



Strengthening International Capital and Liquidity Standards: A Macroeconomic Impact Assessment for Canada

Executive Summary

The recent global financial crisis left a legacy of damaged economies, failed financial institutions, lost jobs, and higher fiscal deficits. Economic output in the G-7 countries fell by almost 5 per cent in the wake of the crisis. This translates into \$2 trillion in lost output, millions of lost jobs, and tremendous financial hardship for affected individuals around the world. As is often the case in such events, much of the cost has been borne by countries, businesses, and individuals who did not directly contribute to the crisis.

Canada was not immune. While this country boasts a strong financial sector, it too was buffeted by financial shocks from abroad. Our economy could not escape the spillover effects of the ensuing global economic downturn. Canadian economic output fell by more than 3 per cent during the crisis, and more than 400,000 jobs disappeared. Unprecedented and timely monetary and fiscal stimulus, combined with a series of measures to support the functioning of the financial system, prevented a worse outcome.

Action is needed to reduce the likelihood of serious financial crises in the future. A return to the pre-crisis status quo is not acceptable. Financial systems around the world, including those in Canada, must be strengthened so that they can withstand shocks without having to resort to government support that is ultimately funded by the public.

G-20 leaders have agreed on comprehensive financial sector reforms to reduce the risk of future crises and to strengthen banking systems. Raising the amount and quality of capital and liquidity that financial institutions must carry is a central component of the reforms. The G-20 is developing a set of proposals for agreement by leaders at their summit in Seoul, Korea, in November. To help determine the appropriate calibration of the proposed new standards, the Financial Stability Board (FSB) and the Basel Committee on Banking Supervision (BCBS) conducted two studies to evaluate the macroeconomic impact of the proposals. These studies assessed the benefits and costs of the new standards over (i) the longer-term period when the proposals are fully implemented and (ii) the initial transition period during which the new standards will be introduced.

Bank of Canada staff participated in both international studies. The Bank also carried out its own assessment of the implications of these new standards for the Canadian financial system and economy. This report summarizes the Bank's key results for Canada and compares them with the results recently published by the FSB and the BCBS.

There are many clear benefits to promoting a safer and more resilient financial system: financial crises should be less frequent and less severe when they happen, and the macroeconomic cycle will be less prone to booms and busts. The FSB and BCBS studies focus only on how the probability of such crises is reduced by strengthening capital and liquidity standards. They did not quantify the other economic benefits in terms of their impact on GDP. This understates the net benefits of the reforms.

Given the relatively healthy state of Canada's banking system, it is tempting to think that there are limited potential benefits for Canada of these new standards applied across countries. This is misguided. The world will remain dependent on global trade and capital flows, and emerging-market economies will play an increasingly important role. Canada's interconnectedness with the rest of the world will continue to grow, as will its exposure to potential shocks from abroad. In addition, the relative infrequency of financial crises in Canada does not mean they could not happen here. It is thus in Canada's interest to work with other countries to develop stronger international capital and liquidity standards that would also apply to Canadian banks.

The benefits of higher capital and liquidity standards must be weighed against their potential costs to the Canadian economy. Over time, it is expected that banks will seek to pass on the cost of higher capital and liquidity requirements through higher lending rates to borrowers. The cost of higher capital is higher lending spreads, which the Bank calculates would increase by about 14 basis points for every percentage-point increase in bank capital requirements. This figure was then used as an input to the Bank's macroeconomic models to gauge the impact on economic output. New liquidity requirements also present costs for the Canadian economy. These requirements are estimated to add roughly an additional 14 basis points to lending spreads, and thus are equivalent in impact to an additional 1-percentage-point increase in bank capital requirements. Consequently, the cost of a 2-percentage-point increase in capital requirements, in conjunction with the new liquidity standards, should be an increase in lending spreads of about 42 basis points.

The Bank also analyzed the transition costs associated with implementing the new rules, including potential credit rationing in recognition of the possibility that banks may restrict the availability of credit as they adjust their capital and liquidity positions to the new standards. The G-20 has acknowledged that a longer transition period would help to mitigate this risk.

Bank staff ran simulations through several different models to verify the robustness of the results and to provide different perspectives on the possible outcomes. By using a range of models and approaches, and cross-checking the results against each other and against those from the two international studies, the Bank created a complex and comprehensive appraisal of the potential benefits and costs of the proposed financial sector reforms.

The results show large potential benefits of strengthening capital and liquidity standards in terms of annual gains to GDP. Moreover, these gains will endure over time—a gift of higher output levels that keeps on giving. Based on conservative estimates of the cost of financial crises to Canada, the Bank calculates the potential benefit from a reduced incidence of crises to be approximately \$1/2 trillion. Even after subtracting the estimated long-run and transition costs of requiring banks to carry more capital and liquidity, the net gains to Canada in present-value terms would still be approximately 13 per cent of GDP, equivalent to about \$200 billion.

These estimates likely substantially understate the net benefits of the reforms because they do not calculate the additional benefits from the reduced severity of crises, a less volatile macroeconomic cycle, and better resource allocation in the economy.

1. Introduction

The global financial crisis has imposed enormous costs on the Canadian and global economies, which will take many years to unwind. Economic output in the G-7 countries fell by almost 5 per cent from peak to trough, with declines in regions such as the United States, Europe, and Japan of 4, 5, and 8 1/2 per cent, respectively.¹ In Canada, GDP fell by more than 3 per cent from peak to trough. These output losses imply a loss of \$2 trillion in output for the global economy, and \$50 billion for Canada. In line with the reduction in economic activity, employment fell, by more than eight million jobs in the United States and more than 400,000 jobs in Canada, imposing considerable hardship for the individuals and families affected. As is often the case in such crises, much of the cost has been borne by countries, businesses, and individuals who did not directly contribute to the crisis. It will take many years to recover from the fallout.

The shock to the global economy necessitated a massive, and costly, public policy response to contain the damage and prevent the “Great Recession” from descending into a global depression. Monetary authorities in many jurisdictions slashed policy interest rates and, in some cases (e.g., the United Kingdom and the United States), introduced unconventional monetary policy operations so that liquidity could continue to be injected into their economies as interest rates approached zero. In the wake of the crisis, the Bank of Canada cut its target for the overnight rate to a historic low of one-quarter of one per cent, and decades of progress in improving Canada’s fiscal position suffered a setback as fiscal support for the Canadian economy pushed federal and provincial government budgets back into substantial deficits. Globally, fiscal support packages totalling approximately Can\$2.5 trillion have been introduced, placing enormous strains on the public finances of some countries, notably in Europe.

Estimates of global banking writedowns are currently in the neighbourhood of Can\$2.5 trillion. Even relatively well-managed banking systems were severely affected. In Canada, although banks and other financial institutions did not engage in risky financial activities to the same extent as in some other countries, a generalized loss of confidence led to a sharp rise in their funding costs. The Government of Canada and the Bank of Canada found it necessary to introduce new or expanded programs to provide sufficient liquidity to the financial system and to support the continued flow of credit to borrowers. At their peak, these programs totalled 6 per cent of GDP.

