdings of euro benchmark covered bonds rose from 9 per cent of total issuance in 2009 to more than 30 per cent in 2015.

The balance sheet effects of covered bonds

To understand the implications of covered bonds, Ahnert et al. (2017) discuss a framework where banks are funded with senior secured debt (such as covered bonds) and unsecured demandable debt (such as bank deposits). This framework is designed to study the positive and normative implications of covered bond issuance. It also permits analysis of the impact of covered bonds on the fragility and pricing of unsecured debt.

Covered bond funding comes with two balance sheet effects that highlight the benefits and costs to an individual bank. The main benefit is a **direct bank funding effect**, while the principal cost of covered bonds is a **risk-concentration effect**.

Direct bank funding effect

Covered bonds are attractive to both issuers and investors because they are relatively safe, even compared with other types of non-government-guaranteed collateralized debt. Since the assets are kept on the issuer's balance sheet, they are subject to standard prudential regulation, including capital requirements. In addition, dynamic replenishment and dual recourse imply that all assets of the bank will back covered bonds in the event of losses on the pool of encumbered assets. Both features provide strong incentives for banks to control risks in their asset portfolios.[3] This encourages robust underwriting practices, thereby minimizing regulatory arbitrage and avoiding some of the pitfalls with the originate-to-distribute model common in securitizations (Acharya, Schnabl and Suarez 2013).

Taken together, these features make covered bonds a relatively safe asset for private investors. Indeed, covered bonds have experienced no defaults over the past two hundred years, and delayed payments to investors have been rare (Mastroeni 2001; Wandschneider 2014). Because of their safety, covered bonds are held by "safety-seeking" investors, including those with mandates to hold high-quality, low-risk assets (e.g., pension funds). Covered bonds also receive favourable regulatory treatment when held by other banks—in the Liquidity Coverage Ratio, for example.[4]

Given their low risk, investors accept lower interest rates for covered bonds than for unsecured debt, making them a cheap source of funding for banks. Moreover, the duration of covered bonds can be matched to the terms of Canadian mortgages, directly adding stability to the composition of bank funding. Thus, banks may use covered bonds to diversify and stabilize their funding sources.

2 Anecdotal evidence suggests that Canadian covered bonds, particularly those denominated in euros, are attractive to bank treasuries, since they count as high-quality liquid assets under prudential regulatory requirements, such as the Liquidity Coverage Ratio.

3 In this sense, covered bonds may be more desirable than private-label residential mortgage-backed securities.

4 The Liquidity Coverage Ratio mandates that banks hold high-quality liquid assets to cover 30 days of liquidity requirements in a stress scenario. Highly rated covered bonds have more flexible restrictions and a lower haircut in these rules than other kinds of asset-backed securities. See Gomes and Wilkins (2013).

Risk-concentration effect

Since the asset pool that backs covered bonds is replenished, losses (from non-performing mortgages, for example) that surpass the bank's capital are concentrated on unsecured debt holders. Thus, the more covered bonds a bank issues, the higher the riskiness of its unsecured obligations. This has an indirect effect on bank funding by increasing the cost of unsecured funding. It can also subject the bank to higher rollover risk, since a meaningful proportion of unsecured debt is short-term. Greater covered bond funding can therefore exacerbate the liquidity risk of banks and raises the probability that a negative shock to asset values could threaten the bank's viability. At the core of this result is encumbrance, whereby assets are "locked away" for covered bondholders and cannot be used to meet withdrawals by depositors and other unsecured debt holders. Encumbrance is also amplified by over-collateralization, which sets aside more assets.

Ahnert et al. (2017) offer a microprudential approach to analyzing the risk-concentration effect, starting with the fact that encumbered assets are also unavailable to a deposit insurance fund during bank resolution.[5] While this feature protects secured debt holders and contributes to the safety of covered bonds, it may cause losses to the deposit insurance fund. If the insurance premium charged on bank deposits does not fully reflect their asset encumbrance levels, banks have an incentive to rely excessively on covered bonds, increasing their fragility. Effectively, banks may shift risks to the deposit insurance fund, which justifies regulation of covered bonds and asset encumbrance.

From a system-wide, macroprudential perspective, the increase in bank fragility can have financial stability implications that may not be fully considered in the private choices of banks. First, higher issuance of covered bonds increases the challenges a bank faces in responding to rapid depositor withdrawals or the failure of unsecured debt holders to renew their debt. The resulting fire sale of assets can depress liquidation values for similar assets held by other banks, creating systemic risk. Second, the cost of recovering encumbered assets for secured debt holders may depend on the number of bank failures (because, for example, courts have limited capacity to process cases). Banks may not take these factors fully into account when choosing the amount of covered bonds to issue. Macroprudential regulation of covered bond use may therefore improve outcomes for the financial system overall.

