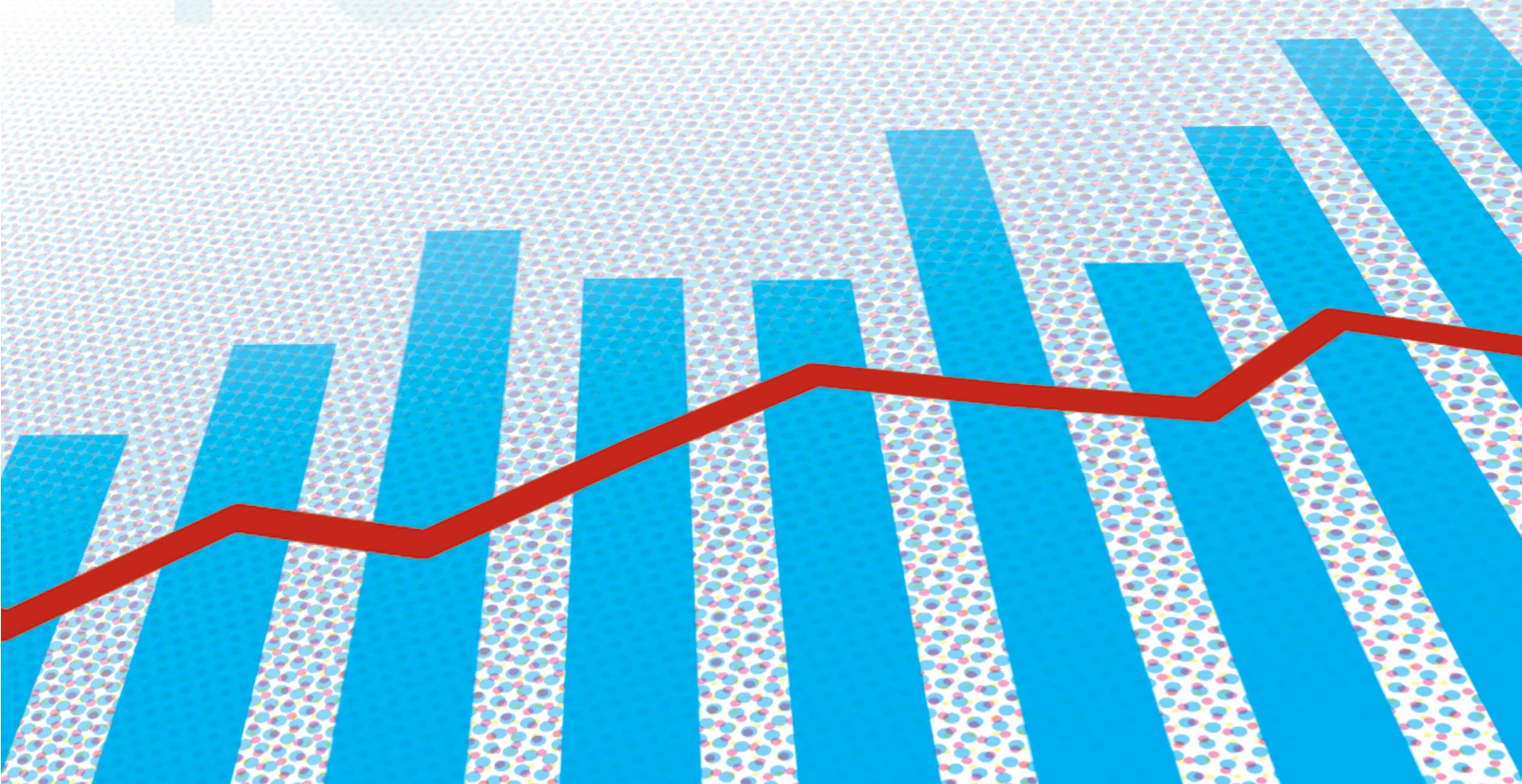
BANK OF CANADA
BANQUE DU CANADA

FINANCIAL SYSTEM REVIEW

June 2016

2016



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 2 June 2016, except for the Toronto MLS Home Price Index, which was released on 3 June 2016.

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Preface

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, manage the associated risks, and acquire and dispose of financial assets with confidence is one of the fundamental building blocks of our economy. Financial stability is defined as the resilience of the financial system in the face of adverse shocks that enables the continued smooth functioning of the financial intermediation process.

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 promotes this objective by providing central banking services, including various liquidity and lender-of-last-resort facilities; overseeing key Canadian payment clearing and settlement systems; conducting and publishing analyses and research; and collaborating with domestic and international policy-making bodies to develop and implement policy. The Bank's contribution complements the efforts of other federal and provincial agencies, each of which brings unique expertise to this challenging area in the context of its own mandate.

The *Financial System Review* (FSR) is one avenue through which the Bank seeks to contribute to the longer-term resilience of the Canadian financial system. The FSR begins with an examination of overall macrofinancial conditions, which provides the context for the analysis. It then summarizes the judgment of the Bank of Canada's Governing Council on the main vulnerabilities and risks to the stability of the financial system and highlights the efforts of the Bank and other Canadian and international regulatory authorities to mitigate those risks. The focus of the FSR, therefore, is an assessment of the downside risks rather than the most likely future path for the financial system. The context for this assessment is our baseline view of the evolution of the global and Canadian economies and the inflation outlook presented in the Bank of Canada's *Monetary Policy Report*. Economic and financial stability are interrelated, so the risks to both must be considered in an integrated fashion.

The FSR also summarizes recent work by Bank staff on specific financial sector policies and on facets of the financial system's structure and functioning. More generally, the FSR aims to promote informed public discussion on all aspects of the financial system.

Overview

Key Financial System Vulnerabilities in Canada

Certain characteristics of the financial system—such as high leverage, mispricing of risk, inadequate liquidity and excessive opacity—can make the system vulnerable because of their potential to amplify or propagate shocks.[1] Among potential vulnerabilities, the Bank identifies three that require special attention in the current financial and economic environment:

- the elevated level of Canadian household indebtedness,
- imbalances in the Canadian housing market and
- fragile fixed-income market liquidity.

Canada's housing market continues to display strong regional divergence, reflecting in part the complex adjustment to low commodity prices under way within the economy. In this context, household vulnerabilities have moved higher. Growth in mortgage credit and rising house prices are reinforcing each other in Vancouver, Toronto and their adjacent areas, leading to an increase in the share of mortgages with high loan values relative to income (**Vulnerability 1**). Some households with these mortgages may have less capacity to cope financially with employment loss or an unexpected rise in interest rates.

House price growth and resales in these areas have been strong, underpinned by robust employment growth and a relatively inelastic supply of single-family homes. The rapid pace of price increases seen over the past year also raises the possibility that prices may be supported by self-reinforcing expectations, making them more sensitive to an adverse shock to housing demand (**Vulnerability 2**). In the oil-producing provinces, job losses and falling house prices have increased financial stress for some highly indebted households. In the rest of Canada, house price growth and debt growth have been more modest.

Globally, fixed-income markets are adjusting to changes in regulation, technological advances, unconventional monetary policies and the level and volatility of interest rates. In this context, market participants in Canada and abroad have expressed concern about market liquidity and its potential resilience during times of stress (**Vulnerability 3**). Some evidence from Canadian and international markets suggests that the variability in market liquidity has increased, which could be a sign that liquidity has become fragile. A rapid drop in market liquidity in response to a shock could amplify asset price changes.

1 See I. Christensen, G. Kumar, C. Meh and L. Zorn, "Assessing Vulnerabilities in the Canadian Financial System," Bank of Canada *Financial System Review* (June 2015): 37–46.

Key Risks

The FSR also examines selected risk scenarios for the Canadian financial system in which trigger events (or shocks) are transmitted and amplified by vulnerabilities, resulting in adverse impacts on the Canadian financial system and the economy. The purpose is to illustrate the potential effects of these vulnerabilities rather than to identify all possible negative scenarios. Each risk includes an overall rating based on the judgment of the Bank's Governing Council regarding the probability of the risk occurring and the expected severity of the impact on the Canadian financial system and economy if it were to materialize.

The most important of these risk scenarios continues to be the possibility of a severe recession in Canada generating a sharp rise in unemployment across the country that places many highly indebted households under financial stress and causes a broad-based correction in house prices (**Risk 1**). This chain of events would strain the financial system and the real economy.

A sharp increase in long-term interest rates driven by higher risk premiums, globally and in Canada, is the second key risk to the Canadian financial system (**Risk 2**). A large and persistent rise in global risk premiums would lead to tighter financial conditions and weaker economic growth both globally and in Canada.

The Canadian financial system could also be exposed to severe economic and financial stress from China and other emerging-market economies (EMEs) (**Risk 3**). These stresses could be transmitted to Canada through their effects on global economic growth, trade, commodity prices and financial market volatility.

Although major Canadian financial institutions and markets are adjusting to the fall in commodity prices, the risk remains that excess global commodity supply could hold down prices for a prolonged period, with adverse implications for the Canadian financial system (**Risk 4**).

A summary of the key risks to Canada's financial system, together with their current ratings, is presented in **Table 1**. The ratings remain unchanged from the December 2015 FSR.

The Canadian financial system is functioning effectively and is resilient. Stress tests in the International Monetary Fund's 2013 Financial Sector Assessment Program (FSAP) for Canada demonstrated that the Big Six Canadian banks are resilient to a scenario that includes a large, persistent and widespread rise in unemployment, as well as a significant drop in oil and house prices.[2] Moreover, increased capital buffers have made the banks even more resilient. As well, recent stress tests conducted by the Canada Mortgage and Housing Corporation (CMHC) indicate that it has sufficient capital to handle an extreme but plausible house price correction.[3]

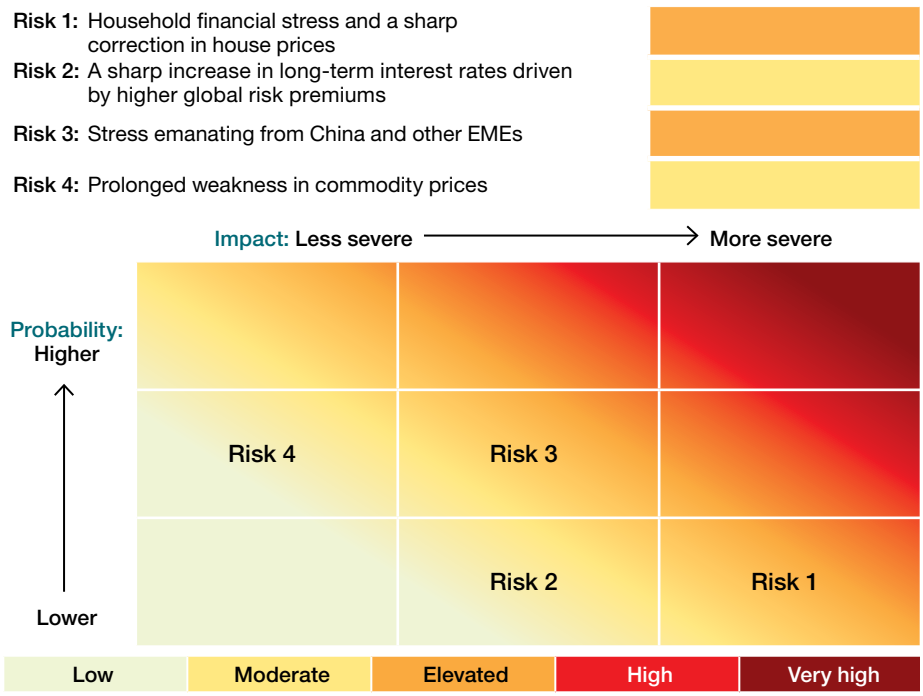
Safeguarding the Financial System

Progress on the global financial reform agenda continues to improve the resilience of the international and Canadian financial systems. Actions identified in this FSR include the designation of the Automated Clearing

2 See International Monetary Fund, "Canada: Financial Sector Assessment Program; Stress Testing–Technical Note," IMF Country Report No. 14/69.

3 Information on CMHC stress testing is available at http://www.cmhc-schl.gc.ca/en/corp/nero/jufa/jufa_036.cfm.

Table 1: Key risks to the stability of the Canadian financial system



Settlement System as a prominent payment system under the *Payment Clearing and Settlement Act* and advances in implementing over-the-counter (OTC) derivatives reforms. Also discussed are measures to help enhance cyber security and the publication of the first phase of the single global code of conduct for the wholesale foreign exchange market.

Reports

This issue of the FSR also features two reports written by Bank of Canada staff. The first examines the role played by a particular type of investor—large public pension funds—in the financial system, and the second describes how the market for securities-financing transactions helps support bond market liquidity in Canada.

In **Large Canadian Public Pension Funds: A Financial System Perspective**, Guillaume Bédard-Pagé, Annick Demers, Eric Tuer and Miville Tremblay review the eight largest public pension funds in Canada. These funds are an important source of retirement income for some Canadians. They are also significant global investors, with net assets under management of over $1 trillion. The authors outline the investment strategies of the funds, as well as how they interact with financial institutions and participate in financial markets. They also discuss the ways in which the funds' risk-management frameworks could contribute to financial system stability and how they minimize potential vulnerabilities.

In **Securities Financing and Bond Market Liquidity**, Jean-Sébastien Fontaine, Corey Garriott and Kyle Gray investigate how the markets for repurchase agreements and securities-lending agreements support the liquidity of Canadian bond markets. In addition, they discuss how recent regulatory changes, as well as low interest rates and settlement failures, are potentially affecting securities-financing markets and, as a result, bond market liquidity.

Assessment of Vulnerabilities and Risks

Macrofinancial Conditions

After a weak start to 2016, global growth is projected to pick up

The growth rate of gross domestic product (GDP) has slowed in many of the major advanced and emerging-market economies. Despite this setback, the global economic recovery, led by the United States and some EMEs, is projected to strengthen gradually. Uncertainty among market participants about the pace of the global recovery remains high. Markets continue to focus on developments in China, policy measures in advanced economies and the outcome of the upcoming referendum in the United Kingdom on membership in the European Union.

In Canada, the economy's structural adjustment to the decrease in oil and other commodity prices continues. Declines in oil sector investment and the devastating Alberta wildfires weigh on economic activity. Growth prospects are being boosted, however, by the resumption of oil production in the Fort McMurray area, higher non-commodity exports, accommodative monetary policy and the expansionary fiscal policy measures announced in the 2016 federal budget.

Market concerns over China and falling oil prices triggered another round of volatility

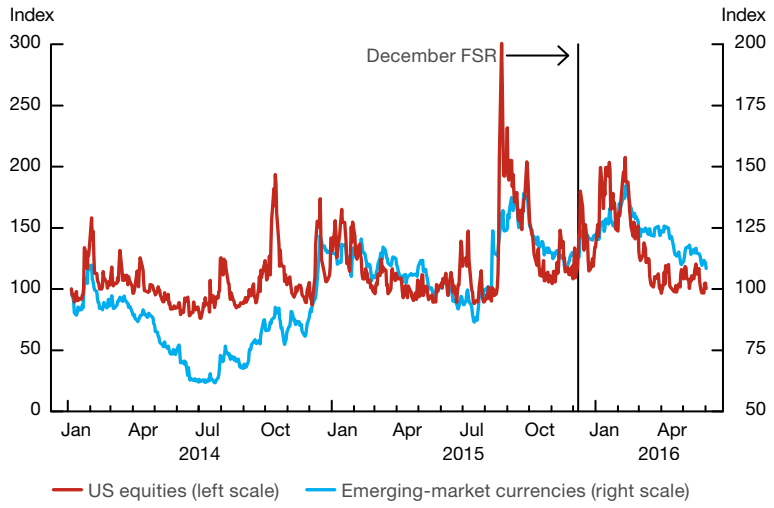
The first six weeks of 2016 saw an increase in market volatility, with sharp sell-offs in equities, corporate bonds and commodities around the globe (**Chart 1**). As with the events in August 2015, the volatility was mainly due to market concerns about China's economic outlook and related economic policies, including the effect of capital outflows and the risk of a sharp devaluation of the renminbi. Strong oil supply, as well as concerns about slowing growth of global demand, also led to a further decline in the price of oil.

Accommodative monetary policy helped stabilize macrofinancial conditions…

Chinese authorities reacted to concerns about slowing growth by introducing more monetary and fiscal stimulus. The Bank of Japan and the European Central Bank (ECB) also responded to weaker economic outlooks with additional stimulus, including lowering policy interest rates further into negative territory and undertaking additional quantitative easing. The ECB, for example, announced a corporate debt purchase program for the euro area.

Chart 1: Markets experienced another round of heightened volatility

Indexes: 6 January 2014 = 100, daily data



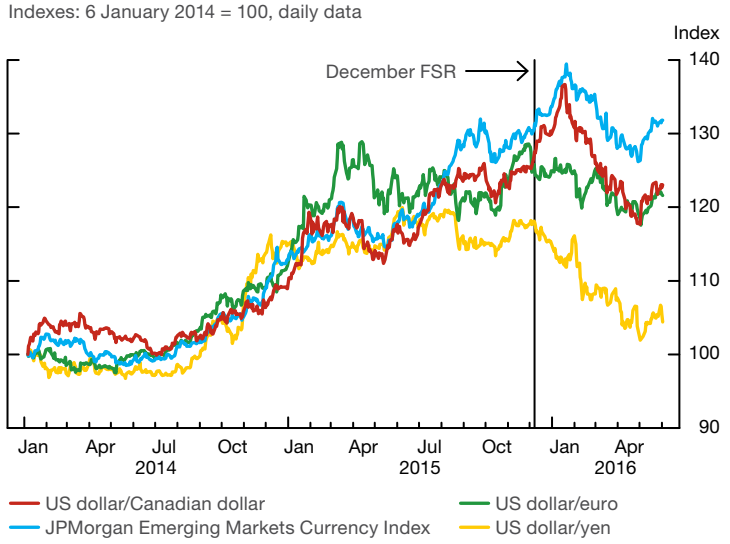
Note: Measures include the VIX (US equities) and the JPMorgan Emerging Market Volatility Index (emerging-market currencies).

