BANK OF CANADA
BANQUE DU CANADA

Financial System Review

December 2011

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December 2011

The Risk Assessment section is a product of the Governing Council of the Bank of Canada:
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The material in this document is based on information available to 2 December 2011 unless otherwise indicated.

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Preface

The financial system makes an important contribution to the welfare of all Canadians, since the ability of households and firms to hold and transfer financial assets with confidence is one of the fundamental building blocks of our economy. A stable financial system contributes to broader economic growth and rising living standards. In this context, financial stability is defined as the resilience of the financial system to unanticipated adverse shocks, which enables the continued smooth functioning of the financial intermediation process.

As part of its commitment to promoting 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 domestic clearing and settlement systems; conducting and publishing analyses and research; and collaborating with various domestic and international policy-making bodies to develop 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 of Canada seeks to contribute to the longer-term resilience of the Canadian financial system. It brings together the Bank's ongoing work in monitoring developments in the system with a view to identifying potential risks to its overall soundness, as well as highlighting the efforts of the Bank, and other domestic and international regulatory authorities, to mitigate those risks. The focus of this report, therefore, is on providing an assessment of the downside risks rather than on the most likely future path for the financial system. The FSR also summarizes recent work by Bank of Canada staff on specific financial sector policies and on aspects 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.

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Overview

This section of the *Financial System Review* (FSR) presents the judgment of the Bank of Canada's Governing Council on the main risks to the stability of the Canadian financial system and the policy actions required to mitigate them.

Conditions in the international financial system have deteriorated significantly since the publication of the June FSR, owing to three interconnected developments: (i) a sharp escalation of the sovereign debt crisis in the euro area; (ii) a much weaker outlook for global economic growth; and (iii) a pronounced retrenchment from risk-taking in international financial markets. These developments have intensified pressures on financial institutions in a number of advanced countries, with European banks in particular facing a marked reduction in their access to wholesale funding.

The Canadian financial system remains strong despite the challenging global environment. While conditions in Canadian financial markets have tightened since June, domestic markets have not been as volatile, and prices have not declined as much as in most other countries. Moreover, unlike most of their international peers, Canadian banks have not experienced any material reduction in their ability to raise funds in wholesale markets. Nevertheless, a further significant deterioration in global financial conditions could be expected to have a considerable impact domestically through financial, confidence and trade channels.

The Governing Council judges that the risks to the stability of Canada's financial system are high and have increased markedly over the past six months. The principal risks are the same as those noted in the June FSR (**Table 1**) and emanate primarily from the external environment. The main risks are:

- the spillovers associated with a further escalation of the European sovereign debt crisis;
- an economic downturn in advanced economies that could be amplified by remaining weaknesses in the balance sheets of global banks;
- a disorderly resolution of global current account imbalances;
- financial stress in the Canadian household sector; and
- a prolonged period of low interest rates, which may encourage imprudent risk-taking and/or erode the long-term soundness of some financial institutions.

The key risks to financial stability are highly interconnected and mutually reinforcing. In particular, a further intensification of the sovereign debt crisis in Europe can be expected to weaken global economic growth. The more fragile global outlook would, in turn, fuel sovereign fiscal strains, impair the credit quality of bank loan portfolios, and raise the probability of an adverse

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

Risk	Direction of risk over the past six months
Global sovereign debt	↑
Economic downturn in advanced economies	↑
Global imbalances	↔
Canadian household finances	↔
Low interest rate environment in major advanced economies	↔
Overall level of risk	↑

shock to the income or wealth of Canadian households. Diminished growth prospects also foster expectations of continued low interest rates, potentially further eroding the financial positions of insurance companies and defined-benefit pension plans, and boosting household borrowing in Canada.

Mitigating the risks to the stability of the international financial system requires a wide range of additional policy actions. In the near term, the most pressing issue is to address funding, fiscal and governance challenges in the euro area. Credible measures to provide financial assistance to governments with liquidity problems and to solidify the banking sector are urgently needed to provide time to return sovereign debt burdens to a sustainable path and to strengthen the fiscal and governance arrangements within the European Monetary Union. The measures taken to date have repeatedly fallen short of what is needed.

In Canada, the elevated levels of household debt and housing prices require continued vigilance and close co-operation among Canadian authorities. Earlier this year, the Government of Canada further adjusted the rules for government-backed insured mortgages. While these measures have helped to slow debt accumulation by households, credit continues to rise as a share of personal disposable income, and the overall financial situation of households remains strained.

Meanwhile, to improve the resilience of the global financial system over the medium term, it is essential to maintain the momentum of regulatory reform. A key element is the implementation of enhanced international prudential standards for the banking sector. The Office of the Superintendent of Financial Institutions (OSFI) is encouraging Canadian banks, which have significantly increased their capital and liquidity positions in recent years, to meet the Basel III capital standards early in the transition period, which starts in 2013. If these enhanced prudential standards divert activity toward the unregulated parts of the financial system, their impact will be weakened. To mitigate this risk, the Financial Stability Board is now actively working toward a framework for the enhanced supervision and regulation of shadow banking, or market-based financing activities.

Enhanced prudential standards are not sufficient to preserve financial stability. Important work under the auspices of the Financial Stability Board is under way to ensure that credible frameworks for resolution are in place so that all banks, even those that are large and complex, can be resolved in a timely and orderly manner. Work is also progressing to ensure that global financial markets operate on a sounder foundation. In Canada, the Bank is working actively with other policy-makers and the financial services industry to develop central counterparty services for the Canadian repo market and to implement the G-20 commitments to reform over-the-counter derivatives markets.

Risk Assessment

This section of the *Financial System Review* (FSR) outlines the Governing Council's evaluation of the key risks to the Canadian financial system. After a brief survey of macrofinancial conditions, the principal risks are examined. The objective of the FSR is not to predict the most likely outcomes for the financial system but to raise early awareness of key risks and promote mitigating actions.

Macrofinancial Conditions

Acute fiscal and financial strains in Europe, together with diminishing prospects for global economic growth, have led to increased volatility in financial markets, reduced business and consumer confidence, and a general retrenchment from risk-taking.

The global economic outlook has been revised down significantly over the past six months

Global economic growth is projected to slow to a pace well below expectations at the time of the June FSR. Ongoing deleveraging by households and banks, greater fiscal austerity, and lower business and household confidence are dampening growth in most of the advanced economies. The Bank judges that the euro area—where these dynamics are the most acute—is currently experiencing a recession. In the United States, where the economy is in the midst of the weakest recovery since the Great Depression, real GDP growth is expected to be modest through the first half of 2012 and to increase only gradually thereafter. While the Canadian economy is in a better position, the outlook for growth has also been revised down since June, owing primarily to the significantly less favourable external environment that is affecting Canada through financial, confidence and trade channels.

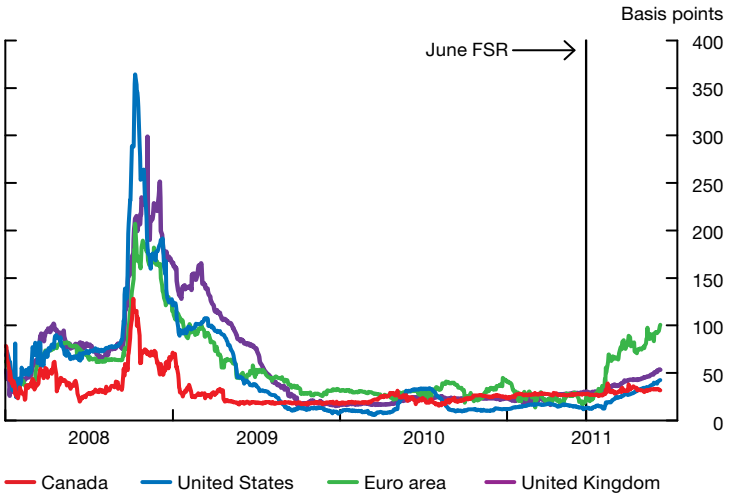
Growth in China and other emerging-market economies is expected to moderate to a more sustainable pace in response to weaker external demand and the lagged effects of past policy tightening. Owing to the lack of exchange rate adjustment and limited progress in rebalancing global demand, the global recovery is expected to remain weak and uneven.

Global financial conditions have deteriorated and investor anxiety has risen

Conditions in euro-area bank funding markets have deteriorated significantly since June (**Chart 1**), and strains are now affecting the region's banking sector as a whole. The banking systems that have been affected the most, such as those in France and Italy, are those with the largest exposures to countries under pressure and that rely most heavily on short-term wholesale funding. In addition, the prices of most financial sector stocks have fallen, with European and U.S. bank shares experiencing particularly steep declines. Shares of many large international banks are priced at deep discounts relative to their book values (**Chart 2**), indicating that market

Chart 1: Conditions in short-term funding markets have deteriorated, particularly in Europe

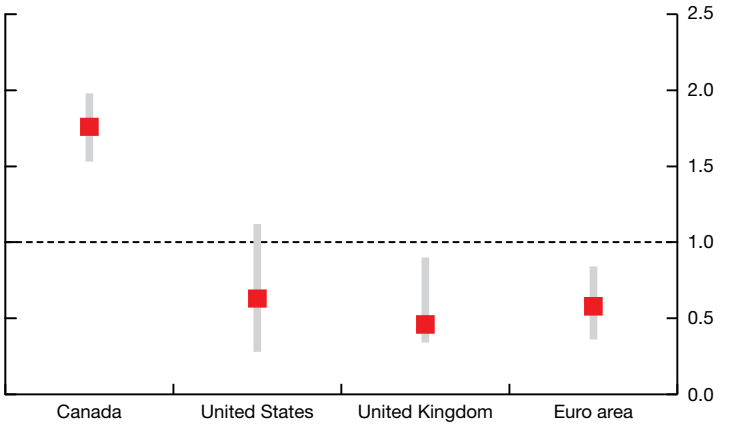
Difference between 3-month interbank offered rates and their respective overnight index swaps[a]



a. For the United States and the United Kingdom, LIBOR; for the euro area, EURIBOR; and for Canada, CDOR
Source: Bloomberg
Last observation: 2 December 2011

Chart 2: Shares of many large global banks are trading at deep discounts relative to their book values

Ratios of maximum, minimum and median price to book value of large banks, by region



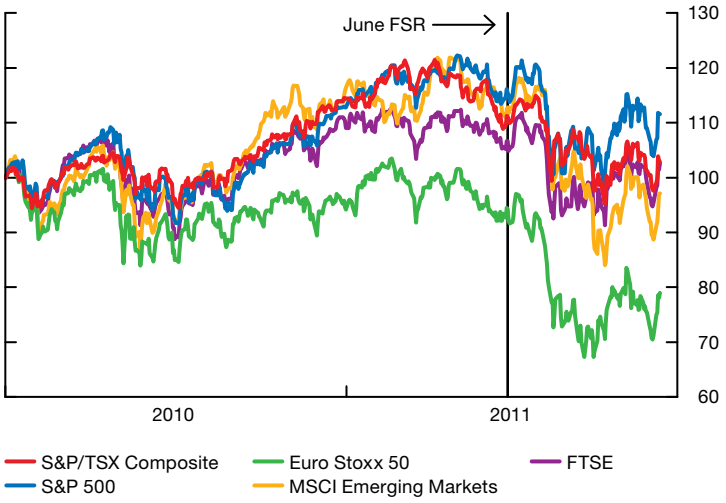
Note: The vertical lines are the maximum and minimum ratio of price to book value for a representative group of banks in each region. The red box represents the median.
Source: Bloomberg
Last observation: 2 December 2011

participants are still acutely concerned about the outlook for these institutions. In contrast, Canadian bank stocks are trading at prices that are, on average, 70 per cent above book value, markedly higher than in many other countries. This indicates that investors continue to believe that Canada's banks are in a better financial position than their global peers.

Rising investor anxiety has driven large investment flows into perceived safe havens such as gold and highly liquid government bonds. The latter have led to further declines in government bond yields in many advanced economies, with 10-year yields trading at or near record lows. In contrast, prices of riskier assets have fallen since June. In Europe, equity prices have declined significantly, with the Euro Stoxx 50 down by about 17 per cent (**Chart 3**). The ratio of stock prices to earnings is now below average across

Chart 3: Equity prices have declined substantially in the euro area

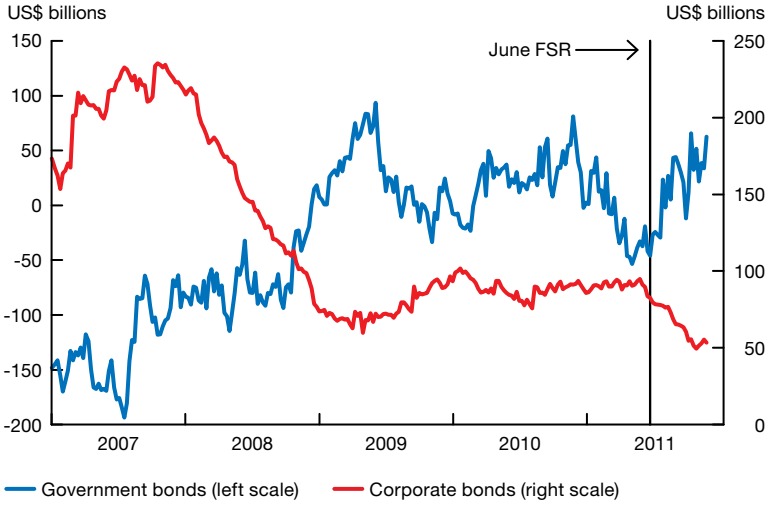
Equity indexes (1 January 2010 = 100)



Source: Bloomberg

Last observation: 2 December 2011

Chart 4: U.S. primary dealers have reduced their holdings of corporate bonds



Source: Bloomberg

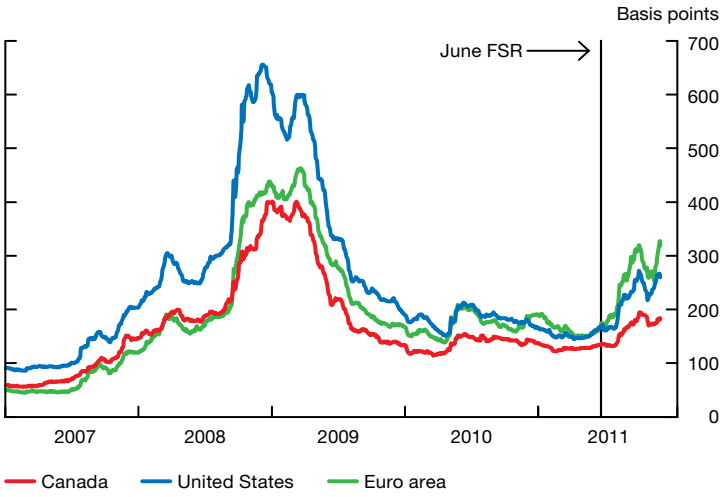
Last observation: 23 November 2011

markets, owing to an increase in equity risk premiums and expectations of lower future earnings growth. Global earnings estimates for 2012 have been downgraded in recent months.

Conditions in global corporate credit markets have also deteriorated since June, with the risk tolerance of both investors and market-makers diminishing. Market-making activity has decreased, with U.S. primary-dealer inventories of corporate bonds falling in recent months (**Chart 4**). Credit spreads have also widened considerably (**Chart 5**). Bond issuance slowed to a near-standstill during the summer. Issuance did pick up in October, but it remains well below the levels recorded in the first half of the year. As is typically the case during a broad retrenchment from risk-taking, bonds with greater credit risk have been affected the most. The timing and pricing of new issuance have been heavily influenced by market sentiment, and there have been periods when credit markets were effectively closed, except for the highest-quality borrowers. In addition, of the few deals that

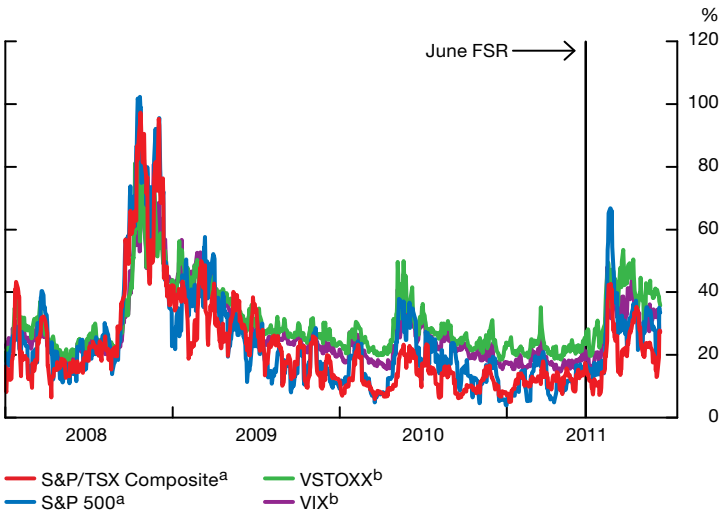
Chart 5: Spreads on investment-grade corporate bonds have widened considerably

Options-adjusted spreads between indexes of investment-grade corporate debt and government bonds



Sources: Bloomberg and Bank of America Merrill Lynch — Last observation: 2 December 2011

Chart 6: Elevated volatility suggests that a high degree of uncertainty persists in global equity markets



a. The S&P 500 and the S&P/TSX Composite volatility measures are based on 10-day historical volatility.
b. The VIX and VSTOXX indexes are measures of the implied volatility obtained from options contracts on the S&P 500 Index and the Euro Stoxx 50 Index, respectively.

Source: Bloomberg — Last observation: 2 December 2011

were completed, many came with sizable price concessions relative to secondary-market levels, indicating decreased investor demand for corporate bonds in global markets. While Canadian credit markets have also been affected by the global turmoil, international demand for the debt of Canadian governments, banks and corporations has remained steady, a sign that their credit quality is perceived to be high by global standards. In particular, Canada's provincial governments and banks have benefited from this increased investor demand for domestic products.

Fluctuations in confidence regarding the prospects for containing the fiscal and banking sector problems in Europe have contributed to sharp price movements in many asset classes, with rumours triggering swift market

reactions. A number of indicators—including high correlations of price movements across financial markets and elevated levels of implied and realized volatility in equity markets—suggest that considerable uncertainty persists in global equity markets (**Chart 6**) and that concerns about the effectiveness of the European policy response have grown.

Key Risks

The sustained intensification of macrofinancial stresses globally threatens to undermine financial stability in Canada. This section explores each of the risks that the Governing Council judges to be the most important for the stability of the Canadian financial system. These sources of risk are the same as those noted in the June FSR, but have evolved over the past six months. Although the risks are interrelated and mutually reinforcing, the following discussion focuses on the underlying vulnerabilities that are distinct for each risk.