Policy tools

To address the financial stability implications of asset encumbrance on bank balance sheets, Ahnert et al. (2017) show that several policy tools can limit excessive encumbrance and bank fragility. Effective tools could include the following:[6]

(i) limits on covered bond issuance or the pool of assets that backs covered bonds;

(ii) minimum capital requirements tailored to the issuance of covered bonds; and

(iii) a surcharge on covered bond funding paid, for example, to the deposit insurance fund.

5 Of course, once secured debt holders are paid, the residual proceeds from the cover pool can be used for unsecured debt holders and the deposit insurance fund.

6 While these limits are phrased in terms of covered bond issuance, they could also apply to other forms of asset encumbrance. Guideline B-11 on Pledging from the Office of the Superintendent of Financial Institutions outlines factors that a bank's board of directors should consider in establishing policies. Pledging refers to how banks designate securities in separate accounts to serve as collateral or guarantees.

Policy-makers are paying attention to the increased encumbrance of bank balance sheets, which may heighten the fragility of the financial system (Haldane 2012; CGFS 2013). In many jurisdictions, concerns about excessive encumbrance have resulted in explicit restrictions that apply through limits on either (i) assets that can be pledged when secured debt is issued or (ii) bond issuance. The approach differs across jurisdictions, in part because rules on covered bonds must consider funding and risk-concentration effects across a range of funding instruments. For example, asset encumbrance can come from repurchase agreements and derivatives, as well as from covered bonds and securitizations. In addition, other types of rules, such as depositor preferences in bankruptcy, can influence the degree of risk concentration. **Table 1** summarizes some existing regulatory measures to limit encumbrance.

Table 1: Prudential regulatory limits on covered bond issuance across selected countries

Country	Policy
Australia	Value of cover pool must not exceed 8 per cent of domestic assets
Canada	Outstanding covered bonds must not exceed 4 per cent of total assets
Italy	Limit depends on regulatory capital ratio
Netherlands	Limit determined on a case-by-case basis by the De Nederlandsche Bank to maintain a "healthy" ratio
New Zealand	Value of cover pool must not exceed 10 per cent of total assets
United Kingdom	Limit determined on a case-by-case basis by the Financial Conduct Authority
Denmark, France, Germany, Norway, Spain, Sweden, Switzerland: No specific limit	

Sources: Poschmann (2015) and national regulators

In Italy, the encumbrance limit depends on a bank's capital ratio (common equity Tier 1 capital), with less-capitalized banks facing stricter encumbrance limits. Ahnert et al. (2017) suggest that this approach may help curb the incentive to excessively encumber assets for banks with low capital, but it does not reduce the incentives for highly capitalized banks. Therefore, regulation should target the covered bond issuance of banks at all levels of capitalization.

The absolute level of the cap on asset encumbrance varies across jurisdictions. In the Netherlands and the United Kingdom, the cap is set on a case-by-case basis for individual banks, considering the financial position and solvency risk of the issuing bank, as well as its risk profile and the riskiness inherent in its assets (DNB 2015). Ahnert et al. (2017) indicate that the socially optimal level of covered bond issuance depends on both aggregate factors (such as the amount that banks can obtain if they need to quickly liquidate assets and the cost of recovering encumbered assets in a bankruptcy situation) and bank-specific factors (the capital ratio and the distribution of loan losses on a bank's balance sheet). This suggests some tailoring of the cap to the individual bank's situation. In particular, a bank's issuance of covered bonds is higher if it has access to more profitable loan opportunities, the required return to investors is lower, it faces fewer writedowns on the loan book, recovery costs on encumbered assets are lower, liquidation values of investments are higher, and it holds higher liquidity reserves.

Interestingly, the effect of increasing the bank capital ratio on covered bond issuance is ambiguous. The additional loss-absorption capacity allows the bank to withstand higher fragility, encouraging greater covered bond issuance. But higher equity levels create more "skin in the game," increasing the bank's desire to limit fragility and discouraging covered bond issuance.

Increasing the cap on issuance may also help some smaller banks develop their own covered bond programs and diversify their funding sources (see the "Other vulnerabilities" section in this issue). The minimum size of a viable covered bond program is approximately $2 billion, which may be above 4 per cent of total assets for some smaller banks. A higher cap may permit some of these banks to participate. Actions that reduce the size of the minimum viable covered bond program could also help in some cases.