While a number of factors contributed to the global crisis, and to the large costs subsequently imposed on the Canadian public as the shock hit the domestic economy, several stand out. It is clear that there was excessive risk-taking by investors and financial institutions. In addition, because risks were not well understood, they were underpriced. As the downturn took hold, it became clear that there was not enough capital and liquidity in the banking system: banks could not withstand the shock without (direct and indirect) public sector support.

¹ Given the weak recoveries in many countries, the losses in output relative to potential growth have continued to climb, further raising the costs imposed on these economies.

Action is needed to reduce the likelihood of such a debilitating crisis occurring again. Financial systems around the world, including in Canada, must be strengthened so that, on their own, they can withstand shocks similar in magnitude to the recent crisis without having to resort to government support that is ultimately paid for by the public.

Recognizing this need, the G-20 leaders initiated an extensive program of reform designed to improve the safety and robustness of the global financial system. Improved capital and liquidity standards for banks are central to this program. In December 2009, the Basel Committee on Banking Supervision (BCBS), which is leading the efforts in this area, proposed a set of measures to strengthen regulatory standards for internationally active banks. An update to these measures was published in July 2010. Requiring banks to carry more capital and liquidity may result in higher costs for financial intermediation on a day-to-day basis, but the proposed reforms will also generate substantial benefits over time through a variety of channels, most notably by reducing the frequency of financial crises. Despite the relatively healthy state of Canadian banks, the Canadian economy will benefit from the reform through both a more robust domestic banking system and a reduction in the potential for damaging foreign financial crises.

To assess the potential economic implications of these reforms, the Financial Stability Board (FSB) and the BCBS conducted two international studies that assessed (i) the longer-run macroeconomic benefits and costs (the LEI report) and (ii) the shorter-term transition costs (the MAG report) associated with adopting the new standards.² Staff from the Bank of Canada actively contributed to both assessments.³ In addition, Bank of Canada staff used the Bank's own macroeconomic models to evaluate the impact of the new standards on the Canadian economy.

In conjunction with the publication of the two international studies, this report summarizes the findings for the Canadian economy and compares them with those from the LEI and MAG reports. Consistent with those two studies, the focus is on the macroeconomic impact of representative changes in bank capital-adequacy ratios, not any specific proposals under consideration by the BCBS. The studies use representative changes because the calibration of the new rules will not be finalized until later this year.

The Canadian study finds that, using conservative assumptions (**Box 1**), Canada will benefit from the decreased likelihood of future financial crises resulting from new banking rules. Most of this benefit will be from the decreased potential for *foreign*, rather than domestic financial crises. The risk of the latter is already low in Canada, owing to the currently strong financial condition of Canadian banks. Meanwhile, the macroeconomic costs of implementing the new standards in Canada are found to be broadly similar to those of other jurisdictions. When the benefits and costs are assessed on a net present-value basis, it is clear that, over time, there are important net economic benefits—worth about \$200 billion for Canada—to be gained from improving the safety and robustness of the Canadian and international financial systems.

² The reports are: “An Assessment of the Long-Term Economic Impact of the New Regulatory Framework” (the LEI report), and “Assessing the Macroeconomic Impact of the Transition to Stronger Capital and Liquidity Requirements – Interim Report “ (the MAG report). Both are available at <<http://www.bis.org>>.

³ The Bank of Canada worked with various partners, especially the Department of Finance and the Office of the Superintendent of Financial Institutions (OSFI). The Bank and OSFI were represented on the BCBS group that oversaw the work on the longer-run economic effects, and the Bank also actively participated in the assessment of transition costs.

Box 1: The underlying assumptions guiding the assessment are conservative

Assessments of the benefits and costs of public policies need to be based on a prudent set of underlying assumptions. They should avoid overstating benefits and understating costs, and should be mindful of the uncertainties and limitations inherent in economic analysis. For example, most macroeconomic models used for policy analysis focus on behaviour of the real economy; they do not pay much attention to the financial sector. The latest generation of models, such as the Bank of Canada's BoC-GEM-FIN model, and the Christensen, Meh, and Moran model, are designed to remedy this gap. The Bank of Canada's analysis understates the benefits of the new rules and errs on the side of overstating the costs. This approach is reflected in the following conservative assumptions:

Benefits

- The only benefit that is quantified in the analysis is the gains to GDP resulting from a reduced probability of future financial crises. Other benefits—such as a decrease in the severity of future crises, smoother economic cycles, and lowered risk of overinvestment problems—are also expected to generate significant output gains over time, but were not taken into account in the calculations. In the recent crisis, losses would have been higher in the absence of costly public interventions, but these costs are not fully captured in the analysis.
- The benefits calculated in terms of the reduced likelihood of a domestic crisis take account of the current strong financial condition of Canadian banks, as well as the fact that Canada has not in the past experienced a major financial crisis. This reduces the calculated benefits of adopting the new standards.

Costs

- In the Bank of Canada's main macro policy model (ToTEM) and in the international studies, banks are assumed to fully pass the costs of higher capital and liquidity requirements to borrowers. Thus, it is assumed that Canadian banks would not need to reduce their current 15 to 20 per cent returns on shareholders' equity or operating expenses, such as compensation, to adjust to the new rules. However, higher capital and liquidity requirements should result in lower-risk banks; in the future, investors may not require as-high returns on bank debt and equity to compensate them for the risks that banks are taking. Indeed, returns on equity for non-bank firms have averaged about 10 per cent this decade, suggesting that there is plenty of scope for bank returns to decline over time.
- Higher capital and liquidity requirements are assumed to have a permanent effect on lending spreads, and hence on the level of economic output. No allowance is made for the possibility that households and firms may find cheaper alternative sources of financing in the longer run that would reduce the impact of the new rules on the economy.

Discount rate

- A 5 per cent real discount rate was used to calculate the net benefits and costs in present-value terms. This rate is higher than current real interest rates and the longer-run growth rate of the Canadian economy. A lower discount rate would increase the net benefits of the new rules in present-value terms.

The rest of this report is structured as follows. Section 2 discusses the economic benefits of imposing higher capital and liquidity standards. Section 3 examines the potential costs, beginning with the most significant channels and the impact on lending spreads (section 3.1), the longer-run costs to the economy arising from the lending-spread effects (section 3.2), and the impact of the reforms over the transition period (section 3.3). Combining the results of the previous sections, section 4 discusses the anticipated net benefits to the Canadian economy. Some concluding remarks are presented in section 5. As well, a series of technical annexes provide more details on the assumptions and models used to conduct the Canadian analysis.