Source: Bloomberg

Last observation: 2 June 2016

Chart 2: Strength in the US dollar was partly reversed

Indexes: 6 January 2014 = 100, daily data



Note: The JPMorgan Emerging Markets Currency Index is inverted to allow comparability across currency indexes.

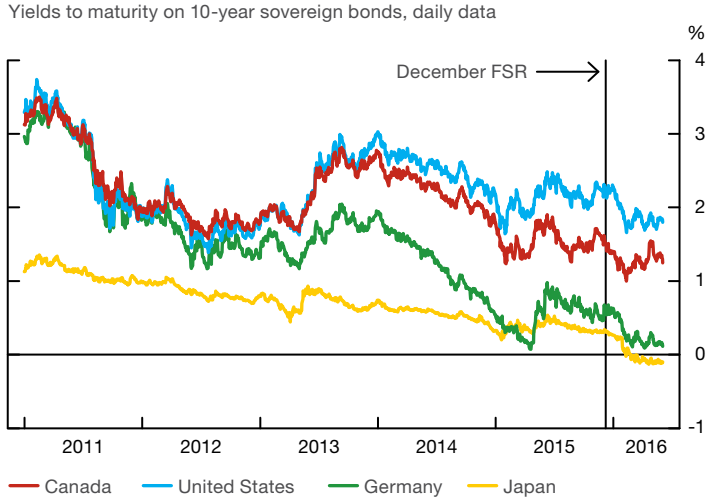
Sources: Bloomberg, European Central Bank, Bank of Japan and Bank of Canada (including calculations)

Last observation: 2 June 2016

Despite its recent rise following comments from US monetary policy-makers, the expected path of the US federal funds rate is much lower than at the time of the December FSR. The downward revision took place in early 2016 as a result of weaker-than-anticipated US economic data, sluggish growth abroad and tighter financial conditions. The lower expected path of the US federal funds rate weakened the US dollar, which, in turn, alleviated pressure on the currencies of EMEs (**Chart 2**).

Chart 3: Yields on long-term government bonds have declined

Yields to maturity on 10-year sovereign bonds, daily data



Source: Bloomberg

Last observation: 2 June 2016

Globally, yields on long-term government bonds have moved lower relative to the December 2015 FSR (**Chart 3**). In Canada, longer-term government bond yields also declined, but by less than in the United States, reflecting perceived changes in monetary policy prospects.

Roughly US$8 trillion worth of government bonds worldwide are now trading at negative yields.[4] Some market participants continue to express uncertainty about the effectiveness of negative policy interest rates and concerns about their potential adverse effects on the profitability and business models of financial institutions.

...contributing to a rebound in asset prices

The Standard & Poor's 500 is now near its historical peak, as it was at the time of the December FSR. Forward price-to-earnings ratios in the United States and Canada suggest that valuations are above their historical averages. Reduced concerns about global demand conditions have supported commodity prices (**Chart 4**). Oil prices have also been boosted by reductions in supply caused by lower producer profitability and, more recently, a number of temporary disruptions to production such as those related to the Alberta wildfires.

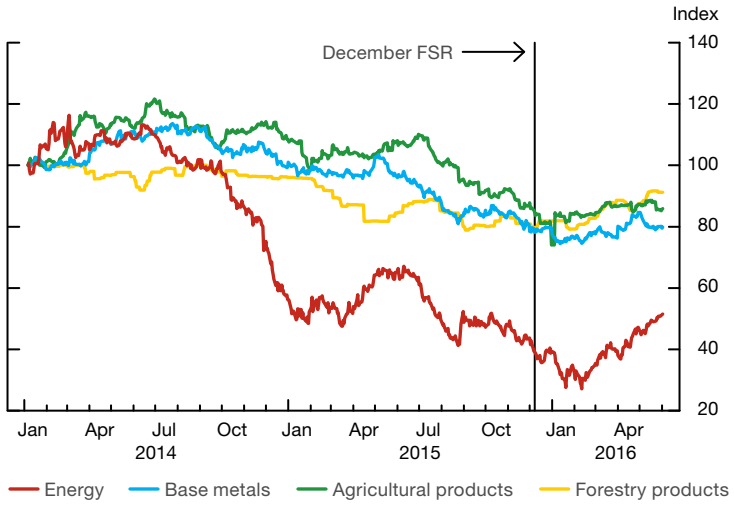
Financing conditions in Canada remain stimulative

Following an increase in business borrowing rates in the first couple of months of 2016, rates have returned to levels prevailing at the time of the December FSR. Rate movements closely followed changes in investment-grade and high-yield credit spreads, which widened because of increased concerns about global economic growth and the decline in the price of oil. The results of the Bank's most recent *Senior Loan Officer Survey* and *Business Outlook Survey* suggest slightly tighter credit conditions in the first quarter of the year for firms with direct or indirect exposure to the oil and gas sector and the metals and mining sector. Spreads on Canadian provincial government bonds also widened to post-crisis highs in the midst of heightened volatility, particularly in the oil-producing provinces. Household borrowing rates have remained steady.

4 See J.P. Morgan, "Flows & Liquidity," 27 May 2016.

Chart 4: Commodity prices have risen from their recent lows

Indexes: 6 January 2014 = 100, daily data



Source: Bank of Canada

Last observation: 2 June 2016

Canadian banks continue to be sound

The earnings of the Big Six Canadian banks remain robust, despite the impact of low prices for oil and other commodities. In the first two fiscal quarters of 2016, the major banks increased their provisions for loan losses by about 55 per cent relative to the same period last year, largely because of increased provisions against energy portfolios.[5] Nevertheless, the impact on earnings to date has been modest, owing to the low initial level of losses and the relatively small share of energy loans in the banks' total loan portfolios. Increasing arrears on consumer loans in Alberta and Saskatchewan have not yet had a notable effect on national loan portfolios. Overall, total earnings of the Big Six in the second quarter of 2016 were down by just 2 per cent from levels one year ago. Moreover, the Big Six have continued to improve their Common Equity Tier 1 capital and Basel III leverage ratios, and liquidity coverage ratios remain well above regulatory minimums. Recently, Canadian bank equities have performed relatively well against global bank equity indexes (**Chart 5**).

Financial losses from the Fort McMurray fire will be significant

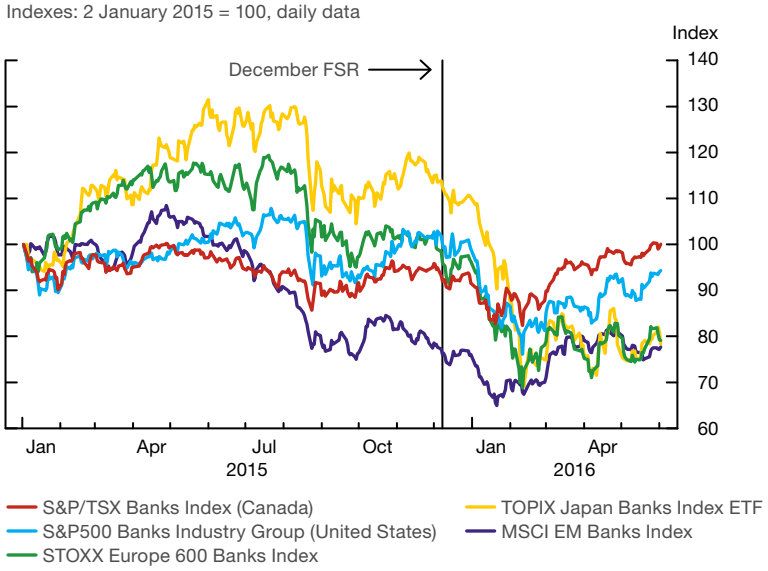
The wildfires in Fort McMurray, Alberta, could be the largest catastrophic claim event for the Canadian property and casualty insurance industry. It is still too early to accurately assess the effects, but most estimates of insurance claims range between $2 billion and $6 billion.[6] Private sector analysts expect claims to be manageable. Furthermore, the burden of claims will likely be shared with global reinsurers. Banks are not expected to be affected significantly.

5 Under current accounting rules, banks provision for losses on an incurred rather than an expected basis. Upcoming changes to the relevant accounting rule—International Financial Reporting Standard (IFRS) 9, Financial Instruments—will make provisions more forward-looking.

6 See, for example, "Major Canadian Insurers Well Prepared for Fort McMurray-Sized Catastrophe," DBRS, 13 May 2016; and "Intact Financial," BMO Capital Markets, 4 May 2016.

Chart 5: Canadian bank equities have performed relatively well

Indexes: 2 January 2015 = 100, daily data



Source: Bloomberg

Last observation: 2 June 2016

Key Vulnerabilities in the Canadian Financial System

Vulnerability 1: Elevated Level of Canadian Household Indebtedness

The vulnerability associated with high household indebtedness has moved higher. In Vancouver, Toronto and their adjacent areas, strong mortgage credit growth and rapidly rising house prices are reinforcing each other, supported by low interest rates. Moreover, the share of households with large mortgages relative to income is increasing in these areas. In the regions most affected by low commodity prices, job losses have increased financial stress for some highly indebted households. In the rest of the country, the vulnerability is largely unchanged, with both debt and income growing moderately.

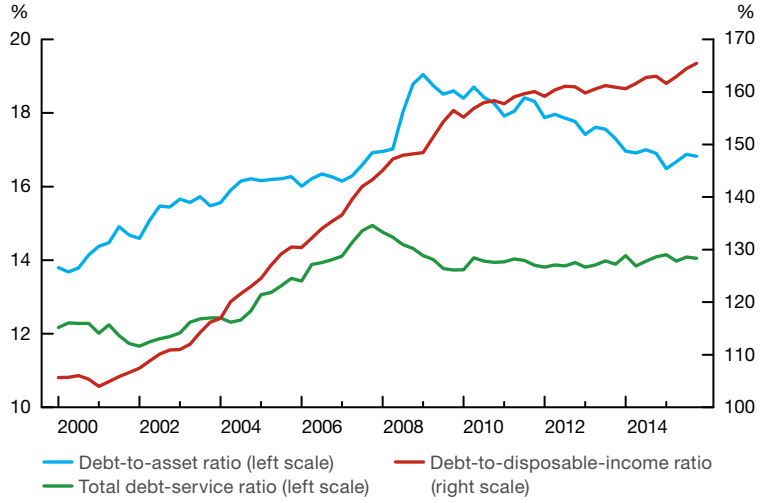
Mortgage debt continues to rise among highly indebted households that have less capacity to cope financially with a loss in income or rising interest rates. This leaves the household sector more vulnerable, with potential consequences for lenders and mortgage insurers.[7] Nonetheless, stronger growth in household income, combined with a gradual normalization of interest rates, will likely diminish the extent of this vulnerability over time.

Growth in household debt continues to outpace income growth on a national level

The national household debt-to-disposable-income ratio rose from 163 per cent to 165 per cent in 2015 (**Chart 6**), reflecting growth in residential mortgage credit that exceeds growth in income. The aggregate debt-to-asset ratio and total debt-service ratio on the stock of household debt are roughly steady, at 17 per cent and 14 per cent, respectively.

7 L. Schembri, "Connecting the Dots: Elevated Household Debt and the Risk to Financial Stability" (speech to the Guelph Chamber of Commerce, 24 February 2016). Available at http://www.bankofcanada.ca/2016/02/connecting-dots-elevated-household-debt-risk.

Chart 6: The debt-to-disposable-income ratio continued to trend higher



Sources: Statistics Canada and Bank of Canada calculations Last observation: 2015Q4

Changes to mortgage finance policies are not yet fully implemented

In December, Canadian authorities announced changes to mortgage finance policies designed to help mitigate the vulnerabilities associated with elevated household debt and imbalances in targeted segments of the housing market. On 15 February 2016, new requirements for insured mortgages increased the minimum down payment for the portion of a house price that is between $500,000 and $1 million from 5 to 10 per cent.[8] The minimum down payment on a $750,000 house, for example, has risen from $37,500 to $50,000. Based on the characteristics of insured loans made in Canada in 2015, this change is expected to affect 13 per cent of newly insured borrowers in Vancouver, 10 per cent in Calgary and 9 per cent in Toronto, but only around 4 per cent nationally.[9]

Guarantee fees on government-sponsored mortgage securitizations will increase on 1 July 2016.

In addition, consultations on modified capital requirements for federally regulated lenders put forward by the Office of the Superintendent of Financial Institutions (OSFI) are ongoing until 10 June 2016; the new requirements, once determined, will take effect on 1 November 2016.[10] OSFI is also developing updates to the capital guidelines for mortgage insurers. The intention of these changes is to ensure that regulatory capital requirements keep pace with housing market developments and any attendant risks.

The recent changes are the latest in a series of reforms to mortgage finance policy implemented by federal authorities. They help increase the resilience of the financial system by building buffers and help to mitigate vulnerabilities by aligning incentives for enhanced risk management.

8 The share of the price that is below $500,000 will continue to have a minimum down payment of 5 per cent; houses priced higher than $1 million do not qualify for mortgage insurance and have a 20 per cent minimum down payment at banks.

9 Potential borrowers can respond by choosing not to buy, purchasing a lower-priced home or finding additional resources for the larger down payment.

10 See OSFI, "Updates to Chapter 6 of Guideline A–Capital Adequacy Requirements (CAR), 29 April 2016, available at http://www.osfi-bsif.gc.ca/Eng/fi-if/rg-ro/gdn-ort/gl-ld/Pages/CAR_chpt6_upd_let.aspx.

There is evidence of increased riskiness in the characteristics of recent mortgage originations

High and rapidly rising house prices in Toronto, Vancouver and their adjacent areas have led some borrowers to take on larger mortgages. The share of both insured and uninsured mortgages issued in 2015 with a loan-to-income ratio (LTI) above 450 per cent increased notably from 2014 (**Box 1**). Higher LTIs are making households more vulnerable to both an adverse shock to income and higher interest rates. To help lower the large mortgage payments typical of a higher LTI, an increasing proportion of uninsured mortgages have been amortized over more than 25 years. The resulting slower repayment of debt leads to a higher aggregate level of household indebtedness.

Despite the increase in mortgages with high LTIs and long amortizations, arrears rates remain very low and are falling in British Columbia and Ontario. Arrears rates are an indicator of financial stress rather than of vulnerabilities. They are low because of the strong growth of house prices and growing employment in these areas. Should these factors undergo a rapid reversal (as in Risk 1), high levels of indebtedness could lead to a sharp increase in household stress, which would put upward pressure on arrears rates.

The growth of more complex lending channels has been evident in recent years. A single loan might involve the participation of a broker, a mortgage finance company, a mortgage insurer and a bank. This has served to

Box 1

An Increasing Share of New Mortgages Have High Loan-to-Income Ratios

Loan-to-income ratios (LTIs) for both insured and uninsured mortgage originations have been rising. In particular, the share of households with high LTI mortgages has risen, indicating that the increased concentration of household indebtedness highlighted in the December 2015 FSR is continuing.[1] The LTI is a useful measure because it contributes to a through-the-cycle assessment of the vulnerability of indebted households. Unlike the debt-service ratio, it does not decrease when interest rates fall, and unlike the ratio of loan size to home value, it does not decrease when house prices rise.

In Canada, mortgage insurance is required by banks when the loan size exceeds 80 per cent of the home value. Around one-third of mortgages are insured at origination. While mortgage insurance protects the lender, the higher equity component of uninsured mortgages provides a buffer against losses to the financial system.

Roughly 15 per cent of insured mortgages originated in 2015 had an LTI exceeding 450 per cent, up from 12 per cent in 2014 (Table 1-A).[2] Weighted by value, these high LTI mortgages accounted for 21 per cent of all insured mortgage

1 See G. Cateau, T. Roberts and J. Zhou, "Indebted Households and Potential Vulnerabilities for the Canadian Financial System: A Microdata Analysis," Bank of Canada *Financial System Review* (December 2015): 49–58.

2 The results are qualitatively similar using other thresholds for high LTI mortgages.

Table 1-A: Changing characteristics of newly originated mortgages, 2014–15

	Insured mortgages[a]		Uninsured mortgages[b]	
	2014	2015	2014	2015
Average loan-to-income ratio	313	323	271	292
Proportion of mortgages with loan-to-income ratio > 450 per cent				
By count	12	15	12	15
By value	16	21	19	24
Proportion of mortgages with amortization > 25 years[c]	0	0	42	46
Average loan-to-value ratio	93	93	69	69

a. Data for insured mortgages include loans used for purchases covered by transactional mortgage insurance for loan amounts that exceed 80 per cent of the home value. The data cover all lenders issuing loans insured by CMHC, Genworth and Canada Guaranty. Insured mortgage size does not include the mortgage insurance premium.

b. Data for uninsured mortgages cover purchases, refinancing and lender changes where the loan amounts are less than 80 per cent of the home value. Data include only the Big Six banks.

c. Insured mortgages are limited to an amortization of 25 years or less.

Note: All figures are expressed as percentages.