Finally, Canadian financial regulators also adjust prices to reflect the risk-concentration effects of covered bonds (as in a Pigouvian tax). The deposit insurance premiums levied by the Canada Deposit Insurance Corporation on systemically important domestic banks reflect the extent to which balance sheets are encumbered. In fact, 5 per cent of the score used to calculate the premium reflects encumbrance considerations.[7] As noted above, Ahnert et al. (2017) suggest including asset encumbrance considerations for banks of all sizes, not just systemically important ones. However, since only the largest banks in Canada currently issue covered bonds, this is not an immediate concern. To affect bank outcomes, an appropriate calculation of deposit insurance premiums also requires a sufficiently large emphasis on covered bond issuance while acknowledging that such surcharges complement existing limits on covered bond issuance imposed by microprudential regulation.

Conclusion

Covered bonds are a low-cost, stable funding source for banks. Unlike in Europe, where covered bond markets are well developed, only about 9 per cent of Canadian mortgage funding currently comes from covered bonds. Since government-guaranteed funding is becoming less available, a rise in covered bond issuance could help provide stable and diversified funding for Canadian mortgages.

For covered bonds to play a larger role in bank funding, raising the prudential limit for covered bond issuance is necessary.[8] But prudential limits and deposit insurance charges are also important to balance the costs and advantages of covered bonds. These costs include the effects on the riskiness of individual banks and on the externalities that are created if bank fragility heightens risk to the financial system.

7 The Canada Deposit Insurance Corporation uses a discontinuous scoring function to set the level of an individual bank's insurance premium. Scores above 80 imply a premium of 7.5 basis points of insured deposits, while scores below 50 require a premium of 33 basis points.

8 Rudin (2018) discusses Canada's covered bond framework.

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The Bank of Canada's Financial System Survey

Guillaume Bédard-Pagé, Ian Christensen, Scott Kinnear and Maxime Leboeuf

- The new semi-annual Financial System Survey (FSS) collects expert opinions on the risks to and resilience of the Canadian financial system as well as emerging trends in financial products and practices.
- The survey improves the breadth of the Bank's surveillance across the financial system, collects information on topics where the Bank has limited data or expertise, and creates a venue for two-way dialogue with financial system participants and industry experts.
- The FSS will be a useful benchmark to compare Bank views and analytical work with outside opinions and will help Bank staff identify new topics for research and analysis. Selected highlights from the survey will be presented in the Bank of Canada's *Financial System Review* and on the Bank's website.
- In the spring 2018 FSS, cyber attacks, rising geopolitical tensions and a drop in real estate prices were most frequently cited by respondents as risks that could have a significant negative impact on the Canadian financial system. The majority of respondents view the probability of a high-impact financial system event in the next year to be low, but they also see that probability increasing over the medium term. More than 90 per cent of respondents expressed confidence in the resilience of the Canadian financial system if a large shock were to materialize.

Introduction

The Bank of Canada is responsible for promoting the efficiency and stability of the financial system. The Bank fulfills this commitment through its liquidity facilities and lender-of-last-resort responsibilities, oversight of key payment clearing and settlement systems, and in-depth research and analysis on potential financial system vulnerabilities and risks. The Bank's research and analytical activities are informed by regular surveillance of developments that affect the health and functioning of the Canadian financial system.

Market intelligence—the insight gained from firms operating in the real economy and in the financial system—is a core element of this surveillance. The Bank's regular intelligence activities complement analytical work with market insight that is particularly useful during times of transition or when data are not available. Market intelligence enables staff to refine their

judgment on key financial system developments and gives new insight into how markets are functioning and evolving. All of this helps shape policies and is integral to the Bank's core functions.

To enhance its market intelligence activities on financial system topics, the Bank has developed the Financial System Survey (FSS) to collect expert opinions on the risks to the Canadian financial system, the resilience of the system and emerging trends in financial products and practices. The first FSS was conducted in spring 2018, following a pilot in autumn 2017. This report describes the survey objectives and design and provides insight from the spring 2018 survey.

Why conduct a Bank of Canada financial system survey?

Over the years, the Bank of Canada has developed several surveys and built considerable expertise in this domain. Notably, since 1998, the quarterly *Business Outlook Survey* has been gathering firms' perspectives on overall demand, capacity pressures and the economic outlook. Focusing on financial intermediaries, the quarterly *Senior Loan Officer Survey* has collected information since 1999 on business-lending practices. And in its role as chair of the Canadian Fixed-Income Forum, the Bank helped conduct a survey in 2016 on market liquidity, transparency and market access.[1] These surveys have provided the Bank, as well as the broader public, with important and timely insight to better understand economic and financial developments.[2]

The FSS fills a gap in Bank of Canada surveys by focusing on the Canadian financial system and its participants. Traditionally, information has been collected from these sources during market intelligence visits. These visits provide useful information but generally occur on an ad hoc basis throughout the year. Inevitably, the issues discussed differ from one interaction to another, and the views of certain types of market participants may be collected less frequently than others. This makes it difficult to aggregate the information systematically.