2. Economic Benefits of Higher Capital and Liquidity Standards

The economic benefits for Canada and other countries arising from stronger capital and liquidity standards for banks are potentially quite large. These benefits, not all of which are easy to quantify, can emerge from a variety of sources:

- Higher capital and liquidity standards will contribute to a lower incidence of financial crises. The historical experience with financial crises, including the recent crisis that began in the U.S. financial system in 2007, has shown that they can be extremely costly in terms of lost output and employment.
- It is possible that, in addition to the incidence, the severity of financial crises will be reduced. Although this seems intuitively plausible, there is very little existing analytical work on this topic.
- With fewer financial crises, the economy may benefit from smoother economic cycles. Lower volatility in the economy is considered supportive of economic growth (especially consumption) and generally improved economic well-being.
- Recent experience has reinforced the view that the economy can be vulnerable to over-investment problems due to the underpricing of risk similar to those that occurred in the U.S. subprime mortgage market. Higher standards (in capital and liquidity and, more broadly, in the supervisory framework) may help to reduce the risk that resources are misallocated.

The most important benefit to the global economy should be a lower incidence of financial crises that can originate in one country but spread to others and to the global financial system. The LEI study of the longer-run benefits and costs of the new rules quantified their potential impact on economic growth through a two-step approach. First, the probability and economic costs of historical financial crises were evaluated, and used as an indicator of future crises, barring any changes. Next, a modelling approach was used to estimate the extent to which stronger capital and liquidity standards could contribute to reducing the incidence of costly crises.

2.1 Estimating the probability and costs of financial crises

Based on the academic literature and international data over the past 25 years, the LEI report found that the average annual probability of a banking crisis in any given country is approximately 4.5 per cent, implying that a crisis typically occurs every 22 years. This acknowledges that financial crises have been a discouragingly common international occurrence in recent decades in both the advanced and emerging-market economies.

The cost of individual crises has also been large, with an average initial decline in the level of GDP of around 10 per cent. Depending on the assumptions used for the permanence of the output loss (meaning how long it would take for the level of output to return to the original baseline trend), estimates for the cumulative loss in output can be very large indeed (beginning at 20 per cent of GDP and rising to considerably larger values). The LEI report, through an extensive survey of the literature on financial crises, identified a median loss of 63 per cent of GDP.⁴

These output losses are very large, and suggest that reducing the incidence of crises has the potential to significantly improve economic performance over time. Previous work to estimate the impact of stronger capital and liquidity requirements on the probability of financial crises has been very limited. Nevertheless, a variety of approaches and economic models were used in the LEI report to show that rising levels of capital and liquidity can effectively reduce the probability of crises (albeit with a diminishing effect as these standards are tightened). Specifically, assuming a starting probability of a crisis of 4.5 per cent in any given country, the LEI report found that an increase of 2 percentage points in bank capital ratios reduced the probability of a financial crisis by 2.9 percentage points, while increases in capital ratios of 4 and 6 percentage points reduced the probability of a financial crisis by 3.6 and 4 percentage points, respectively. These calculations assume a combined effect from increases in capital as well as from new liquidity rules.

When these reductions in the probability of a crisis (e.g., 2.9 percentage points for a 2-percentage-point increase in capital ratios) are multiplied by the cumulative cost of crises (63 per cent of GDP), the benefits to annual economic output are potentially large, in the order of 2 per cent of GDP (**Table 1**). The LEI report found that the benefits exceed by a large margin the longer-run costs of the higher capital and liquidity requirements.

⁴ These figures are appropriately discounted. The literature finds that the present value of average cumulative losses runs from around 20 per cent of GDP (with no permanent effects) to 200 per cent or more (assuming substantial permanence). See Table A1.1 in the LEI report.

Table 1: International benefits to the level of GDP from a lower probability of financial crises

| Percentage-point increase in bank capital and liquidity ratios | Percentage-point decrease in probability of a crisis | Increase in annual level of GDP^a (%) |
|---|---|--|
| 2.0 | 2.9 | 1.8 |
| 4.0 | 3.6 | 2.3 |
| 6.0 | 4.0 | 2.5 |

Note: the calculations assume a 4.5 per cent probability of a financial crisis as a starting point.

^a Based on crisis having cumulative costs of 63 per cent of GDP.

Source: BCBS LEI report

2.2 Applying LEI analysis to Canada

It is significant that *none* of the financial crises that are typically used in this analytical approach occurred in Canada.⁵ The banking sector in Canada is strong, and the probability of a crisis is relatively low. Nonetheless, Canada is vulnerable to the weaknesses of the banking sectors elsewhere, and analysis shows that Canada would strongly benefit from a reduced probability of financial crises abroad.

Given Canada's relatively favourable experience, when the various methodologies from the LEI report are used with Canadian data to estimate the benefits to output of a reduced incidence of crises, the gains tend to be smaller than those based on the international experience. For example, following the approach used by the United Kingdom Financial Services Authority (U.K. FSA) and described in Barrell et al. (2009), the annual probability of a domestic financial crisis was estimated based on several domestic factors, including the unweighted capital ratio of banks, their liquid assets as a share of total assets, and house prices expressed in real terms. This approach suggests a 1.7 per cent probability of a financial crisis occurring in Canada (implying that a financial crisis occurs, on average, every 60 years or so). This figure is substantially lower than the LEI report's 4.5 per cent likelihood of a foreign financial crisis (approximately once every 22 years).

⁵ Indeed, according to two prominent studies of banking crises, by Reinhart and Rogoff (2008) and Laeven and Valencia (2008), Canada is one of only two G-20 countries that has not had a financial crisis.

The lower probability of domestic financial crises might suggest that regulatory improvements are therefore significantly less important for Canada, but this would overlook two important considerations.

- Historical experience, on which this analysis is based, is not always an accurate guide to the future. While Canada has benefited—and continues to benefit—from a strong regulatory framework and balanced economic growth, it should not be assumed that these factors will always be sufficient, or that they will be the same in the future. Stronger capital and liquidity standards should still reduce the probability of future banking crises in Canada, as well as improve the sector’s overall resilience. More fundamentally, it is important that Canadian authorities and financial sector participants not become complacent based on past experience.
- The largest negative effects of financial crises on the Canadian economy stem from crises originating in other countries (e.g., the global financial crisis that began in 2007). In addition to damaging Canadian output and employment, such shocks can have adverse contagion effects on the Canadian banking system by making it very difficult for Canadian banks to fund themselves in foreign markets.

Box 2: The impact of foreign financial crises on the Canadian economy

Although a crisis of domestic origin is always a possibility, for an open economy like Canada’s, it is more likely that the national economy will be affected by a foreign financial crisis. One effect of a foreign crisis would occur through dampening growth in Canada’s trading partners. Another would be to create problems in Canada’s financial system through contagion effects. Both of these channels were evident in the most recent crisis, which originated in the United States. Slower U.S. and global growth hurt the Canadian economy by reducing demand for Canadian exports and contributing to a decline in commodity prices, causing large output and employment losses in Canada. The Canadian financial system was also affected by the global loss of confidence in banks. This caused higher funding costs, which in turn led banks to increase the cost and reduce the availability of credit, worsening Canada’s recession.