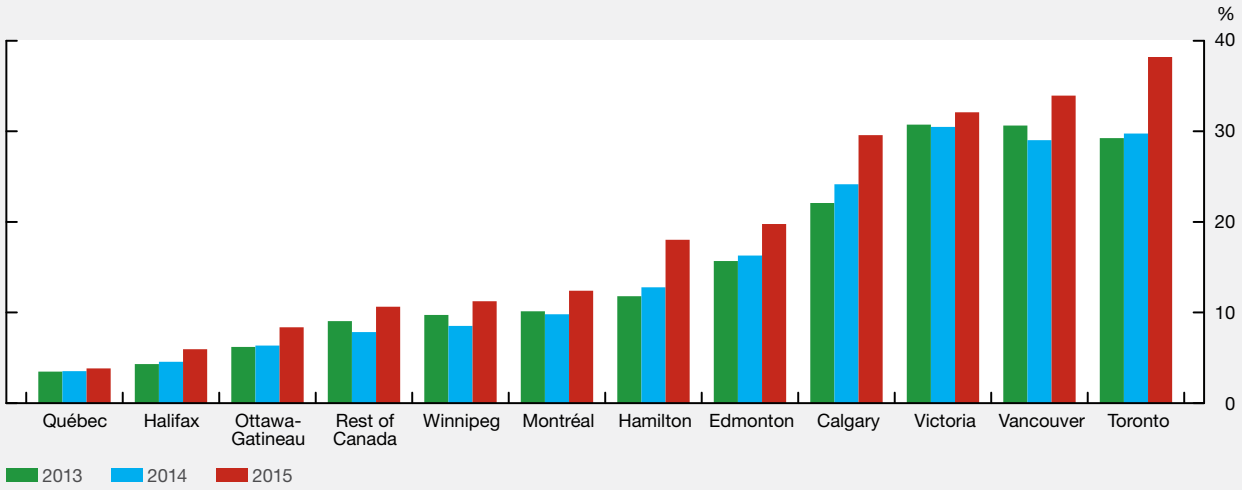
Sources: Department of Finance Canada and the Office of the Superintendent of Financial Institutions

(*continued...*)

Box 1 (*continued*)

Chart 1-A: The proportion of insured mortgages with high loan-to-income ratios has been rising

Percentage of new mortgages (used to purchase) that have a loan-to-income ratio greater than 450 per cent



Source: Department of Finance Canada

Last observation: 2015

debt originated in 2015, up from 16 per cent in 2014. The most significant growth has been in Toronto and Vancouver, which also experienced the largest jumps in house prices in 2015 (Chart 1-A). The increase is evident across all types of lenders, including banks, mortgage finance companies and credit unions. A similar pattern has been observed in uninsured mortgage borrowing, with roughly 15 per cent of uninsured mortgage originations in 2015 having an LTI greater than 450 per cent, compared with only 12 per cent in 2014. Weighted by value, these high LTI mortgages accounted for 24 per cent of uninsured mortgage debt originated in 2015, up from 19 per cent in 2014.

A higher LTI mortgage would typically result in households making larger payments relative to their income. However, a greater share of households with uninsured mortgages—46 per cent in 2015 compared with 42 per cent in 2014—are using an amortization period of more than 25 years. In total, 58 per cent of uninsured mortgage debt originated in 2015 has an amortization period longer than 25 years. Lengthening the amortization period lowers the monthly payment, improving the debt-service ratio. But it also implies that the households will reduce their outstanding principal more slowly, leading to higher aggregate household indebtedness.

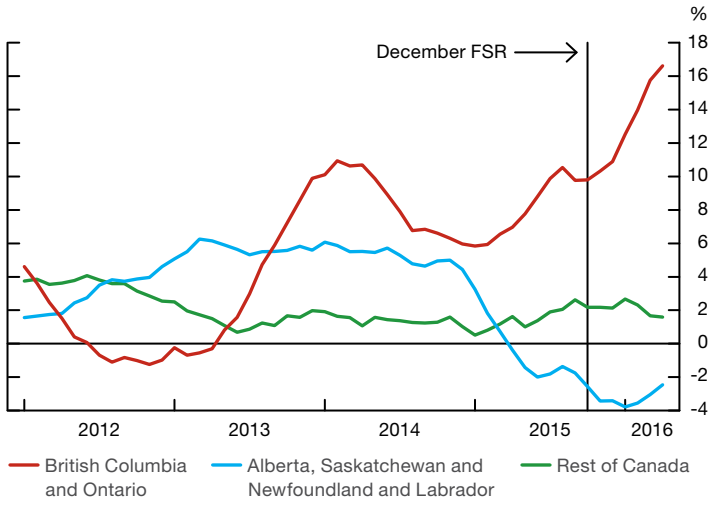
enhance the efficiency and competitiveness of the mortgage market. But to ensure that good lending standards are maintained, incentives are aligned and fraud is prevented, strong risk management is necessary along the entire lending chain, enforced by close monitoring and effective supervision.

Vulnerability 2: Imbalances in the Canadian Housing Market

Canada's housing market continues to display strong regional divergences, reflecting, in part, the complex adjustment to low commodity prices under way in the economy. Fundamental factors underpinning housing demand in the greater Vancouver and Toronto areas are strong, but the rapid pace of price increases seen over the past year raises the possibility that prices are also being supported by self-reinforcing price expectations. In contrast, home sales in the oil-producing provinces remain at a low level, and prices continue to decline. In the rest of Canada, most markets appear well balanced and price growth is modest. Overall, the vulnerability associated with housing market imbalances has moved higher.

Chart 7: Divergence in the growth of house prices has increased

6-month moving average of year-over-year growth in average prices



Sources: Canadian Real Estate Association and Bank of Canada calculations Last observation: April 2016

The trifurcation of housing markets in Canada has become more pronounced

On a national basis, resales continue to rise to new historical highs, while new listings have stagnated. Price growth, as measured by the MLS Home Price Index (MLS HPI), has picked up and is now 10 per cent on a year-over-year basis, up from 7 per cent at the time of the December FSR.

The strength in the national data, however, reflects a growing divergence across Canada's regional housing markets (**Chart 7**). Sales and house price growth in British Columbia and Ontario are high and rising. In particular, year-over-year house price growth in the Greater Vancouver Area (GVA) has risen sharply, reaching 30 per cent in May, from 15 per cent at the time of the December FSR. In the Greater Toronto Area (GTA), house prices are growing by 15 per cent on a year-over-year basis, up from 10 per cent six months ago.

Because housing in these cities has become less affordable for the average buyer, demand has increasingly shifted to areas surrounding the GTA and the GVA, boosting regional prices.[11] For example, house price growth in Hamilton has averaged around 10 per cent over the past eight months. A similar phenomenon is taking place in the Fraser Valley, which is adjacent to the GVA.

Deteriorating labour market conditions continue to weigh on housing sales in the oil-producing provinces. Sales have declined by about 3 per cent since the December FSR and are now 25 per cent below their peak in October 2014. Weakness in demand, combined with relatively ample supply, continues to exert downward pressure on house prices, which are falling by about 2 per cent on a year-over-year basis. Elsewhere in Canada, resale activity remains relatively stable and is only slightly higher than its 10-year average, with adequate supply and modest price growth.

11 This observation is based on the MLS HPI. For areas covered by the GTA and GVA, see the Toronto Real Estate Board (http://www.trebhome.com/about_GTA/Neighbourhood/index.html) and the Real Estate Board of Greater Vancouver (http://www.rebgv.org/your-community).

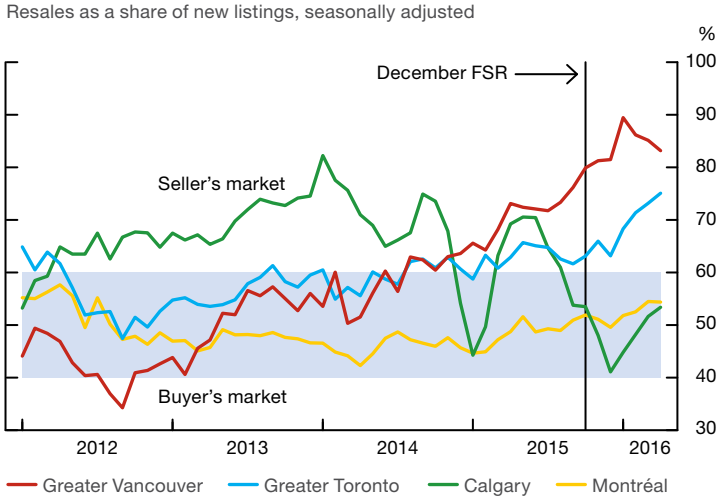
Multiple factors are supporting house price growth in British Columbia and Ontario

The ratio of sales to new listings is high in many markets in British Columbia and Ontario, consistent with upward pressure on house prices (**Chart 8**).

In particular, in Vancouver and Toronto, resale activity and price growth are high, supported by migration and employment gains (**Chart 9**). Foreign demand is also playing a role in specific segments of the GVA and GTA markets. A recent CMHC survey reported that foreign ownership in newer

Chart 8: The ratio of sales to new listings is high in key British Columbia and Ontario markets

Resales as a share of new listings, seasonally adjusted



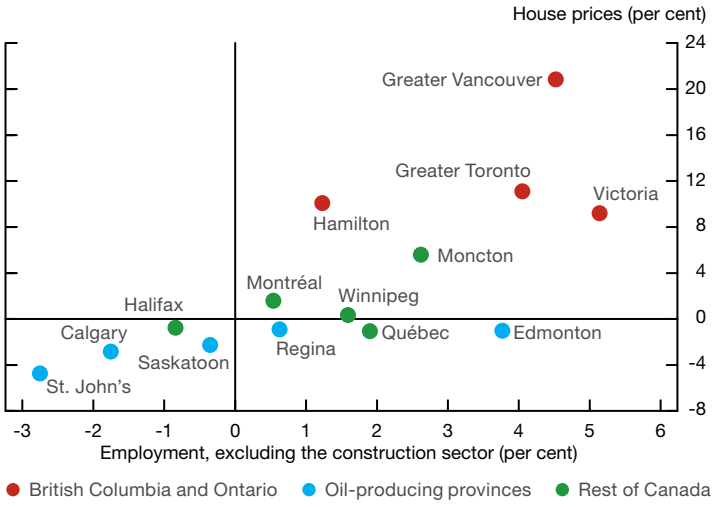
Note: The shaded area represents the market roughly balanced between buyers and sellers.

Sources: Canadian Real Estate Association, Québec Federation of Real Estate Boards and Bank of Canada calculations

Last observation: April 2016

Chart 9: Regional divergence in house price growth partly reflects employment growth

6-month average of year-over-year growth rates



Sources: Employment growth: Statistics Canada Labour Force Survey; house price growth: Teranet-National Bank (Edmonton, Halifax, Hamilton, Québec and Winnipeg) and Canadian Real Estate Association (Calgary, Greater Toronto, Greater Vancouver, Moncton, Montréal, Regina, Saskatoon, St. John's and Victoria); and Bank of Canada calculations

Last observation: April 2016

condominium apartment structures has increased in the past year, reaching 6.0 per cent in Vancouver and 7.5 per cent in Toronto in 2015.[12] Market reports also suggest that international interest in the Vancouver and Toronto luxury markets remains strong, boosted recently by a lower Canadian dollar.[13]

Because it is currently difficult to measure the effect of demand from foreign residents,[14] the governments of Canada and British Columbia have announced plans to improve collection of data on foreign ownership of Canadian real estate.[15] To the extent that foreign demand reflects buy-and-hold investment, it does not directly increase the risk of a house price correction. Together with other factors stoking demand, however, foreign demand does contribute to price increases that are driving the rise in household indebtedness (**Vulnerability 1**).

Constraints such as geography and land-use regulation are limiting supply growth in the GVA and GTA, strengthening the upward pressure on prices, particularly for single-family detached homes. As a result, demand is increasingly shifting to the more affordable areas surrounding these cities. In addition, the supply of condominiums has been responding to the higher prices in these areas.

The potential for a downturn in house prices has increased in some areas

It is unlikely that the current pace of price increases in the GVA and GTA can be sustained. Supply will be somewhat more elastic in the long term, and it is unlikely that demand fundamentals will justify continued strong price increases. The rapid pace of price increases seen over the past year also raises the possibility that prices may be supported by self-reinforcing expectations, making them more sensitive to an adverse shock to housing demand.[16]

Vulnerability 3: Fragile Fixed-Income Market Liquidity

Market liquidity in fixed-income markets is evolving in response to structural and cyclical changes to the financial system.[17] Market perceptions that liquidity in many markets, particularly in fixed-income markets, has become more variable have led to questions about its potential resilience during times of stress. If a large number of investors were to try to simultaneously adjust their portfolios in response to a shock, a drop in market liquidity would amplify asset price changes, leading to a widespread increase in volatility.

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12 CMHC's *Housing Market Insight—Canada* (April 2016) also reported that foreign ownership outside of the GVA and GTA remains quite low. For more details, see http://www.cmhc-schl.gc.ca/en/hoficlincl/observer/observer_053.cfm.

13 See Sotheby's International Realty Canada, Press Release, 3 March 2016, available at http://www.marketwired.com/press-release/luxury-real-estate-sales-surge-to-continue-in-toronto-in-spring-2016-2102514.htm.

14 Survey results, such as those from the CMHC survey, may underestimate the number of non-residents who are buying through local representatives. It can also be difficult to distinguish non-resident buyers from recently arrived immigrant buyers. As well, there are important data gaps outside of Vancouver and Toronto and for different types of housing, such as single-family and row homes.

15 See http://www.budget.gc.ca/2016/docs/plan/ch8-en.html#_Toc446106871 and http://bcbudget.gov.bc.ca/2016/backgrounders/2016_Backgrounder_1_Housing.pdf.

16 There is a significant economic literature on the role of extrapolative expectations and house price dynamics. Examples of recent papers include P. Gelain and K. J. Lansing, "House Prices, Expectations, and Time-Varying Fundamentals," Working Paper 2013/05, Norges Bank, 2013; and E. Granziera and S. Kozicki, "House Price Dynamics: Fundamentals and Expectations," *Journal of Economic Dynamics and Control* 60 (November 2015): 152–65.

17 The name of this vulnerability has changed from the December FSR to emphasize the financial stability concerns regarding market liquidity.

Globally, fixed-income markets are adjusting to changes in regulation, technological advances, unconventional monetary policies and the level and volatility of interest rates. It is difficult to draw conclusions about the net effect of these changes on market liquidity because the system is still in flux. The use of both qualitative information from market participants and quantitative measures is important for a better understanding of how market liquidity might be changing.

Market participants report a generalized decline in market liquidity

Market participants in Canada have stated that trades are taking longer to execute and that large trades need to be broken up into smaller sizes across fixed-income markets, especially in the corporate bond market.[18] There have also been reports of a shift in market-making in the corporate bond market, from a "principal" to an "agency" model (i.e., dealers are matching buyers and sellers without holding bonds on their own balance sheets). This model increases the time it takes to complete transactions. Market-making capacity can also decline when there is an increase in the number of settlement fails in the repo market, as observed recently, which can potentially reduce market liquidity.[19]

In response to concerns about declining market liquidity, some asset managers are adjusting their portfolio-management practices. They now expect a longer holding period for their less-liquid securities and, as a result, are holding a greater amount of highly liquid assets, such as government bonds. They are also increasing the use of derivatives to adjust the risk profile of their portfolios. Lower market liquidity and changes in asset managers' practices, especially in Canadian provincial and corporate bond markets, can increase issuance costs for debt issuers or constrain their ability to obtain funding in desired tenors.

There is some empirical evidence of diminished market liquidity in certain market segments

Transactions-based metrics for non-benchmark Government of Canada (GoC) bonds and provincial bonds have shown signs of deterioration in the average level of market liquidity since early 2015 (**Box 2**). The same measures for the corporate bond market do not show a recent decline in the average level of market liquidity, which is difficult to reconcile with the views of market participants. While these measures capture some key elements of market liquidity, they do not provide a complete picture of all its dimensions.

Has liquidity become fragile?

In addition to its level, the variability of market liquidity can provide information about its fragility. An increase in variability may suggest an increase in the potential for a large and persistent loss of market liquidity, resulting in a market freeze. From a financial stability perspective, such an event is most worrisome, especially in the core markets that financial sector participants rely on to meet unexpected demands for cash.

There is some empirical evidence of a rise in the variability of liquidity in government bond markets. Measurements of the volatility of transactions-based liquidity metrics provide one indicator of whether the variability of

18 The information in this section is based on discussions at meetings of the Canadian Fixed-Income Forum. See http://www.bankofcanada.ca/markets/canadian-fixed-income-forum.

19 See J.-S. Fontaine, C. Garriott and K. Gray, "Securities Financing and Bond Market Liquidity," in this issue.

Box 2

Measured Trends in the Level of Market Liquidity

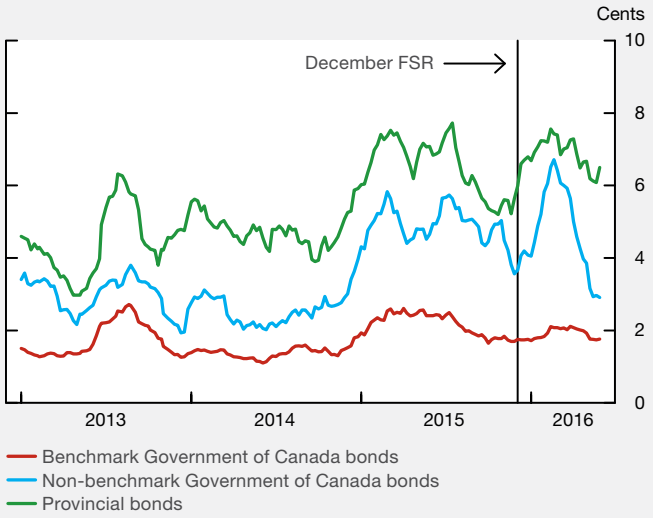
Indicators constructed from data on fixed-income transactions provide some evidence of a decline in the average level of market liquidity in Government of Canada (GoC) and provincial bond markets. The indicators include proxies for the price impact of trades and bid-ask spreads that are commonly used in the academic literature.[1]

While these indicators remain indirect measures, they capture some key features of liquidity in fixed-income markets. For example, the transactions-based price-impact proxy is lowest for benchmark GoC bonds, which are very liquid, and highest for corporate bonds, which are very illiquid. These measures also indicate that liquidity in non-benchmark GoC and provincial bonds is between these extremes, as expected. For these less-liquid government bonds, the price-impact proxy has generally been higher since the beginning of 2015 than it was in the previous two years. This indicates a greater deterioration in liquidity than that seen for the benchmark GoC bonds (Chart 2-A).[2]

In contrast, the price-impact proxy for the corporate bond market has been relatively stable over the same period (Chart 2-B), which is at odds with the experiences often described by market participants. However, there are many possible reasons for these different assessments. For example, the transactions-based measures do not take into account bonds that did not trade because of lower liquidity, and data gaps prevent us from obtaining valuable information for those bonds, such as quoted bid-ask spreads. In addition, structural and cyclical changes in the financial system may be affecting market liquidity in a way that may not be captured by traditional measures of market liquidity, especially in the corporate bond market. Importantly, these measures cannot capture changes in the time needed by market participants to execute large trades.