The FSS will help the Bank fulfill three key objectives:

- **It contributes to the Bank's financial system surveillance efforts to systematically cover a large and diverse range of financial system participants.** Using a recurring survey and including the same respondents each time will allow the Bank to aggregate and track views on risks and important financial system developments over time.
- **The survey is an effective method to collate expert opinions on topics where the Bank has limited data or expertise.** Because data may not exist or may arrive with a time lag, the survey will help the Bank identify new and emerging financial system developments.
- **It allows the Bank to strengthen its network and creates a venue for regular dialogue with financial system participants and industry experts on financial system topics.** To this end, the Bank will regularly communicate aggregate results to the public, notably in the *Financial System Review* and on the Bank's website, which will allow respondents to compare their own views with those of their peers.

1 For more information, see the market notice.

2 See Patterson (2017) for a more extensive discussion of the use of surveys and importance of market intelligence at the Bank of Canada.

The Bank will use this survey to improve its ability to identify new risks and vulnerabilities and assess the effects of innovation and changes in regulation on the financial system. In addition, new information collected from market participants can confirm the Bank's current views on several financial system topics and may indicate a need to rethink others—helping to define work priorities and inspire new ideas for research.

Overview of existing financial system surveys

Before the 2007–09 global financial crisis, surveys focused primarily on market positioning, risk perceptions and investor expectations and were generally conducted by the private sector. These surveys provided information to help investors gauge overall market sentiment and position their investment strategies to enhance future returns. Investor-expectations surveys have been used for some time and have proven to be an important source of market intelligence; they offer meaningful insight into widely shared market beliefs. Notably, Greenwood and Shleifer (2014) and Goetzmann, Kim and Shiller (2016) show empirical evidence that changes in measured beliefs influence portfolio allocation decisions and investor flows into and out of mutual funds.[3]

Following the crisis, organizations such as the Depository Trust and Clearing Corporation, the Bank of England and Sveriges Riksbank introduced surveys focusing on systemic risk and financial system functioning (**Table 1**). These surveys target a wide range of financial system participants and, perhaps more importantly, focus on topics that are generally not covered by

Table 1: Overview of existing surveys related to the financial system

	Start year	Country	Types of participants	No. of respondents	Focus	Frequency
Investor Behavior Project at Yale University	1989	United States	Institutional investors	Slightly more than 100	Investor expectations of stock market returns and confidence	Monthly
Riksbank Risk Survey[a]	2008	Sweden	Fixed-income and foreign exchange market participants	57[b]	Risks to functioning of the financial system and of Swedish fixed-income and foreign exchange markets	Biannual
Bank of England Systemic Risk Survey	2008	United Kingdom	Asset managers, pension funds, insurers and primary dealers	96[b]	Risks to the functioning of the financial system and confidence	Biannual
Reserve Bank of India Systemic Risk Survey	2011	India	Experts, market participants and other stakeholders	N/A	Major risks facing the financial system: global, macro, market, institutional and general	Biannual
Depository Trust and Clearing Corporation (DTCC) Systemic Risk Barometer Survey	2013	United States	DTCC clients (brokers/ dealers, banks, service bureaus, hedge funds, mutual funds and insurance companies)	200+	Sentiment on key and emerging trends that affect the safety and resiliency of the global financial system	Biannual
Global Risk Institute (GRI) Risk Outlook Survey	2016	Canada	GRI members	N/A	Key risks to the stability of the financial system and the strength of major global economies	Annual
Bank of Canada Financial System Survey	2018	Canada	Financial industry, public sector entities, think thanks and debt issuers	Slightly more than 100 targeted institutions	Key risks to the financial system and respondent firms, overall confidence, financial innovations and other key developments	Biannual

a. The Riksbank is reviewing its survey and has not published it since the spring of 2017.

b. In last survey

3 Confidence and other expectations surveys also indicated future portfolio allocation, investment and consumption decisions. See Pichette and Robitaille (2017), Amromin and Sharpe (2013) and Gennaioli, Ma and Shleifer (2016). However, investor "crash" beliefs are influenced asymmetrically by positive and negative articles in the financial press, which makes the interpretation of the results more challenging.

other types of surveys, such as low-probability but high-impact risk events, financial system resilience and the functioning of systemically important markets. Over the years, both the Bank of England and the Riksbank have regularly reported and discussed their survey results in their financial stability reports to complement staff analysis. As shown in the next section, the FSS shares many features with the Bank of England and Riksbank surveys.

Key features of the Bank of Canada Financial System Survey

The FSS is targeted at individuals working in the financial services industry in a senior risk-management capacity (chief risk officer or equivalent level of seniority) and non-practitioner experts in finance and economics. To capture the diversity of opinions about risks to the Canadian financial system, the FSS covers a wide range of activities, business models and expertise across the country. The sample includes financial institutions such as banks, credit unions, non-depository credit intermediaries, pension funds, insurers and domestic asset managers of various sizes. However, it also surveys other institutions and financial system experts such as financial market infrastructures, think tanks, consultants, debt issuers and academics. The sample also includes some foreign firms with significant Canadian operations.