However, a foreign crisis can have a negative effect without leading to a recession, i.e., growth may be slower, but still remain positive. It is thus difficult to evaluate the frequency with which a foreign crisis will negatively affect the Canadian economy. There have been many financial crises over the past 25 years (as reviewed in the LEI report). Besides the most recent crisis, some others that may have hurt growth in Canada include the debt crisis in less-developed countries (early 1980s), the Mexican financial crisis (1994–95), and the Asian financial crisis and Russian debt default (1997–98).⁶ Looking ahead, it is reasonable to assume that the world will remain dependent on global trade and capital flows and that emerging-market economies will play an increasingly important role. As Canada’s interconnectedness with the rest of the world continues to grow, so too will its exposure to potential shocks from abroad. In addition, the relative infrequency of financial crises in Canada does not mean they could not happen here. It is thus in Canada’s interest to work with other countries to develop stronger international capital and liquidity standards that would also apply to Canadian banks.

⁶ See Illing and Liu (2003), Table 2 and Appendix B, for a longer list of events associated with financial stress.

To calculate the positive impact on Canadian GDP of fewer domestic financial crises, the extent to which higher capital and liquidity requirements can reduce the probability of a crisis occurring is first estimated (the same model is used for both calculations). The result is then multiplied by the cost of a financial crisis.⁷ The model results show that the probability of a crisis is reduced by 0.8 percentage points for an initial 2-percentage-point increase in bank capital requirements. (This is less than the 2.9 percentage points found in the international study, since the initial probability of a crisis is much lower in Canada.) As in the LEI report, there are diminishing returns from further increases in capital requirements; increases of 4 and 6 percentage points reduce the probability of a financial crisis by 1.3 and 1.5 percentage points, respectively.

The next issue is to assess the loss of output that would arise should a crisis take place. The LEI report suggested a median cumulative loss of 63 per cent of GDP. Although an initial direct drop in GDP of approximately 10 per cent is typically used as an appropriate value from an international perspective, for Canada, the gauge is the recent financial crisis, where the initial loss in output relative to trend was approximately 5 per cent. The median estimate used by the LEI study for the cumulative cost of a financial crisis was thus reduced by half (i.e., from 63 per cent to 31.5 per cent of GDP).

Chart 1 illustrates how the 31.5 per cent of GDP crisis cost assumption affects the calculated benefits. The chart shows a range of benefits of 20 to 160 per cent of GDP (in the blue shaded area), representing the range of costs of historical crises from the LEI report. The dashed blue line indicates the benefit using the LEI's assumed 63 per cent median international crisis cost. The solid blue line indicates the benefits for Canada associated with the 31.5 per cent of GDP crisis cost assumed in this report, which is near the bottom of the range of expected benefits.

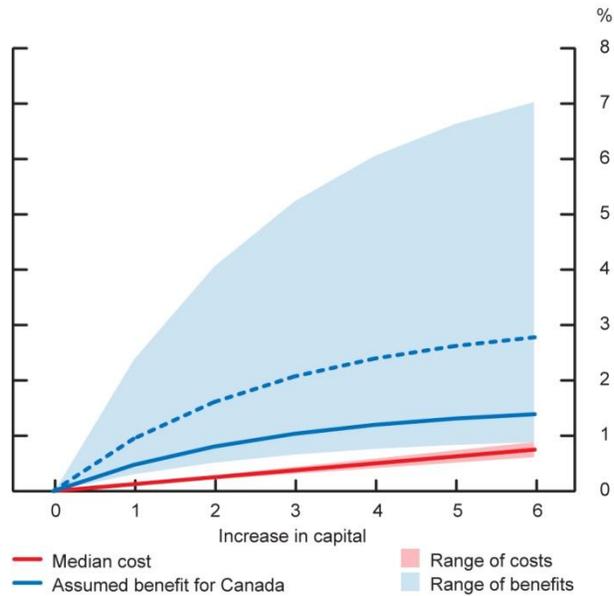
This estimate is consistent with the cumulative losses in GDP experienced since the start of the recent crisis, as well as reasonable assumptions about the persistent effects of the crisis on future output. **Chart 2** illustrates the combination of these effects on the level of GDP. It indicates that the cumulative short-run losses since the start of the crisis through to the end of the Bank's projection period in 2012 already amount to 9 per cent of GDP (part A in **Chart 2**). To obtain the total output losses from the crisis, the implied cumulative losses on the future level of potential output are added (part B in **Chart 2**). The level of potential GDP from pre-crisis to post-crisis is estimated to have fallen by 2.8 per cent of GDP. Assuming that only half of this decline, or 1.4 per cent, is a permanent consequence of the crisis, the combination of part A and part B results in a cumulative loss of 31.5 per cent of GDP.⁸

⁷ In calculating these benefits, those via the foreign channel include the impact of higher liquidity standards. Benefits via the domestic channel do not: given the calculated probabilities, their impact would likely be small.

⁸ All of these calculations are in discounted present-value terms using a 5 per cent real discount rate.

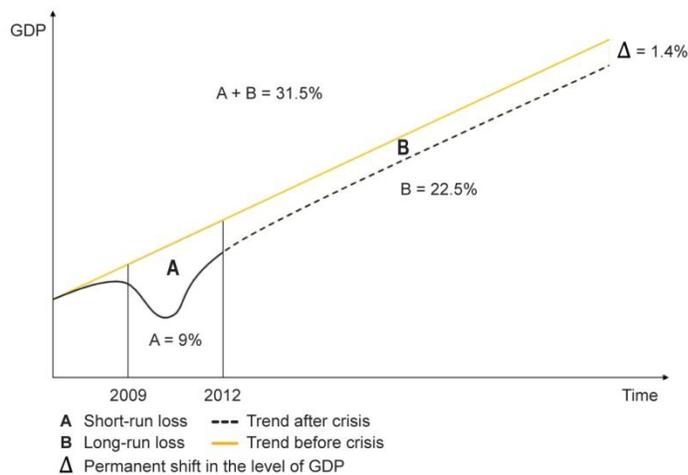
Chart 1: Expected longer-run benefits and costs of tighter capital and liquidity standards

In per cent of GDP



Source: Bank of Canada estimates based on LEI data

Chart 2: An illustration of the cumulative output loss in Canada from the financial crisis



Following the LEI report, the next step was to compute the potential benefits from increasing capital and liquidity requirements in terms of the level of output relative to trend. The results are shown in **Table 2**. The gains from reducing the probability of a domestic crisis are shown in column four; those from a reduction in future foreign crises in column five. The results for column five are taken from Table 1, but with two key adjustments. First, the cumulative cost of a

financial crisis was halved, to 31.5 per cent of GDP, in keeping with the conservative starting assumptions listed in **Box 1**. Second, the change in the probability of a foreign crisis for a given change in bank capital ratios was scaled down to reflect the conservative assumption that, while there have been many foreign financial disruptions over the past three decades, only one major foreign financial crisis is expected to seriously impair the Canadian economy every 25 years, instead of the 22 years assumed in the LEI report. This implies a 4 per cent probability of a foreign crisis occurring in Canada each year.