Chart 2-A: The price-impact proxy has risen for non-benchmark Government of Canada and provincial bonds since early 2015

Price-impact proxy by issuer category, 12-week moving average, weekly data

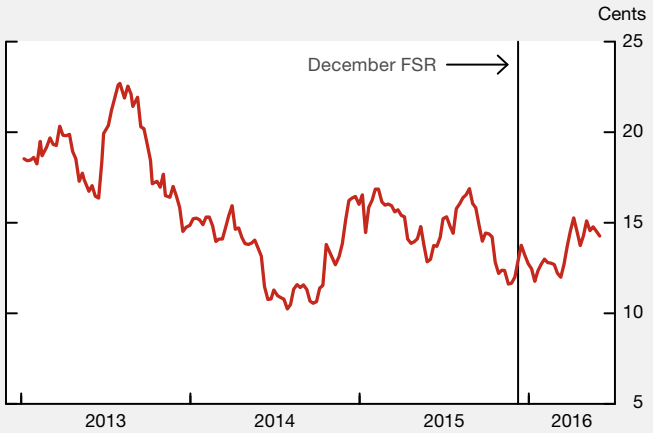


Note: Higher values indicate lower market liquidity.

Sources: Bloomberg, Canadian Depository for Securities and Bank of Canada calculations Last observation: 2 June 2016

Chart 2-B: The price-impact proxy for Canadian corporate bonds has been stable

Price-impact proxy, 12-week moving average, weekly data



Note: Higher values indicate lower market liquidity.

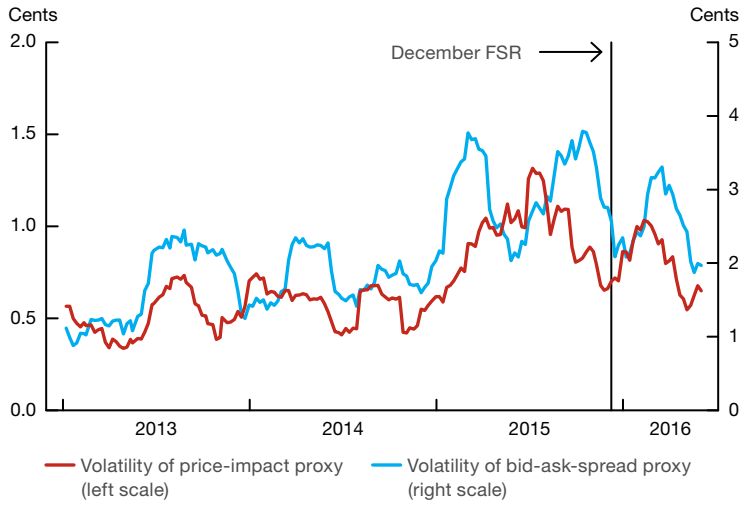
Sources: Bloomberg, Canadian Depository for Securities and Bank of Canada calculations Last observation: 2 June 2016

1 For more information on these metrics and their limitations, see Box 3, "Measures of Market Liquidity for Government of Canada Securities," Bank of Canada *Financial System Review* (December 2015): 21.

2 The upward trend in the non-benchmark GoC price-impact measure remains evident despite its recent decline.

Chart 10: The volatility of liquidity in Government of Canada bonds has been higher, on average, since early 2015

Weekly standard deviation of the median daily liquidity measure, 12-week moving average



Sources: Canadian Depository for Securities and Bank of Canada calculations

Last observation: 2 June 2016

liquidity has increased. **Chart 10** plots the within-week variation of the daily price-impact and bid-ask-spread proxies for all GoC bonds since 2013 and shows that the volatility of these measures has been higher, on average, since early 2015. Another approach is to measure the frequency of "jumps" (an abrupt deterioration) in liquidity metrics.[20] Liquidity metrics calculated for US Treasuries, Japanese government bond futures and Italian government bonds provide some evidence of recent clustering of jumps, which are indicative of higher variability. Global equity and foreign exchange markets have also experienced outsized intraday price movements, suggesting an increase in the variability of liquidity in these markets as well. It is difficult, however, to find similar evidence for corporate bond markets.[21]

It is hard to determine whether the increase in variability seen in the data is the result of the changing nature and frequency of shocks or whether it reflects the fragility of liquidity. More work is needed to better understand how the system is adapting, including whether the ongoing changes are transitory, how market participants are adjusting to the new trading environment and how the resilience of market liquidity is being affected.

20 A report by the Committee on the Global Financial System (CGFS Papers No. 55, "Fixed Income Market Liquidity," available at http://www.bis.org/publ/cgfs55.pdf) uses the term fragility to describe the variability of liquidity.

21 We do not find evidence of an increase in the variability of liquidity for Canadian corporate bonds. Staff at the Federal Reserve Bank of New York calculate the frequency of jumps in the US corporate bond market and find no evidence of a recent increase. See the Liberty Street Economics blog post at http://libertystreeteconomics.newyorkfed.org/2015/10/has-liquidity-risk-in-the-corporate-bond-market-increased.html#.Vy-HxoQrLDc.

Key Risks

Risk 1: Household Financial Stress and a Sharp Correction in House Prices

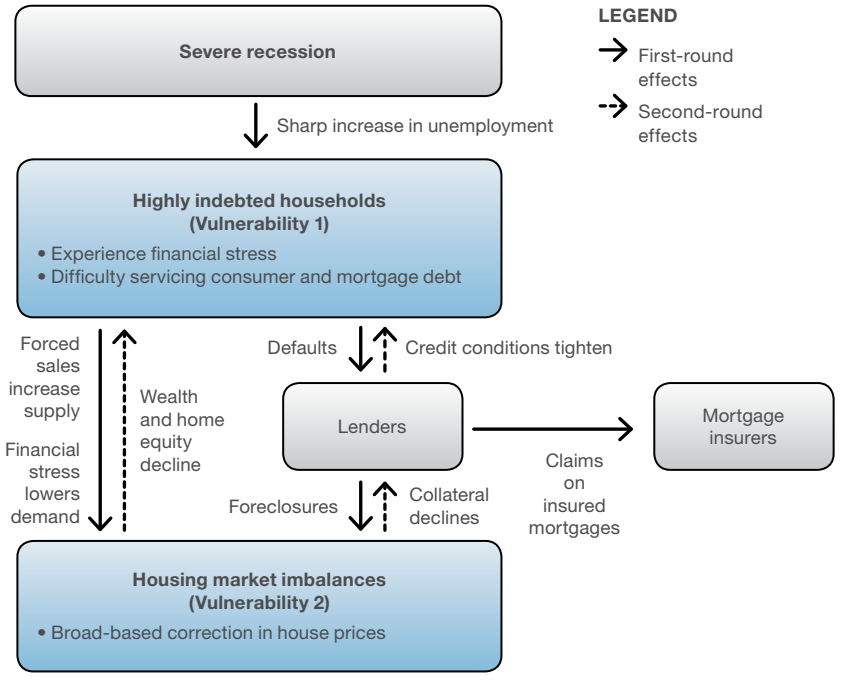
In this risk scenario, a severe recession in Canada generates a sharp increase in unemployment across the country that places many highly indebted households under financial stress and causes a broad-based correction in house prices (**Figure 1**). This chain of events would strain the financial system and the real economy. Such a scenario might unfold if a large negative demand shock hit the Canadian economy, but the probability of this risk occurring remains low.

Household vulnerabilities have moved higher, while the overall rating of this risk remains "elevated."

The probability of this risk materializing remains low

Households in regions affected by declines in commodity prices are facing increased stress: credit arrears rates are up mildly, house price growth has turned negative and employment is declining in some areas. For this risk to be triggered, however, the negative effects would need to be more severe and widely felt across the country. There is no evidence that this is occurring. Outside Alberta and Saskatchewan, about 70 per cent of households have reported that the oil price shock has had little, or even a positive, effect on their personal finances.[22] In the corporate sector, evidence of deterioration in credit quality is limited to commodity-related industries and commodity-intensive regions. Activity outside these industries is expanding,

Figure 1: Propagation channels in Risk 1



22 Results are from a special question asked in the Bank's *Canadian Survey of Consumer Expectations*. See M.-A. Gosselin and M. Khan, "A Survey of Consumer Expectations for Canada," *Bank of Canada Review* (Autumn 2015): 14–23. Available at http://www.bankofcanada.ca/wp-content/uploads/2015/11/boc-review-autumn15-gosselin.pdf.

particularly in non-commodity export industries. Combined with continued low interest rates and fiscal stimulus, this expansion is reducing the probability of the risk being triggered over time.[23]

Growing vulnerabilities increase the potential impact of the risk

Higher household indebtedness, its growing concentration in highly indebted households and an increase in the proportion of mortgages with riskier characteristics (**Box 1**) make households more vulnerable. As such, the possible severity of this risk has increased. Income losses and house price declines would lead to significant cutbacks in expenditures since households would be focused on servicing debt and attempting to offset the losses in wealth. Financially constrained households that are unable to service their debt might be forced to sell assets, including their homes, or to enter into foreclosure. A rapid change in expectations for future house prices could combine with greater selling pressure to trigger a sharp correction in the housing market, causing some households to have outstanding mortgages that exceed the value of their homes (**Box 3).**

Significant stress in the household sector would affect Canadian financial institutions, including mortgage insurers and lenders. Although mortgages would be the most directly affected by a correction in house prices, several factors limit the possible damage. Insured mortgages are backed in whole or in part by the Canadian government. Uninsured mortgages are required to have down payments of 20 per cent or more, creating significant collateralization that helps mitigate losses to financial institutions. Banks are likely to suffer greater losses from consumer and business credit. However, the capital positions of Canadian banks and mortgage insurers, enhanced further in recent years by global and domestic regulatory reform initiatives, make them resilient to an extreme but plausible widespread rise in unemployment and a correction in house prices.

There would nonetheless be important economic and financial costs if this scenario were realized. Evidence from international experiences suggests that high household leverage can amplify the effect of adverse income shocks on economies.[24] In addition, Canadian financial institutions would be left in a weaker position, impairing credit intermediation for an extended period while buffers are replenished. Households and businesses might face higher borrowing rates or suffer reduced access to credit as deleveraging occurs across the economy. Public finances would also suffer, and the cumulative negative effect on the economy and the financial system would be significant.

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23 The effects of commodity price declines are discussed further in Risk 4 and Box 5, below.

24 See, for example, International Monetary Fund, "Chapter 3: Dealing with Household Debt," *World Economic Outlook: Growth Resuming, Dangers Remain* (April 2012): 89–124; R. Glick and K. J. Lansing, "Global Household Leverage, House Prices, and Consumption," *FRBSF Economic Letter* 2010:01 (11 January 2010); and Ò. Jordà, M. Schularick and A. M. Taylor, "The Great Mortgaging: Housing Finance, Crises, and Business Cycles," Federal Reserve Bank of San Francisco Working Paper No. 2014-23, September 2014.

Box 3

What Proportion of Mortgages Could Exceed Home Values Following a House Price Correction?

Home values could be eroded by a house price correction to the point that some households might have more outstanding mortgage debt than their home is worth. The results presented here use self-reported data on outstanding mortgage debt and house values from 2012 to 2014 to estimate the proportion of mortgages that would have been in a negative equity position if a house price correction had occurred.[1] The scenarios used for the analysis reflect two regional experiences: those in Alberta and British Columbia in the 1980s (where house prices declined by 25 per cent) and in Ontario and British Columbia in the 1990s (where house prices declined by 15 per cent). The scenarios are based on regional experiences because Canada has never undergone a nationwide protracted decline in nominal house prices.

In one of these scenarios, a house price correction of 15 per cent would have caused 13 per cent of mortgages in Canada to be in a negative equity position in the 2012–14 period (Table 3-A). This represents about 600,000 households and $280 billion in mortgage debt.[2] Around one-third of these negative equity mortgages (4 per cent of all mortgages) would have been held by highly indebted households.

The median home equity position of Canadian mortgage holders is estimated to be about 52 per cent of the value of the house overall and 31 per cent for highly indebted households (Chart 3-A). In the scenario with a 15 per cent house price correction, the average equity would have been only -5 per cent for mortgages that fall into a negative equity position.

Households will typically continue to service their debt even when they are in a negative equity position to avoid losing their home and other assets.[3] A house price correction alone is therefore not likely to cause a large increase in defaults. But a negative equity position is more likely to lead to a default if it is expected to be long-lasting and is accompanied by a loss of income that makes it difficult to service the debt, as in Risk 1. If this should occur, lenders would typically face high transaction costs when selling foreclosed houses, and an increase in foreclosures may also push house prices down further. While very difficult for the affected households, the small size of the negative equity positions means that losses to lenders and insurers could be limited.

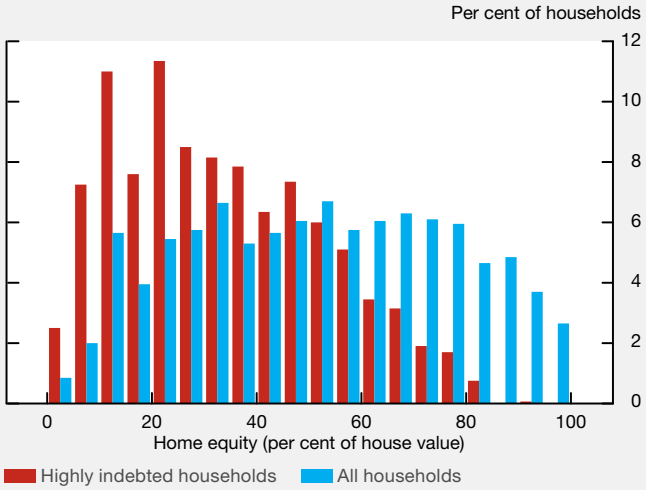
Table 3-A: Characteristics of negative equity mortgages

	Scenario	
Decline in house prices	15	25
Proportion of mortgages with negative equity	13	23
Proportion of mortgages with negative equity and held by a highly indebted household	4	7
Average equity position for mortgages with negative equity	-5	-9

Notes: All figures are expressed as percentages. Highly indebted households are those that have a ratio of total household debt to disposable income exceeding 350 per cent. This differs from the 450 per cent threshold used in Box 1 because this box is analyzing the stock of outstanding debt rather than mortgage originations. Data are averaged over the years 2012 to 2014.

Chart 3-A: Distribution of home equity

2012–14 averages



Sources: Ipsos Reid and Bank of Canada calculations

1 Data are from the Canadian Financial Monitor and cover mortgage debt and total household real estate assets. The scenarios calculate the direct and immediate effect of a house price drop and do not attempt to incorporate any additional market or policy reactions.

2 This figure includes both mortgages and home equity lines of credit.

3 For most mortgages in Canada, the lender has recourse to other household assets if a borrower defaults on a mortgage. The exceptions are uninsured mortgages in Alberta and all mortgages in Saskatchewan, which are non-recourse.

Risk 2: A Sharp Increase in Long-Term Interest Rates Driven by Higher Global Risk Premiums

A sudden increase in long-term interest rates due to higher risk premiums, globally and in Canada, is the second key risk to the Canadian financial system.[25] Such a scenario could be triggered by, for example, a market overreaction to surprise changes in monetary policy in major advanced economies, a resurgence of financial stresses in Europe or an escalation of geopolitical tensions. A large and persistent rise in global risk premiums and the resulting increase in interest rates would lead to tighter financial conditions, a drop in confidence, weaker growth and rising debt-service burdens, both globally and in Canada.

This risk continues to be rated as "moderate," with a low probability of occurring and a moderately severe impact on the Canadian financial system if it were to occur.

The probability of this risk materializing remains low

Ongoing quantitative easing in the euro area and Japan is maintaining downward pressure on risk premiums on government bonds, mitigating the potential for a sharp rise in these premiums. As well, the Federal Reserve continues to be committed to its approach of clearly communicating its intentions in the process of policy normalization, which should reduce the potential for market surprises. Should the premiums on government bonds rise more quickly than anticipated from their current historically low levels, monetary policies in advanced economies could be adjusted to help offset the adverse economic effects.

Greater financial stress in Europe or an escalation of geopolitical tensions could also trigger a rise in global risk premiums. Ongoing concerns about the health of the European banking sector, in particular, could reignite in the context of non-performing loans, domestic economic weakness and negative interest rates.

The impact on the Canadian financial system would be moderately severe

A sudden increase in global risk premiums, including in Canada, would drive up yields on GoC bonds and lead to a decline in the prices of other financial assets. Asset price movements could be amplified by a sudden decline in market liquidity, resulting in a further rise in risk premiums.

Tighter financial conditions and higher risk aversion, if persistent, would adversely affect financial institutions, leading to a rise in borrowing rates (**Box 4**). Sharply higher funding costs for Canadian corporations would lead to a decline in business investment, and higher consumer borrowing rates would raise debt-servicing costs for Canadian households. In addition, higher provincial bond yields would add stress to the balance sheets of provincial governments, particularly those with greater short-term refinancing needs.

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25 The name of this risk has changed to clarify the scenario, but the scope of the risk remains the same as it was in the December FSR.

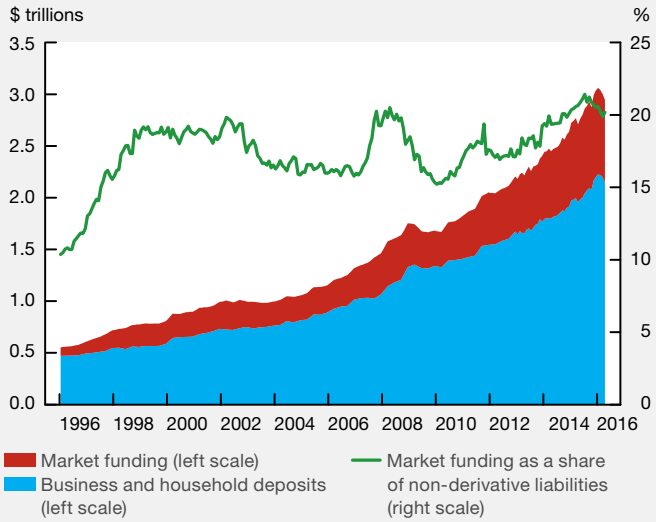
Box 4

Use of Market Funding by the Big Six Banks

Deposits of households and businesses amount to roughly 55 per cent of total liabilities for the Big Six Canadian banks. Increasingly, however, banks have tapped market funding—in both Canadian dollars and foreign currencies—to sustain the growth of their balance sheets and further diversify their funding sources.[1] The share of market funding for the Big Six banks reached a peak of 21 per cent of non-derivative liabilities in the third quarter of 2015 (Chart 4-A). There are a number of reasons why some use of market funding by Canadian banks is advantageous. First, unlike deposits, market funding is flexible since it can be scaled up or down relatively easily to meet banks' operational needs. Market funding also enables banks to manage balance-sheet risks by matching the maturity and liquidity characteristics of their funding with that of their assets. Regulatory safeguards are in place (e.g., the Liquidity Coverage Ratio) that help banks withstand periods of stress in funding markets.