Global Sovereign Debt

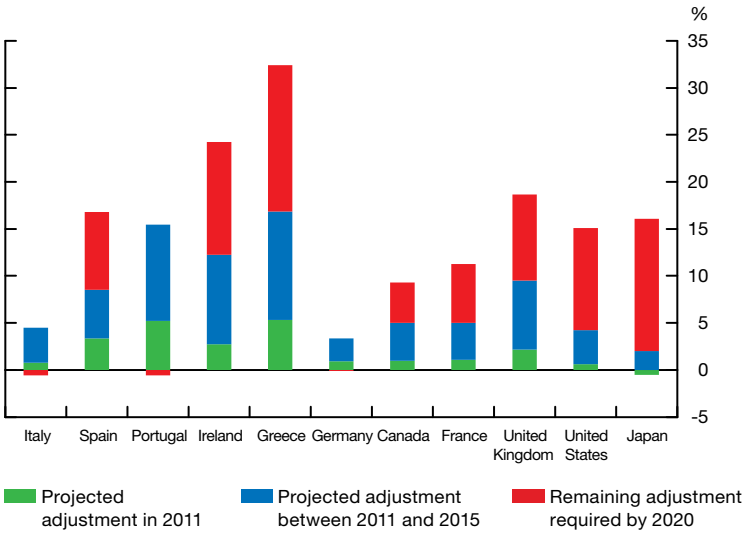
Last June, the Governing Council judged that the principal threat to domestic financial stability was the risk that sovereign debt dynamics in the euro area could create an adverse spiral. This risk has partly materialized. Dislocations in euro-area sovereign debt markets have been amplified by growing doubts over the credibility of the policy response to the crisis. Tensions have become acute for a broader range of countries, including Italy, the region's third-largest economy and the world's third-largest sovereign bond market. Worries over the health of European banks have also escalated, rekindling acute concerns over counterparty risk and creating severe strains in funding markets. In addition, the euro-area debt crisis has triggered the general flight to safety in international financial markets. While the action plan proposed by euro-area leaders on 26 October is a step in the right direction, its announcement has failed to restore market confidence.

The possibility that these sovereign strains could intensify remains the most important risk to Canadian financial stability in the near term. This risk is very high and has risen since June. So far, spillovers from the European financial turmoil to the Canadian financial system have been limited, because of the relative strength of Canada's businesses and financial sector, the low direct exposures of domestic banks to the most vulnerable sovereigns, and Canada's modest trade links with the euro area. Nonetheless, the risk is very high that a further escalation of tensions in the euro area could adversely affect domestic financial stability, particularly through a general retrenchment from risk-taking, funding pressures and confidence effects.

In addition to these acute sovereign debt problems in Europe, fiscal sustainability is at issue in other advanced economies (**Chart 7**). In the United States and Japan, in particular, fiscal deficits and debt-to-GDP ratios are at record levels and are still rising. Until now, debt-service burdens in both of these countries have been held down by favourable borrowing conditions—stemming in part from structural factors such as the high level of liquidity in the market for U.S. Treasuries, the role of the U.S. dollar as the international reserve currency and high domestic savings in Japan. There remains, however, a small but significant risk that this advantage could be lost if investor confidence suffers from repeated failure to undertake the needed fiscal consolidation. The significant market volatility created by the political stalemate over the U.S. debt ceiling in July and August underscored this risk.

Chart 7: Fiscal consolidation is required in some advanced economies outside the euro-area periphery

Change in cyclically adjusted primary balances necessary to attain a debt-to-GDP ratio of 60 per cent by 2030



Note: Total adjustment required to reduce the gross debt ratio to 60 per cent by 2030 (net debt target of 80 per cent for Japan). After 2020, the primary balance must be maintained at the prevailing level until 2030.
Source: IMF *Fiscal Monitor,* September 2011

The sovereign debt crisis in Europe has intensified and spread to core economies

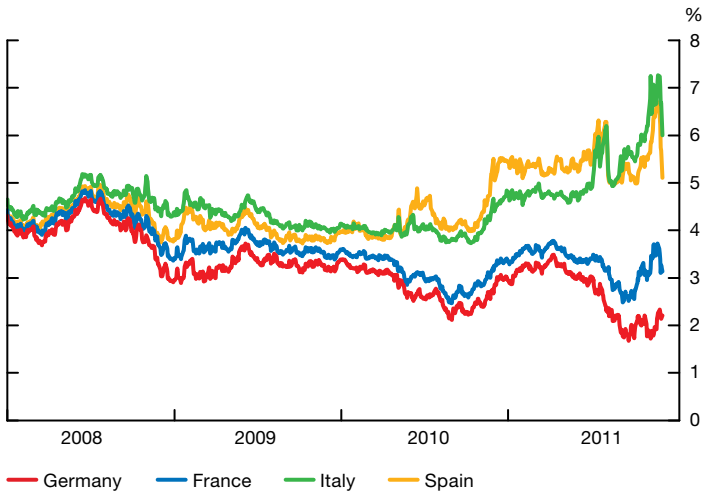
The sovereign debt crisis in the euro area has escalated sharply in recent months. The inability of the European authorities to agree on a policy response of sufficient scope to effectively address the crisis has undermined investor confidence and fuelled market tensions. Measures announced on 26 October include:

- increased financial assistance from the European Union (EU) and the International Monetary Fund (IMF) to the Greek government, with proposed concessions from bondholders to accept a haircut of 50 per cent, a higher percentage than previously agreed;
- a recapitalization plan requiring banks to attain a core Tier 1 capital ratio of 9 per cent or more by 30 June 2012, after a revaluation of sovereign exposures;
- the optimization of the resources of the European Financial Stability Facility (EFSF), with a view to significantly increasing its lending capacity without extending the government guarantees underpinning the facility; and
- additional fiscal consolidation and structural adjustment measures by Spain and Italy.

While these measures are steps in the right direction, and elicited a favourable initial market response, doubts have quickly resurfaced. The credibility of the package was undermined in particular by uncertainties surrounding the "voluntary" writedown of Greek debt, concerns over the procyclical effect of the deleveraging resulting from the bank recapitalization scheme and disagreements regarding possible methods of expanding the lending capacity of the EFSF. Tensions have thus continued to intensify in government debt markets for some of the region's larger economies, especially Italy and Spain (**Chart 8**). While both countries still have access to markets, their bond yields have risen

Chart 8: Tensions have escalated in sovereign funding markets for some larger euro-area economies . . .

Yields on 10-year sovereign bonds

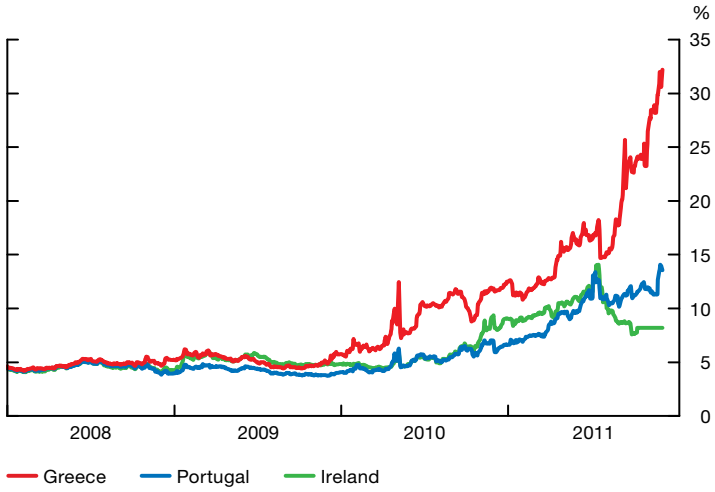


Source: Bloomberg

Last observation: 2 December 2011

Chart 9: . . . and yields on Greek government debt have risen sharply

Yields on 10-year sovereign bonds



Source: Bloomberg

Last observation: 2 December 2011

sharply, reaching levels at which their fiscal positions are unsustainable over the long run. Sovereign debt markets for France and Germany, the euro area's largest economies, have also been affected, with reduced participation at bond auctions and, in the case of France, higher yields.

Yields on Greek sovereign bonds have moved sharply higher despite a second financial aid package from the IMF and the EU (**Chart 9**). The cost of insuring against sovereign default in credit default swap (CDS) markets has also risen markedly.

The European Central Bank (ECB) has been supporting the market for government bonds from Greece, Ireland and Portugal—the three countries that have received financial aid from the EU and the IMF—as well as from Italy and Spain, by buying these securities through the Securities Markets Programme. At the time of writing, the ECB's purchases totalled slightly more than €200 billion.

Tensions have spilled over to the European banking sector

The most immediate impact of these sovereign debt concerns has been on European banks. Bank funding costs have been affected primarily through the following three channels, which reflect the central role of government debt in the financial system:

- The lower quality of government debt has weakened bank balance sheets, increasing their riskiness as counterparties and, in turn, making funding more costly and difficult to obtain.
- Higher sovereign risk has reduced the value of the collateral that banks can use to raise wholesale funding.
- The weaker financial positions of governments have lowered the funding benefits that banks derive from implicit and explicit government guarantees.

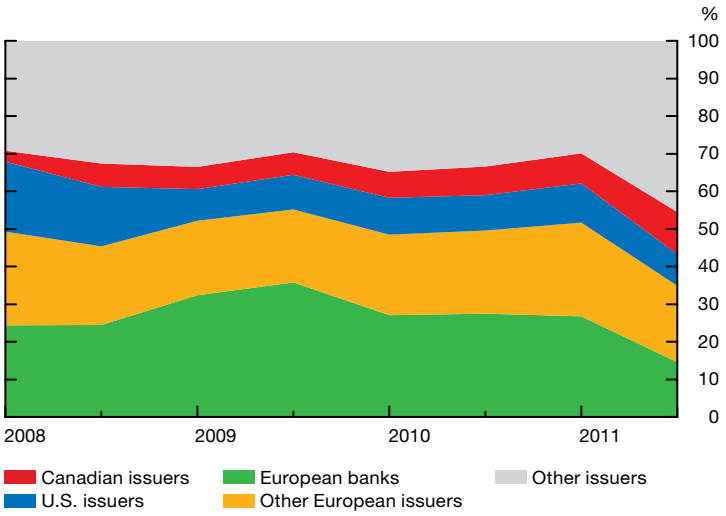
European banks are relying increasingly on the ECB to obtain funds . . .

European banks have been relying increasingly on borrowing from the ECB. This has been particularly true of banks in the countries of peripheral Europe with the most fragile fiscal fundamentals—notably Greece, Ireland and Portugal. To meet these higher funding needs, the ECB has expanded its extraordinary facilities further in recent months. Euro liquidity is now being provided for longer terms than usual. As well, a €40 billion program to purchase covered bonds has been introduced.

European banks' access to U.S.-dollar funding has again come under mounting pressure, motivating the ECB to enhance its program to provide U.S.-dollar liquidity. Since European banks hold large amounts of assets denominated in that currency, they have a significant and persistent need for U.S.-dollar funding. This was heightened in recent months as U.S. money market mutual funds reduced their positions in European bank debt (**Chart 10**), shortened the maturities of their loans to euro-area banks and placed limits on overall counterparty credit exposure. In September, the

Chart 10: U.S. money market mutual funds have reduced their holdings of European bank paper in recent months

Holdings of U.S. money market mutual funds as a percentage of total assets under management



Source: Fitch Ratings

Last observation: October 2011

ECB announced three 3-month U.S.-dollar liquidity operations, allowing financial institutions to secure financing in U.S. dollars beyond the year-end, which is typically a period when funding needs rise owing to seasonal factors. In addition, 1-week U.S.-dollar liquidity operations, which were set to expire in August 2011, have been extended until August 2012.

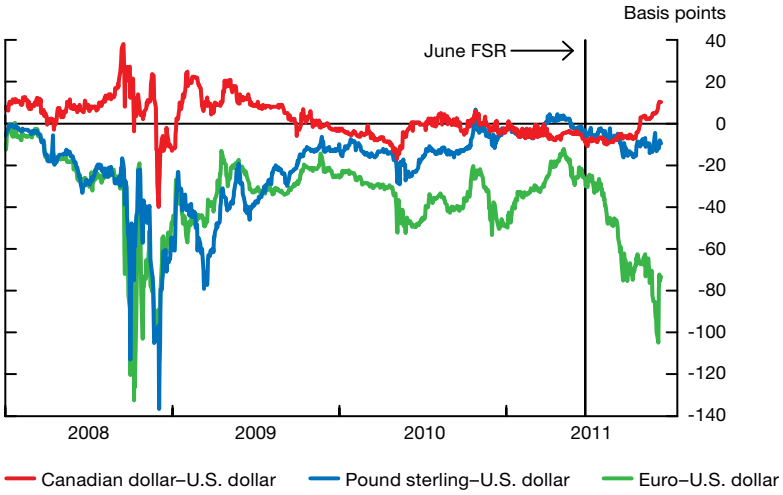
In the current environment in which unsecured funding markets are closed, financial institutions need to pledge collateral to access funding either from markets or the ECB. The euro-area banking sector as a whole holds a sizable stock of assets—estimated to be approximately €4 trillion—that are eligible to be pledged as collateral to obtain financing. However, as is evident from the recent example of Dexia, this stock varies significantly across institutions and across jurisdictions.[1]

. . . while central banks have also acted in a coordinated way to reduce strains in U.S.-dollar funding markets

With tensions in U.S.-dollar funding markets particularly acute as a result of rising counterparty concerns in Europe (**Chart 11**), a group of six central banks, including the Bank of Canada, took action on 30 November to extend U.S.-dollar swap lines with the U.S. Federal Reserve to 1 February 2013. The rate was lowered by 50 basis points, and the network of swap lines was expanded to include bilateral swaps among all pairs of currencies to provide financing if needed. For a number of the central banks involved, including the Bank of Canada, the U.S.-dollar swap lines have been precautionary in nature, but the ECB has made use of its swap facility to provide U.S.-dollar financing to European banks.

Chart 11: U.S.-dollar funding markets for European banks are experiencing acute tensions

One-year cross-currency basis swaps[a]



a. A cross-currency basis swap is a contract in which a market participant borrows funds in one currency at a variable interest rate and simultaneously lends the same value to the same counterparty in another currency, also at a variable interest rate.

Source: Bloomberg

Last observation: 2 December 2011

1 For example, when the French-Belgian bank Dexia declared bankruptcy on 5 October, approximately 77 per cent of its total assets were tied up in its various funding programs. This undermined Dexia's liquidity position and reduced its ability to secure additional funding.

Deleveraging by European banks could undermine financial stability

European banks have responded to market pressures by selling assets, some at their fastest pace since the peak of the subprime crisis, as they seek to reduce leverage, increase cash holdings and reduce reliance on short-term borrowings. This deleveraging is likely to be accelerated by the requirement to boost core Tier 1 capital to 9 per cent of risk-weighted assets by mid-2012, which was announced as part of the 26 October package of measures. Given market conditions, it seems likely that the higher capital ratios will be achieved at least in part through asset sales, as well as retained earnings and capital issuance. In an extreme scenario where only asset sales are used, up to €2.5 trillion of disposals would be required to raise core Tier 1 capital ratios to 9 per cent by next June as agreed to by euro-area leaders. Based on last year's earnings, and assuming that no dividends are paid, the lower bound for asset sales would be €1.4 trillion.

Asset sales are likely to be concentrated in non-core business lines. For instance, there are reports that European banks have been selling assets in emerging-market economies. In recent months, capital flows to emerging markets have slowed and, in some cases, have reversed. Expectations of further deleveraging, combined with a general decrease in risk appetite, could intensify this dynamic. Some European banks are also selling U.S.-dollar assets, which has the advantage of reducing the funding-currency mismatch that has plagued them for the past several years.

With recent quarterly results, banks have also announced a number of cost-cutting measures, including downsizing trading desks and other capital market operations. This raises the possibility of a marked decrease in their market-making activities, especially since this appears to be a strategy being used by many banks in Europe and abroad.

Deleveraging is already amplifying the economic downturn now under way, and is likely to have additional detrimental effects. There is a risk that a broad-based fire sale could lead to a general decline in asset prices, which would raise investors' funding liquidity risk through margin calls and exacerbate funding difficulties further.

Recent events in Europe call into question the effectiveness of credit default swaps as hedging instruments

Positions in credit default swap (CDS) markets are used to hedge sovereign risk exposures. Since a credit event triggering payments on sovereign CDSs would entail losses for institutions that have sold credit protection, there is a risk that this could be an important channel of contagion to other markets and institutions. At the same time, the usefulness of such protection is called into question by recent proposals for voluntary writedowns of Greek sovereign debt by 50 per cent without triggering a credit event. The resulting inability to hedge exposures to sovereign credit risk could further reduce investor demand for these securities.

The Canadian financial system is vulnerable to the tensions currently affecting European markets

As noted in the June 2011 FSR, sovereign credit strains in Europe could be transmitted to Canada through three main channels: direct and indirect credit exposures, funding conditions, and a general repricing of risk. The assessment at that time was that a general retrenchment from risk—and the related impact on the cost and availability of funding—would be the most important channels for Canada. This has so far been borne out by events: since June, the global retrenchment from risk associated with the European crisis has

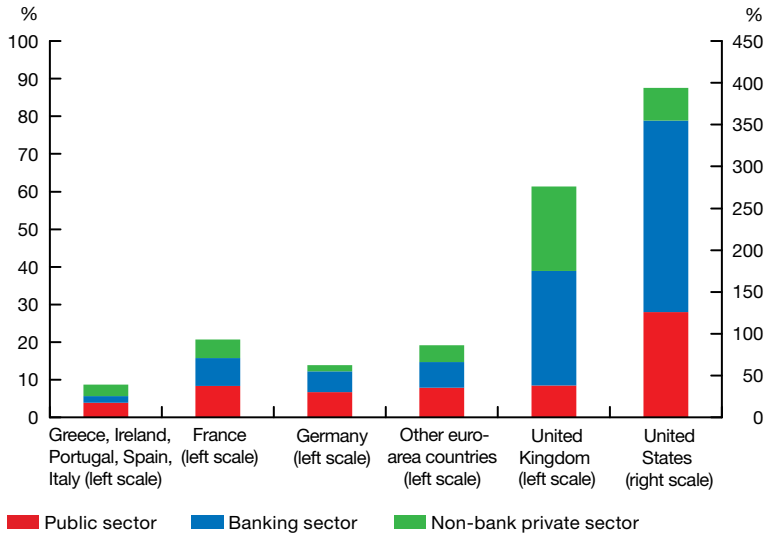
Table 2: Foreign claims as a percentage of Tier 1 capital in the banking sector of the claiming country, 2011Q2

		Claims on Greek entities	Claims on Portuguese entities	Claims on Irish entities	Claims on Italian entities	Claims on Spanish entities
Canadian banks	Public sector	0.0	0.0	0.2	2.6	1.1
	Total	0.2	0.1	2.9	3.4	2.0
German banks	Public sector	11.8	8.5	3.3	45.3	28.0
	Total	20.3	34.1	105.1	153.9	168.8
French banks	Public sector	5.0	2.9	1.3	49.5	14.1
	Total	25.8	11.9	14.8	193.0	69.9
U.K. banks	Public sector	0.8	0.4	0.9	4.0	1.8
	Total	2.9	5.9	32.7	17.1	23.4
U.S. banks	Public sector	0.3	0.1	0.2	1.5	0.9
	Total	1.0	0.6	6.2	5.4	7.7

Sources: Regulatory filings by Canadian banks, Bank for International Settlements and Bloomberg

Chart 12: The direct exposure of Canadian banks to credit claims on entities from the most vulnerable euro-area countries is low

Canadian domestic banks' cross-border claims as a percentage of total Tier 1 capital, by sector, on an ultimate-risk basis



Source: Regulatory filings by Canadian banks

Last observation: 2011Q2

indeed resulted in a significant correction in the prices of equities and other risky assets, as well as a widening of credit spreads in Canada, albeit less pronounced than in most other countries. Funding conditions for Canadian banks have remained more favourable than elsewhere: they have maintained market access at a relatively stable cost. This in turn partly reflects the relatively low total direct credit exposure of the Canadian banking sector to credit claims on entities from the most vulnerable euro-area countries (**Chart 12**).[2]

However, should the crisis deepen and spread further to the larger European economies, transmission to Canada could become more severe, through the credit and funding channels. Indirect credit exposures could also become more important—for example, via the significant exposures of German and French banks to Italian and Spanish borrowers, or in a more extreme case, if U.S. banks were affected (**Table 2**). An adverse outcome for Europe would also raise the risk of a significant impairment of funding conditions

2 The exposure of Canadian life insurers is also relatively modest.

for Canadian institutions.[3] There could also be a more severe retrenchment from risk than has occurred so far. Finally, a further deterioration of the financial situation in Europe represents an important downside risk to the global macroeconomy, which could generate adverse feedback to the financial system through its effects on credit risk as well as asset prices.