Table 2: Canadian benefits to the level of GDP from a lower probability of financial crises

| Benefits to Canada from reducing the probability of a crisis | | | | | |
|---|---|----------------|--|---|------------------------------|
| Percentage-point increase in bank capital ratios, applied globally | Percentage-point decrease in probability of a crisis | | Increase in annual level of Canadian GDP | | |
| | Domestic | Foreign | Owing to reduced probability of a domestic crisis (%) | Owing to reduced probability of a foreign crisis (%) | Combined increase (%) |
| 2.0 | 0.8 | 2.6 | 0.3 | 0.8 | 1.1 |
| 4.0 | 1.3 | 3.2 | 0.4 | 1.0 | 1.4 |
| 6.0 | 1.5 | 3.6 | 0.5 | 1.1 | 1.6 |

Note: Based on a crisis having cumulative costs of 31.5 per cent of GDP. Calculations based on a starting-point probability of 1.7 per cent for a domestic financial crisis occurring in Canada and 4 per cent for a foreign crisis

Sources: BCBS LEI report and Bank of Canada calculations

The main conclusion from this analysis is that increases in capital and liquidity requirements that reduce the probability of a crisis generate significant permanent gains in the level of economic output. For example, a change of 2 percentage points in bank capital ratios results in an annual 1.1-per-cent increase in GDP relative to potential. Not surprisingly, given the health of the Canadian banking system, three-quarters of the benefits arise from the decrease in the likelihood of foreign financial crises; the remaining quarter represents the gains from reducing the likelihood of a domestic financial crisis.

2.3 Other Benefits

As noted at the beginning of section 2, beyond lowering the probability of a financial crisis, other benefits can be gained from increasing bank capital and liquidity requirements. A drop in volatility is one. As in section 2.1, a model-based approach was used to determine whether higher capital requirements would reduce volatility in the economy (outside of crises) and thereby have a positive impact on growth and well-being. This effect would be possible because higher capital gives banks greater scope to smooth the supply of credit to borrowers over the economic cycle.⁹ The results from models that explicitly include bank capital indicate that increased levels of capital could indeed reduce volatility in the economy. For example, an increase in capital of 2 percentage points reduced the standard deviation of output by 2.5 per cent. Results for the Canadian economy are similar: specifically, a 2-percentage-point rise in capital ratios lowers the standard deviation of Canadian output by 3.3 per cent of its starting value (see Christensen, Meh, and Moran 2010). Nevertheless, the benefits arising from this channel are likely to be fairly small compared with that of making banks safer and reducing the likelihood of a future financial crisis. Hence, they are ignored in the overall assessment of benefits and costs. As noted earlier, further benefits can also accrue from reducing the severity of crises when they occur and better allocation of resources, thanks to higher standards for capital and liquidity and, more broadly, for the supervisory framework. These benefits are not quantified in the assessment.

3. Assessing the Economic Costs of Stronger Capital Requirements

Despite the clear benefits, stronger prudential standards also impose costs on the economy, since banks will try to pass on to their customers the higher costs of carrying more capital and liquidity. In other words, higher standards increase the cost of financial intermediation for the economy as a whole. In turn, this can be expected to reduce the level of economic output on an ongoing basis, since more costly financial intermediation results in reduced consumption and investment spending.

This section begins with a discussion of the ways in which higher capital and liquidity requirements increase lending spreads in the economy. This is followed by an examination of how, over the longer run, higher lending spreads reduce the level of economic output relative to a baseline trend. The section concludes with a discussion of the shorter-run transition costs associated with the new requirements and a brief discussion of the risks surrounding these estimates. The methodology used to compute these costs is illustrated in Appendix 1 of this report.

⁹ Among the various proposals under review, the BCBS is examining the explicit introduction of capital buffers that are intended to give banks, in co-operation with supervisory authorities, greater scope to vary the amount of capital they hold in response to economic circumstances. In July 2010, the BCBS issued for consultation a proposal for a counter-cyclical capital buffer regime, with a call for comments by 10 September 2010: <http://www.bis.org/publ/bcbs172.pdf>.

3.1 Linking capital and liquidity requirements to bank lending spreads

In principle, banks can follow several longer-run strategies to meet regulatory demands for higher capital requirements. First, if given enough time to meet the new capital requirements by regulators and markets, banks can generate capital internally over time through the retention of earnings. In addition, they would likely seek to pass on the costs of the higher standards to their customers by demanding higher interest spreads, increasing non-interest fee income, and/or reducing operating expenses. Second, they can lower the risk-weighted asset denominator of their regulatory capital requirements by slowing the growth (or even disposing) of assets that do not generate sufficient revenue to justify the extra capital charges. Third, they can raise additional capital by issuing new shares to investors.

Past experience suggests that banks are likely to use a combination of all *three* methods over the short run, with the approach pursued being highly dependent, at least in part, on the length of time provided to meet the higher requirements. Over time, the LEI report and this analysis assume that banks recoup the cost of higher capital and liquidity requirements mainly through higher lending spreads. In addition, the new capital rules generally reset the balance between conventional banking-book and trading-book activities at the margin in favour of traditional banking activities, which, all things being equal, should encourage banks to continue their current lending activities.

Higher liquidity requirements essentially represent a demand on banks to carry more-liquid assets at the expense of lending activities and longer-term investments. However, the BCBS has substantially relaxed the definition of liquid assets from the one proposed in its December 2009 consultation paper, *International framework for liquidity risk measurement, standards and monitoring* by allowing a broader range of assets to be counted as liquid assets and introducing more lenient assumptions regarding such elements as run-off rates.¹⁰ It is also reconsidering the definition of the Net Stable Funding Ratio requirement, which was thought to be more stringent than the proposed new Liquidity Coverage Ratio. Hence, the analysis focuses on the impact of the Liquidity Coverage Ratio. As indicated in Annex 1, most Canadian banks appear to be well placed to meet the new Liquidity Coverage Ratio requirement, since they carry a large stock of residential mortgages that could be converted at a small cost to federal government-guaranteed National Housing Act Mortgage-Backed Securities that would qualify as eligible liquid assets under the new rules. This cost is estimated in Annex 1 to be around 14 basis points in lending-spread terms, equivalent to a 1 percentage point change in capital requirements.

An important assumption in the international studies and in this analysis is that banks will seek to maintain their return on equity over the longer run, which is then used in the Bank's main macroeconomic policy model, ToTEM. This is a conservative assumption, since it could be argued that higher capital and liquidity requirements should make banks less risky, thereby reducing the required rate of return on both bank debt and equity. Moreover, as noted in **Box 1**, banks earn higher returns on equity than other types of businesses, suggesting that there is scope for their returns to decline over time, especially if there were new entrants into the banking sector.

¹⁰ See July 2010 Group of Governors and Heads of Supervision press release: <http://www.bis.org/press/p100726.htm>.