Nonetheless, the use of market funding has the potential to amplify the impact of a global shock, such as a rise in global risk premiums, on the Canadian financial system. The credit spreads of Canadian banks are narrower than the spreads of many of their global peers, but they are correlated with them. In particular, the widening in credit spreads observed during the first couple of months of 2016 was a global phenomenon (Chart 4-B). This correlation suggests that the funding costs of Canadian banks could rise in response to global shocks even if their relative credit quality remained unchanged. Since bank funding costs tend to be passed on to borrowers, market-based funding represents an additional channel through which global shocks can lead to higher borrowing costs for Canadian households and businesses.

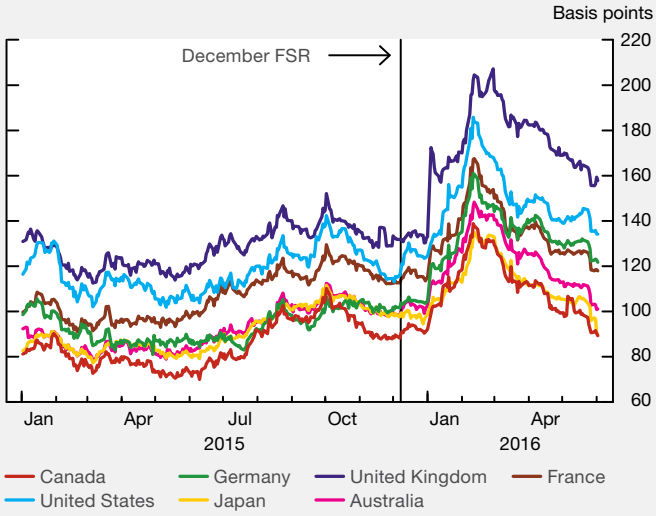
Chart 4-A: Market funding has been increasing as a share of the total liabilities of banks



Sources: Regulatory filings of Canadian banks and Bank of Canada calculations
Last observation: April 2016

Chart 4-B: Bank credit spreads are highly correlated globally

Indexes of 5-year USD-denominated senior unsecured spreads over US Treasury bonds, by country of domicile of global banks, daily data



Sources: Markit and Bank of Canada calculations
Last observation: 2 June 2016

1 Market funding includes all bearer deposit notes: short-, medium- and long-term notes; fixed- and floating-rate notes; and other negotiable deposit notes, including covered bonds, that could be transferred to third parties without the institution being informed of the new holder of the note.

Risk 3: Stress Emanating from China and Other Emerging-Market Economies

The Canadian financial system could be exposed to severe economic and financial stress from China and other EMEs. Potential triggers for this risk include a severe financial disruption or an economic downturn in China. In addition, further slowing in growth in EMEs or a disorderly depreciation of their currencies could lead to corporate or sovereign defaults, especially in EMEs that have large, unhedged debt denominated in US dollars. Such a scenario would weigh on global economic growth and trade, lowering commodity prices and leading to significant volatility across financial markets.

The rating of this risk remains "elevated." Its probability of occurring is medium, and the impact on the Canadian financial system would be moderately severe if it were to materialize.

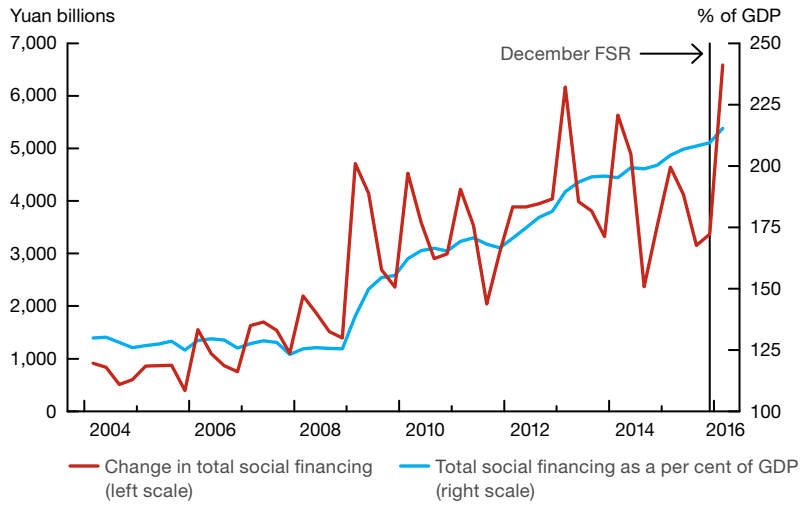
The probability of financial stress in China and other EMEs remains medium

Considerable uncertainty surrounds the structural transition of the Chinese economy and financial system. In the first quarter of 2016, China's GDP grew at a rate of 6.7 per cent on a year-over-year basis, suggesting that China is gradually slowing to a more sustainable pace of growth. At the same time, however, China has experienced rapid credit growth, mainly in the corporate sector (**Chart 11**). Firms are also using new debt to refinance maturing debt, which has the potential to mask growth of non-performing loans in the banking sector. Increasing financial sector vulnerabilities against a backdrop of slowing economic growth could pose a challenge for Chinese authorities, who are trying to facilitate a smooth transition.

In other EMEs, slower growth and weak commodity prices continue to exert pressure on corporate and sovereign balance sheets, especially in commodity-exporting EMEs, and are reflected in their higher borrowing costs (**Chart 12**). Weaker currencies and tighter credit conditions in these countries are likely to affect the ability of businesses in EMEs to refinance, especially those with high US-dollar-denominated debt. However, some

Chart 11: Outstanding loans in China increased rapidly in the first quarter of 2016

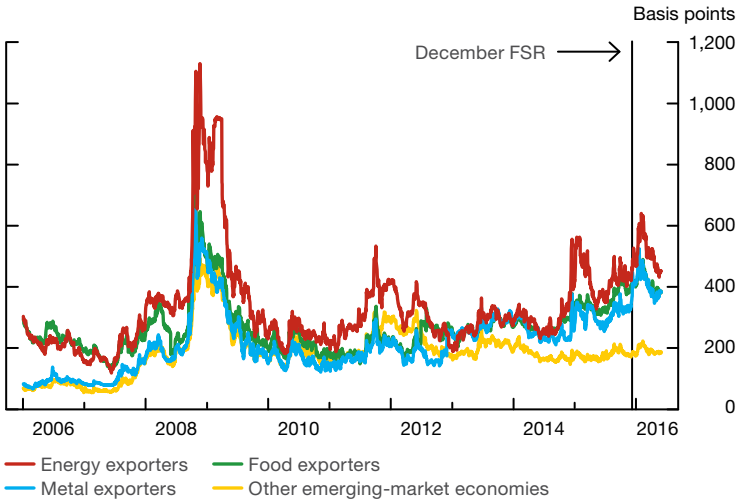
Quarterly data



Note: Total social financing refers to total outstanding corporate and household borrowing.
Source: Bloomberg
Last observation: 2016Q1

Chart 12: Bond spreads across commodity-exporting emerging-market economies have recently increased

Daily data



Source: International Monetary Fund

Last observation: 31 May 2016

of these countries have scope for easing monetary or fiscal policy; others have buffers, such as ample foreign exchange reserves or a well-capitalized banking sector, that can help offset the effects of a slowing credit cycle.

The impact on Canada would be moderately severe

If this risk were to materialize, stress would be transmitted to Canada through lower commodity prices, slower global trade, higher financial market volatility and greater risk aversion. Over the past year, global financial markets experienced short-lived episodes of heightened stress spilling over from China and other EMEs. These episodes suggest that financial linkages, including those to Canada, are stronger than previously thought. As China's financial system becomes more integrated with the global financial system, potential transmission channels are likely to become stronger.

Risk 4: Prolonged Weakness in Commodity Prices

To date, major Canadian financial institutions and markets are adjusting to the fall in commodity prices (**Box 5**). A risk remains, however, that strong commodity supply could hold down prices for a prolonged period, with adverse implications for the Canadian financial system.

This risk continues to be "moderate," with a medium probability of occurring. The severity of the impact on the financial system, should the risk occur, remains relatively low.

The probability of this risk materializing has declined but remains medium

After bottoming out earlier in the year, the price of West Texas Intermediate (WTI) crude oil has climbed to about US$50 per barrel. Base metals prices have also increased, but more modestly. Commodity prices could retrench and remain low if the pace of production cutbacks slows or the growth of global demand softens. While production cutbacks have begun in the oil industry, global productive capacity continues to expand in base metals.

Box 5

Tracking the Impact of the Oil Price Shock

The impact of the decline in oil prices on the financial system continues to evolve largely as anticipated. The effects have been felt mostly by firms and households in the oil-producing provinces, and there is limited evidence of negative spillovers to other industries and regions of Canada. The Canadian economy is diverse, and some industries are benefiting from the decline in both oil prices and the value of the Canadian dollar. Further, major Canadian banks are well capitalized, with diverse exposures and revenue sources, and are therefore resilient to sector-specific and regional losses. Nonetheless, the evolving impact of the oil price shock on the Canadian financial system is being carefully monitored.

Following the drop in oil prices, firms in the oil and gas industry acted quickly to cut spending to preserve liquidity and protect their balance sheets. Profitability has fallen sharply, funding conditions have tightened and some firms in the industry have recently been downgraded by credit-rating agencies. Several small and mid-sized Canadian producers have gone into receivership, and several others have sought creditor protection or concessions from lenders. Nonetheless, the typical amount of leverage in the industry is moderate, and larger oil and gas firms have little need for refinancing over the next two years.[1]

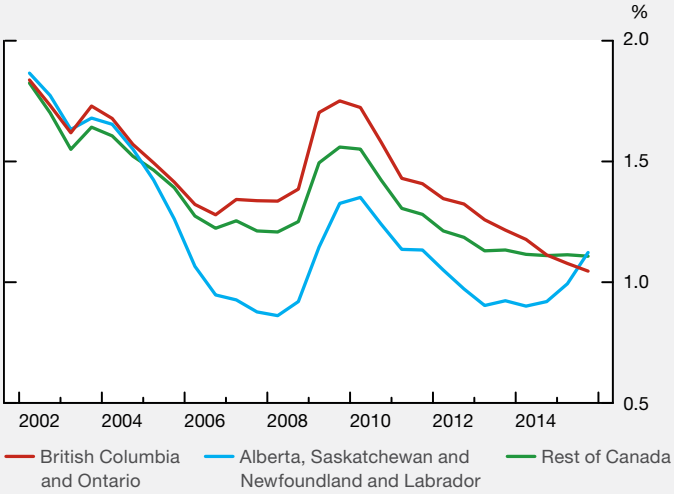
The collapse in investment and the declining profitability in the oil and gas industry have led to a deterioration in labour market conditions in oil-producing regions that has put pressure on the ability of some households to service their debt. Automatic stabilizers, such as employment insurance and expansionary fiscal policy, have provided a partial offset. Rates of consumer loan delinquencies and mortgage arrears have, however, started to increase in these areas, albeit from very low levels (**Chart 5-A**). Rising unemployment typically predicts delinquencies six months in the future, suggesting that a further rise in delinquencies should be expected. In contrast, loan delinquencies outside the oil-producing regions are decreasing or stable. An adverse impact is also evident in some commercial real estate markets. In the downtown Calgary market, for example, where oil and gas firms account for about 70 per cent of total occupancy, vacancy rates are spiking (**Chart 5-B**).

Loans to firms in the oil and gas sector are relatively small, representing roughly 2 per cent of the total loans of the Big Six banks.[2] Credit quality on existing loans deteriorated during 2015 and early 2016, leading to increases in impaired loans and provisions for loan losses. Since the December 2015 FSR, the gross impaired loan (GIL) ratio of the Big Six banks in the oil and gas sector has risen substantially.[3] In contrast, GIL ratios and loan-loss provisions have not risen significantly in other sectors, suggesting limited spillovers into other industries.

(continued...)

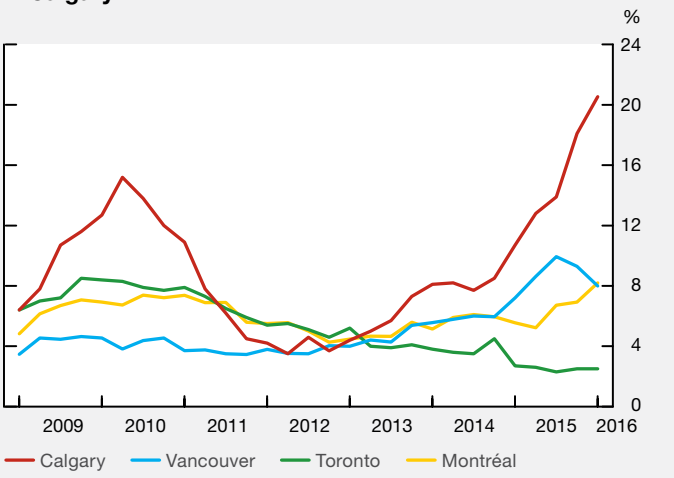
Chart 5-A: Consumer loan delinquencies are increasing in oil-producing provinces but not elsewhere

Consumer loans 90+ days in arrears



Sources: Equifax and Bank of Canada calculations Last observation: 2015H2

Chart 5-B: Office vacancy rates have increased sharply in Calgary



Source: Colliers International Last observation: 2016Q1

1 Moody's Investor Service, "Refunding Risk and Needs 2016–20: Non-Financial Corporations—Canada," 6 February 2016.

2 Oil and gas firms represent 4.1 per cent of loans at the Big Six banks if undrawn exposures are included. This is down from 4.6 per cent, mainly as a result of reductions in undrawn exposures as credit limits were cut back.

3 Gross impaired loans in the oil sector of the Big Six banks rose from about 2 per cent to about 6 per cent. Gross impaired loans are delinquent loans (typically over 90 days) in which the lender believes there is a high probability that full repayment will not be made.

Box 5 (*continued*)

Loans to households and the commercial sector, especially real estate in the oil-producing provinces such as Alberta, constitute a much larger share of total loans. Indeed, for the Big Six, loans in Alberta represent about 10 per cent of total outstanding loans globally. Although losses related to consumer loans and mortgages will likely continue to increase from relatively low levels, many of the mortgage loans are protected by collateral and mortgage insurance. Loss rates are therefore expected to be much lower than those associated with direct loans to the oil industry. The diversity of the exposures of Canada's Big Six banks, their broad earnings base and their strong capital positions suggest that the effect of the oil price shock on earnings will be manageable.

The Canadian financial system has sufficient diversity and buffers to limit the impact of this risk

Commodity producers have a wide variety of evolving cost structures. The lower prices fall and the longer they stay low, the greater the financial stress on commodity producers and the greater the negative impact on businesses, households and governments in affected regions.

The total impact on the financial system would be limited by the diversity of both the Canadian economy and the loan books of national financial institutions. In contrast, regional financial institutions tend to be less diversified and more affected by losses in regional real estate and commercial loans. Fiscal balances for provincial governments in commodity-intensive regions would also deteriorate and their borrowing costs would rise. Overall confidence in Canadian financial institutions might decline, increasing funding costs, with consequences for the price of credit in the broader economy.

For this risk to extend from a regional risk to one that has serious nationwide consequences for the financial system, important negative spillovers would be required. Such spillovers could come in several forms: as a regional housing market correction that transmits to housing markets across the country, as negative spillovers to businesses outside the region that lead to widespread credit losses, or as stresses at regional financial institutions that create broader funding stresses in the financial system. The likelihood of these negative spillovers occurring is low.

Safeguarding the Financial System

Oversight of the Automated Clearing Settlement System

The Governor of the Bank of Canada designated the Automated Clearing Settlement System (ACSS) as a prominent payment system under the *Payment Clearing and Settlement Act*, effective 2 May 2016. Designation brings the system under the formal oversight of the Bank of Canada, which requires compliance with the Risk Management Standards for Prominent Payment Systems.[26] Designation also provides the system with legal protections that are important to the finality of payments.

The ACSS is owned and operated by the Canadian Payments Association (CPA). It clears the majority of non-cash retail payments in Canada, including cheques and other paper-based transfers, debit card transactions and electronic transfers of funds. This amounts to a daily average of around 27 million transactions, with a value of $25 billion.

26 See http://www.bankofcanada.ca/wp-content/uploads/2016/02/criteria-risk-management-standards.pdf.

The ACSS was designated following the expansion of the Bank's oversight responsibilities in December 2014 to include systems that have the potential to pose payments system risk (referred to as prominent payment systems). Payments system risk includes a disruption or failure of a prominent payment system that could cause a significant adverse impact on economic activity in Canada by producing a general loss of confidence in the overall Canadian payments system. The CPA has also updated its governance framework and has begun work to modernize its systems.[27]

Ongoing Reform of Derivatives Markets

Canadian authorities continue to make progress in implementing over-the-counter (OTC) derivatives reforms. Strong incentives to centrally clear derivatives trades are already in place in Canada, and most interest rate derivatives are now cleared. A provincial clearing mandate will further contribute to fulfilling Canada's commitment to centrally clear standardized and sufficiently liquid derivatives. Starting in September 2016, OSFI will also begin phasing in requirements for banks to exchange margin for non-centrally cleared trades.[28] Provincial regulators are developing similar rules for market participants. Finally, rules are in place across Canada that require the reporting of trades in OTC derivatives to trade repositories. As the quality of reported data is improved over time, this should help increase the transparency of OTC derivatives markets for regulators.

Enhancing Cyber Security

A cyber attack that affects financial market infrastructures (FMIs) or multiple financial institutions could cause a prolonged disruption to the provision of financial services in Canada. FMIs, financial institutions and authorities continue to collaborate to enhance cyber security.