The FSS is conducted online twice a year (spring and fall). It includes a mix of multiple-choice and open-ended questions. To gather additional insight and enhance the Bank's understanding of the results, the survey is followed up with in-person visits to a subset of respondents.

The survey features four main sections (see **Box 1** for examples of survey questions):

Identification of important and emerging risks

The first section provides an inventory of key risks to the financial system highlighted by survey respondents. The Bank can identify new and emerging risks and rank them based on perceptions of their relative importance to the overall financial system. In addition, the survey identifies key risks at the firm level, including those that firms are taking action to mitigate.[4] The ability to compare risks that firms believe they can mitigate with those perceived as most important to the financial system enriches the Bank's analysis of vulnerabilities and the policies that could be enacted to mitigate them.

Overall risk to and resilience of the financial system

The second section collects respondents' views on the probability that a systemic event will occur over short and medium horizons. The source or type of event is not specified; this is a measure of the probability that any risk will materialize. Respondents also state their level of confidence in the ability of the system to withstand severe shocks. This confidence will depend on, among other things, market participant perceptions of the adequacy of financial system capital buffers, how stress flows across the system, and the expected actions taken by public authorities during a potentially systemic event. While views on the level of confidence or probability of a stress event at a given point in time are interesting, the real value of this information lies in how these perceptions change over time.

4 To keep the language of the survey as simple as possible, the distinction between vulnerabilities and risks from the Bank of Canada's analytical framework is not explicitly used. The survey emphasizes risks but nevertheless elicits information useful in assessing vulnerabilities.

Box 1

Overview of questions in the Financial System Survey

The first three sections of the Financial System Survey (FSS) feature 10 recurring questions on 4 main topics. The questions in these sections are expected to remain fairly consistent in every survey to follow the 4 topics as they evolve and to identify changes in views. The survey also includes an additional section for ad hoc questions on a broad range of current topics; these questions will change over time to explore issues of near-term interest or concern.

Identification of important and emerging risks

- Over the next three years, which risks, if realized, do you believe would have the greatest negative impact on the functioning of the Canadian financial system (i.e., can impair the financial system and harm the economy)? Please identify the top three risks, in order of importance.
- Over the same period, which financial system risks, if realized, do you believe would have the greatest negative impact on your organization's activities? Please identify the top three risks, in order of importance.
- Which of these risks is your organization currently allocating the most resources to in order to mitigate/manage its potential impact?

Overall risk to and resilience of the financial system

- In your view, what is the probability that an event would occur with the potential to severely impair the functioning of the Canadian financial system in the short-term (0–12 months) and medium-term (1–3 years) periods ahead?
- How do these probabilities today compare with those from six months ago?
- How confident are you that the Canadian financial system will be resilient in the event of a large shock that has the potential to severely impair the functioning of the Canadian financial system?
- How does your level of confidence in the stability of the Canadian financial system today compare with that of six months ago?

Financial system developments and innovation

- Please identify any new or emerging developments in the Canadian financial system, positive or negative, that your organization is tracking or has observed. These new developments can be global or limited to the Canadian market.
- Over the next three years, which financial innovations do you believe will have the largest impact, positive or negative, on your organization's activities? Please identify the top three innovations, in order of importance, and identify whether they are positive or negative for your organization.
- Of the top three innovations you have listed, indicate the one that your organization is planning to allocate the most resources to over the next three years.

Financial system developments and innovation

A third section seeks to identify new trends in the financial system, including those that are likely to influence incentives, overall market structure and efficiency. Given that data about financial innovations are often scarce, the quantitative results in this section are likely to provide information on new financial products, changing market practices and the impact of technological change on markets.

Current topics

The final section includes flexible ad hoc questions that change for each survey. This section can include general questions for all survey respondents or topical questions targeted to a subset of participants. These questions are often related to specific market developments or topics where more detailed information is desired.

Overview of key insights from the spring 2018 survey

The survey was conducted between March 26 and April 9, 2018. It was sent to 109 participants and had a response rate of 61 per cent. Since this is the first full survey, it is not yet possible to assess the evolution of the responses, which will be an important element of analysis in the future. Instead, the responses provide a useful baseline for assessing current concerns.