A comprehensive policy response is urgently needed

The European sovereign debt crisis is acute, but it can be resolved if policymakers address the situation in a forceful manner. European authorities must take steps to restore confidence, which will create time to refound their monetary union based on credible fiscal arrangements and enhanced governance.

European authorities are working to strengthen the capital of European banks and provide a more reliable funding backstop for euro-area sovereigns. But, judging from the lingering skepticism of investors, bolder action—including clear decisions and firm implementation—is needed to get ahead of the crisis.

Economic Downturn in Advanced Economies

As noted earlier, global economic activity has slowed markedly since June and downside risks remain elevated. In addition to the risks associated with a failure to contain the European sovereign debt crisis, there is the risk that household deleveraging and fiscal consolidation in the United States could drag the U.S. economy into another recession.

An economic downturn in advanced economies would have a substantial impact on Canadian businesses, households and financial institutions. While the most obvious channel of transmission would be via the effects of deteriorating credit quality on bank capital bases, these effects could be amplified by significant vulnerabilities in the global economy, including an intensification of funding pressures and of fiscal strains. This risk is judged to be high and to have risen since June, owing primarily to the deterioration in the global economic outlook.

International banking systems remain fragile

In aggregate, banks have become more resilient since the 2008 crisis. They have raised the level and quality of their capital in order to enhance their ability to absorb losses. They have also reduced leverage and improved the stability and resilience of their funding. These improvements will continue in the coming years as enhanced prudential standards are implemented.

Balance-sheet repair thus far has been uneven. While banks continue to build strong capital buffers in aggregate, some banks, particularly in Europe, still have thin capital buffers (**Chart 13**) and high exposures to underperforming assets.

The current macroeconomic context implies an elevated risk that progress in solidifying the international financial system will be delayed further. In recent quarters, bank profits have fallen globally, with Canadian banks continuing to generally outperform their international peers in the third quarter (**Chart 14**). Globally, the performance of banks has varied considerably across institutions. Lower trading revenues, decreased demand for credit and higher funding costs have weighed on profits, with many European and U.S. banks incurring large charges on mortgages and sovereign debt holdings.

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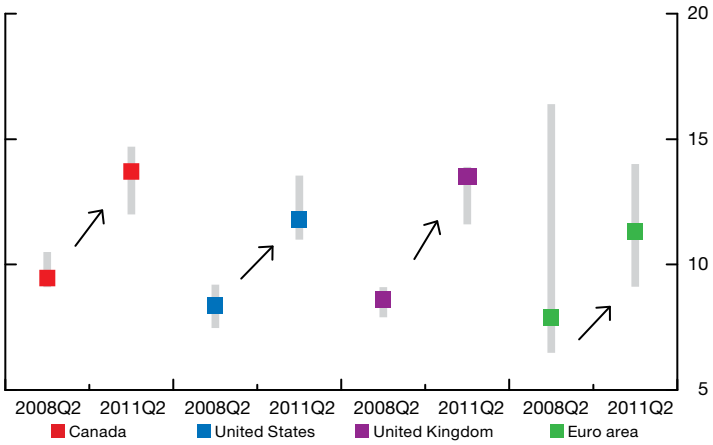
3 The reliance of banks, both in Canada and in other countries, on wholesale funding—which is less dependable than other funding sources such as retail deposits—increases their vulnerability to a deterioration in funding market conditions.

Chart 13: Capital levels have improved, but vary across banks

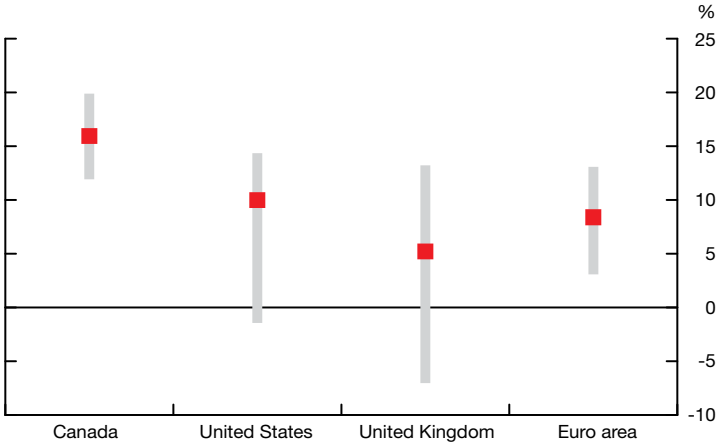
Comparison of maximum, minimum and median Tier 1 capital ratios of large banks, by region (Basel II definition)



Note: The boxes represent the median Tier 1 capital ratio. The vertical lines are the maximum and minimum Tier 1 capital ratios for a representative group of banks in each region (6 Canadian banks, 8 U.S. banks, 5 U.K. banks and 9 euro-area banks).
Source: Bloomberg
Last observation: 2011Q2

Chart 14: Bank profitability is still much higher in Canada than in other major economies

Maximum, minimum and median return on equity (ROE) of large banks, by region



Note: The red box represents the median ROE. The vertical lines are the maximum and minimum ROE for a representative group of banks in each region (6 Canadian banks, 8 U.S. banks, 5 U.K. banks and 9 euro-area banks).
Source: Bloomberg
Last observations: Canadian and U.S. banks, 2011Q3; U.K. and euro-area banks, 2011Q2

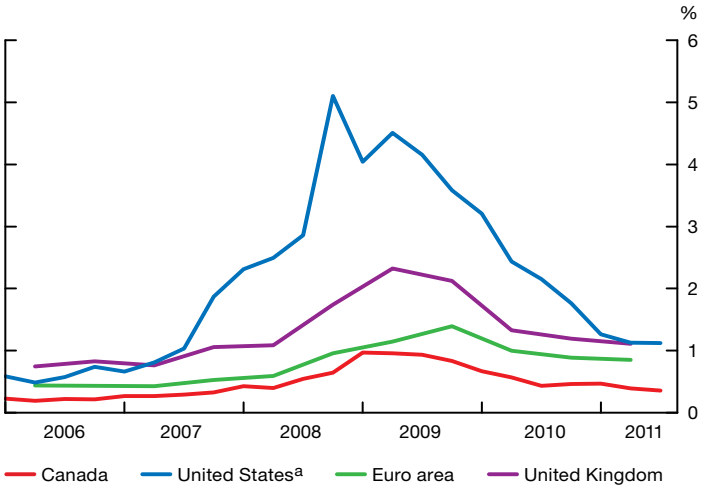
Persistent concerns over asset quality weigh on the outlook for the global banking sector

Provisions for loan losses (**Chart 15**) and non-performing loans (**Chart 16**) remain well above historical levels. While these indicators have improved since the peak of the crisis in most countries, non-performing loans continue to rise as a proportion of total loans in the euro area.

An area of particular weakness is the U.S. real estate market, which remains fragile and is vulnerable to further deterioration. Stagnant wage growth is impairing the ability of U.S. borrowers to service mortgage debt, and a large shadow inventory of housing persists. Banks with sizable holdings of real estate assets resulting from past foreclosures have difficulty liquidating them or finding buyers at reasonable prices. Data from the Federal Deposit

Chart 15: Provisions for loan losses have declined markedly but remain above pre-crisis levels . . .

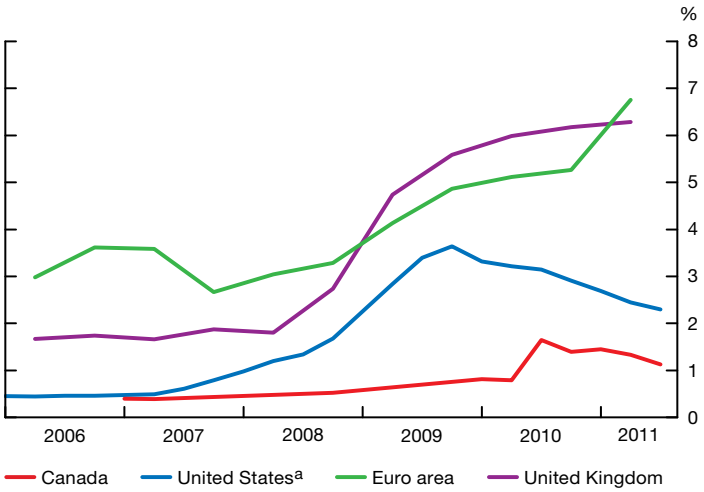
Provisions for loan losses as a percentage of total loans (annualized)



a. U.S. data exclude Goldman Sachs, Merrill Lynch and Morgan Stanley.
Source: Bloomberg Last observations: Canada and United States, 2011Q3; other countries, 2011Q2

Chart 16: . . . and non-performing loans at global banks continue to be elevated

Non-performing loans as a percentage of total loans



a. U.S. data exclude Goldman Sachs, Merrill Lynch and Morgan Stanley.
Source: Bloomberg Last observations: Canada and United States, 2011Q3; other countries, 2011Q2

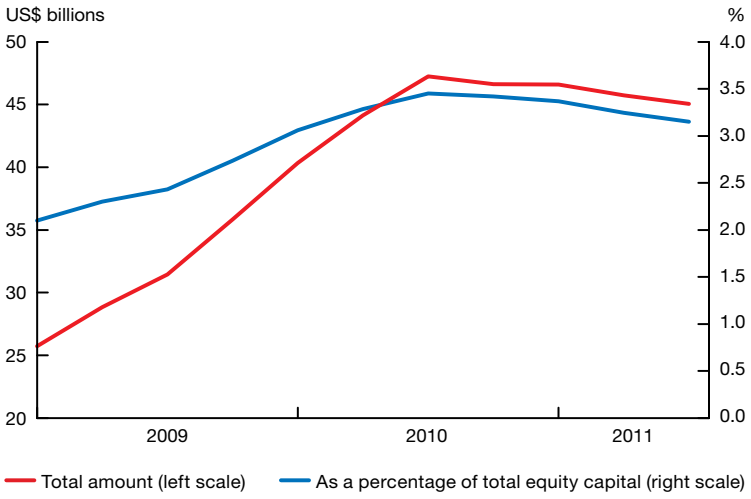
Insurance Corporation show that, while the stock of real estate assets on bank balance sheets stabilized, both in absolute value and as a share of the total equity capital of U.S. banks, real estate assets remain elevated (**Chart 17**).

There is a risk that an economic downturn could impair the credit quality of bank loan portfolios

If economic activity declines significantly, a growing number of Canadian households and businesses would experience financial difficulties, which would translate into an increase in loan losses at financial institutions. Writedowns of investments held by those institutions would also likely rise. If banks curtail credit, this would trigger an adverse feedback loop through which declines in economic activity and stress in the financial system would reinforce each other. Finally, a downturn leading to rising concerns over credit risk could be reflected in increased costs and reduced access to

Chart 17: The stock of foreclosed properties owned by U.S. banks has stabilized but is elevated

Other real estate owned by banks[a]



a. All real estate, other than bank premises, actually owned or controlled by the institution and its consolidated subsidiaries, including real estate acquired through foreclosures

Source: Federal Deposit Insurance Corporation Last observation: 2011Q3

wholesale bank funding, which currently makes up a significant portion of funding by banks in advanced economies, including Canada.

Global Imbalances

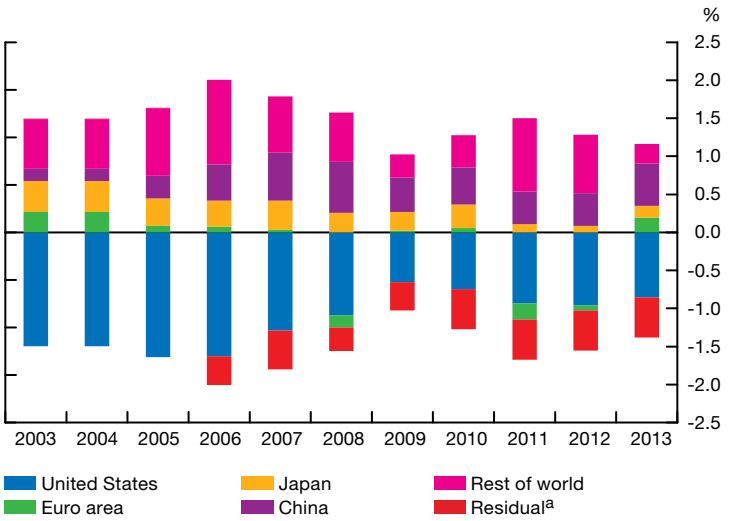
Global current account imbalances remain an important source of risk to the global financial system. These imbalances—and the lack of exchange rate flexibility that allows them to persist—are a central part of the macroeconomic background to the financial crisis, as well as to the current configuration of risks. They correspond to unsustainable debt accumulation in some advanced economies counterbalanced by unsustainable asset accumulation in some emerging-market economies. At the global scale, asymmetric adjustment to these imbalances is contributing to deficient global demand. Indeed, the world is currently experiencing the economic ramifications of an international monetary system that does not have a coherent set of exchange rate policies.

The risks posed by global imbalances are high and broadly unchanged since June. These risks have several dimensions. First, there is the risk that these imbalances might unwind in a disorderly way, with large and abrupt movements in exchange rates and other asset prices that could impose significant losses on institutions that are imperfectly hedged and/or have fragile funding strategies. Second, to the extent that some key exchange rates are not allowed to adjust, pressures can be displaced onto other more flexible currencies, in turn provoking intervention and other responses that might have knock-on effects on global markets. Third, reserve accumulation in surplus countries may result in financial system distortions in those countries, such as asset-price bubbles. Attempts by authorities in these economies to thwart the inflationary consequences of these dislocations may fuel imbalances further.

The global macroeconomic and financial conditions already discussed can be viewed, in part, as a result of asymmetric adjustment of the global imbalances through deleveraging in the deficit countries. While the G-20 Action Plan for Strong, Sustainable and Balanced Growth provides a useful road map of the necessary adjustments and a mechanism for monitoring progress, the agreed policies have yet to be implemented.

Chart 18: Global imbalances are projected to remain large through 2013

Current account balance as a percentage of global GDP



a. The residual represents the statistical error and has been kept constant at its last historical value over the projection period.

Sources: IMF September 2011 *World Economic Outlook* and Bank of Canada projections

Last data plotted: 2013

Global imbalances are expected to persist

While global imbalances narrowed during the recent recession, they have re-emerged with the recovery and are expected to remain large through 2013 (**Chart 18**).

A key reason for the persistence of global imbalances is the lack of exchange rate flexibility, particularly in many Asian emerging-market economies, including China. In some of these countries, the real effective exchange rate has indeed appreciated, but not enough. Moreover, this adjustment has occurred mainly through inflation rather than nominal exchange rate adjustment. Although weakening global economic growth has caused inflation to decline in many emerging-market economies in recent months, it remains elevated. While reserve accumulation in emerging markets—a direct result of maintaining an undervalued exchange rate—is also slowing, this tends to reflect cyclical factors rather than structural adjustments.

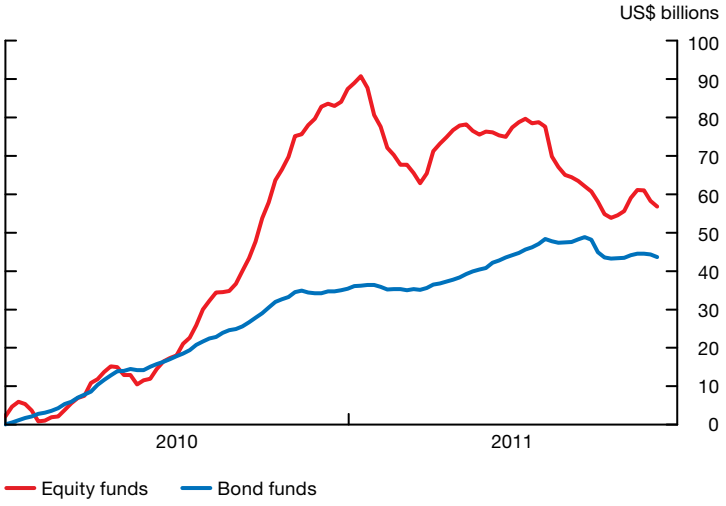
More broadly, currency adjustments have also been impeded by safe-haven flows related to the deterioration of the European sovereign debt situation. For example, since June, despite a weakening economic outlook, the U.S. dollar has appreciated on a trade-weighted basis. Similar dynamics compelled the Swiss National Bank to take the extraordinary step of announcing and reinforcing a cap on the Swiss franc/euro exchange rate. The actions of the Swiss National Bank have, in turn, increased exchange rate pressures on other safe-haven currencies, such as the Swedish krona. Japan has also conducted significant interventions to arrest the appreciation of the yen, but without announcing a specific target.

Capital flows into emerging-market economies have fallen off

Another manifestation of global imbalances has been elevated capital inflows to the surplus countries, which have contributed to vulnerabilities in those economies. In some cases, these inflows have been reversed since June, as slowing global economic growth and heightened risk aversion among investors have resulted in capital outflows from emerging markets

Chart 19: Capital flows to emerging markets have slowed and, in some cases, have reversed

Cumulative flows into emerging-market funds



Source: EPFR Global

Last observation: 30 November 2011

(**Chart 19**). In addition, policy rates are no longer increasing and, in a few cases, have fallen. The inflows may resume in the event that the European sovereign debt crisis is resolved and investor risk appetite revives. Raising the flexibility of their exchange rates would provide emerging-market economies with a mechanism to deal more efficiently with such pressures.