In 2015, the Bank of Canada participated with the Committee on Payments and Market Infrastructures and the International Organization of Securities Commissions in the development of a consultative report that proposes guidance on the cyber resilience of FMIs.[29] The guidance addresses an FMI's ability to anticipate, withstand, contain and rapidly recover from a disruption caused by a cyber attack. Also highlighted in the guidance is the importance of FMIs managing risk from their participants and IT service providers, rigorously testing their cyber resilience practices and using cyber threat intelligence. The guidance is expected to be finalized in the second half of 2016, following stakeholder input.

A Global Code of Conduct for the Foreign Exchange Market

The Foreign Exchange Working Group (FXWG) of the Bank for International Settlements' Markets Committee has just published the first phase of a new global code of conduct for the wholesale foreign exchange market.[30] The code is being written in two phases, with the second phase scheduled to be published in May 2017. The code is intended to promote, on a global basis, a robust, fair, liquid, open and appropriately transparent foreign exchange

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27 L. Embree and P. Miller, "Improving the Foundation of Canada's Payments System," *Bank of Canada Review* (Spring 2015): 26–34. Available at http://www.bankofcanada.ca/wp-content/uploads/2015/05/boc-review-spring15-embree.pdf.

28 OSFI issued the final version of guidance in this area in February; see *Margin Requirements for Non-Centrally Cleared Derivatives* at http://www.osfi-bsif.gc.ca/eng/fi-if/rg-ro/gdn-ort/gl-ld/pages/e22.aspx.

29 See *Consultative Report: Guidance on Cyber Resilience for Financial Market Infrastructures* (November 2015), available at http://www.bis.org/cpmi/publ/d138.pdf.

30 The *FX Global Code: May 2016 Update* is available at http://www.bis.org/about/factmktc/fxwg.htm.

market. The foreign exchange market forms a vital part of the global financial system, and its effective functioning is in the interest of all market participants.

Regional foreign exchange committees involved in creating the code, including the Canadian Foreign Exchange Committee, have confirmed that their members intend to endorse and support widespread adherence to the global code when it is launched in 2017. Furthermore, where they act as market participants themselves, the central banks involved in the FXWG, including the Bank of Canada, intend to adhere to the principles and standards of the global code and expect their trading counterparties to do the same.

Reports

Reports examine selected issues of relevance to the Canadian and global financial systems.

Large Canadian Public Pension Funds: A Financial System Perspective

Guillaume Bédard-Pagé, Annick Demers, Eric Tuer and Miville Tremblay

- The eight largest Canadian public pension funds (the Big Eight) are major investors globally as well as domestically, with net assets under management of more than $1 trillion.
- Because of their size, their longer-term investment horizons, the diversity of their investment strategies and the stability of their members' contributions, these funds may be better able than other financial market participants to invest countercyclically and therefore act as a stabilizing force in the Canadian financial system.
- The overall balance-sheet leverage of the Big Eight is not high. However, the trends toward more illiquid assets, combined with the greater use of short-term leverage through repo and derivatives markets may, if not properly managed, lead to a future vulnerability that could be tested during periods of financial market stress.
- The Big Eight mitigate this vulnerability by taking a range of measures, including performing liquidity stress tests. The large public funds that are most active in Canadian repo markets are also working with the Bank of Canada and Canadian banks to become limited-liability direct clearing members of the repo central counterparty operated by the Canadian Derivatives Clearing Corporation. This will reduce counterparty credit exposures between the participating funds and the banking sector and improve the overall resilience of the repo market.

Introduction

Pension funds are important sources of retirement income for Canadians that deploy patient investment capital for the global economy. The pension fund sector holds about 15 per cent of the total assets of the Canadian financial system, or $1.5 trillion.[1] About two-thirds of pension assets are managed by the eight largest public pension funds in Canada (the Big Eight): the Canada Pension Plan Investment Board (CPPIB), Caisse de dépôt et placement du Québec (CDPQ), the Ontario Teachers' Pension Plan (OTPP), the British Columbia Investment Management Corporation (bcIMC), the Public Sector Pension Investment Board (PSPIB), the Alberta Investment Management Corporation (AIMCo), OMERS (Ontario Municipal Employees Retirement System) and the Healthcare of Ontario Pension Plan (HOOPP). With net investment assets ranging from $64 billion to $265 billion, the Big Eight are among the world's largest pension funds. All eight were included in a list of the 100 largest pension funds, with three of them ranked among the 20 largest.[2]

The Big Eight manage the funds of various defined-benefit pension plans: the Canada Pension Plan, the Régime des rentes du Québec, and the plans of public sector employees of the federal and four provincial governments. A broader measure of the assets they control is gross assets under management (AUM), which is $1.5 trillion (**Chart 1**).[3] To provide further context, gross AUM of the Big Eight as a group are similar in aggregate asset size to the four biggest insurers and roughly one-quarter of the aggregate asset size of the Big Six banks.

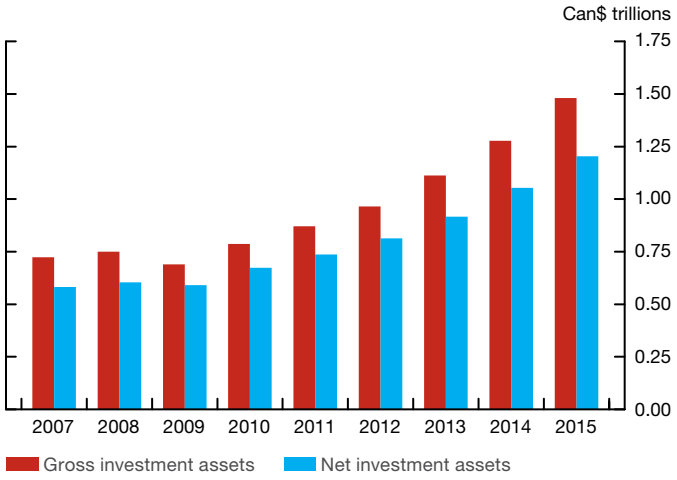
The amount of balance-sheet leverage, defined as the ratio of a fund's gross assets to net asset value, varies greatly across the funds, but appears modest at 1.3:1 for the group (**Table 1**). However, because leverage can take

1 According to Statistics Canada, $1.5 trillion is invested in trusteed employer- and government-sponsored pension funds.

2 Boston Consulting Group, "The Top 10: Investing for Canada on the World Stage," February 2016.

3 Net assets are a measure of the current resources backing the promise of the pension plan sponsor or owned by other government-sponsored funds, while gross assets are a measure of the assets controlled by the pension fund and balance-sheet leverage. For example, a $1 billion real estate acquisition that receives half of its financing from bonds issued by the fund will have $500 million in net and $1 billion in gross assets.

Chart 1: Investments managed by the Big Eight



Note: The fiscal year ends on 31 March for AIMCo, bcIMC, CPPIB and PSPIB and on 31 December for CDPQ, HOOPP, OMERS and OTPP.

Sources: Funds' latest annual reports

Last observations: 31 March and 31 December 2015

Table 1: Big Eight investment assets under management
$ billions

Fund	Gross investment assets	Net investment assets[a]
CPPIB	319	265
CDPQ	291	248
OTPP	263	168
HOOPP	147	64
OMERS	129	80
bcIMC	127	124
PSPIB	125	112
AIMCo	100	90
Total	1,501	1,151

a. Net investment assets include non-pension investment assets.

Note: The fiscal year ends on 31 March for AIMCo, bcIMC, CPPIB and PSPIB and on 31 December for CDPQ, HOOPP, OMERS and OTPP.

Sources: Funds' latest annual reports

Last observations: 31 March and 31 December 2015

many forms in addition to what is shown on the balance sheet, it is not possible to precisely assess aggregate leverage using public sources.

From a financial system perspective, the Big Eight are of interest not only for their size, the composition of their asset holdings and their investment strategies but also for their interconnections with other financial institutions. Because of their funding and derivative transactions, the Big Eight are connected to the major Canadian banks through their counterparty exposures.

This report describes the main characteristics of the Big Eight. It considers how these funds have the capacity to make the financial system more stable, as well as the potential vulnerabilities associated with some of their activities, particularly in times of heightened stress. It provides an overview of their risk-management practices and then concludes.[4]

Pension Fund Governance

The Big Eight manage the funds of various public sector defined-benefit pension plans.[5] Although the concepts are often used interchangeably, a pension plan refers to the pension benefits promised by an employer to the plan's members (the employees), whereas a pension fund refers to both the portfolio of assets that back up the promise and the organization that manages the portfolio. Among Canada's Big Eight, all but three of the pension funds are distinct organizations from the authorities that sponsor the pension plan.[6]

The Big Eight vary in terms of mandates and liability profiles. For example, although they all manage the assets of pension plans, some of them also manage funds for several public entities.[7] Their largest responsibility, however, is always the mandate of a pension plan. The plans are also at different stages of their respective life cycles, with the membership of some plans consisting of an older demographic.[8] Nevertheless, all funds share a similar real return target of close to 4 per cent per year over the long term.

Nearly all of these funds were created by specific federal or provincial legislation that sets their mandates and assigns oversight of the activities of the pension fund to a board of directors. In the three instances where the same organization is responsible for both the assets and the liabilities, the funds report to a pension regulator that focuses on the soundness of the plans, as measured by their funding and solvency ratios, and on the protection of the rights of their members. The boards of the other five funds are accountable to federal or provincial ministers, either directly or through government departments or agencies.

Pension laws impose on fund managers a fiduciary duty toward current and future retirees. Investment decisions must be based on the best interests of existing and future retirees. This principle is a cornerstone of the elaborate governance frameworks of the Big Eight, which entrust

4 This report does not cover the pension plans' design, solvency or adequacy to meet the needs of future Canadian retirees.

5 This is in contrast to a defined-contribution (DC) plan where the retirees receive a lump sum equal to the contributions made over time, plus the accumulated returns. In Canada, DC plans are found mostly in the private sector and are much smaller than the Big Eight.

6 The exceptions are OTPP, OMERS and HOOPP.

7 These additional funds include those of provincial insurance schemes, provincial endowments and various other provincial government pools of money.

8 A young plan has relatively large inflows and relatively small benefit outflows, while a mature plan will have small inflows and large outflows.

Box 1

Characteristics of the Canadian Model of Public Pension Investment

Relative to smaller and more traditional pension funds, the Big Eight are characterized by a greater

- use of internal management made possible by their economies of scale;[1]
- reliance on investment strategies designed to capture the liquidity premiums offered by less-liquid alternative assets;
- diversification across a broader set of asset classes, investment styles and geography;
- use of leverage and derivatives designed to improve returns and mitigate risks;
- reliance on in-house risk-management functions; and
- competitive compensation with the private sector to attract and retain talent.

1 External managers can, however, offer a welcome complement in some niche markets or as partners in co-investment schemes.

the boards and their respective investment committees with a critical responsibility for establishing and controlling the fund's risk appetite, investment policy and risk-management framework. The majority of boards consist of experienced business and finance professionals, generally appointed by governments, often upon the recommendation of the boards' governance committees or by an independent nomination committee. Strong governance is key for the success of large and complex financial institutions such as the Big Eight.

The Evolving Canadian Model of Public Pension Investment

The Big Eight stand apart from most other Canadian and many foreign pension funds because of their size, the way they operate and their investment strategies. Their asset-management approach, sometimes referred to as the "Canadian Model" of public pension investment (**Box 1**), has been adopted by large pension and sovereign wealth funds in other jurisdictions. The model has several key characteristics. Considerable economies of scale lower average costs, allowing the funds to employ complex, internally managed investment strategies. The funds are able to hire large teams of highly specialized professionals that allow them to invest directly in a wide range of assets and niche markets. The Big Eight are increasingly present globally, investing in less-liquid alternative assets, which include real estate, infrastructure and private equity. Although the Big Eight share common characteristics, their investment approaches differ, given their different philosophies, mandates and maturity profiles. As a result, they should not be considered a homogeneous group of investors that would react in the same manner to a market shock.

Like most other Canadian pension funds, the Big Eight believe that active management of their assets adds value over time, but they differ from other funds by managing them internally, substantially reducing their costs. In aggregate, the Big Eight employ around 5,500 people (twice that number if their real estate subsidiaries are included) and manage about 80 per cent of the funds' assets internally.

They incur total management costs of around 0.3 per cent, lower than the roughly 0.4 per cent incurred by a typical pension fund that relies wholly on external private fund managers. However, the cost difference would be larger if the typical pension fund were to invest as much as the Big Eight do in alternative assets that are more labour intensive and therefore costlier to manage than the traditional asset classes of equities and bonds.[9, 10]

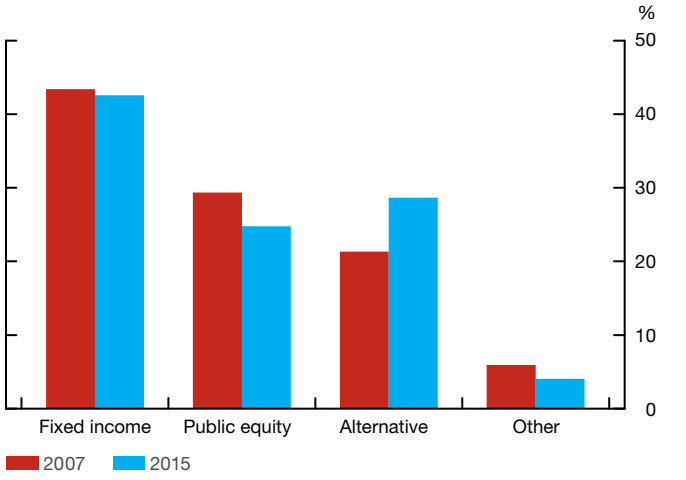
The persistence of low interest rates and the concomitant search for yield has led to a growing shift toward less-liquid alternative assets. Given the long-term nature of their liabilities and their size, the Big Eight are structurally well positioned to capture the liquidity premiums offered by such assets. On the one hand, real estate and infrastructure provide fairly predictable cash flows, offer inflation protection and, to some extent, can be seen as partial substitutes for bonds, although with a significantly different liquidity profile. Private equity, on the other hand, is generally perceived as a complement to public equities, offering potentially superior returns to large investors.

9 Pension funds invest in costlier alternative assets because they have higher expected returns than traditional asset classes. These alternative assets generally fit the long-term investment horizons of the funds and offer diversification benefits.

10 Smaller Canadian pension funds own roughly 10 per cent, on average, in alternative investments (including hedge funds), nearly twice as much as they had before the 2007–09 financial crisis, although these allocations tend to be largely in real estate. Among the pension funds worth over $1 billion (excluding the Big Eight), the larger the fund, the more important the share devoted to alternative assets tends to be. Their most frequent choice is Canadian real estate, but they show a growing interest in private equity and infrastructure.

Chart 2: Aggregate asset allocation of the Big Eight

As a percentage of gross investment assets



Notes: Alternative assets consist of private equity and real assets such as real estate and infrastructure. Other assets consist of positions mostly held in overlay strategies and external hedge funds. The fiscal year ends on 31 March for AIMCo, bcIMC, CPPIB and PSPIB and on 31 December for CDPQ, HOOPP, OMERS and OTPP.

Sources: Funds' latest annual reports and Bank of Canada calculations

Last observations: 31 March and 31 December 2015

Between 2007 and 2015, the Big Eight's collective allocation to less-liquid alternative assets—real estate, private equity and infrastructure—grew from 21 per cent to 29 per cent (**Chart 2**). This shift occurred through a gradual reduction in the allocations to public equities and fixed-income assets, suggesting that it was mostly done by channelling new contribution inflows into alternative assets, rather than by selling assets outright. Underlying the aggregate data, however, is a marked heterogeneity across the group in terms of both the importance of real asset holdings—a low of about 10 per cent to a high of about 40 per cent—and the pace of the shift since 2007.[11]

Given their size and ability to complete large transactions, the Big Eight are among the most active real asset investors in the world.[12] Many of their investments have been executed in foreign markets to increase the diversification benefits and because of the relatively limited set of attractively priced and sizable opportunities in Canada. Together with substantial holdings in international listed equities, the foreign assets of the funds have increased to a range of 35.0 per cent to 81.5 per cent in 2015, with the exception of one fund that had a negative exposure due to the net impact of its derivatives positions.[13]

In general, the Big Eight give relatively small mandates to external hedge funds since many already run some in-house, hedge-fund-like strategies. These overlay strategies use derivatives and leverage in order to seek to add value to an underlying portfolio. Derivatives are also used to hedge certain investments or liabilities or to efficiently adjust economic exposures across asset classes or geographic regions. The overall use of derivatives by the Big Eight has increased since the 2007–09 global financial crisis in terms of their aggregate notional amount and, in most cases, as a percentage of net assets. Although notional amounts of derivatives are important to consider when assessing the materiality of leverage, they do not provide a complete picture of the risk exposures of the funds, since derivatives may also be used as hedging or other risk-mitigation tools to reduce economic exposures. More information on both the size and the nature of the funds' exposures would therefore provide additional insight.[14, 15]

The three organizations that manage both the liabilities and assets of the pension plan have adopted an investment framework that minimizes the volatility of their contributions and funding status (i.e., the difference between the value of the assets and the value of the liabilities). When the benefits owed are well covered by assets, the contribution rate for members and employers can be kept stable. These liability-driven investment (LDI) strategies require the funds to hold a portfolio of assets whose interest rate sensitivities closely offset those of their liabilities. In contrast to most of their peers, these funds have higher or increasing allocation to fixed-income assets, which are partly leveraged in the repo market.[16]

11 Some of the funds already had a meaningful allocation to alternative assets before 2007.

12 When adding to their investments in real assets, the Big Eight tend to partner with other institutional investors, including each other. They usually seek local partners in foreign countries or partners that have specific industrial expertise in relation to that specific real asset.

13 Canada represents only 2 to 3 per cent of investment opportunities globally. Thus, any higher proportion invested domestically constitutes a home bias. Until 2005, pension funds were subject to a Foreign Property Rule in the *Income Tax Act* that capped investments outside Canada to 30 per cent. The original limit of 10 per cent was set in 1971 and raised over subsequent years to eventually reach 30 per cent before being removed.