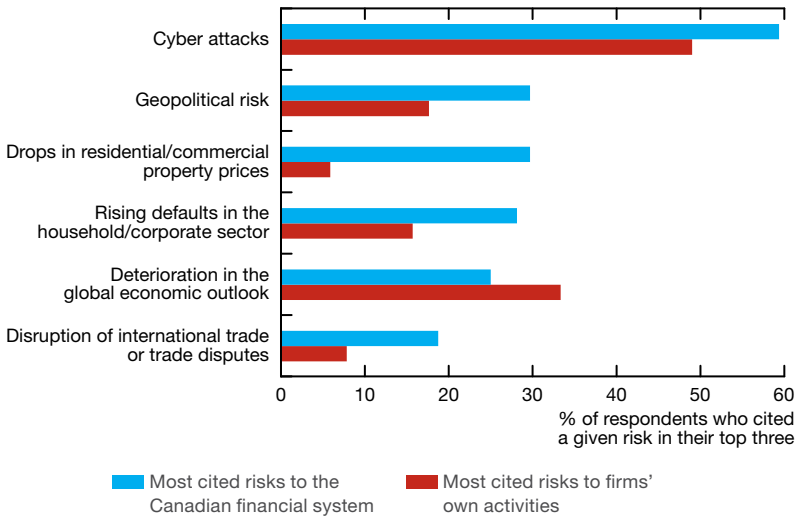
Key financial system risks

Respondents were asked to list the top three risks to the financial system and to their firm's activities (if applicable), based on the size of the potential negative impact on the functioning of the financial system or on their firm's activities should these risks materialize. **Chart 1** shows the risks cited by at least 10 per cent of respondents. Cyber attacks, geopolitical risks and drops in real estate prices were most frequently cited by respondents as among the top three risks to the Canadian financial system. These risks closely match the key vulnerabilities and key risks identified and discussed in recent issues of the Bank's *Financial System Review.* Among risks to their own firms, respondents indicated that cyber attacks and a deterioration in the global economic outlook would have the largest negative impacts. Other risks mentioned by less than 10 per cent of respondents (and therefore not included in **Chart 1**) include those related to the impact of unconventional monetary policies, operational risks and dislocations in securities markets.

Chart 1: Cyber attacks were cited as the most important risk to the functioning of the Canadian financial system

Over the next three years, which risks, if realized, do you believe would have the greatest negative impact on the functioning of the Canadian financial system? Please identify the top three risks, in order of importance.

Over the same period, which financial risks, if realized, do you believe would have the greatest negative impact on your organization's activities? Please identify the top three risks, in order of importance.



Notes: Risks have been regrouped into categories. Risks to the Canadian financial system cited by more than 10 per cent of respondents have been included. "Geopolitical risk" refers to political tensions (e.g., with Russia and North Korea). "Disruption of international trade or trade disputes" includes issues with the North American Free Trade Agreement and trade with China.
Source: Bank of Canada Financial System Survey, spring 2018

Aggregated risks and confidence

In the short term (0 to 12 months), 72 per cent of survey respondents view the probability of an event that severely impairs the functioning of the financial system as low or very low (**Chart 2a**). There was less agreement in views on the probability over the medium term (1 to 3 years), with around 62 per cent of respondents indicating that the probability was moderate, high or very high.

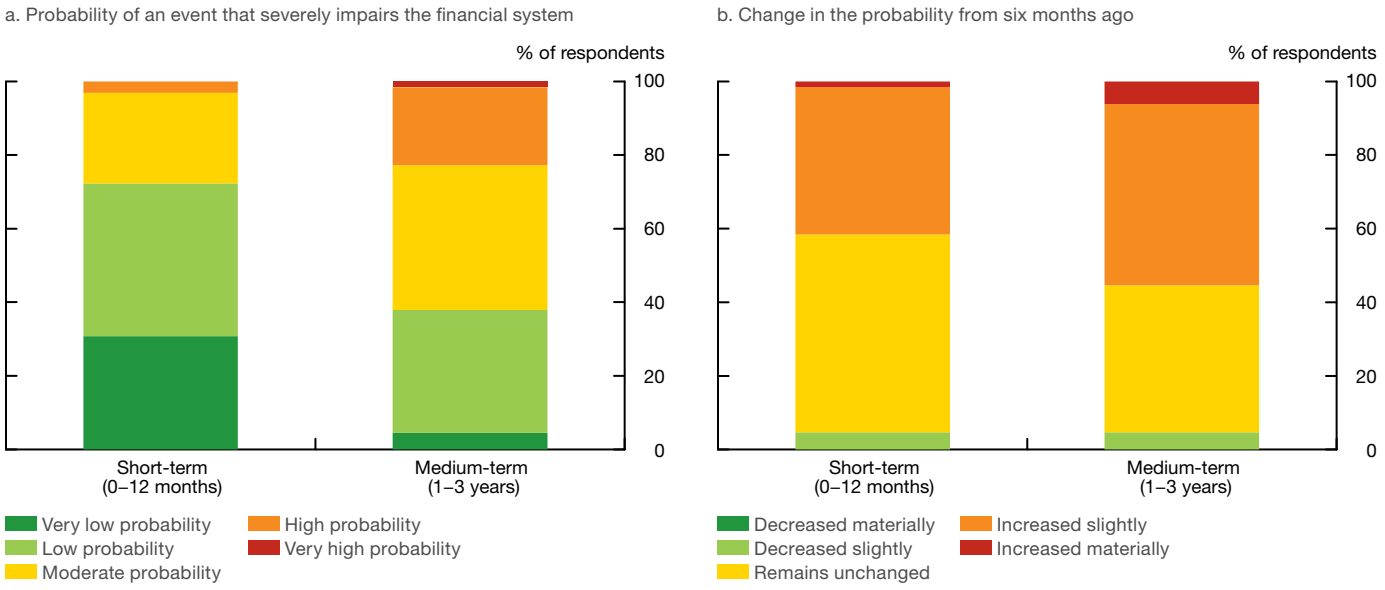
Respondents reported that their views on the short-term probability of a high-impact event were unchanged or had increased slightly over the past six months (**Chart 2b**). More respondents indicated a slightly increased probability over the next one to three years. Increased geopolitical uncertainty and the impact of reduced monetary stimulus from central banks on the domestic housing market and global asset prices were cited as reasons for the increase.