A particularly important example of the buildup of vulnerabilities in surplus countries is the current situation in the Chinese economy. As outlined in **Box 1**, these vulnerabilities are associated with an increased risk of a more pronounced slowing of economic activity in China.

Low Interest Rate Environment in Major Advanced Economies

Interest rates are currently at, or near, historically low levels in most advanced economies, and, given the weak economic environment, markets are pricing in a high likelihood that this will persist. While accommodative monetary policy is necessary to support the global economic recovery, it poses two important sets of risks to the global financial system.

First, persistently low interest rates put pressures on the balance sheets of institutional investors—particularly those with long-duration liabilities, such as life insurance companies and defined-benefit pension plans. For these institutions, low interest rates increase the actuarial value of contractual liabilities and reduce returns on their assets—thus creating tensions with the need to satisfy minimum-return guarantees offered to policyholders and beneficiaries. These tensions are often compounded by the capital losses many of the institutions have already experienced during and after the global financial crisis. In many instances, these institutions may need to change their business models to succeed over the longer term. Banks may also find their profitability under pressure, since low interest rates tend to compress their net interest income.

Second, the conviction that interest rates will be low for an extended period can spur a search for yield through riskier assets or investment strategies. In particular, investors may seek to boost returns through additional leverage, or

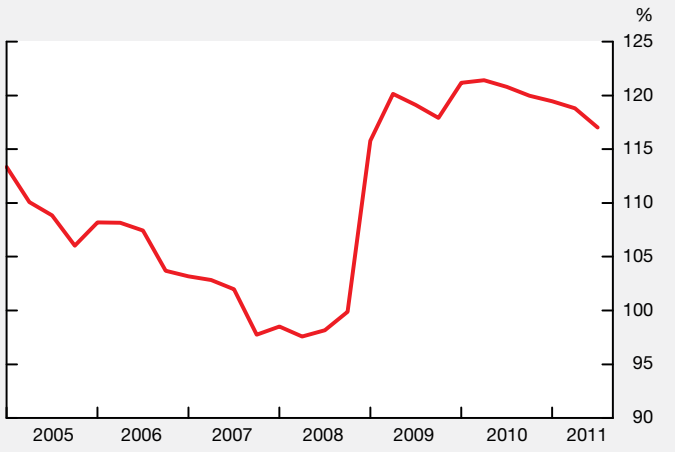
Box 1

Assessing the Risks to Financial Stability in China

Signs of important imbalances in the Chinese financial system represent a threat to its stability. After growing rapidly in recent years, China's economy is now slowing. While the rate of credit expansion in relation to GDP has moderated recently (**Chart 1-A**), history suggests that credit booms are often accompanied by an increase in the overall riskiness of banks. China's banking system continues to register strong performance, with high profitability and few non-performing loans. Concerns over the long-term viability of projects financed during the recent credit boom place the repayment of some loans in doubt, however, and increase the contingent liability of the public sector.

The recent real estate boom is also a key source of risk. Property prices have risen sharply in recent years (**Chart 1-B**). Anecdotal evidence suggests that a large number of properties are being purchased for investment purposes and that the vacancy rate is rising. It now appears that property markets are softening, owing partly to the lagged effect of the price-control policies implemented by domestic authorities since April 2010. There is a risk that efforts by authorities to slow housing activity to a more sustainable pace could result in a sharper-than-expected correction in prices. Reduced collateral values would put pressure on banks and amplify strains on local governments, since the latter rely heavily on revenue from land sales.

Chart 1-A: China's credit-to-GDP ratio has moderated recently



Sources: Bloomberg and Bank of Canada calculations — Last observation: 2011Q3

Chart 1-B: Property prices in China have risen significantly in recent years

Equity and house price indexes in China

Sources: Bloomberg, SouFun and Bank of Canada calculations — Last observations: house prices, July 2011; equity prices, 30 November 2011

by amplifying their exposure to both interest rate and credit risk. These two elements of risk are, of course, related, since the drive for yield is more intense for institutions facing pressures associated with their long-term liabilities.

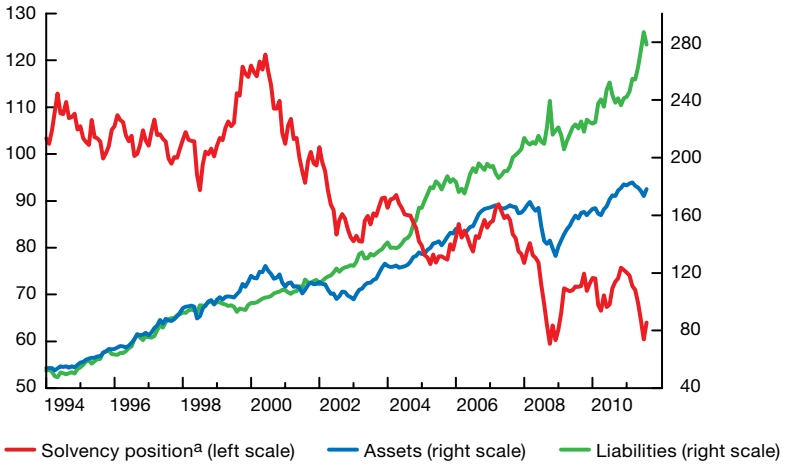
These elements of risk have evolved in opposite directions since the June 2011 FSR. The first element has been exacerbated by the decline in global long-term interest rates associated with the weakening economic outlook. The second element has been mitigated by the general retrenchment from risk-taking that has occurred over the same period. Taking these different forces into account, the Governing Council judges that the risk to domestic financial stability arising from the low interest rate environment is moderate and broadly unchanged since June.

The current macrofinancial environment poses risks for pension plans and life insurance companies in particular

Recent macrofinancial developments have increased the challenges faced by pension funds and life insurance companies. The weak performance of financial markets in recent months has lowered returns on their investment

Chart 20: The aggregate solvency of defined-benefit pension funds in Canada is close to an all-time low

Indexes (December 1998 = 100)



a. Solvency position is equal to assets divided by liabilities.
Source: Mercer (Canada) Limited

Last observation: October 2011

portfolios. As well, further declines in interest rates are amplifying the challenges associated with a low interest rate environment, since the actuarial value of guaranteed liabilities with a long duration is particularly sensitive to changes in interest rates.

According to the Mercer Pension Health Index, the decline in long-term interest rates over the past six months has brought the funded status of Canadian pension funds near the all-time low reached in 2008 (**Chart 20**). This index declined from 71 per cent in the second quarter of 2011 to 64 per cent at the end of October, indicating that a representative pension plan faces a higher risk of being unable to fully meet its financial obligations.

Recent market developments have had a similar negative impact on the life insurance sector. Some large Canadian insurers reported sizable losses in the third quarter, reflecting the impact of lower interest rates, the decline in equity markets and revisions to actuarial assumptions. The recent market turmoil has also intensified sensitivities to market risk. Equity hedging strategies designed to help mitigate the impact on profit and loss will be less effective under very stressful financial market conditions to the extent that these strategies may be subject to basis and counterparty risk. These issues are especially challenging for firms that have been more aggressive in providing guarantees on investment products and in operating with greater asset-liability mismatches.

While International Financial Reporting Standards (IFRS) require that the financial statements of life insurance companies reflect the current level of interest rates, an assumption is made that interest rates converge toward their long-term average. A persistent low interest rate environment would gradually require insurance companies to lower their ultimate reinvestment rates, putting pressure on profits and capital. A more important issue relates to actuarially assumed returns on non-fixed-income assets: given the low level of interest rates, current assumptions for future investment returns might be overly optimistic.

Strategies to reduce the financial impact of lower interest rates are not without risks

Life insurance companies, both globally and in Canada, have been actively modifying product design to reduce guarantees. They have also withdrawn some interest-rate-sensitive product lines, raised prices on a broad range of products and targeted increased sales of products that feature loss-sharing agreements with policyholders (i.e., participating policies). Similarly, some pension plan sponsors have raised both employer and employee contributions to improve the funding status of their plans.

Strategies to reduce sensitivity to interest rates may also be pursued, perhaps by establishing a portfolio of investments that better matches the risk and return characteristics of the plan's liabilities. This typically involves increasing the duration of a plan's assets, and possibly altering their composition to increase the proportion that is held in fixed-income investments. However, given the current low interest rate environment, extending duration can be particularly costly, since it effectively reduces profitability. In addition, because of the limited availability (or liquidity) of securities and the desire to maintain a certain level of exposure to other asset classes (e.g., equity markets) or a targeted rate of return, it may not be possible to fully match the assets of the fund to its liabilities.

As an alternative strategy, instruments such as interest rate swaps, bond forwards and term repos can be used to maintain a desired portfolio mix while still hedging the interest rate risk. This involves some degree of leverage and exposes the institution to new sources of risk. For example, the use of derivatives such as interest rate swaps results in counterparty risk—i.e., the risk that the opposite party in these transactions fails to meet its obligations. It can also result in an imperfect hedge of interest rate risk. Alternatively, the purchase of longer-term assets financed by rolling over shorter-term repurchase agreements exposes the entity to funding liquidity risk.[4] This can be a serious problem: the financial crisis has shown that, in extreme cases, liquidity can evaporate quickly, even for high-quality and normally liquid assets.

The broad-based retrenchment from risk-taking in international financial markets has mitigated some of the adverse consequences of low interest rates

The increased popularity of riskier financial instruments in late 2010 and the beginning of 2011 manifested itself in several ways. For example, the issuance of high-yield corporate debt in the United States and Canada in the first half of 2011 was on track to exceed the 2010 historical record. In addition, there were signs of a resurgence of covenant-lite loans in the United States, while the issuance of complex exchange-traded funds was growing rapidly in Europe.

Since then, however, risk-taking has been pared back considerably, as concerns about the global economic outlook and fears of contagion from the sovereign debt crisis in the euro-area periphery have increased. The issuance of high-yield corporate debt has slowed noticeably compared with the first half of 2011 (**Chart 21**). In addition to low levels of issuance, credit spreads for high-yield borrowers have risen in Canada and the United States since June.

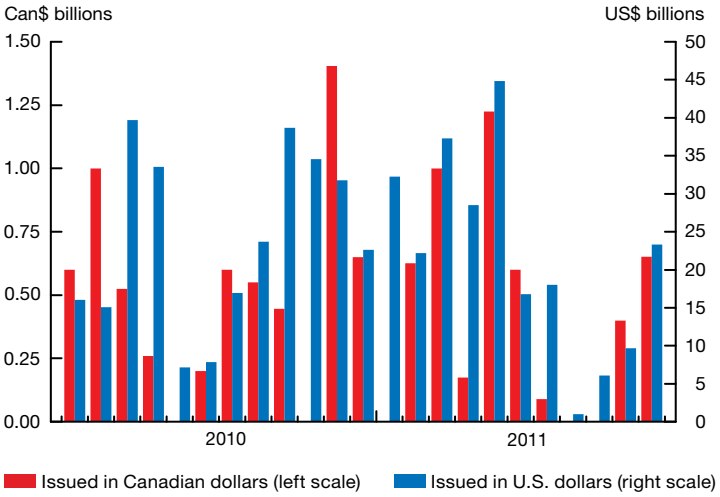
Risk-taking behaviour and changes to business strategies must be carefully monitored so that any financial imbalances can be identified early

The financial crisis provided ample evidence of the far-reaching consequences that can occur when investors do not fully understand the risks they have assumed. Developments in the Canadian third-party

4 A repurchase agreement combines two transactions: an immediate sale of securities and a simultaneous agreement to repurchase those securities at a pre-specified future price and date.

Chart 21: After reaching record-setting levels, high-yield issuance has fallen significantly

Issuance of high-yield debt by global corporations



Sources: Bloomberg and Bank of Canada calculations

Last observation: November 2011

asset-backed commercial paper market in the summer of 2007[5] provide a telling example. Since investors may be tempted to adopt riskier strategies to increase returns in the current low interest rate environment, it is imperative that financial market participants carefully assess the risks they are exposed to, taking into account credible expectations for the macroeconomic environment—including interest rates—over the full investment horizon. This requires that information on financial instruments be readily available to participants, allowing investors to clearly identify the factors that influence price changes in the instrument, as well as those that might result in significant losses. In addition to avoiding taking on excessive risk in an effort to boost investment returns, institutional investors need to continue to adjust their business models.

Canadian Household Finances

The rising indebtedness of Canadian households in recent years has increased the possibility that a significant proportion of households would be unable to make debt payments in the event of an adverse economic shock. This growing vulnerability has heightened the risk that a deterioration in the credit quality of household loans would amplify the impact of the shock on the financial system. The resulting increase in loan-loss provisions for financial institutions and the reduced quality of the remaining loans would lead to tighter credit conditions and, in turn, to mutually reinforcing declines in real activity and in the overall health of the financial sector.

The vulnerability to this risk remains elevated and is broadly unchanged since June. There are tentative signs that the sustained rise in the proportion of vulnerable households in recent years has moderated and credit growth has slowed noticeably over the past six months. Nonetheless, our simulation results suggest that household balance sheets remain vulnerable to adverse economic shocks.

5 In August 2007, Canadian issuers of third-party asset-backed commercial paper had difficulty rolling over maturing securities because of heightened concerns in markets about the quality of the underlying assets. With non-bank-sponsored conduits unable to draw on backup liquidity lines from banks, a standstill was called to effect an orderly workout.

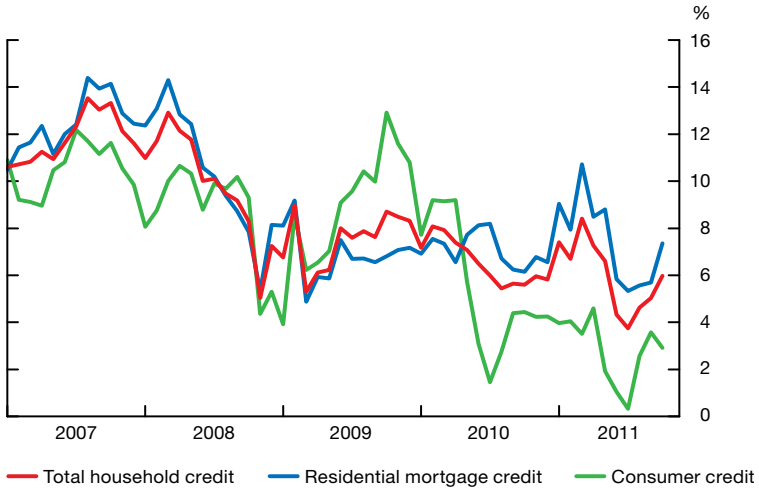
The growth of household credit has moderated since early 2011 but remains higher than income growth

After registering strong growth in the first quarter of 2011, total household credit has since slowed to a more moderate pace (**Chart 22**). The uptick in the first quarter was concentrated in mortgage credit and was likely driven by a number of temporary factors, including a surge in the resale housing market in late 2010 and a pulling forward of credit before the new rules for government-backed insured mortgages became effective in March and April. The moderation in the rate of household credit growth over the second and third quarters of 2011 partly reflects the dissipation of these temporary factors. Nevertheless, the rebound in mortgage growth in October and the robust growth in resale activity in housing markets in the third quarter suggest that credit growth may exhibit some strength in the near term.

While the growth of household credit has slowed since early 2011, it has continued to increase more rapidly than income. As a result, the

Chart 22: The growth of total household credit has moderated since early 2011

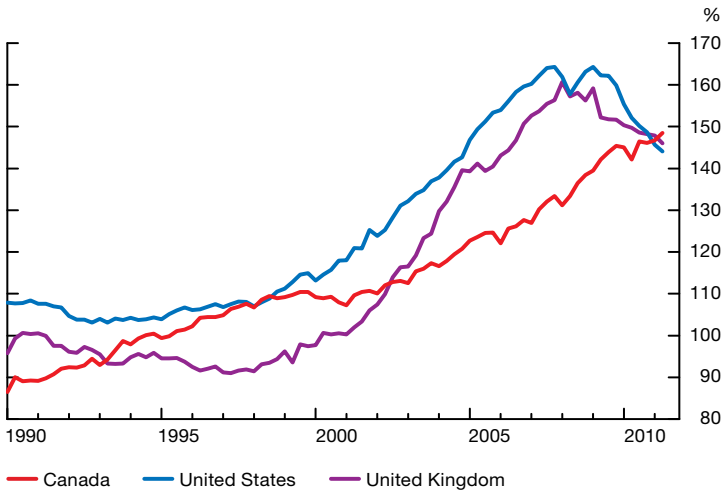
Annualized 3-month growth rates



Source: Bank of Canada

Last observation: October 2011

Chart 23: The aggregate debt-to-income ratio rose to a historical high in the second quarter



Sources: Statistics Canada, U.S. Federal Reserve and U.K. Office for National Statistics

Last observation: 2011Q2

debt-to-income ratio of the Canadian household sector increased to a historical high of 149 per cent in the second quarter (**Chart 23**) and has been higher than the ratio in the United States since the start of 2011.

If recent trends persist, the ratio of household debt to income will continue to rise

Despite the rebound in the growth rate of mortgage credit in October, the Bank expects a gradual moderation in the underlying trend in household debt accumulation over the medium term as activity in the housing market slows and as lower commodity prices and heightened volatility in financial markets weigh on the wealth and confidence of Canadian households. Since the growth of personal disposable income is also projected to be moderate, the gap between credit and income growth is expected to narrow but remain positive, implying that further increases in the aggregate household debt-to-income ratio are likely.

The overall financial situation of households remains strained

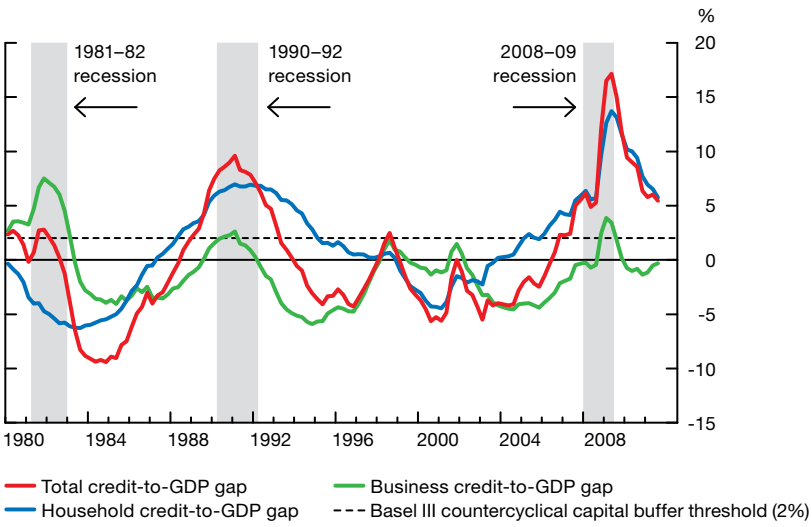
Data for both individual households and the sector as a whole indicate that the financial situation of the household sector remains vulnerable. In particular, both the share of indebted households that have a debt-service ratio exceeding 40 per cent[6] and the proportion of debt owed by these households remain above the 2000–2010 average.