14 Although the credit risk stemming from derivative activities is currently small because of netting and central clearing, those instruments are also subject to market risk. Sudden fluctuations in the prices of the underlying assets can therefore induce rapid changes in the market value of derivatives and have a non-negligible impact on financial performance and liquidity positions.

15 Derivative transactions are governed by International Swaps and Derivatives Association (ISDA) master agreements to allow transactions to settle on a net basis. As well, two-way negotiated credit support annex agreements give further counterparty protection by providing power to realize collateral posted by counterparties in the event of a default.

16 Lower interest rates increase the discounted value of liabilities. A large allocation to bonds, whose value increases with lower interest rates, is therefore a good hedge against interest rate risk. Further explanations of leveraged LDI strategies can be found in the Bank of Canada *Financial System Review* (December 2012): 36–38, available at http://www.bankofcanada.ca/wp-content/uploads/2012/12/fsr-1212.pdf.

Over the past 10 years, the Big Eight have achieved or exceeded their nominal target return of approximately 6 per cent (or 4 per cent net of inflation), with an average return of about 8 per cent. This target was achieved despite the sharp losses during the financial crisis. Over the same period, their active management has added between 30 and 210 basis points to the passive return of their policy portfolios.[17, 18]

Contributions to the Financial System and Potential Vulnerabilities

Given their size and the structural features of defined-benefit plans, the Big Eight may be better able than other financial market participants to invest counter-cyclically and therefore act as a stabilizing force in the Canadian financial system.[19] Their long-term investment horizon means that the Big Eight are more likely to be able to weather short-term market volatility. The investment policies and ongoing portfolio rebalancing of pension funds can help smooth asset prices. Funds are also more likely to be able to adopt what may be viewed as a contrarian investment strategy over the short term by periodically taking advantage of opportunities in the market to purchase assets as they decline in price and reach depressed values. In addition, defined-benefit pension funds are better equipped to bear liquidity risk than defined-contribution plans, mutual funds or private fund managers, since they are not subject to redemptions by their beneficiaries that could force them to sell asset holdings in a stressed market.[20] On the contrary, they can continue to add to their asset holdings since pension plan contributions continue to be invested as they come in. There is, however, little formal empirical evidence of the actual behaviour of defined-benefit pension funds during a financial crisis.[21]

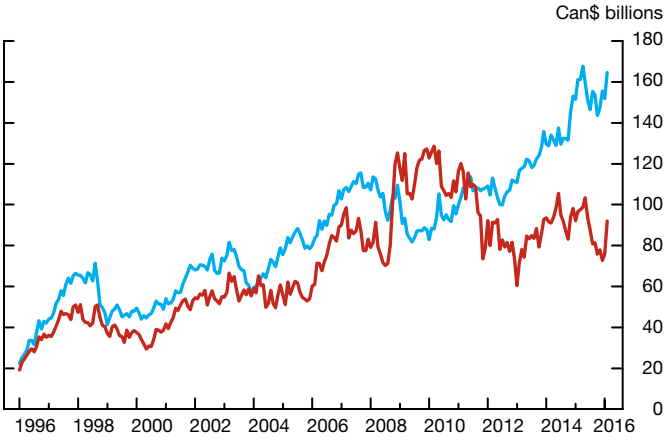
The low interest rate environment that has prevailed since the financial crisis has created challenges for pension funds. Persistently low interest rates tend to boost the prices of assets and lower their expected return while also reducing borrowing costs and increasing incentives to use leverage. In response, most of the Big Eight have increased their allocations to alternative assets,[22] and many have increased leverage, often financed short term, to support complex investment and risk-mitigation strategies. If not properly managed, these trends may lead in the future to a vulnerability that could create challenges in a severely stressed financial environment.

Leverage and derivatives also open a potential channel of contagion through which stress in the banking sector could spill over to the balance sheets of pension funds. Strategies that rely on leverage generated through repo and other similar markets therefore depend on the resilience of those markets.

An important source of leverage for some of the Big Eight has been the repo market. Unlike the situation in many other countries, Canadian banks are, in aggregate, net *providers* of funding in the repo market, rather than net demanders of liquidity (**Chart 3**). When using the repo market to add leverage to their fixed-income portfolios, the Big Eight rely on both domestic and international banks for liquidity to adjust duration and enhance returns. The funds could also use the repo

Chart 3: Canadian-dollar repo and reverse repo activity for all banks in Canada

Monthly data



Note: Since 2011, banks in Canada have, in aggregate, been net providers of cash (taking securities as collateral) to the financial system, which would include transactions with the Big Eight.

Sources: Banks' regulatory filings and Bank of Canada calculations

Last observation: February 2016

17 The policy portfolio is the long-term strategic allocation of assets whose return is measured by the relevant market indexes. The actual portfolio will differ as a result of active management decisions and, if successful, will show their added value.

18 Although skill plays a role, the differences in performance cannot be fairly compared across the Big Eight because the return and risk objectives vary for each pension plan, largely as a function of their liabilities and funding status.

19 L. Schembri, "Double Coincidence of Needs: Pension Funds and Financial Stability" (speech to the Pension Investment Association of Canada, Québec, Quebec, 15 May 2014).

20 In defined-contribution plans, participants are freer to alter their asset allocation. For example, in a panic, investors may sell risky assets and convert their holdings into cash.

21 A recent Bank of England study concludes that the evidence of potential stabilizing asset allocation in the investments of UK pension funds is mixed. See "Procyclicality and Structural Trends in Investment Allocations by Insurance Companies and Pension Funds: A Discussion Paper by the Bank of England and the Procyclicality Working Group," July 2014.

22 The investment trend toward alternative assets likely comes at the cost of reduced liquidity and increased complexity. The heated global competition for real estate, infrastructure and private equity may push the Big Eight to enter larger, more complex and possibly riskier transactions.

market as a preferred source of liquidity rather than sell assets outright. It is estimated that, at the end of 2015, the Big Eight were counterparties to about 15 to 35 per cent of the total amount of repos and reverse repos outstanding that Canadian financial institutions reported on their balance sheets.[23]

If banks themselves were to experience a period of acute funding stress due to an unexpected adverse event, they could reduce their repo lending to even their most high-quality counterparties, such as public pension funds, potentially forcing such counterparties to sell assets to repay the borrowed funds. Derivatives could trigger similar dynamics if funds faced unexpected margin calls, requiring them to raise cash by selling assets. The adverse impact on asset prices could then propagate losses to other financial institutions more broadly, with potentially important spillover effects to the rest of the financial system.[24]

This dynamic underlines the important role played by well-regulated central counterparties (CCPs) in reducing counterparty credit exposures and systemic risk in markets such as for repos and for certain derivative transactions. To increase the resilience of Canada's core fixed-income and repo markets, the Bank of Canada has been supporting an initiative since 2010 to develop central clearing in the Canadian repo market. In 2012, the Canadian Derivatives Clearing Corporation (CDCC) began to clear fixed-income cash and repo transactions between the banks most active in the Canadian repo market. The Bank is now working with CDCC, the existing bank clearing members and the four public pension funds that are most active in the repo market to develop a new clearing model to allow those pension funds to become limited-liability direct clearing members of the repo CCP. This will further increase the overall resilience of this core funding market and support pension funds' access to repo funding in stressed conditions.

Risk Management

The Big Eight face vulnerabilities, but these vulnerabilities vary significantly in terms of importance and composition. The funds assess vulnerabilities and manage them within a risk-management framework adapted to their investment policies. For many, the financial crisis led to a significant reinforcement of risk management, particularly around liquidity. They have also invested more heavily in technology and systems, reduced reliance on external credit ratings, improved stress testing and enhanced the independence of the risk-management function.[25]

The greater use of more complex investment strategies by Canadian pension funds has required improvements to their risk-management systems. The Big Eight are expanding their risk models, moving away from those that are driven mainly by the short-term, mark-to-market volatility of liquid, public assets and toward those that would better tackle long-term risk in less-liquid asset classes.

The Big Eight generally mitigate rollover and liquidity risks by holding a buffer of liquid assets.[26] For this reason, the strength of liquidity-risk-management frameworks is key to assessing this vulnerability. The funds that access external sources of funding (e.g., the repo and securities-lending markets, short-term commercial paper programs and longer-term financing in the bond market) to leverage some of their assets[27] appear to be much more aware of the higher contingent funding risks, including rollover risk, and perform rigorous liquidity stress tests. It is important that, when designing these tests, the funds consider extreme situations in which they could have diminished access to leverage from derivatives and repo markets.

Conclusion

No pension fund can achieve a 4 per cent average real return in the long run without assuming a certain amount of properly calibrated and well-diversified risk. This group of large Canadian pension managers seem generally well equipped to understand and manage that risk. The ability of the Big Eight to withstand acute stress is important for the financial system, as well as for their beneficiaries. They can rely on both the structural advantages of a long-term investment horizon and stable contributions. Moreover, they have reinforced their risk-management functions since the height of the 2007–09 global financial crisis.

23 These figures are based on outstanding repo exposures in foreign currencies and Canadian dollars, as reported on consolidated balance sheets. Market shares are estimated by aggregating both sides of the balance sheets of all market participants (i.e., reverse repos and repos) and then comparing the share of the Big Eight with the total. It's important to note that figures reported on the balance sheets of participants are imperfect proxies for the total quantity of repos outstanding, i.e., repo and reverse repo exposure can be offset (reduced) to some degree using bilateral netting agreements, or through central clearing.

24 At the international level, the Financial Stability Board is researching potential vulnerabilities of pension funds and sovereign wealth funds as part of its analysis of structural issues in asset management. See "Meeting of the Financial Stability Board in London on 25 September," FSB press release, 25 September 2015, available at http://www.fsb.org/2015/09/meeting-of-the-financial-stability-board-in-london-on-25-september.

25 Most chief risk officers (CROs) report directly to the chief executive officer to strengthen CRO independence, and regular reports are made to the board and its investment committee.

26 Some funds define their liquidity narrowly as cash and cash-like securities; others use a broader definition to include additional liquid assets such as government bonds. The percentage of assets variously defined as cash substitutes range between 13 and 82 per cent. The funds that tend to have large ongoing incoming contributions as a source of liquidity tend to hold fewer liquid assets.

27 Most of the Big Eight or their real estate subsidiaries have issued bonds that are rated AAA or AA.

Securities Financing and Bond Market Liquidity

Jean-Sébastien Fontaine, Corey Garriott and Kyle Gray

- Securities-financing transactions, including repurchase agreements and securities-lending agreements, are essential to market liquidity. They enable dealers to borrow and reuse securities efficiently or to fund purchases of securities.
- The importance of the securities-financing market for bonds is growing in Canada. Monthly trading volume in the 5-year benchmark Government of Canada bond increased from 5 times its quantity outstanding in 2010 to over 10 times that amount in 2015.
- The nature of the link between the securities-financing market and bond market liquidity is likely changing as a result of financial sector reforms and the low interest rate environment. The development of the repo central counterparty in Canada and the implementation of the Basel III regulatory framework are changing the incentives for conducting specific types of securities-financing transactions. For example, the new liquidity requirements provide more incentive to conduct longer-maturity transactions. The current low level of the overnight interest rate also diminishes the incentives for timely settlement of securities-financing transactions.
- The Bank of Canada plays a role in supporting securities financing and will continue to monitor how the market for securities financing is supporting the resilience of the financial system and how this market is adapting to new conditions.

Introduction

Financial market participants enter securities-financing transactions (SFTs) to obtain cash or securities using either of those instruments as collateral. These transactions share several features with collateralized loans: the borrower makes interest payments and, at the end of the loan period, the principal and collateral are returned to their respective owners. The most common types of SFTs are repurchase agreements (repos) and securities-lending agreements (see **Box 1** for definitions of

Box 1

Terminology for Securities-Financing Transactions

Repurchase agreement (repo): A contract in which a borrower agrees to sell and later repurchase a security. It is equivalent to collateralized borrowing.

Reverse repo: A repo contract from the perspective of the lender. If bank one is conducting a repo with bank two, then bank two is conducting a reverse repo with bank one. Bank two agrees to purchase and later resell a security.

Securities-lending agreement (sec lending): A contract in which a borrower obtains a specific security in exchange for cash or securities pledged as collateral.

General collateral repo (GC repo): A repo contract in which the collateral can be any security in a menu of acceptable collateral. In Canada, the most common type of GC repo uses a list of Government of Canada securities.

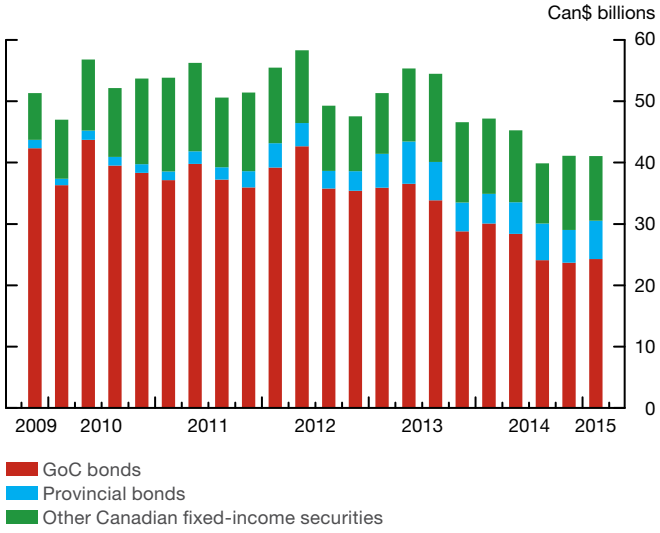
Specific repo: A repo contract in which the collateral is a specific security. A specific repo is similar to a securities-lending agreement in that it is originated by a market participant seeking to borrow a particular security.

Repo settlement failure: The event in which the counterparty that receives the security in a repo fails to return it on the maturity date of the contract.

Haircut: The difference between the market value of securities pledged in a securities-financing transaction and the initial purchase price. A haircut is economically equivalent to a margin.

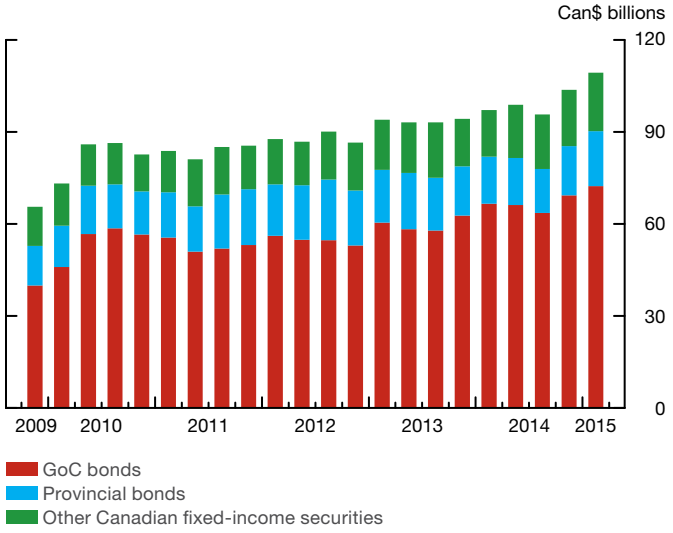
Chart 1: The majority of securities-financing transactions use Government of Canada (GoC) bonds

a. Repurchase agreement volumes by collateral type, quarterly average of daily trading volume



Sources: Canadian Depository for Securities Ltd. and Bank of Canada

b. Security loans outstanding by issuer, quarterly average of daily stock outstanding



Sources: Markit and Bank of Canada calculations

Last observation: 2015Q1

terminology used in SFT markets). The market for SFTs supports bond market liquidity by enabling financial institutions, particularly securities dealers, to engage in two types of borrowing: (i) borrowing funds to satisfy the typical short-term funding needs of a financial institution, and (ii) borrowing and reuse of securities to satisfy client requests to trade or to take a short position. A key feature of SFTs is the reuse of securities, either through outright sales or through further securities-financing transactions.

SFTs play a role in markets beyond their support for market liquidity because they make it possible for investors to engage in a variety of trading strategies. For example, SFTs help investors take leveraged positions by enabling them to borrow cash to purchase additional securities. SFTs also allow institutions to take speculative positions on securities and obtain short-term funding, as well as hedging and managing interest rate risk.

Over the past 20 years, the securities-financing market (SFT market) has grown to about $450 billion outstanding (across all securities) in Canada.[1] The growth and size of the repo market and the securities-lending market are similar.

Daily trading volume in the repo market typically averages between Can$40 billion and Can$60 billion, mostly backed by Government of Canada (GoC) bonds (**Chart 1a**). Trading volume is lower in the securities-lending market, since these transactions have long or open-ended tenors. The stock of outstanding securities-lending transactions is estimated to have exceeded $200 billion in Canada in 2015, which includes equities loaned. The fixed-income portion of this now exceeds $100 billion, with GoC bonds representing a majority of the securities on loan (**Chart 1b**).

Participants in the Canadian SFT market include banks, broker-dealers, securities custodians, hedge funds and large asset managers. The majority of SFTs in Canadian markets are conducted by just a few participants, primarily the largest banks and the major pension funds (Bédard-Pagé et al. 2016). Close to half of all securities financing involves a buy-side investor, with interbank trades making up the remainder. For additional information on securities-financing transactions in Canada, see **Box 2**.

The SFT market is a core funding market in Canada because it provides essential access to funding liquidity for financial institutions and market-makers, the key providers of liquidity to the financial system (Fontaine, Selody and Wilkins 2009). In particular, the market is crucial for supporting trading in the Canadian bond market. A strong and robust SFT market therefore promotes financial intermediation in Canada, allowing bond markets to function efficiently. This is important because the Canadian government and private sector borrowers use bond markets to fund operations and investment plans, which contribute to economic growth and welfare.

1 This aggregate estimate is based on data, discussions with financial institutions and Bank of Canada calculations and ignores haircuts and overcollateralization.