More than 90 per cent of respondents are very confident or fairly confident in the resilience of the Canadian financial system if a large shock were to materialize (**Chart 3a**). Around 10 per cent are not very confident. Among survey participants, confidence in the resilience of the financial system is roughly unchanged relative to six months ago (**Chart 3b**), but respondents expressed concern about increased leverage in the financial system, uncertainty about the future path of house prices, and rising interest rates as factors that could affect their level of confidence in the future.

Chart 2: Many respondents believe the probability of a high-impact event that severely impairs the functioning of the financial system has increased over the last six months

In your view, what is the probability that an event would occur with the potential to severely impair the functioning of the Canadian financial system in the short-term (0–12 months) and medium-term (1–3 years) periods ahead?

How do these probabilities today compare with those from six months ago?

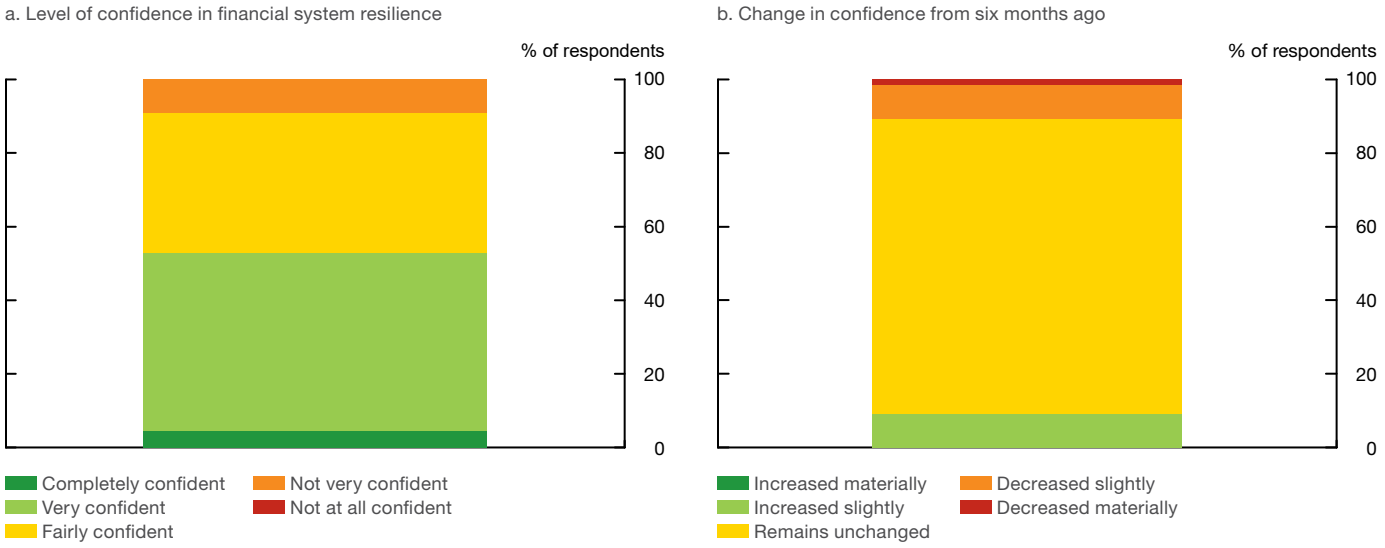


Source: Bank of Canada Financial System Survey, spring 2018

Chart 3: Confidence in the resilience of the financial system if a large shock were to materialize has remained unchanged in the last six months

How confident are you that the Canadian financial system will be resilient in the event of a large shock that has the potential to severely impair the functioning of the Canadian financial system?