The aggregate credit-to-GDP gap for Canada has fallen from its cyclical peak but remains high by historical standards, owing to the growth in household credit (**Chart 24**). International evidence has shown that this indicator is a useful guide for identifying a potential buildup of imbalances in the banking sector.[7]

Financial stress in the household sector has eased since the beginning of 2011, although it remains above pre-crisis levels: mortgage and consumer loans in arrears have moderated somewhat during 2011 but are nonetheless

Chart 24: The aggregate credit-to-GDP gap has declined but remains high

Percentage deviation from trend



Sources: Statistics Canada and Bank of Canada calculations

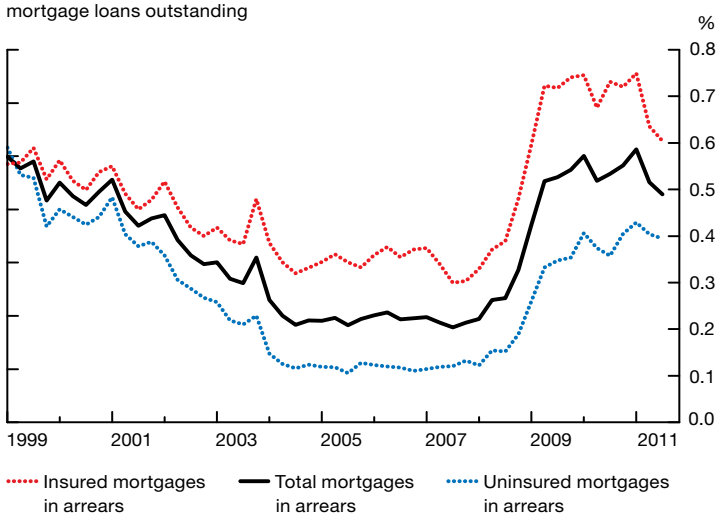
Last observation: 2011Q3

6 Consistent with industry standards, a household is considered to be more likely to have difficulty making loan payments when its debt-service ratio exceeds 40 per cent.

7 For more information on the credit-to-GDP gap indicator, see Box 3 on page 22 of the June 2011 issue of the FSR.

Chart 25: Mortgages in arrears remain elevated

Residential mortgages in arrears 90 days or more as a percentage of total mortgage loans outstanding



Source: Regulatory filings by Canadian banks

Last observation: 2011Q3

elevated (**Chart 25**). As well, the ratio of household debt to assets remains above its pre-crisis level, and household net worth declined modestly in the second quarter. Given negative returns across a broad range of assets since mid-year, net worth is expected to have declined further in the third quarter.

Households are vulnerable to adverse shocks to the labour and housing markets

Given the vulnerable state of their balance sheets, households would be less able to cope with the impact of significant adverse shocks. Two inter-related events to which Canadian household balance sheets are vulnerable are a significant decline in house prices and a sharp deterioration in labour market conditions.

Since high-ratio mortgages in Canada are insured, it is likely that a moderate fall in house prices would affect systemic risk primarily through the negative feed-back loop with the real economy. In such a scenario, declines in house prices would lead to lower household net worth, reduced access to secured credit and lower employment in the housing-related sector. These factors would reduce consumer spending and increase strains on household balance sheets.

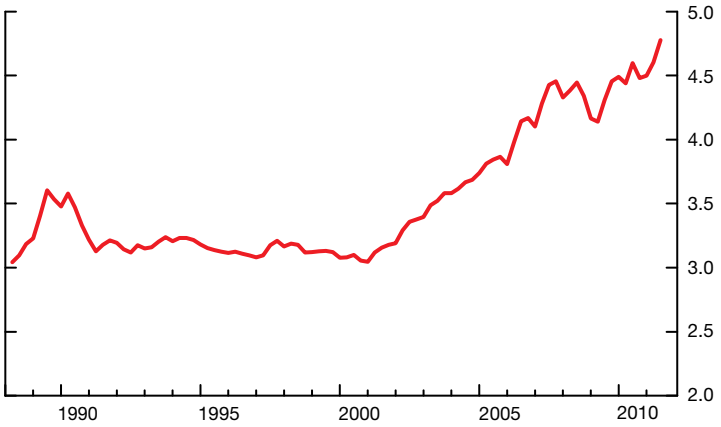
Some measures of housing affordability suggest continued imbalances, owing to the robust performance of this market. In particular, house prices remain very high relative to income (**Chart 26**). Since the adverse impact of elevated residential property prices on affordability has been largely offset by low interest rates, affordability would be considerably curtailed if interest rates were closer to historical norms (**Chart 27**).

Certain areas of the national housing market may be more vulnerable to price declines, particularly the multiple-unit segment of the market, which is showing signs of disequilibrium: the supply of completed but unoccupied condominiums is elevated, which suggests a heightened risk of a correction in this market.

A sharp and persistent increase in the unemployment rate would reduce aggregate income growth and make it more difficult for some households to make their debt payments. It would also have adverse knock-on effects on consumer confidence, the housing market and Canadian household net worth.

Chart 26: House prices in Canada are very high relative to income . . .

Ratio of Teranet-National Bank house price index to household disposable income[a]

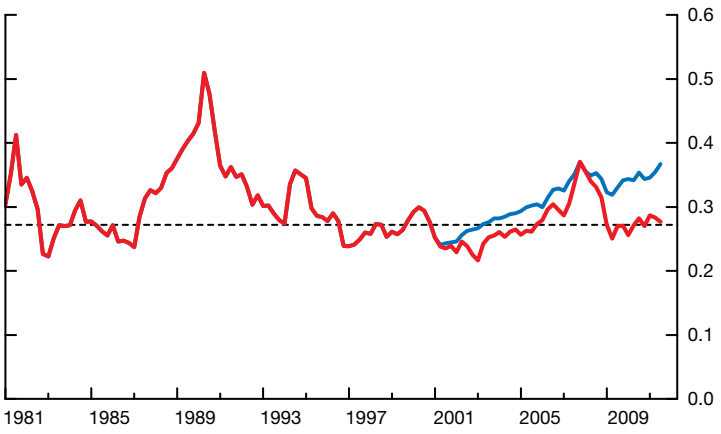


a. The Teranet-National Bank house price index is used from 1999 onward. Before 1999, house prices consistent with that index were estimated by the Bank of Canada.

Sources: Statistics Canada, Teranet-National Bank and Bank of Canada calculations

Last observation: 2011Q3

Chart 27: . . . and housing affordability would be less favourable if interest rates were closer to long-term norms



a. This measure estimates the size of mortgage payments for a representative first-time homebuyer given prevailing interest rates and house prices, and then scales this value by personal disposable income in order to measure affordability.

b. To illustrate affordability if interest rates were closer to historical norms, the average real mortgage rate since 1995 (4 per cent) is used to set a floor for the real interest rate; if the observed value is below 4 per cent in a period, the floor is used in the calculation.

Source: Bank of Canada calculations

Last observation: 2011Q3

Household loans in arrears would roughly double under a stress test involving a hypothetical labour market shock

The Bank has updated the stress-test simulation reported in the June 2011 FSR to assess the potential impact of an adverse labour market shock on the financial situation of Canadian households and the banking sector.[8] Despite lower market expectations of interest rates and a more moderate assumed path for credit growth than in June, the stress test continues to suggest that a negative labour market shock would have a significant effect on loans in arrears.

The simulation is conducted in two steps. First, the evolution of the distribution of the household debt-service ratio (DSR) is simulated until the end of 2013. The DSR for each household is conditional on assumptions about the future pace of debt accumulation, income growth and the level of interest rates. Given the simulated distribution, the second step is to estimate the impact of a hypothetical labour market shock at the end of the simulation period on the proportion of household loans in arrears for three months or more.[9]

The simulation incorporates the following assumptions. Consistent with the recent developments discussed earlier, the growth of household credit gradually moderates over the simulation horizon (**Table 3**), but remains higher than income growth. This differential between the growth rates of debt and income implies that the aggregate debt-to-income ratio for Canadian households continues to rise over the simulation period, reaching 155 per cent by the fourth quarter of 2013. The interest rate profile is based on market expectations as of 29 November.[10] The assumptions for credit growth and interest rates are lower than in the exercise reported in the June FSR. The labour market shock entails a 3-percentage-point rise in the unemployment rate and a six-week increase in the average duration of unemployment from

Table 3: Assumptions for simulation of debt-service ratio

Period	Market expectations of 1-week rate (%)	Effective household borrowing rate (%)	Annualized growth rate of household income (%)	Year-over-year growth rate of household credit (%)
2011Q3	1.0	5.0	2.7	5.9
2011Q4	1.0	4.8	3.5	6.0
2012Q1	0.9	4.6		5.5
2012Q2	0.8	4.5		
2012Q3	0.8	4.5		
2012Q4	0.8	4.5		
2013Q1	0.8	4.4		5.0
2013Q2	0.8	4.4		
2013Q3	0.9	4.4		
2013Q4	0.9	4.4		

Note: The effective household borrowing rate is a weighted average of interest rates on various mortgage and consumer loans.

8 The simulation was conducted with microdata from Ipsos Reid's Canadian Financial Monitor. The methodology is outlined in "The Bank of Canada's Analytic Framework for Assessing the Vulnerability of the Household Sector" on page 57 of the June 2010 FSR.

9 A loan is assumed to be in arrears when the sum of a household's income from employment insurance (where applicable) and the value of its holdings of liquid assets are not sufficient to make loan payments for a period of at least three months. In this exercise, liquid assets are defined as chequing and savings accounts, term deposits, guaranteed investment certificates and a proportion of mutual fund holdings.

10 The risk premium (i.e., the difference between mortgage rates and the respective yield on Government of Canada bonds) is assumed to remain at its current level over the simulation horizon.

current levels. The shocks to the unemployment rate and to the duration of unemployment are calibrated to broadly replicate those experienced in Canada during the recession of the early 1990s.

When subjected to the unemployment shock in the fourth quarter of 2013, the proportion of loans in arrears at domestic financial institutions is projected to rise to 1.3 per cent, compared with 0.6 per cent in the second quarter of 2011 (**Table 4**).[11] Qualitatively, these results are in line with those from the exercise reported in the June 2011 FSR, suggesting that the risk from household finances is broadly unchanged.[12]

Table 4: Results for simulation of debt-service ratio

	Proportion of debt owed by households with a DSR ≥ 40% (%)	Proportion of debt owed by households with a DSR ≥ 35% (%)	Proportion of household loans in arrears three months or more (%)
2011 (last observation)	11.5	16.9	0.6
2013Q4	10.0	17.0	1.3[a]

a. Loans in arrears after a hypothetical 3-percentage-point increase in the unemployment rate
Source: Bank of Canada simulations

Since a number of simplifying assumptions were necessary to conduct the simulation, the results are purely illustrative. This partial simulation exercise does not attempt to capture any of the additional repercussions of an economic downturn severe enough to provoke such a labour market shock. Other features of the model may cause the results to overstate the rise in the arrears rate.[13] Nevertheless, the results continue to underscore the need for banks to carefully consider the aggregate risk of their household exposures and for households to assess their ability to service their debt over the entire maturity of their loans.

The elevated debt loads of the household sector require continued vigilance

The Government of Canada has taken important measures in recent years to strengthen underwriting practices for government-backed insured mortgages. The most recent set of measures was implemented in March and April 2011, when the maximum amortization period was reduced from 35 to 30 years, the maximum loan-to-value ratio when refinancing a mortgage was lowered from 90 per cent to 85 per cent, and government-backed insurance on lines of credit secured by houses was withdrawn. These measures represented the continuation of a series of actions taken by the Government of Canada since 2008 to foster stability in the domestic mortgage market,[14] and should help to moderate the future growth in household debt.

11 The level of the projected arrears rate at the end of the simulation is lower than in June by 0.2 percentage points for two reasons. First, the revised assumptions for credit growth and interest rates contribute to lower vulnerabilities (i.e., fewer households with an elevated DSR) than in the stress test in the June FSR. Second, the starting point for the simulation is more favourable, since the microdata for the first half of 2011 suggest that the current level of vulnerabilities is lower than what was expected in the June simulation.

12 Although the share of debt owed by households with a DSR greater than 40 per cent decreases over the simulation horizon, there is an increase of similar magnitude in the proportion of debt owed by households with a DSR between 35 per cent and 40 per cent. Thus, the total share of households with an elevated DSR is stable throughout the simulation (Table 4).

13 The model does not account for the possibility that households may use pre-approved limits on personal lines of credit and credit cards to meet their financial needs during a period of unemployment. While accumulating more debt would increase the vulnerability of these households to future shocks, it may nonetheless prevent them from becoming insolvent in the near term. In addition, the model does not allow households to avoid insolvency by selling less-liquid assets.

14 Box 2 on page 21 of the June 2011 FSR outlines the government's actions to support the long-term stability of the housing market.

Nonetheless, continued vigilance is warranted, since adverse debt dynamics remain in place. The Bank is co-operating closely with other federal authorities to continuously assess the risks arising from the financial situation of the household sector.

Given the robust pace of mortgage credit growth in recent years, the Office of the Superintendent of Financial Institutions has conducted focused research on retail lending products over the past 18 months. An advisory was recently released noting that additional analysis is planned in the coming months.[15] Where appropriate, this analysis will build on international mortgage underwriting principles being developed by the Financial Stability Board.[16] OSFI has reiterated that mortgage lenders are expected to have an established policy for mortgage underwriting that is supported through appropriate risk-management practices and internal controls.

Safeguarding Financial Stability

The Governing Council judges that even though the domestic financial sector is currently on a solid footing, the overall level of risk to the stability of the Canadian financial system is high and has increased since June. Concerns arise from the combination of acute fiscal strains in Europe, the weaker global economic outlook, large global imbalances, low interest rates in the major advanced economies and the vulnerability of Canadian households to adverse shocks.

A number of policy priorities that are essential for safeguarding financial stability have been outlined in this issue of the FSR. They include the need for a comprehensive action plan to reduce sovereign risk in advanced economies by stabilizing, and ultimately reducing, public debt ratios on a timeline consistent with achieving healthy economic growth. It is also crucial that banks in the euro area become better capitalized and that the European Financial Stability Facility has sufficient capacity to provide an effective backstop for vulnerable sovereigns.

To safeguard financial stability over the medium term, the regulatory reform agenda established by G-20 leaders must be implemented in a timely manner. The Basel III agreements to strengthen international capital requirements and to introduce new global standards for bank liquidity are a significant development in this regard. Reports exploring global initiatives to develop liquidity standards and to strengthen the capitalization of assets held for trading purposes are included in this issue of the FSR on pages 35 and 43, respectively.

Reducing the likelihood and consequences of future periods of turmoil also requires that global financial markets operate on a more solid foundation. Establishing stronger infrastructure that would be resilient in times of stress is an important priority in this regard. In Canada, central counterparty services for repos are currently being developed. The Bank is also working with other policy-makers and the financial industry to implement the G-20 commitments to reform over-the-counter derivatives markets. **Box 2** outlines recent developments related to these efforts.

Firm implementation of the G-20 commitments to promote an orderly, timely and sustained resolution of global imbalances that is supported by greater flexibility in exchange rates is also essential. Market-oriented exchange

15 The OSFI advisory is available at <http://www.osfi-bsif.gc.ca/app/DocRepository/1/eng/notices/osfi/mtguwr_e.pdf>.

16 The FSB has undertaken a public consultation on mortgage underwriting practices. A proposed set of principles is available at <http://www.financialstabilityboard.org/publications/r_111026b.pdf>.

rates that reflect underlying economic fundamentals are needed to facilitate this adjustment and strengthen the resilience of economies to shocks. Surplus economies also need to undertake reforms to bolster self-sustaining domestic sources of growth—thereby reducing their reliance on external demand—while deficit countries need to boost national savings.

In Canada, the financial position of the household sector requires continued vigilance. When taking on debt, households need to ensure that they will be able to service that debt over the duration of the loan. It is also essential that financial institutions have high standards for evaluating the ability of borrowers to service their loans. Banks need to actively monitor the risks in their household loan portfolios, taking into account the macroeconomic outlook. Authorities in Canada will continue to closely monitor the financial situation of the household sector.

Box 2

Strengthening Canada's Financial Market Infrastructure

Canada's financial market infrastructure is being strengthened in a number of areas. First, the Canadian Derivatives Clearing Corporation (CDCC) is developing central counterparty (CCP) services for the Canadian repo market. A well-designed CCP with appropriate risk safeguards supports the continued operation of markets, even in times of stress, by mitigating concerns over counterparty risk, primarily through novation.[1] Second, Canadian authorities and market participants are working to implement the G-20 commitments to reform over-the-counter (OTC) derivatives markets.

In co-operation with the Investment Industry Association of Canada, the CDCC has been working with stakeholders on the design, development and implementation of a new CCP service for repos. The repo market is a core funding market for financial institutions, which, at the height of the crisis in September–October 2008, experienced periods of illiquidity.[2] Implementation of the new service is planned to be carried out in three stages. Clearing of conventional fixed-income repos is presently scheduled to be phased in beginning in February 2012. The clearing of cash trades (i.e., the outright purchase and sale of securities) and repos where the identity of the original parties is not disclosed ("blind repos") is currently planned for implementation in early 2013. Work also continues on defining the high-level business requirements for a third phase that will include a service for repos where collateral is assigned from a basket of multiple securities ("general collateral").

Given the important role that the CDCC's new services will play in supporting the repo market, and providing that the Minister of Finance is of the opinion that designation will be in the public interest, the Bank plans to designate the CDCC's system upon the new service commencing operations.[3] To this end, the Bank has been assessing the new service to ensure that it will meet applicable international standards when it is designated for oversight.

Reform of the OTC derivatives market is also currently under way in Canada and other G-20 jurisdictions. This includes promoting central clearing of standardized OTC derivatives contracts, reporting all trades to trade repositories, and imposing higher capital requirements for non-centrally-cleared contracts.[4] Since its last progress report in December 2010, Canada's inter-agency OTC derivatives working group has continued working with the industry and the official sector, both domestically and internationally, to push these reforms forward. While considerable progress has been made, many countries, including Canada, are still working to put in place the legislative and regulatory frameworks required to meet the G-20 commitment by the end of 2012.[5] Given the global and interconnected nature of these markets, it is essential that these frameworks be harmonized across jurisdictions.

With respect to the commitment to increase the use of CCPs for OTC derivatives, Canada is considering two options. Canadian market participants could clear certain

(continued)

1 Novation involves the replacement of transactions between two market participants with two equivalent transactions: one between the seller and the CCP, and another between the buyer and the CCP. For more information on central counterparties, see "Central Counterparties and Systemic Risk" on page 43 of the December 2010 FSR.

2 For a more detailed discussion of core funding markets in Canada, see "Improving the Resilience of Core Funding Markets" on page 41 of the December 2009 FSR.