Given the current exceptionally low level of bank deposit rates and the cost of bank debt funding more generally, it is also assumed that the wider interest margins will effectively result in higher interest rates (lending spreads) on bank loans to households, firms, and other sectors of the economy. It is further assumed that the higher lending spreads will be passed along to *all* bank borrowers, and not just to certain subgroups, such as households or small and medium-sized businesses (SMEs), because all banks in Canada and abroad will be affected by the higher capital and liquidity requirements. In addition, past experience suggests that other lenders will also be affected by the new rules, either because those rules will be applied to them by their own regulators, or because they too are reliant, to some extent, on bank funding to support their own lending activities. Thus, there should be scope for banks to pass along the higher lending spreads to all of their borrowers. While there could be some distributional effects arising from differences in interest elasticities and competitive conditions across lending markets, this assessment focuses only on the overall macro implications of the new rules and does not consider distributional effects across economic sectors.

3.2 Calculating the impact of capital and liquidity requirements on bank lending spreads

The first step in estimating the impact of the higher capital and liquidity standards on lending spreads was to use an error-correction statistical regression model to uncover the longer-run relationship between bank capital and liquidity metrics and lending spreads. This approach is similar to that used by the U.K. FSA, and was also used in the international assessment.¹¹

As in the international studies, the results of the above methodology were cross-checked by using a stylized accounting model of bank balance sheets. The results were subjected to sensitivity analysis, focusing particularly on different assumptions regarding returns on bank capital and changes in the starting levels for different variables.

Further information on both of these approaches can be found in Annex 1.

The findings are summarized in **Table 3**.¹² This table presents the results of the estimates for Canada using the accounting-based model and error-correction model (ECM) (columns four and five) and compares them with (i) the international results (first two columns), and (ii) the LEI report accounting-based estimate for Canada (column three).

¹¹ See Barrell et al. (2009).

¹² To be consistent with the international study, all costs are for a 1-percentage-point change in capital requirements. However, they increase linearly with the size of the change in capital requirements. Hence, a 2-percentage-point change would double the cost of a 1-percentage-point change.

**Table 3: Impact on lending spreads of a 1-percentage-point increase in capital ratios
(in basis points)**

| Country average | Country median (end period of simulation) | Canada | | |
|-----------------|--|--------------------------------------|--|--|
| | | LEI report Accounting-based model | MAG report Error - correction model | Estimated by the LEI Accounting-based model |
| 15 ½ bp | 15–16 bp | 9 bp | 7–17 bp | 14 bp |

Sources: BCBS LEI and BCBS/FSB reports and Bank of Canada estimates

Table 3 suggests that the 14-basis-point ECM results for Canada are very close to the international results of 15 to 16 basis points. These results are corroborated by the accounting-model analysis presented in Annex 1. The accounting-based approach used in the LEI study finds an average increase of about 15 basis points across countries, but less than 10 basis points for Canada. The primary reason for this difference is that the LEI study used a longer sample period (1993 to 2007) in their analysis, which led to the use of a 10 per cent return on equity for Canadian banks. If a return-on-equity assumption of 15 to 20 per cent is used for Canadian banks (which is more consistent with returns observed this decade and with the ECM analysis), the results for Canada are closer to 15 basis points.

3.3 Impact of higher lending spreads on longer-run economic output

In this part of the analysis, the 14-basis-point increase in lending spreads is used to assess the longer-run cost on the level of economic output (GDP) in terms of forgone output relative to a starting base-case projection. The lending-spread increase, or its equivalent increase in capital ratios, is inserted into several Bank of Canada macroeconomic models to evaluate the implications for the behaviour of GDP.¹³

The models used are:

- ToTEM—the Bank of Canada’s main macroeconomic policy model for the Canadian economy. This is a dynamic stochastic general-equilibrium (DSGE) model that

¹³ The increase in spreads is used as an input into ToTEM, while the other two models are able to take the changes in capital requirements directly into account in computing the impact on output.

incorporates various nominal and real frictions in the spirit of state-of-the-art New Keynesian models.¹⁴

- A DSGE model with banking sector add-ons used by the Bank of Canada. This model is explained in detail in Meh and Moran (2010) and Christensen, Meh, and Moran (2010), and is attached as Annex 3.
- BoC-GEM-FIN—the Bank of Canada’s global economic model with a banking sector add-on (as explained in Dib 2010) to capture the effects of the banking sector on global economic output (see Annex 4). This model also takes into account the impact of the higher capital and liquidity requirements on other jurisdictions, since this is a change in global requirements, not a domestic regulatory policy adjustment.

The results of this analysis are reported in **Table 4**, which summarizes the results for both Canada and the LEI study of the long-run impact of tighter capital standards. The range of the results on long-run output loss for the Canadian economy is similar to that observed in the LEI report. The average is similar to the median of the international results—i.e., about 0.1 per cent of GDP for a 1-percentage-point rise in bank capital requirements. Note that a high degree of uncertainty accompanies the calculation of long-run estimates, as evidenced by the wide range of model outcomes. Thus, the focus is on the median results of the Canadian models.

Table 4: Long-run output loss owing to a 1-percentage-point increase in capital ratios

| | Canada | LEI report |
|---------|--------------------------------------|------------|
| | (percentage deviation from baseline) | |
| Median | 0.10 | 0.10 |
| Maximum | 0.23 | 0.35 |
| Minimum | 0.04 | 0.02 |

Sources: BCBS LEI and BCBS/FSB reports and Bank of Canada estimates

3.4 Assessing the transition costs

Section 2 showed that stronger capital and liquidity standards will generate large benefits by lowering both the frequency and the intensity of financial crises, thus reducing their massive economic costs. These benefits will need to be balanced against the adjustment costs of transiting to the new standards. Indeed, introducing higher capital and liquidity requirements for banks may result in significant transition costs in the short run, since banks need time to adjust their business models in response to the new rules. If the transition costs are substantial, they set up a difficult trade-off for policy-makers between long-term gain and short-term pain. The objective of this section is to evaluate the macroeconomic effects of the transition to higher capital and liquidity requirements.

¹⁴ See Annex 2 for more details on how ToTEM is constructed and how this policy experiment was conducted.

The various channels through which bank responses to stronger capital and liquidity standards are transmitted to the real economy in the shorter run are summarized in **Box 3**.

Box 3: How banks respond to the new standards can affect the economy

The macroeconomic effects of bank responses to higher capital and liquidity requirements will be transmitted through several channels:

- Short-run consumption and investment expenditure will be dampened because higher interest margins and tighter lending standards will reduce spending by households and businesses. The duration and extent of these effects depends on whether they lead to a fall in the prices of assets used as collateral for bank lending or cause a decline in the net worth of firms through lower retained earnings.
- Restricting the tightening of capital and liquidity requirements to a single country could cause the effect on GDP of lower consumption and investment to be partially offset by weaker import demand and, hence, an improvement in net exports. A global tightening of regulatory requirements, however, could generate some reductions in domestic spending for all countries. The global nature of the regulatory changes could thus intensify the impact of any national regulatory tightening.
- Weaker GDP growth, together with the downward pressure on prices and wages, suggests the probability of a monetary policy response in which the central bank eases the stance of policy to counter the drop in output and inflation.