Box 2

Securities-Financing Transactions in Canada: Sources of Information

Securities financing is included in the Bank of Canada's definition of core funding markets (Fontaine, Selody and Wilkins 2009). Early discussion of the Canadian repo and securities-lending markets and their subsequent development can be found in Morrow (1994–1995) and Reid (2007). The evolution of the repo and securities-lending markets during the financial crisis is discussed in Chande, Labelle and Tuer (2010) and Dreff (2010), respectively, while Chatterjee, Embree and Youngman (2012) describe the introduction of a central counterparty for repos. Garriott and Gray (2016) provide a detailed discussion of the Canadian repo market. The Bank of Canada is preparing a similar review of the securities-lending market.

In this report, we describe the link between securities financing and the bond market and discuss some of the ways in which securities financing has evolved since the financial crisis. These developments have the potential to change the links between SFT markets and bond market liquidity.

How Securities Financing Supports Bond Market Liquidity

Investors who trade Canadian bonds in the secondary market do so using the services of dealers that stand ready to buy or sell securities with clients. By facilitating trades with clients, dealers are supplying *market liquidity*—the ability to buy and sell an asset at a price close to the market price, in volume, and with immediacy. The SFT market supports bond market liquidity in three fundamental ways, even as the bond market continues to evolve in Canada.

Funding inventory

Dealers use securities financing to manage the cost of holding inventories. It is difficult to forecast what bonds clients might like to purchase, and holding a large inventory of bonds is costly. The SFT market provides a flexible avenue for dealers to fund the purchase of inventory at short notice. Dealers who are asked to purchase a bond can source the cash for the purchase based on other securities in their inventory or even on the security they purchase.[2] In normal conditions, this greater flexibility created by securities financing enables dealers to provide liquidity to clients at a lower cost.

Sourcing securities efficiently

Dealers do not always hold in inventory the exact securities that a client might want to buy. If a client wants to buy a bond that is not in the dealer's inventory, the dealer can facilitate the trade by either (i) looking for a counterparty from whom to purchase the bond outright or (ii) borrowing the bond in the SFT market. Borrowing the bond allows the dealer to sell the bond to the client quickly, while providing the dealer with more time to find, purchase and return the bond to its lender at a later date.

Allowing reuse of securities

Each bond is issued in limited supply and, in some cases, a large part of the issue is held by buy-and-hold investors who have no desire to sell or lend it. If a specific bond becomes scarce in the market, securities borrowers will offer an attractive interest rate to entice the bondholders to lend the security. This makes the securities more readily available to the broader market while allowing the investor to retain the economic benefits of ownership. The SFT market not only brings more bonds into the market but also allows bonds to be reused. A bond in one SFT can be used by the receiver in another transaction, creating a chain of transactions for a single bond. Securities reuse is similar to the reuse of money by commercial banks, since a bank holding retail deposits from its clients can use the money to issue loans to companies. In both cases, reuse makes an asset more available when and where it is needed.

The Growing Importance of Securities Financing

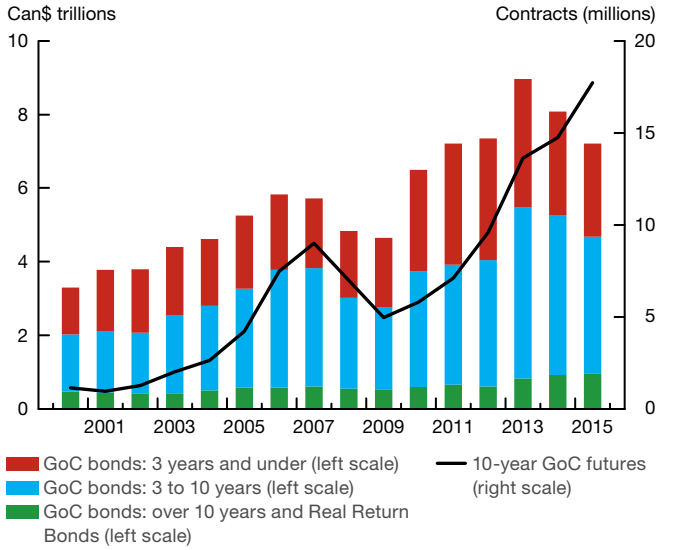
Trading volume for GoC bonds has grown considerably in the past 15 years (**Chart 2**), reaching Can$9 trillion traded on the cash market in 2013.

Higher trading volumes have occurred even though the stock of Canadian sovereign debt has not grown significantly in the past five years: the amount of benchmark GoC bonds outstanding has been stable since 2009, at roughly $30 billion to $40 billion across 2-year, 5-year and 10-year bonds (**Chart 3**). To support the growing trading volume on this fixed base, the outstanding stock of benchmark bonds must turn over more frequently. In Canada, monthly trading volume in

2 A financial institution can obtain funding for a purchase using the purchased asset as collateral in much the same manner as a home borrower obtains a home loan using the home as collateral. The institution purchases the security and then repos the security to obtain an amount of cash that is equivalent or nearly equivalent to the purchase price.

Chart 2: Trading volumes of Government of Canada (GoC) bonds continue to rise

Annual data

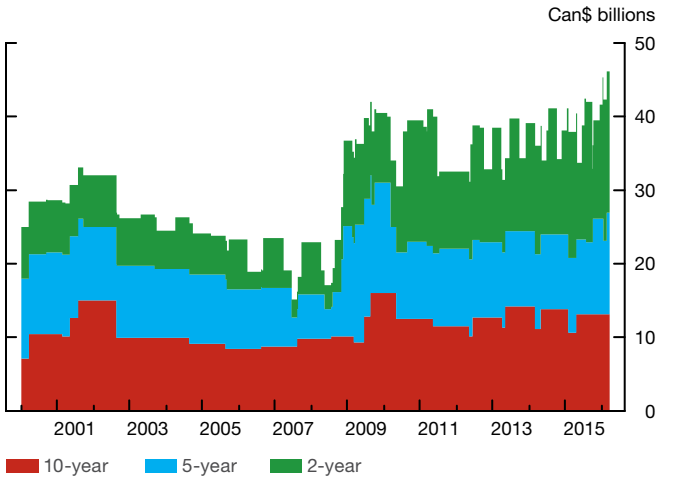


Sources: Bloomberg, Market Trade Reporting System and Bank of Canada calculations

Last observation: 2015

Chart 3: The stock of benchmark bonds outstanding is stable

Outstanding Government of Canada benchmark bonds



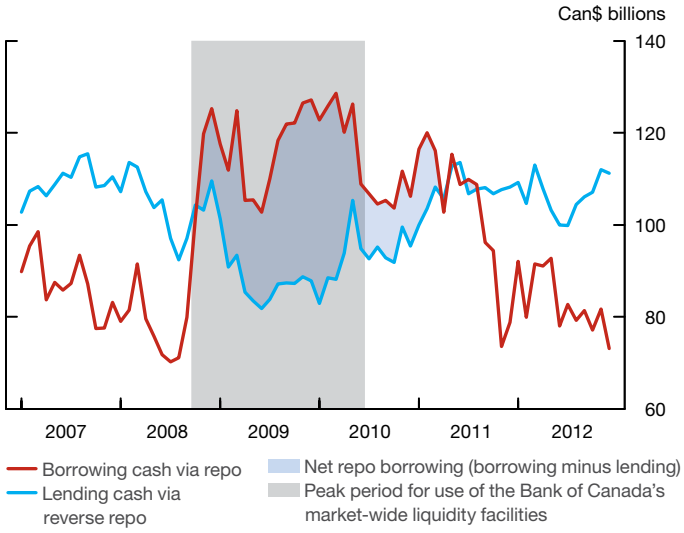
Source: Bank of Canada

Last observation: 15 March 2016

the 5-year benchmark bond has increased from 5 times its supply in 2010 to over 10 times that amount in 2015. The SFT market has played an important role in the growth of trading volume because it enables higher turnover through reuse of securities. A key factor behind the growth in trading activity and turnover is the greater issuance and amount outstanding of corporate bonds and mortgage-backed securities. The expanded stock of fixed-income securities increases the demand by bondholders to hedge interest rate risk, which leads to greater reuse of securities to establish short positions.

Chart 4: Large banks became net repo borrowers during the financial crisis

Repo and reverse repo positions of the Big Six Canadian banks, monthly data[a]



a. Bank of Montreal, Canadian Imperial Bank of Commerce, National Bank of Canada, Royal Bank of Canada, Bank of Nova Scotia and Toronto-Dominion Bank

Sources: Regulatory filings of Canadian banks and Bank of Canada calculations

Last observation: December 2012

Regulatory Reform

During the financial crisis, the Canadian SFT market—like those in other countries—experienced periods of illiquidity. Many participants were concerned about counterparty risk and simultaneously reduced the amount of financing they provided in the market. For example, while large Canadian banks are generally net lenders of cash in the SFT market, they were net borrowers of cash in 2009, shortly after the financial crisis (**Chart 4**). Because of the central role of SFT markets, the illiquidity spread throughout Canadian fixed-income markets, resulting in large, widespread dislocations in bond prices (Pasquariello 2014). In response, the Bank of Canada engaged in a program of term cash lending to support financial stability (Zorn, Wilkins and Engert 2009).

An important part of the response to the crisis has been international and domestic reforms of the SFT market. The aim of these reforms is to make the market a source of stability, even in stressful situations, rather than a channel for the propagation and amplification of financial stress. The reforms can be divided into two parts: (i) additional capital and liquidity regulations for banks (the primary dealers in the SFT market) that make them more resilient, and (ii) reforms targeted at SFTs themselves. In Canada, to address the objective of these reforms, market participants have set up a central counterparty for repo transactions.

Bank regulation

Basel III—like previous regulatory frameworks—requires regulated financial institutions to satisfy capital requirements (e.g., a capital-adequacy ratio). In addition, it has introduced a backstop leverage ratio and two liquidity requirements: the Liquidity Coverage Ratio and the Net Stable Funding Ratio. The Basel III capital ratios require more capital for certain forms of bank borrowing, including cash borrowing on securities collateral, since previous requirements did not fully capture the risks associated with those transactions. The liquidity requirements limit the use of short-term financing by regulated institutions and create incentives to use longer-term funding. Short-term financing, such as securities financing, can make banks more vulnerable in times of stress. If institutions use securities financing to borrow for terms of less than 30 days, the liquidity standards require the collateral to be high quality. Since the new regulations put constraints on the composition of balance sheets, they are expected to change securities-financing costs and incentives (CGFS 2014). SFTs will need to be more profitable to be considered viable, or regulated institutions may decline transactions that will worsen their regulatory ratios. The liquidity requirements can also be expected to increase demand for high-quality assets and to lengthen the average term of funding, since higher-quality assets and longer terms improve the capital and liquidity ratios of a regulated institution.

Regulating the securities-financing market

The Financial Stability Board (FSB) has published a policy framework for addressing systemic risks posed by securities financing (FSB 2013, FSB 2015) with the policy goals of improving data collection, imposing more-rigorous standards for collateral reuse and limiting leverage in SFTs.[3] The lack of data on SFTs is acute in some markets and prevents regulators from enhancing their monitoring of the buildup of leveraged exposures. Canada is addressing the data gap in its repo markets through the new Market Trade Reporting System, which in late 2015 began to collect trade-by-trade data on repos, including quantity, price, collateral and counterparties. Canadian regulators are also developing better methods to collect data on securities-lending exposures, consistent with the guidance given by the FSB.

The FSB has also recommended improved disclosure to the market of collateral reuse to allow better monitoring of risks by counterparties to a trade. It has proposed standards for the liquidity and quality of investments made using the cash collateral of clients. The FSB also proposes the use of central clearing, where feasible, to reduce counterparty risk; where clearing is infeasible, it proposes numerical floors, as well as qualitative standards, for calculating haircuts. These reforms would also change the costs and incentives associated with securities financing. Canada is considering how to implement the FSB proposals, and Board members have agreed on a 2018 deadline for implementation.

Repo central counterparty

To increase the resilience of market liquidity, the Investment Industry Association of Canada worked with the Canadian Derivatives Clearing Corporation (CDCC) to create a repo central counterparty (CCP), which opened in 2012. This CCP manages counterparty risk in the market by guaranteeing the performance of participants in a repo transaction and by netting offsetting trades to reduce the total counterparty exposure in the financial system (Chaterjee, Embree and Youngman 2012). The Bank of Canada continues to work with market participants to expand their use of the repo CCP so that its stability benefits can be brought to a larger share of the market.

Settlement Fails

In a securities-financing transaction, the borrower of a security may fail to return the security on the maturity date of the loan. This is called a settlement fail. The contracts underpinning securities-financing transactions contain explicit clauses governing a failure to return securities. In most cases, the bond lender chooses to roll over the transaction and impose a penalty: interest does not accrue after the repo's original maturity date. The lender of the bonds gets to keep the cash at zero interest until the securities are returned (Fontaine et al. forthcoming), and the borrower who failed to return the security forgoes the interest rate.

Borrowers might fail to deliver the security for a number of reasons. In the simplest case, the borrower may be experiencing operational difficulties with its systems and is physically unable to transfer possession of the security. In another case, the borrower may have reused the security, lending the bond to another party that failed to return it.

Settlement fails and low interest rates

Since the financial crisis, short- and long-term interest rates have declined to historical lows and are expected to remain low for an extended period. The terms of securities-financing contracts were not written with near-zero interest rates in mind. Consequently, in the current low interest rate environment, a borrower who fails to

3 Excessive reuse of collateral is a vulnerability because it can expose securities lenders to the behaviour of multiple, possibly unknown, participants. Collateral reuse can generate long chains of loans in which each participant lends to the next using the same security as collateral. SFTs can also transmit risks through the financial system because they can create leveraged interconnections between market participants. When SFTs create interconnected and leveraged exposures, the failure of one entity can spread to others and may amplify the impact.

return securities forgoes very little interest. The monetary incentives to avoid fails are therefore weak when interest rates are very low (Fleming and Garbade 2005).[4] However, market participants may still have other incentives to avoid failure. For example, regulatory capital charges can increase the costs of settlement fails, and reputational risk can provide incentives to avoid failing in a bilateral transaction where the counterparty is known.

Settlement fails and bond market liquidity

From 2003 to 2005, when the overnight interest rate was low, the US Treasury market experienced increased episodes of settlement fails associated with market stress (Fleming and Garbade 2005). Markets with many settlement fails might be less effective in supporting bond market liquidity because they discourage the participation of securities holders. In an extreme case, a large cluster of fails may amplify the propagation of financial shocks and could drive increases in bond market illiquidity.

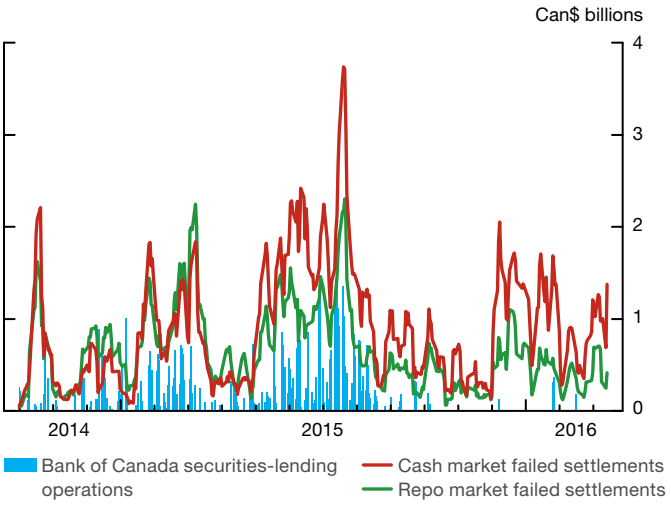
A market with a high and persistent rate of fails can benefit from an increase in the penalties (implicit or explicit) associated with settlement failure. In the United States, the Treasury Market Practices Group introduced a minimum 3 per cent fail fee in 2009. Since the implementation of this fee, the number of fails has been substantially lower, despite the overnight rate remaining close to zero for several years. Nonetheless, settlement fails have not disappeared in the United States, partly because the level of the minimum penalty is constant and its efficacy at discouraging fails is reduced when the cost of borrowing a security approaches the minimum penalty (Fontaine et al. forthcoming). Overall, however, the international experience—including in Italy, Japan and Spain—indicates that introducing a minimum penalty discourages settlement fails.

Despite concerns about high and persistent rates of settlement fails, failure to return a bond is not a rare event in markets, with or without fail fees. In Canada, the median value of repo settlement fails since 2014—when data became continuously available—is close to Can$600 million and has not fallen below Can$60 million. These markets are able to tolerate substantial rates of fails while operating reasonably well.

Since 2002, the Bank of Canada has participated in the securities market as a lender of bonds, making its holdings of Government of Canada securities available to market participants through an auction when these securities are scarce.[5] The Bank modified the design of its securities-lending operations in 2009 and again in 2015 to promote their efficacy whenever the overnight rate is close to the effective lower bound. These activities mitigate some, but not all, of the consequences associated with settlement fails and occur by design when bonds are scarce. Indeed, in recent years, these operations have often coincided with the occurrence of clusters of settlement fails (**Chart 5**). In addition, the Bank of Canada has reduced its planned purchases of GoC securities and—acting as custodial agent—has allowed more flexibility to its clients wishing to lend securities.

Chart 5: Failed settlements have increased moderately

5-day average for failed settlements



Sources: Canadian Depository for Securities Ltd. and Bank of Canada
Last observation: 15 March 2016

Nonetheless, a persistent rise in settlement fails above levels seen in recent history would raise concerns about the functioning of the GoC bond market and would require further investigation.

Conclusion

Securities-financing markets are essential to broader market liquidity. They provide dealers with flexibility in obtaining funding and securities to transact with clients. The SFT market in Canada is growing, and recent regulatory changes, as well as low interest rates, are affecting these markets, with potential consequences for market liquidity.

The Bank has a role in supporting securities financing. It is working with market participants to expand use of the repo CCP opened in 2012 to bring its stability benefits to a larger share of the market. It is also monitoring the progress and effects of new regulations as they are implemented in SFT markets. Finally, the Bank is assessing the effects of settlement fails on the functioning of the bond market and may consider further measures to mitigate these effects if the situation worsens.

4 This analysis applies to the case of positive interest rates. With negative interest rates, the penalty would actually benefit the failing party, creating perverse incentives. Therefore, in securities-financing contracts, negative rates continue to accrue after a fail.

5 Details of the securities-lending program can be found at http://www.bankofcanada.ca/2015/10/securities-lending-program.

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