3 To oversee a clearing and settlement system, the Governor of the Bank of Canada must designate it under the Payment Clearing and Settlement Act, and the Minister of Finance must be of the opinion that the designation is in the public interest.

4 An overview of these reforms is provided in "Strengthening the Infrastructure of Over-the-Counter Derivatives Markets" on page 35 of the December 2010 FSR.

5 See "Progress of Financial Regulatory Reforms," a 31 October 2011 letter from the FSB to the G-20. Available at <http://www.financialstabilityboard.org/publications/r_111104ff.pdf>. Further details on the progress in implementing the reforms can be found in Financial Stability Board, "OTC Derivatives Market Reforms: Progress Report on Implementation," 11 October 2011.

Box 2 *(continued)*

systemically important products through a CCP located in Canada, with other products cleared offshore. While this option could allow for easier domestic oversight, it may fragment markets and raise costs. Alternatively, all products could be cleared at existing and planned global CCPs, which for the moment are located in the United States and Europe. If systemically important Canadian markets are cleared through global CCPs, four safeguards will be necessary to protect the safety and robustness of the Canadian market: (i) acceptable multilateral co-operative oversight arrangements; (ii) satisfactory multi-currency emergency liquidity arrangements; (iii) a robust recovery and resolution regime for CCPs; and (iv) fair and open access to CCPs.[6]

Beyond central clearing, considerable progress is being made toward the development and use of trade repositories. Internationally, work to develop common data-reporting and aggregation standards, including legal-entity identifiers, will make trade-repository data useful for increasing market transparency, monitoring systemic risk and conducting market surveillance. Capital rules for derivatives trades and margin requirements for bilaterally cleared derivatives are also being coordinated at the international level. While the move to organized trading venues will likely be one of the last components of the reforms to be implemented, it remains an important initiative to enhance transparency and protect against market abuse.

In recognition of ongoing challenges and to promote solutions that focus on the fundamental objectives of the G-20 commitment, the G-20 leaders recently endorsed the actions of the Financial Stability Board in forming a senior-level coordination group to set priorities, address sequencing and provide a road map for completing the OTC derivatives reforms.[7] Canada will actively participate in this process. The Canadian Securities Administrators (CSA) are also consulting with market participants on specific aspects of OTC derivatives reform. The comments received by the CSA will help to guide the development of new regulations to support the implementation of the G-20 reforms in Canada.

6 In its letter to the G-20, the FSB has highlighted the importance of these safeguards as part of a robust global policy framework. For more on access issues, see "Access to Central Clearing Services for Over-the-Counter Derivatives," on page 39 of the June 2011 FSR.

7 See the G-20's "Cannes Summit Final Declaration," 4 November 2011. Available at <http://www.g20.org/pub_communiques.aspx>.

Reports

Reports examine selected issues of relevance to the financial system.

Introduction

This section of the *Financial System Review* includes two reports exploring issues on which work is under way internationally to strengthen the resilience of the global financial system: liquidity standards for banks and capital charges associated with trading activities.

In **Strengthening Bank Management of Liquidity Risk: The Basel III Liquidity Standards**, Tamara Gomes and Natasha Khan explain the new global prudential standards for liquidity that will be implemented starting in 2015, highlighting their prospective benefits. They also examine some aspects that merit further consideration before the standards are finalized: the use of the pool of liquid assets during a period of stress, the definition of high-quality liquid assets and the implications of the standards for the provision of committed liquidity lines.

In **A Fundamental Review of Capital Charges Associated with Trading Activities**, Grahame Johnson discusses weaknesses in the current Basel II global framework for calculating capital charges for bank trading activities and outlines improvements to the market-risk framework coming into effect at the end of 2011. He also explores outstanding issues yet to be addressed, including the definition of the boundary between the banking and the trading books and gaps of both a theoretical and practical nature in the standardized and internal-models-based frameworks.

Strengthening Bank Management of Liquidity Risk: The Basel III Liquidity Standards

Tamara Gomes and Natasha Khan

Introduction

The global financial crisis highlighted the importance of ensuring that the financial system has adequate liquidity to withstand adverse circumstances. The funding pressures that began in 2007 underlined the acute deficiencies in the liquidity-risk-management practices of some banks, and the severity of the ensuing crisis required massive public sector support to stem the liquidity spiral and mitigate its detrimental effect on the real economy. Managing funding liquidity risk and market liquidity risk is integral to the role that banks play in maturity transformation, which is, in turn, a fundamental aspect of intermediation between savers and borrowers that contributes to the efficient allocation of resources in the economy. If funding liquidity risk and market liquidity risk are not adequately managed, they can lead to severe liquidity spirals.

The financial crisis prompted the Basel Committee on Banking Supervision (BCBS) to intensify its efforts to strengthen the principles and standards for capital, as well as for the measurement and management of liquidity risk.[1] "Basel III: International Framework for Liquidity Risk Measurement, Standards and Monitoring," published in December 2010 (BCBS 2010), represents a fundamental review of the risk-management practices of banks related to funding and liquidity to address the shortcomings revealed by the recent crisis. The liquidity framework is part of a comprehensive set of complementary and mutually reinforcing measures for regulatory reform that have been introduced to strengthen the risk management and supervision of banking systems.

These new global standards encourage banks to manage their liquidity positions more prudently, giving market participants greater confidence in the ability of the banking sector to withstand periods of stress, and, hence, lowering the probability of acute shortfalls in liquidity. The standards include two quantitative metrics: the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR), which were developed to meet two separate, but complementary, objectives (**Box 1**). The objective of the LCR is to promote short-term resilience by ensuring that a bank has enough high-quality liquid assets to survive an acute stress scenario that lasts for one month. The NSFR was developed to achieve the second objective of the Basel III liquidity standards: promoting longer-term resilience by encouraging banks to fund their activities with more stable sources of funding.[2] Thus, even in the face of financial stress, an accumulated stock of high-quality liquid assets will help banks to absorb liquidity shocks, enabling them to continue to meet their obligations and perform their intermediation role. This will help to reduce the impact of any liquidity shocks on the broader financial system and the real economy. Given the interlinkages between banks and markets, the new standards will also dovetail with initiatives to boost the resilience of the financial market infrastructure and support the continuous operation of core funding markets.[3]

The Basel III liquidity framework breaks new ground. While several countries have previously established regulatory frameworks for the management and supervision of liquidity risk by banks, the Basel III standards seek, for the first time, to establish a *globally harmonized* regulatory framework. By outlining minimum requirements for all global banks, the framework encourages international consistency and cross-border

1 The BCBS has long discussed the merits and challenges associated with the management of liquidity risk by banks. For example, it first published a framework for managing and measuring liquidity risk in 1992 and, more recently, in 2008, released a review of the principles for managing liquidity risk. The Working Group on Liquidity, a BCBS subgroup established in 2006, has issued reports that update and strengthen these documents (BCBS 2000, 2008).

2 Trevisan (2011) also provides a detailed overview of the quantitative standards.

3 See, for example, Carney (2008a,b) and Fontaine, Selody and Wilkins (2009).

Box 1

The Liquidity Coverage Ratio

The Liquidity Coverage Ratio (LCR) aims to increase banks' resilience to an acute 30-day stress scenario. The LCR is calculated as the

> **stock of high-quality liquid assets/total net cash outflows over the next 30 calendar days ≥ 100 per cent.**

In other words, to meet funding obligations and draws on contingent liabilities over the next 30 days, the LCR requires banks to hold a stock of unencumbered high-quality liquid assets equal to or greater than stressed net cash outflows. The requirement must be met continuously and reported to supervisors on at least a monthly basis, with an ideal time lag of no more than two weeks.

There are two broad groups of high-quality liquid assets. The first group includes cash, central bank reserves and cash substitutes such as top-rated sovereign debt ("Level 1" assets). These assets can make up an unlimited amount of total liquid assets and are measured at full value (i.e., no haircuts). "Level 2" assets include lower-rated public debt and higher-rated covered bonds and non-financial corporate bonds. These assets are restricted to 40 per cent of the total pool of liquid assets and are given a minimum haircut of 15 per cent.

The denominator of the LCR is net cash outflows during a 30-day period. The size of the net outflows is based on withdrawal rates on retail and wholesale funding obligations and drawdown rates on contingent liabilities that reflect the amount of liabilities that are likely to mature or be called within 30 days under a scenario that combines an idiosyncratic and systemic liquidity shock, similar to shocks observed during the 2007–08 financial crisis. The calibration assumes that runoff rates are higher for liabilities that have been shown to be less stable. For example, retail deposits are assigned much lower runoff rates than the drawdown rates for the undrawn portion of liquidity lines to non-financial corporate firms.

The Net Stable Funding Ratio

The LCR is complemented by a structural funding ratio, the Net Stable Funding Ratio (NSFR), which is structured to ensure that long-term assets are funded with a minimum amount of stable long-term funding. The NSFR is calculated as the

> **available amount of stable funding/required amount of stable funding > 100 per cent.**

"Available stable funding" includes capital, preferred stock and liabilities with remaining maturities equal to one year or more, and the portion of deposits and wholesale funding "with maturities of less than one year that would be expected to stay with the institution for an extended period in an idiosyncratic stress event." Similar to the LCR, these categories are assigned factors that are related to their perceived stability. "Required stable funding" is calculated as the sum of unencumbered assets, as well as off-balance-sheet exposures and other activities. These assets are assigned a factor that is inversely related to their perceived liquidity; in other words, the more liquid the asset is deemed to be, the less required stable funding is needed. For example, immediately available cash is assigned a 0 per cent factor, since it is assumed to be directly on hand, whereas retail loans with a remaining maturity of less than one year are assigned a factor of 85 per cent, since they will not be fully repaid until a later date. The NSFR must be met continuously and reported to supervisors at least quarterly.

co-operation. Furthermore, by outlining additional monitoring metrics, the framework enhances regulators' toolkits and encourages greater transparency and dialogue between banks and regulatory authorities.

Designing an internationally consistent set of quantitative liquidity standards is a challenging task. The effects on banks' operations could introduce significant changes to the broader financial system, as well as having unintended consequences. Given the size and breadth of the potential effects, policy-makers have instituted an observation period to undertake further analysis of certain aspects of the current calibration—and their implications—before the standards are finalized and implemented (in 2015 for the LCR and 2018 for the NSFR). Since the LCR is the more developed and better known of the two liquidity metrics and has garnered greater attention, the BCBS committed in 2010 to finalizing a few outstanding aspects of the LCR by mid-2013; the Committee has since agreed to accelerate its review and to introduce any adjustments to key areas

well ahead of the mid-2013 deadline. This will reduce some of the uncertainty about the final design of the LCR and will facilitate its smooth implementation (see BCBS 2011).

This report examines two types of liquidity—funding liquidity and market liquidity—and highlights how the interaction between the two led to destructive liquidity spirals during the financial crisis. As well, it underscores the importance of strong liquidity-risk management by banks in reducing the likelihood and severity of future financial crises, and outlines the benefits of the Basel III liquidity standards. Finally, it discusses some aspects of the LCR that merit further consideration.

Interactions Between Funding Liquidity and Market Liquidity During the Financial Crisis

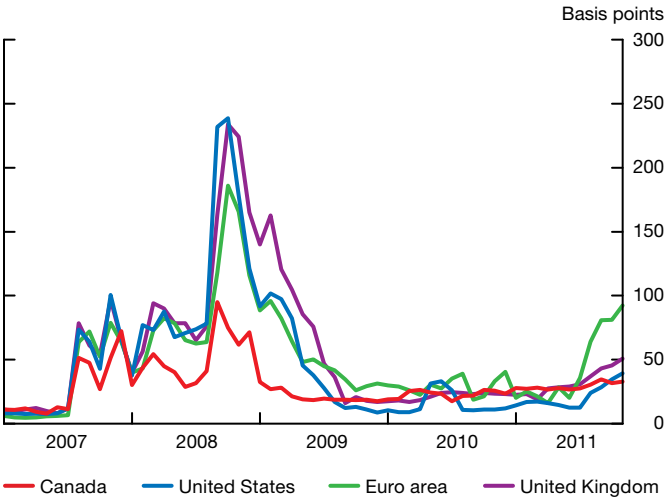
The events of 2007–08 highlighted the importance of liquidity management for the proper functioning of the banking sector and financial markets. Despite having relatively high capital levels, many banks experienced difficulties because they had not managed their liquidity properly. However, as noted in Crockett (2008), liquidity is "easier to recognize than define." Broadly speaking, there are two different, mutually reinforcing types of liquidity: funding liquidity and market liquidity.[4]

- *Funding liquidity* is the ability of a firm to generate funds by deploying assets held on its balance sheet to meet financial obligations on short notice. The liquidity position of a given bank is determined primarily by its holdings of cash and other readily available marketable assets, as well as by its funding structure and the amount and type of contingent liabilities that may come due over a specified horizon.
- *Market liquidity* is the ability of an agent to execute transactions in financial markets without causing a significant movement in prices. Market liquidity can be considered along several different dimensions: immediacy, breadth, depth and resilience (BIS 1999).[5] Gauthier and Tomura (2011) note that the market liquidity risk arising from endogenous fire sales of assets is an important channel of contagion that exacerbates system-wide instability.

Market and funding liquidity tend to be highly pro-cyclical—abundant in benign periods but scarce during stressful times (Financial Stability Forum 2009). As demonstrated during the 2007–08 liquidity crisis, interactions between these two types of liquidity can lead to debilitating liquidity spirals whereby poor conditions for funding liquidity lead to a decrease in market liquidity that, in turn, contributes to a further deterioration in funding liquidity.[6] In the absence of adequate liquidity-risk management, banks that face a liquidity shock often engage in fire sales, hoard liquidity and reduce lending to the real economy (Brunnermeier 2009). These actions in turn increase the likelihood of market disruptions and liquidity shocks faced by other institutions, resulting in a prolonged deterioration in market liquidity that has a severe impact on real economic growth. In particular, the financial crisis demonstrated the high degree of reliance that banks have on short-term wholesale funding markets, which essentially ceased to exist at maturities longer than overnight. Widening interbank funding spreads (**Chart 1**) and sharply lower trading activity put strong funding pressures on banks that had to find alternative financing quickly in order to replace lost sources of funding. The asset-backed commercial paper (ABCP) market in the United States and Canada came under particular stress as widespread concerns about the valuation of structured products and a lack of confidence in the reliability of credit ratings severely impaired market functioning, resulting in a dramatic decline in the stock of these securities (**Chart 2** and **Chart 3**) and

Chart 1: Interbank funding spreads widened sharply during the crisis, forcing banks to seek alternative sources of financing

Difference between 3-month interbank offered rates and their respective overnight index swaps[a]



a. For the United States and the United Kingdom, LIBOR; for the euro area, EURIBOR; and for Canada, CDOR

Source: Bloomberg Last observation: November 2011

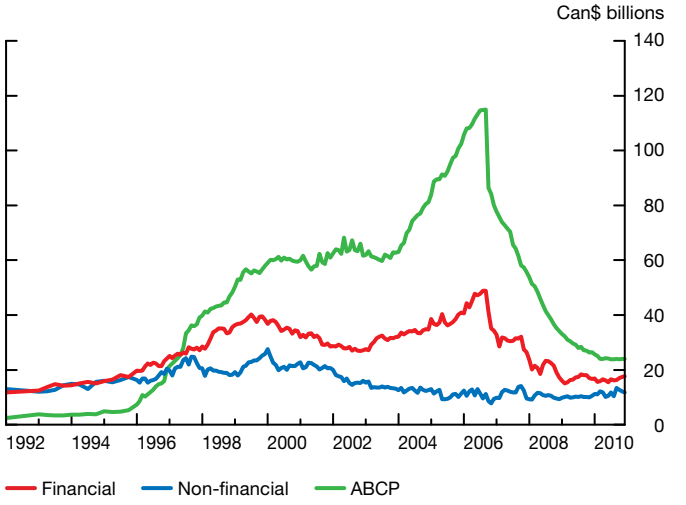
4 A third type of liquidity, monetary liquidity, refers to credit conditions and the fluctuations of monetary aggregates (Longworth 2007). This article, however, focuses only on funding and market liquidity.

5 Immediacy refers to the speed with which trades of a certain size can be executed. Breadth is the divergence in the price of an asset from mid-market prices and is generally measured by the bid-offer spread. Depth refers to either the volume of trades that can be executed without affecting current market prices or the amount of orders on the order books of market-makers. Resilience is the speed with which price fluctuations that occur during the execution of a trade return to former levels.

6 See, among others, Allen, Babus and Carletti (2010); Brunnermeier and Pedersen (2009); and Fontaine and Garcia (2009).

Chart 2: The asset-backed commercial paper market experienced the sharpest contraction, both in Canada . . .

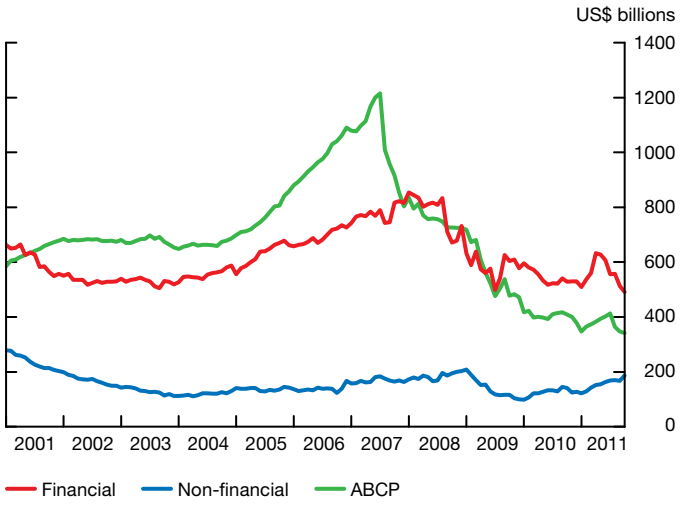
Canadian commercial paper outstanding, by type



Sources: Bank of Canada and DBRS Last observation: October 2011

Chart 3: . . . and in the United States

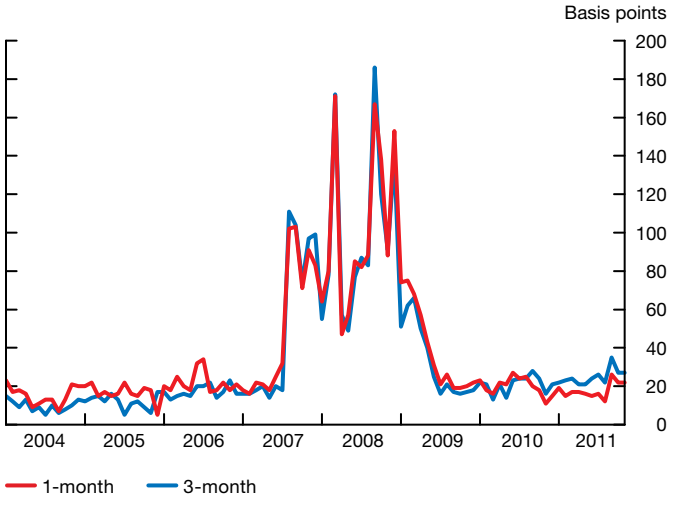
U.S. commercial paper outstanding, by type



Source: U.S. Federal Reserve Last observation: October 2011

Chart 4: Yield spreads on Canadian commercial paper widened considerably over the course of the crisis

Yield spreads between R-1 mid-rated commercial paper and treasury bills



Sources: Bank of Canada and Bloomberg Last observation: November 2011

a sharp widening in spreads (**Chart 4**). The disruption in bank-sponsored ABCP markets also highlighted the need to better manage the liquidity risk associated with contingent liabilities, which require the sponsoring bank to provide liquidity under backstop arrangements at a time when the bank itself is already under stress.[7] The crisis also made it clear that many global banks were not holding sufficient liquid assets to meet upcoming obligations and were thus forced to sell less-liquid assets precisely when market prices were low, which depressed prices further and induced more selling, resulting in a vicious loss spiral.