To assess the transition costs, it was assumed that the longer-run 14-basis-point increase in lending spreads associated with a 1-percentage-point increase in bank capital requirements would be phased in gradually over a 2- or 4-year transition period (transition costs gradually converge to the longer-run cost over 10 years, after the new standards are introduced).¹⁵ Like the assessment of the longer-run costs, this assessment was conducted using the Bank of Canada's ToTEM macroeconomic model to capture the direct effects on the domestic economy, plus the BoC-GEM-FIN model to capture the international spillover effects. Basically, the profile of the interest rate spread was inserted into ToTEM to assess the direct effects of the higher lending spread in Canada on the level of Canadian economic output.

3.4.1 Results

Table 5 summarizes the results from the ToTEM analysis, including the global spillover effects from BoC-GEM-FIN. If the transition period is 4 years, the level of GDP relative to the baseline projection declines by a maximum of roughly 0.33 per cent before converging to the longer-run 0.10 per cent decline over a 10-year time frame. This result falls within the range of the effects reported in the international study of transition costs (the MAG report). As indicated in Annex 3, the international spillover effects account for roughly 20 per cent of the total impact on the Canadian economy for the 4-year implementation period. The table also shows that the longer

¹⁵ The actual length of the implementation period will be set later this year, when the new rules are calibrated.

the implementation period, the smaller the maximum drop in aggregate output. Therefore, the length of the transition period is a critical factor in assessing the transition costs of implementing the tighter capital and liquidity rules. For example, the maximum decline in Canadian output following a 1-percentage-point increase in capital ratios is 0.3 per cent when the implementation period is 4 years, while the maximum decline is 0.5 per cent of GDP for a 2-year phase-in period.

Longer-run and transition costs were independently calculated in the two international studies. Therefore, the transition costs shown in the MAG report include the longer-run costs during the transition period. The results presented in **Table 5** are consistent with those of the MAG report to allow comparison between the results of this study and that report. However, when the longer-run and transition costs are combined in **section 4**, the transition costs are reduced to eliminate this overlap.

Table 5: Estimated deviation of GDP from baseline forecasts (%)
ToTEM analysis

| Phase-in period | ToTEM (including spillover effects) | | MAG report |
|-----------------|--|--------------------------|--|
| | Trough | 32 nd quarter | 32 nd quarter |
| 2 years | -0.48 | -0.43 | Median -0.10 (range of 0.03 to -1.34) |
| 4 years | -0.33 | -0.31 | Median -0.10 (range of 0.09 to -1.25) |

Sources: MAG report and Bank of Canada estimates

Monetary policy assumptions

It is important to note that the economic models used to generate the long-run and transition costs assume that monetary policy will respond to mitigate the effects of the more stringent bank capital and liquidity requirements on the economy. In other words, they assume that central banks will help to cushion the effects of the tighter rules by pursuing a lower path for their target

interest rates relative to their base cases.¹⁶ When combined with higher lending spreads, this policy stance would be consistent with achieving inflation targets.

Cross-checking results with vector autoregression (VAR) models

As a cross-check on this analysis, the same reduced-form estimation techniques employed in the international study of transition costs were used here. These techniques help with the examination of the statistical relationship between lending spreads and GDP. These VAR models are not grounded in any presumed theoretical relationships, but simply outline the statistical relationships that exist in the underlying data.¹⁷ The results suggest that a 1-percentage-point increase in risk-weighted asset ratios of bank capital would reduce the level of economic output by about 0.2 percent, regardless of the length of the transition period. While there is a large degree of uncertainty associated with these results, owing to data limitations, they are at least broadly consistent with the results of the previous analysis and with the results presented in the MAG study of transition costs.

3.4.2 Accounting for transition effects on the supply of credit

The analysis presented so far has focused on the economic consequences of higher lending spreads. No account has been taken of the possibility that banks could decide to restrain the growth of their balance sheets (i.e., reduce the supply of credit in the economy) to help conserve capital and liquidity to meet the tighter standards in the short run. Thus, in this section, findings are presented on how a reduction in the supply of credit could affect the level of economic output during the transition to the new standards. This analysis is conducted using ToTEM, the Christensen, Meh, and Moran model and the BoC-GEM-FIN model described above, and assesses the impact on the economy of a 1-percentage-point increase in bank capital ratios, allowing banks to adjust both lending margins and the supply of credit during the transition period.

The results are summarized in **Table 6**, (which does not include the ToTEM results as they are unchanged from those presented in **Table 5**). They incorporate both the lending-spread effects from **Table 5** and the credit-supply effects described above. The first observation is that the effects of stronger capital requirements on aggregate output are roughly similar to the upper-end results from ToTEM, when monetary policy can help to cushion some of the effects of the

¹⁶ Given very low nominal policy rates in Canada and many jurisdictions, conventional monetary policy may be unable to fully offset any unexpectedly large drag on activity. Therefore, estimates of the mitigating effects of monetary policy may be overstated. To account for this, Bank researchers examined a scenario in which monetary policy does not act to help mitigate the impact of the new rules. The likelihood of such a scenario is sufficiently small that the results are not included in this report but can be found in the annexes. Even if interest rates are low at the start, central banks could adopt unconventional monetary policy measures to help cushion the effects of the new capital and liquidity rules. See the Bank of Canada *Monetary Policy Report* of April 2009 for an explanation of how unconventional monetary policy can be conducted:
<<http://www.bankofcanada.ca/en/mpr/pdf/2009/mpr230409.pdf>>.

¹⁷ See Annex 5 for more details on how these models were constructed and used in this study.

reform (**Table 5**). This is particularly true when the transition period is long and banks do not cut lending substantially following the rise in capital requirements.

Note that, the longer the transition period, the less likely it is that credit-supply effects will have a major impact on the level of economic output, since a longer transition period would give banks more flexibility to meet the tougher regulatory requirements through increases in retained earnings and the issuance of additional capital. Furthermore, as noted previously, the new capital rules adjust the balance between conventional lending and trading activity which, all things equal, should increase incentives for banks to supply credit. The analysis does not incorporate this dynamic.

Table 6: Estimated deviation of GDP from baseline forecasts (%) of a 1-percentage-point rise in capital ratios

| Phase-in period | BoC-GEM-FIN model | | Christensen-Meh-Moran model | | MAG report (Bank-augmented DSGE models) |
|-----------------|-------------------|--------|-----------------------------|--------------------------|--|
| | Trough | 2018Q4 | Trough | 32 nd quarter | 32 nd quarter |
| <i>2 years</i> | -0.35 | -0.19 | -0.38 | -0.13 | Median -0.07 (range of -0.02 to -0.25) |
| <i>4 years</i> | -0.13 | -0.08 | -0.32 | -0.10 | Median -0.08 (range of -0.01 to -0.30) |

Sources: MAG report and Bank of Canada estimates

3.5 Evaluating the risks around the assessment of costs

There are a variety of reasons why the actual impact of the higher capital and liquidity requirements on bank lending and GDP may well be smaller than indicated by the above results.