How does your level of confidence in the stability of the Canadian financial system today compare with that of six months ago?



Source: Bank of Canada Financial System Survey, spring 2018

Emerging developments

Respondents identified several emerging financial system developments that their firms have observed or are tracking. They are summarized in **Table 2**.

Key financial innovations

Participants identified machine learning and artificial intelligence, big data and blockchain as the financial innovations that will have the largest impact on their firms' activities over the next three years (**Chart 4**). Respondents plan to dedicate most of their resources toward machine learning and big data over the next three years, which they perceive as positive for their firms' activities. Other innovations that were mentioned include robo-advisors, digital currencies, systematic trading strategies, securitization and digitalization.

Table 2: New or emerging financial system developments

Please identify any new or emerging developments in the Canadian financial system, positive or negative, that your organization is tracking or has observed. These new developments can be global or limited to the Canadian market.

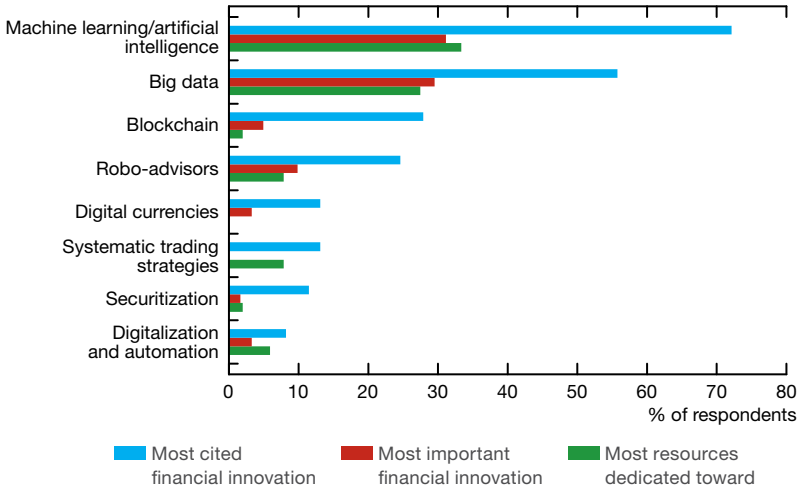
Financial technology (fintech)	▪ Emergence of fintech-based solutions could disrupt incumbent business models in the financial sector
Regulatory environment	▪ Replacement of international and domestic reference interest rate benchmarks ▪ Changes in payment systems and anti-money-laundering and anti-terrorist-financing rules could have an important impact on foreign investment in Canada
Household credit markets	▪ Rise of private lenders and credit unions in the face of the new B-20 mortgage underwriting guideline issued by the Office of the Superintendent of Financial Institutions ▪ Increased lender focus on non-mortgage consumer lending programs such as auto loans and consumer goods financing ▪ Restrictions on mortgage portfolio insurance are reducing consumers' financial flexibility, pushing them increasingly toward home equity lines of credit, second mortgages, credit cards and other costlier forms of consumer debt
Investment strategies	▪ Increased focus on private equity and real estate as more funds look at increasing allocation to alternatives to generate higher returns ▪ Rise of quantitative and systematic strategies, potentially increasing co-movements across asset classes that had not historically been linked ▪ Broader use of more sophisticated counterparty collateralization framework between banks and non-financial institutions

Source: Bank of Canada Financial System Survey, spring 2018

Chart 4: Financial innovations expected to have the largest impact on firm activities

Over the next three years, which financial innovations do you believe will have the largest impact, positive or negative, on your organization's activities? Please identify the top three innovations, in order of importance.

Of the top three innovations you have listed, indicate the one that your organization is planning to allocate the most resources to over the next three years.



Source: Bank of Canada Financial System Survey, spring 2018

Conclusion

The FSS greatly enhances the Bank's surveillance of developments in the Canadian financial system. It enables the Bank to systematically collect market intelligence from a broad range of financial system experts and helps to build ongoing dialogue. The FSS also allows the Bank to identify and track new financial system risks and vulnerabilities, measure perceptions of the resilience of the financial system, and assess the impacts of innovation and changes in regulation. New information collected from market participants may challenge the Bank's current views—helping to define policy priorities and inspire new ideas for research.

The Bank is confident that the analysis of the information obtained through this new initiative will also be useful for market participants and the general public. The spring 2018 survey benefited greatly from active collaboration with the majority of Canada's largest financial institutions. Over time, as more financial market participants become aware of the survey and its objectives, the diversity of respondents should increase, with greater representation from smaller financial firms.

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