In response, governments and central banks around the world undertook a number of extraordinary measures to inject liquidity into the financial system, in order to support banks and markets and to mitigate the impact of the crisis on the global economy. In Canada, the maximum liquidity support provided through the various Bank of Canada liquidity facilities and the government's Insured Mortgage Purchase Program reached Can$88 billion, or 5.9 per cent of GDP, in March 2009. This was far less than the public sector liquidity support provided in other major jurisdictions. For instance, in the United States, support provided through numerous liquidity facilities peaked at US$1,788 billion, or 12.7 per cent of GDP, in December 2008.[8]

It is essential to strengthen the management of liquidity risk in order to make the banking sector more resilient to liquidity shocks and thus reduce the probability and severity of future financial crises. To accomplish this, several interrelated weaknesses need to be addressed. First, banks were overly reliant on short-term wholesale funding markets, which can be costly and difficult to access in times of stress. Indeed, in the extreme, these markets may freeze up completely, with little or no lending occurring, and can remain frozen for extended periods of time. Second, banks underestimated both the amount of contingent liabilities they would need to

7 In Canada, the inability of non-bank-sponsored conduits to draw on backup bank liquidity lines prompted the Montréal Accord, through which $32 billion of these securities were restructured as longer-term notes.

8 This includes support provided through the following entities: Term Auction Facility, Primary Dealer Credit Facility, Term Asset-Backed Securities Loan Facility, Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility, Commercial Paper Funding Facility, Term Securities Lending Facility, central bank liquidity swaps and discount window credit.

honour and the speed at which clients could draw on those facilities during a financial crisis. Most importantly, banks had too few high-quality liquid assets set aside to meet these obligations in the event of an acute and prolonged liquidity shock. The LCR and the NSFR are designed to address these shortcomings by creating incentives for banks to adopt more stable practices for the management of funding liquidity risk and market liquidity risk through reducing maturity mismatches, pricing liquidity risk appropriately and increasing liquidity buffers.

The Process and Challenges of Creating Global Liquidity Standards

Establishing a globally harmonized framework for managing liquidity risk, especially the calibration of quantitative metrics, is challenging, given the differences in bank funding models and market structures across various jurisdictions. As banks adopt the new standards, they may change their role as providers of credit and liquidity in ways that could have far-reaching consequences for the functioning of the financial system and the real economy. Thus, while the broad design of the new liquidity standards will achieve the objectives intended by policy-makers, there is a possibility that they may have some undesirable consequences. As a result, some aspects of the current calibration may warrant further consideration to minimize any potential adverse effects.

The observation period established by the BCBS (see page 36) provides the opportunity to address these issues. Several aspects of the design of the LCR are under consideration; three areas that are most important from a system-wide perspective, and the challenges associated with them, are discussed below.[9]

Using the pool of liquid assets during a period of stress

As noted in **Box 1**, the LCR requires banks to accumulate a pool of liquid assets so that they can meet potential short-term obligations during periods of stress. One of the main challenges for authorities is to outline under what circumstances and to what extent banks can use this pool of assets for this purpose.

It is generally agreed that banks should be required to meet the standard for the LCR in normal periods, but should be allowed to use the pool in times of stress. During periods of systemic stress, in particular, the inability to use liquid assets could cause a vicious liquidity spiral, with knock-on effects on other parts of the financial system and the real economy. It could also result in earlier or more extensive reliance on central bank funding. While central banks will continue to fulfill their role as lender of last resort, banks should still be able to deploy the pool of liquid assets, as is the intent of the standards (Northcott and Zelmer 2009).

It is difficult, however, to determine ex ante what constitutes a period of stress and, therefore, when the pool of liquid assets can be used. The source of liquidity shocks has differed significantly across various stress periods and will clearly differ in future crises as well. Moreover, even if stress can be defined, there are inevitable identification lags.

Finally, there is the question of the extent to which banks can draw down the accumulated stock of liquid assets during a period of stress. While there may be value in establishing a minimum floor in normal times, any a priori restrictions on the amount of liquid assets that can be used could simply result in a new, lower, binding minimum that constrains banks in times of stress.

Given the potential for severe negative consequences to the financial system and overreliance on central bank liquidity, further guidance on the conditions under which the pool of liquid assets can be drawn down in times of stress is important. While providing such guidance is a challenging task, it will reduce uncertainty and mitigate potential negative consequences. Most importantly, it will ensure that banks are able to use the accumulated liquid assets so that "available liquidity" is indeed "usable liquidity."[10]

Defining high-quality liquid assets

Defining what constitutes high-quality liquid assets is another important aspect of the liquidity regulation. To meet the objectives of the LCR, the quality of these assets should be apparent and the assets should be easily sold in the event of a liquidity shock. As noted in **Box 1**, the current BCBS framework classifies liquid assets into two distinct categories. While the framework identifies a number of fundamental and market-related characteristics that can be used to distinguish high-quality assets that are likely to retain their liquidity in times of severe market stress, the resulting classification of assets within the two categories raises some concerns. In particular, the escalating sovereign debt crisis raises questions about the treatment of certain sovereign debt, specifically, debt consisting of "Level 1" liquid assets that require no haircuts or concentration limits, regardless of credit quality and liquidity characteristics, if held by banks in the country where the liquidity risk is being taken.

The sovereign debt crisis highlights the risk of concentrating the exposure of the banking sector within a particular asset class, including assets traditionally

9 Work on the NSFR will also continue during the observation period.

10 Goodhart (2008) uses the following analogy: "…the weary traveller who arrives at the railway station late at night, and, to his delight, sees a taxi there who could take him to his distant destination. He hails the taxi, but the taxi driver replies that he cannot take him, since local bylaws require that there must always be one taxi standing ready at the station."

considered to be risk-free. In crisis situations, any asset class can prove to be less liquid than expected, depending on the source of the turbulence. Hence, it is important that banks hold a well-diversified portfolio of high-quality liquid assets to guard against unexpected liquidity demands. Furthermore, a higher structural demand for sovereign debt that stems from the liquidity framework may undermine fiscal discipline. In some jurisdictions, this may even raise the risk that the new liquidity standards might be used to force the domestic banking sector to buy sovereign debt, thereby subsidizing governments.

A narrow and discrete definition of high-quality liquid assets does not reflect the fact that the liquidity characteristics of assets vary along a continuum and can change over time. Applying too narrow a definition could institutionalize market segmentation and result in market price distortions, reduced market liquidity, increased concentration on banks' balance sheets and lower incentives for positive market development. For example, the degree of liquidity of assets that have been classified as liquid (such as government bonds) could decrease if banks hold such assets for purposes of meeting the LCR rather than actively trading them. Market-making activities for assets that are not considered eligible liquid assets under the standards could decline, negatively affecting market functioning in these asset classes.

Given these considerations, additional quantitative criteria—predominantly based on market indicators such as the bid-ask spread, average issue size, turnover and price volatility—to help identify high-quality liquid assets could be considered further. Clearly, it is difficult to determine ex ante the liquidity characteristics of particular assets during periods of stress, since those characteristics will depend on the nature of the crisis. Nonetheless, liquidity characteristics observed over a sufficiently long time horizon, including past stress periods, may provide some insight into how the assets should be ranked in terms of expected liquidity during a crisis. Policy-makers will need to take into account the trade-off between the potential for a reduction in market segmentation based on moving to a broader definition and the data and operational difficulties associated with a broad definition, which may include assets that turn out to be less liquid under stressful conditions.

In addition to the quality and liquidity characteristics of assets, further policy objectives of the global regulatory framework should be taken into account. In particular, the objective of reducing channels of contagion within the banking sector argues for the exclusion of unsecured bank debt from the definition of high-quality liquid assets.

Committed liquidity lines

Another issue to consider is the potential impact of the assumed drawdown rates for backup liquidity lines to non-financial corporations. In the stress scenario envisioned in the LCR under the current framework, the undrawn portion of these backstops is assumed to be drawn down completely for all lines. There are concerns that this assumption may significantly reduce incentives for banks to provide these committed lines, which could have important adverse implications for economic activity and the ability of authorities to address systemic shocks that originate in the non-financial corporate sector.

Backup liquidity facilities from banks are critical components of liquidity management for non-financial firms, providing an important source of liquidity insurance against unexpected demands for funds. In the absence of this insurance, firms have to self-finance and self-insure by maintaining large stocks of liquid assets. This could increase the risk of liquidity mismanagement within the corporate sector, and induce firms to pass up valuable investment opportunities when their cash flow is low, ultimately increasing costs to the economy (Fazzari, Hubbard and Petersen 1988). Firms in certain sectors of the economy that experience large seasonal fluctuations in their cash flows may be particularly affected. In addition, bank liquidity lines support the issuance of commercial paper by non-financial corporate firms. Reduced access to this market-based financing may increase the reliance of non-financial corporate firms on bank lending and may concentrate credit intermediation within the banking sector, potentially increasing borrowing costs and amplifying the transmission of negative shocks in the banking system to the overall financial system and the real economy.

Committed lines are almost always provided by banks because they are better able to manage liquidity risk than non-financial corporate firms. In particular, deposit insurance schemes and the fact that banks have direct access to central bank liquidity facilities instill confidence that supports deposit inflows to banks, especially when market liquidity dries up. This offers a natural hedge, giving banks a competitive advantage in providing this source of liquidity insurance to the financial system (Gatev and Strahan 2006). In the absence of bank liquidity lines, central banks will have greater difficulty addressing a liquidity shock in the corporate sector. Since non-financial corporate firms do not have direct access to central bank liquidity, authorities would have to lend to banks and encourage them to lend to corporate firms, which may not happen if banks hoard liquidity at the height of a crisis.[11]

11 The Penn Central crisis in 1970 provides an example in which the Federal Reserve responded by lending aggressively to banks and encouraging them to provide liquidity to their borrowers. However, the difficulty in addressing the liquidity shock, because of the reluctance of banks to extend liquidity to firms in the midst of a crisis, resulted in borrowers purchasing backup committed lines from banks to insure against future funding disruptions.

Conclusion

The recent financial crisis exposed significant failures in the framework that supports banks in the management of liquidity risk. The Basel III liquidity framework incorporates several important measures that will enhance the resilience of banks to short-term liquidity shocks, better align their funding models with their risk preferences and incorporate liquidity risk into product pricing. In response to these standards, banks will be required to improve their practices for liquidity-risk management. Although the new liquidity rules will result in higher costs, they will undoubtedly produce a net benefit to society by reducing the probability and impact of devastating financial crises. Thus, they complement other aspects of the global regulatory reform agenda to make the financial system more resilient.

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A Fundamental Review of Capital Charges Associated with Trading Activities

Grahame Johnson

Introduction

Strengthening the capital that banks are required to hold to absorb losses from their trading and derivatives activities is a key component of the agenda for the reform of the global financial system. The global financial crisis revealed several shortcomings in the existing prudential framework for capitalizing banking activities, which is based on internationally agreed minimum standards (commonly referred to as Basel II) published by the Basel Committee on Banking Supervision (BCBS 2006). In particular, it became clear that many large banks did not hold sufficient capital to absorb the significant trading and credit-related losses they suffered, and many also lacked an adequate liquidity buffer to absorb the risks they faced in wholesale funding markets. To address these shortcomings, the BCBS is implementing a range of reforms (many of which are collectively referred to as Basel III) designed to augment both capital and liquidity.[1] The reforms will significantly increase the level, quality and consistency of capital and improve the degree of risk coverage.

The existing structure of capital requirements distinguishes the framework for trading-book capital, which is designed to capture market risk, from the banking-book framework, which captures credit risk. While both elements are to be strengthened in the wake of the crisis, the framework for trading-book capital involves some complex and distinctive issues that are currently being examined at the international level. An initial step was taken in July 2009 when the BCBS introduced changes to the framework for capitalizing trading activities (often referred to as Basel 2.5). Although these changes increase the amount of capital required, they do not explicitly address a number of other issues in the current framework for market-risk capital. Recognizing this, the BCBS also announced that it would embark on a fundamental review of the risk-based capital framework for trading activities. This review is currently being undertaken by a subcommittee of the BCBS (the Trading Book Group), with Canadian representation from both the Bank of Canada and the Office of the Superintendent of Financial Institutions. The group will work toward delivering a robust framework that provides appropriate capital charges for the full range of risks that financial institutions face in their trading activities.

This report identifies weaknesses within the current risk-based capital framework and the issues that a new capital regime must address to avoid such problems in the future. Given the breadth, complexity and importance of the BCBS review, input from the financial industry will be sought, and the group will release a consultation paper in early 2012.

The Current Prudential Regime for Trading Activities

While the distinction that is drawn between the banking book and the trading book under the current framework could be considered somewhat artificial, there are valid reasons for making it. The traditional banking business of maturity transformation and credit extension (that is, transforming deposits into loans) does not readily lend itself to daily valuation of assets and liabilities. Assets (e.g., mortgages and personal and commercial loans) and liabilities (deposits) are generally held to maturity. Marking these to market would be both highly subjective (prices are not observable, so valuations would be dependent on model outputs) and potentially destabilizing, since transitory valuation gains and losses would not crystallize in practice unless they resulted in a permanent change to the value of the assets and liabilities upon maturity. Recognizing transitory profits and losses on financial assets or liabilities that will ultimately be held to maturity could encourage procyclical behaviour, since risk appetite increases during times of

1 A summary of the Basel III reforms is available at <http://www.bis.org/bcbs/basel3/b3summarytable.pdf>.

rising asset prices and declines when those prices fall. For these assets, it is appropriate to focus on the risk of permanent credit impairment rather than short-term fluctuations in market prices. Capital requirements for banking book positions are therefore based on credit risk. Banks have the choice of using a standardized model based on external ratings or an internal ratings-based approach whereby credit risk is assessed by banks using their own risk models that have been approved for use by their supervisors.[2]

The business of trading, in contrast, involves holding financial assets and liabilities for the purposes of both market-making and profiting from fluctuations in market prices. Given the intent to sell these positions prior to maturity, the institution is exposed to the risk of short-term changes in market prices. The different nature of these two underlying business models can justify the existence of distinct capital treatments. The concept of the trading book (and the associated capital regime) was introduced in the 1996 Basel Committee market-risk amendment (BCBS 2005). The following criteria must be met for a position to be eligible for trading-book treatment:

> A trading book consists of positions in financial instruments and commodities held either with trading intent or in order to hedge other elements of the trading book. To be eligible for trading book capital treatment, financial instruments must either be free of any restrictive covenants on their tradability or able to be hedged completely. In addition, positions should be frequently and accurately valued, and the portfolio should be actively managed. (BCBS 2006)

The boundary between the trading book and the banking book, therefore, is primarily based on intent. The same product can be held in either book, depending on management's intention to hold the asset to maturity (banking book) or to actively trade it (trading book).

Banks have two options for determining capital charges for trading-book positions. The first is the standardized-measurement method (SMM). Under this relatively simple framework, positions are aggregated into various supervisory-specified categories (or buckets), against which predefined capital charges are applied. The second option is the internal-models approach (IMA), which is based on value at risk (VaR) models that have been approved by bank supervisors.[3] Banks have some flexibility in the precise nature of the model, but the minimum standard is a VaR calculated at the 99th-percentile, one-tail confidence interval, over a 10-day holding period. Banks must use a minimum of one year of historical data to estimate the statistical behaviour of the risk factors. A multiplier (with a minimum value of three) is then applied to this value, partly in recognition of the fact that most financial time series have fat tails, with severe negative events occurring more frequently than the statistical models would suggest. The actual capital charge is then calculated as the greater of the previous day's charge and the average of the daily charges over the past 60 days. Under the IMA, the statistical models are further supplemented by stress tests designed to capture the impact of severe events.

What Went Wrong?

This framework made sense for capitalizing trading books in the mid-1990s, when trading book positions were dominated by relatively simple interest rate and foreign exchange products, equities and commodities. The VaR-based models, supplemented by stress tests, captured these risks reasonably well. Indeed, the capital framework faced an early test in the extreme market volatility of 1998 and was generally seen to have provided an adequate capital buffer (BCBS 1999).

Events since 2007 have made it clear, however, that the current framework is insufficient to fully address the range of products and risk factors that now exist in the trading books of large banks. For a number of international institutions, actual losses for a range of positions in the trading book were significantly larger than the capital levels held. Specifically, weaknesses in the current framework were evident in the following areas.

Inability to properly capture credit risks

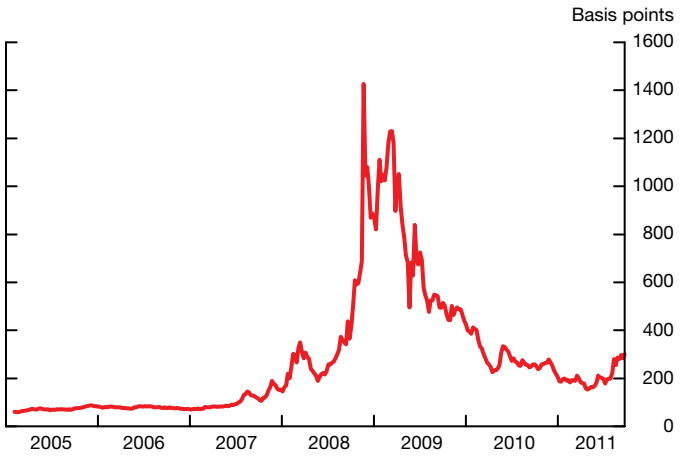
Perhaps the largest flaw revealed by the financial crisis is the inability of the current framework to properly capture credit risk in the trading book. The 1996 framework effectively split risks into two categories for capital purposes: credit risk (capitalized in the banking book) and market risk (capitalized in the trading book). The rapid growth of securitized credit products blurred this distinction, and the existing framework did not have the flexibility to adequately capture this. This weakness became apparent in the nature of the losses suffered by large financial institutions during the crisis. A 2009 study of loss attribution by the U.K. Financial Services Authority (2010) found that, for a sample of 10 large international banks, over 85 per cent of the reported losses in the trading book were associated with credit exposures. The firms essentially assumed that modelling of credit risk could be based on the volatility of indexes measured over a relatively brief historical sample. Not enough attention was paid to the risk of downward migration in credit quality or the risk of default by a specific obligor. Furthermore, the models ignored the fact that, in many cases, the structured nature of the

2 References to capital in this report refer to Pillar One capital under the BCBS framework, which calculates minimum capital requirements based on each bank's risk of economic loss. Pillar Two capital charges, which are based on supervisory judgment, allow for higher levels of capital than the minimum Pillar One standard specifies.