First, higher capital and liquidity requirements may enable banks to be perceived as less risky by investors. As a result, banks may experience lower debt funding costs, and investors may not require as high returns on equity to compensate them for the risks banks are taking. This could eventually reduce, or even eliminate, the need to either raise lending rates or curtail lending activity.

Second, bank behaviour will almost certainly be affected by a strengthened regulatory environment. For instance, banks are likely to further improve operational efficiency in an effort

to cut non-interest expenses and may also adjust their business models in response to strengthened capital and liquidity standards.

Finally, the availability of alternative sources of finance that are not closely linked to banks (capital markets and retained earnings for non-financial corporations) is likely to moderate the impact of changes in credit growth on economic activity.

At the same time, a number of non-modelled factors could have a greater impact. For example, to the extent that banks cannot satisfy the new liquidity requirements from their existing stock of liquid assets or through holding residential mortgages in securitized form, the price of eligible liquid assets may increase. Second, funding markets may take time to adapt to the longer-term liabilities that banks may need to issue to meet the requirement for a future Net Stable Funding Ratio standard. Finally, bank-dependent small and medium-sized businesses may find it disproportionately difficult to obtain financing. The changes to the proposed liquidity standards announced by the BCBS in July 2010 and a longer implementation horizon for the new capital and liquidity rules would likely help to mitigate these possible effects.

On balance, the Bank judges that there are risks on both sides, and that our results represent a fair balance of the risks associated with this analysis.

4. The Net Benefits

In this section the benefits described in section 2 and the costs outlined in section 3 are considered together to outline the net benefits to be gained from increasing bank capital and liquidity requirements.

Table 7a summarizes the longer-run benefits and costs associated with higher capital and liquidity requirements for hypothetical increases in capital requirements of 2, 4, and 6 percentage points. The results suggest that the longer-run benefits are 2-3 times the longer-run costs and that the net longer-run benefits would be just under 1 per cent of GDP each year. This is a benefit that reoccurs year after year. It is also a conservative estimate, since it excludes several other benefits listed in the table that are positive but not quantified.

To link the annual net benefits with the one-time transition costs, it is important to calculate the present values of both the longer-run net benefits and the shorter-run transition costs (after eliminating the overlap between the longer-run and transition costs, as described in section 3.4.1). The results are presented in **Table 7b**. They indicate a net benefit of approximately 13 per cent of GDP, or \$200 billion (for 2009 GDP).¹⁸ If the costs of financial crises are, in fact, closer to the 63 per cent median estimate used in the international analysis instead of the 31.5 per cent assumption used in this report, the potential benefits would be substantially larger. By the same token, the net benefits continue to be positive even if the cost of a financial crisis amounts to at least 12 per cent of GDP for a 2-percentage-point increase in capital requirements (or 18 per cent of GDP in the case of a 6-percentage-point increase). See **Chart 1** for an illustration of how this assumption affects the range of possible benefits.

¹⁸ This is calculated by taking the present value of the benefits less that of costs, using a discount factor of 5 per cent.

Table 7a: Estimated long-run costs and benefits for Canada from stronger regulatory requirements (expressed as annual percentage impact on the level of GDP)

| Increase in capital ratio (percentage points) | Long-run benefits | | | | | Long-run costs | | | Net long-run benefits (%) |
|---|--|-------------|--|---|-----------------------------|-------------------------------|---------------------------------|--------------------------|---------------------------|
| | Benefit of reduced probability of crisis | | Benefit of reduced economic volatility ¹⁹ | Benefit of reduced misallocation of resources | Total long-run benefits (%) | Cost of capital standards (%) | Cost of liquidity standards (%) | Total long-run costs (%) | |
| | Domestic (%) | Foreign (%) | | | | | | | |
| 2 | 0.3 | 0.8 | Positive but not quantified | Positive but not quantified | 1.1 | -0.2 | -0.1 | -0.3 | 0.8 |
| 4 | 0.4 | 1.0 | Positive but not quantified | Positive but not quantified | 1.4 | -0.4 | -0.1 | -0.5 | 0.9 |
| 6 | 0.5 | 1.1 | Positive but not quantified | Positive but not quantified | 1.6 | -0.6 | -0.1 | -0.7 | 0.9 |

Source: Bank of Canada calculations

¹⁹ Evidence was found that increased capital reduced economic volatility for both the international and Canadian economies, but this was not quantified in terms of GDP (see section 2.3).

Table 7b: Summary – Present value of benefits and costs from stronger regulatory requirements

| Present value of cumulative benefits and costs (as per cent of GDP) | | | | |
|--|------------------------------|---------------------------|--|-------------------------|
| Increase in capital ratio (percentage points) | Long-run benefits (%) | Long-run costs (%) | Transition costs (%)²⁰ | Net benefits (%) |
| 2 | 21.6 | -6.0 | -2.6 | 13.0 |
| 4 | 28.0 | -10.0 | -4.4 | 13.6 |
| 6 | 32.0 | -14.0 | -6.2 | 11.8 |

Note: A discount factor of 5 per cent was used for all present-value calculations.

Source: Bank of Canada calculations

5. Concluding Remarks

This report summarizes the macroeconomic implications of higher bank capital and liquidity standards for the Canadian economy, and compares them with those from two international studies conducted by the Financial Stability Board and the Basel Committee on Banking Supervision, which explored the impact of the new rules on the global economy. Given Canada's low initial risk of crises, the largest benefits accrue from a reduction in the probability of future foreign crises of the type that have seriously damaged the Canadian economy in the past, reducing growth and raising unemployment. When the costs both over the longer run and during the transition period are taken into account, the general message is that the net benefits of stronger capital and liquidity requirements are likely to be large—in the order of several times the costs and amounting to 13 per cent of GDP, or \$200 billion on a net present-value basis. Additional benefits are likely as well, in terms of reducing the severity of crises when they occur, moderating regular economic cycles, and helping to alleviate misallocations of resources in the economy.

Clearly, the significant uncertainty that is embedded in both the international studies and the Bank's calculations for Canada must be acknowledged. Adding financial sector properties to mainstream macroeconomic models is in its infancy, and work continues around the world to gain a better understanding of the theoretical relationships between the financial sector and the real economy. In conducting this analysis, however, the Bank has erred on the side of

²⁰ Transition costs represent additional costs incurred over the 10-year simulation period.

conservatism in estimating the benefits and has assessed the costs using a variety of models and assumptions. The Bank finds that net benefits accrue even when conservative benefit assumptions are combined with the most extreme cost estimates. Thus, the Bank is confident that its estimates are balanced in terms of risks, and are robust to changes in underlying assumptions.

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Appendix 1: Methodologies used to calculate costs to Canadian economy of stronger capital and liquidity standards