3 Value at risk is a statistical measure of the minimum potential loss in value of a portfolio, given a specific distribution of returns, time horizon and level of statistical confidence.

products increased the risk that prices could be subject to extreme moves, since the embedded credit risks were both larger and more correlated than had been anticipated. **Chart 1** provides an example of these problems, showing the credit spread on an index of AAA-rated super-senior tranches of commercial mortgage-backed securities (CMBS). A VaR model based on the relatively short data period of 2004 to the end of 2007 would have shown almost no risk to the product, with spreads remaining very stable at around 80 basis points. In 2008, however, spreads spiked to over 1,400 basis points.[4]

Chart 1: Spreads between the AAA-rated super-senior tranches of commercial mortgage-backed securities, and U.S. Treasuries



Source: Bloomberg Last observation: 23 September 2011

Issues with the standardized-measurement method

Issues with the current standardized method are generally a result of the SMM's lack of risk sensitivity and its incomplete recognition of the impact of hedges on risk exposure. The lack of risk sensitivity is attributable to the "bucketing" approach taken by the SMM, in which capital charges are often the same across a range of products that share a common risk factor, but have very different risk characteristics.[5] The SMM also provides limited recognition of hedging benefits and, for a number of more complicated products, has such strict definitional requirements that it may in fact discourage hedging (since the offsetting position attracts an additional capital charge).

Issues with the internal-models approach

The financial crisis highlighted a wide range of issues with the current IMA, including its failure to capture extreme events, potential for procyclicality, assumption that trading instruments are always liquid and inability to capture the risks of complex securities. Each of these weaknesses is explained in more detail below.

Arguably the most critical shortcoming of the IMA is the inability of VaR models to capture extreme tail risks, both in terms of the frequency and the magnitude of the exceptions.[6] This was evidenced by the fact that observed VaR exceptions during the crisis were well in excess of what would be expected under the model assumptions.[7] This weakness was likely due to three factors. First, the VaR models may have been miscalibrated because they were based on a historical period that did not include sufficiently stressful events, particularly those related to extreme periods of market illiquidity. Second, the inability to forecast the absolute magnitude of the exceptions is a function of the VaR methodology: it provides for the probability of a loss exceeding a certain threshold, but says nothing about the potential magnitudes of the losses once that threshold has been breached.[8] Third, it is possible that several important risk factors (particularly for structured credit products) were not properly captured in the existing models.

The potential for VaR-based models to encourage procyclical behaviour is well known.[9] During periods of relative stability in markets, VaR-based capital charges tend to decline fairly quickly, encouraging increased risk-taking. The opposite occurs during periods of stress, however, with VaR capital charges increasing rapidly, forcing the unwinding of positions. This dynamic can raise systemic issues. According to the "herding hypothesis" (Persaud 2001), when a large number of firms use VaR to set risk limits, the procyclical properties can generate destabilizing effects in financial markets, exacerbating sharp price movements in both directions and increasing the riskiness of the financial system as a whole.

Under the current IMA, all positions are also assumed to have the same (10-day) capital horizon for modelling

4 From 2004 to the end of 2007, spreads averaged 85 basis points with a standard deviation of 25 basis points. The spike to over 1,400 basis points represented a move of 53 standard deviations, something statistically impossible under almost any model. While this example uses the super-senior tranches of CMBS, the problem exists for other structured products as well. In its 2008 annual report, RBS states that the reported VaR data "excludes [sic] exposures to super-senior tranches of asset backed CDOs, as VaR no longer produces an appropriate measure of risk for these exposures."

5 For example, interest rate products that face prepayment risk (such as mortgage-backed securities) are treated in the same way as those that do not.

6 A VaR exception occurs when the realized loss exceeds the threshold predicted by the VaR model. For a VaR model calibrated to the 99th-percentile confidence level, the actual loss should exceed the VaR threshold only 1 per cent of the time.

7 For example, UBS experienced 25 VaR exceptions in 2008Q4. This is 40 times more than would be expected under the 99 per cent confidence level assumed in the VaR models.

8 VaR makes no assumptions about the shape of the loss distribution beyond the confidence level.

9 For a more detailed discussion of procyclicality and VaR, see Youngman (2009).

purposes.[10] While this may be conservative for many simple, liquid products, it is clearly inappropriate for more complex products, which are not as actively traded and are prone to periods of extreme illiquidity. Beyond questions of the capital horizon, the current VaR-based IMA faces broader challenges in capturing the risks of complex products, particularly those with non-linear payoffs or with low-probability but high-cost tail risks, and newer products that lack a sufficient amount of historical price data to assess risks properly.

Significant differences between the SMM and the IMA

There are significant differences between the capital requirements derived from the SMM and the IMA. Generally, it is expected that the IMA will result in lower capital charges, given that it more fully incorporates the impact of hedges on risk exposures. This lower capital charge is not always the case for all products, however, and the difference between the two capital charges can vary significantly and unpredictably. The SMM is intended to be a conservative capitalization approach suitable for institutions with a very low level of trading activity and minimal risk exposures. For larger, more active institutions, the adoption of an IMA is important, since it is consistent with a more sophisticated internal risk-management capability. As such, the adoption of an IMA should lead to lower risk charges, although the consistency and magnitude of this reduction should be appropriate.

The boundary between the trading book and the banking book

Drawing the boundary between the trading book and the banking book on the basis of intent has proven to be vulnerable to misuse. Trading intent is extremely difficult either to define or to enforce; as such, there is a risk that some assets that might not be readily tradable (or hedgeable) will be held in the trading book. As well, there is a potential for regulatory arbitrage, where firms move positions into whatever classification provides the most favourable capital treatment.

This incentive to move positions can work in both directions. For example, credit exposures generally require a lower amount of capital if held in the trading book (given the use of internal models that allow for the benefits of hedging). This provides a strong motivation to securitize credit and hold it in the trading book, even if it is ultimately impossible to sell the exposure. The banking book, on the other hand, does not require assets to be marked to market, which would allow institutions to avoid recognizing (temporary) losses. For securities that have seen sharp declines in market price (which the bank views as temporary), there is an incentive to move these positions to the banking book, where the short-term loss would not have to be recognized. Highly rated sovereign government bonds present an example of this second arbitrage opportunity. In a volatile market, a portfolio of high-grade sovereign bonds could require a significant capital charge in the trading book (based on movements in the market price of the bonds); yet if the holding was moved to the banking book, the securities would have a risk weight of zero and would therefore require no capital.

Lack of adjustment to counterparty credit valuation

An over-the-counter (OTC) derivatives contract represents a bilateral contract between two firms, with the mark-to-market gains of one counterparty equivalent to mark-to-market losses by the other. For OTC contracts that have positive market values, the bank faces credit exposure to its counterparty. As such, the fair value of an OTC derivatives contract should reflect the credit quality of the counterparty. Fair-value losses on OTC derivatives proved to be a significant source of losses during the global financial crisis, and these risks are not explicitly capitalized under the current requirements for counterparty credit risk.

July 2009 Revisions to the Market-Risk Framework (Basel 2.5)

While many of the issues described above were recognized before the crisis, the magnitude of the losses suffered by a range of international banks over the 2007–09 period made it clear that the capital charges for trading-book positions were inadequate. The BCBS responded quickly, and by July 2009 had already agreed on a range of revisions to address specific weaknesses in the Basel II market-risk framework (BCBS 2009). Under these revisions, which will come into effect on 31 December 2011, trading-book capital will consist of the following three components:

- The existing VaR measure—calculated over a 10-day horizon at the 99th-percentile confidence level with a historical observation period of at least one year.
- Stressed VaR—similar to the existing VaR calculation, but measured over a 12-month period of severe stress.
- An incremental risk-capital charge—a credit VaR measure designed to capture the losses on credit products from both ratings migration and default. This is calculated over a 12-month capital horizon and at a 99.9 per cent confidence level.[11]

10 That is, it is assumed that positions are either eliminated or fully hedged within this timeframe.

11 Additional charges apply for securitized products. Generally, securitization positions held in the trading book will be subject to capital charges similar to those that apply to the banking book.

On average, it is expected that the requirement for market-risk capital for large, internationally active banks will increase by three to four times (BCBS 2009).

While these changes help to mitigate a number of shortcomings within the existing framework, including raising required capital levels, dampening procyclicality (through the stressed VaR) and better capturing credit risk, the Basel 2.5 revisions do not explicitly deal with several of the issues highlighted above. Furthermore, the revisions to the framework have been criticized as lacking internal consistency, having little theoretical basis (and not reflecting current best practices in either the industry or in academia) and potentially overcapitalizing relatively simple business lines.[12] Acknowledging that Basel 2.5 does not confront these issues, the BCBS simultaneously announced that a fundamental review of the framework would be undertaken.

Outstanding Issues Not Addressed in Basel 2.5

The key issues not specifically addressed in Basel 2.5 are described below.

The boundary between the trading book and the banking book

The potential misuse of the boundary between the trading book and the banking book (and the associated possibility of regulatory arbitrage) should be addressed in more depth. A revised boundary could be defined by a range of possible options, including:

- no boundary—eliminate the distinction between the trading book and the banking book;
- liquidity—to be included in the trading book, products must demonstrate liquidity (particularly in times of stress);
- valuation—all positions that are carried at fair value (and therefore exposed to market risk) must be held in the trading book; and
- trading intent—a revised (and more robust) version of the current boundary.

Under a "no-boundary" approach, identical risks would receive identical capital treatment, regardless of which book the position was held in. As discussed above, however, there may be reasons why two distinct capital regimes could be appropriate. The same is true for a boundary based on liquidity characteristics: a bank may have a valid reason for electing to hold a liquid asset to maturity.

A boundary based on a valuation methodology would require that all positions held at fair value (and therefore having market-valuation risk) be capitalized in the trading book. Under this approach, all market risk is captured within the trading-book rules, where it would receive the most appropriate capital treatment. This approach could also reduce the potential for regulatory arbitrage, since the choice of whether to hold a position in the trading book would be based on valuation rules and not managerial discretion. To the extent that the boundary is linked to accounting valuations, however, the regulatory framework would be dependent on the decisions made by those who set the accounting standards.

It can be argued that many of the issues with the current boundary are a result of poor implementation of the boundary, rather than an inherent flaw in its design. To address this, it would be necessary to have a stricter definition of "tradable" and "hedgeable," including the recognition that these criteria must hold in times of market stress. Defining the boundary based on trading intent is consistent with capturing those businesses within the bank that perform market-based functions (and therefore aligns with the internal processes and architecture). This approach would also continue to be consistent with internal risk management at the banks in which trading activities are generally subject to a higher standard of risk modelling than more traditional banking activities. However, this approach would require a clear definition of intent (and ability) to trade or hedge, as well as a means of monitoring adherence to those requirements.

Revised standardized approach

Although Basel 2.5 introduced a number of incremental capital charges to the IMA, the SMM was not fully recalibrated. As a result, there is broad recognition that the SMM should be reviewed with the objective of making it more risk sensitive by incorporating the appropriate degree of hedging recognition and increasing its consistency with the IMA. The changes required to meet these objectives would include a more comprehensive set of risk factors (or asset categories), with improved calibration of those risk factors to appropriately reflect their behaviour during stressed periods. While the revised SMM could be based on either risk factors or products, in either case, it would likely continue to rely on supervisory-provided parameters. Efforts should be made, however, to reduce the SMM's reliance on external credit ratings.

If the revised SMM is sufficiently risk sensitive and properly calibrated, it has the potential to serve as an effective backstop to an IMA. This backstop could be used in several possible ways: as an alternative to an IMA approach for firms that have not yet received model approval for a certain business line or product; as a

12 For a brief discussion of some of the criticisms of Basel 2.5, see Pengelly (2010).

"credible threat" that would allow regulators to disallow the use of models that are not deemed to be performing properly; or as a potential means of confirming the appropriateness of the capital results produced by an internal model (e.g., the IMA capital would not be permitted to fall below a certain percentage of the SMM capital charge).

Revised models-based approach

While the Basel 2.5 revisions address a number of identified deficiencies in the IMA, they do not respond to three important questions: (i) the extent to which it is appropriate for supervisors to constrain the degree of diversification benefits across broad product or risk factors; (ii) how varying degrees of liquidity are reflected in the models; (iii) and what type of statistical risk model should be used.

Benefits of diversification

In contrast to the SMM approach, where it is widely accepted that increased recognition of the benefits of hedging is desirable, there is a risk that the IMA may allow a significant overestimation of the benefits of diversification across risk factors or asset categories, especially in times of stress. This is particularly likely if the bank has full discretion on whether and to what extent to recognize these benefits. This concern is best illustrated by considering a range of possible modelling approaches. At one end of the spectrum, a bank runs a single comprehensive model that captures all risk factors and uses internally generated correlation factors to determine diversification benefits across categories. Under this approach, the amount of diversification benefit that the bank can recognize is based on the calibration of its model and is beyond the influence of the regulator.[13] If this model is calibrated over a relatively limited historical period, it would not capture correlation behaviour during stressed periods and could significantly overestimate these benefits. At the other end of the spectrum, the firm could run a unique model for every position (or risk factor). This would produce a large number of capital charges, which would then be aggregated according to a supervisory-specified formula. Under this extreme, the regulator has full control over the degree of diversification benefit allowed (through the parameters of the aggregation formula). Such a complete level of supervisory control over the recognition of diversification benefits would also be undesirable, however, since this approach would likely not recognize legitimate diversification effects and would be so dominated by supervisory-imposed parameters that it would essentially be a replication of the SMM. Finding the right balance between these two extremes is an important question: the 2009 revisions break the trading-book capital into market risk and credit risk (and aggregate through straight addition—no diversification benefit is allowed). Taking a more granular approach is another possibility.

Recognizing liquidity in risk models

The Basel 2.5 revisions improved on the existing assumption of a standard 10-day capital horizon across all products by requiring a 12-month horizon for credit products. Nonetheless, both the VaR and stressed VaR calculations continue to use a 10-day horizon for all other products, regardless of their actual liquidity characteristics. There are a number of possible options that would allow a revised IMA to better capture variations in liquidity. First, the models could make use of varying liquidity horizons. The current 10-day horizon across products is clearly inappropriate, and the use of longer horizons for less-liquid products would more realistically reflect the time required to sell a given position.[14] Second, the models could treat liquidity as another risk factor, modelling (and appropriately capitalizing) the risk and impact of a sharp deterioration in liquidity. Third, prudential adjustments to observed market prices to adjust for liquidity conditions could be applied. This final adjustment would be particularly relevant if the institution held a very large position relative to the overall size of the market.

Addressing shortcomings of VaR-based models

Both the current framework and the 2009 revisions are based on VaR models. At the time of the 1996 Basel Committee's market-risk amendment, VaR represented the state of the art in risk modelling and effectively captured the risk characteristics of the products that dominated the trading books at the time. VaR has a number of well-documented shortcomings, however.[15] In particular, it focuses on only one point (or percentile) of the possible distribution of losses; the behaviour of losses beyond this percentile is ignored. As such, VaR does not effectively capture potential risks or exposures in extreme market events. Newer risk measures, such as expected shortfall, address this issue and can effectively capture extreme loss events; the role of other statistical risk measures within a revised IMA needs to be considered.[16]

A key challenge for any statistical measure is that the actual distribution of losses is unknown. No matter how accurately the model can describe events in the tail of the distribution, if the loss distribution itself is not known, then extreme events will not be properly captured in the capital framework. For this reason, it will be important to integrate stress tests and scenario analysis

13 Short of de-recognizing the firm's internal model.

14 The 2009 revisions take this approach by using a 1-year horizon for credit risk (under the incremental risk capital).

15 For an in-depth analysis of VaR and other statistical risk measures, see BCBS (2011).

16 The expected shortfall of a position is the average loss, given that the VaR threshold has been exceeded.

into the modelling framework. These will help to identify the impact of rare, but plausible, outcomes that may not be well captured in the assumed distribution of losses used in the model (BCBS 2011).

Conclusion

The trading activities of major international banks have changed materially over the past 15 years, and the financial crisis made it clear that the capital framework first introduced in 1996 was no longer suitable to capture and capitalize the associated risks. Trading-related losses over the 2007–09 period were well in excess of those predicted by the institutions' risk models and much larger than the level of regulatory capital held for those activities. The BCBS moved quickly to address the capital shortfall with the introduction of the 2009 revisions to the market-risk framework (Basel 2.5), which will come into effect on 31 December 2011 and will increase capital requirements for large banks by an average of three to four times.

While the 2009 revisions address the capital deficiency, they do not deal with a number of other important issues, including the definition of the boundary between the banking and trading books and both theoretical and practical gaps in the existing standardized and internal-models-based frameworks. In recognition of this, the fundamental review currently being conducted by the Trading Book Group is working toward developing a robust framework that provides appropriate capital charges for the full range of risks in the trading book. While Canadian institutions did not experience the severe trading losses suffered by a number of large international banks, they do have significant trading operations and allocate a substantial amount of regulatory capital to the trading book. The results of this fundamental review will therefore be relevant for the capital requirements for large Canadian institutions. Reflecting this position, both the Bank of Canada and the Office of the Superintendent of Financial Institutions are active in the fundamental review.

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Abbreviations

A more comprehensive list of financial and economic terms, as well as information on Canada's payment clearing and settlement systems, is available at <http://www.bankofcanada.ca>.

ABCP: Asset-backed commercial paper

CCP: Central counterparty

CDCC: Canadian Derivatives Clearing Corporation

CDOR: Canadian Dealer Offered Rate

CDS: Credit default swap

CSA: Canada Securities Administrators

DSR: Debt-service ratio

ECB: European Central Bank

EFSF: European Financial Stability Facility

EPFR: Emerging Portfolio Fund Research

EU: European Union

EURIBOR: Euro Interbank Offered Rate

FSB: Financial Stability Board

G-20: Group of Twenty

GDP: Gross domestic product

IFRS: International Financial Reporting Standards

IMF: International Monetary Fund

LIBOR: London Interbank Offered Rate

MSCI: Morgan Stanley Capital International

OSFI: Office of the Superintendent of Financial Institutions

OTC: Over-the-counter

ROE: Return on equity

SMP: Securities Markets Programme

S&P: Standard & Poor's

TSX: Toronto Stock Exchange

VIX: Ticker symbol for the Chicago Board Options Exchange Market Volatility Index

VSTOXX: Euro Stoxx 50 Volatility