

# Reports: Procyclicality in the Financial System

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Reports address specific issues of relevance to the financial system (whether institutions, markets, or clearing and settlement systems) in greater depth.

## INTRODUCTION

A defining element of the policy response to the global financial turmoil has been broad agreement on the need to rigorously adopt a macroprudential approach to financial system stability. A macroprudential approach implies that the authorities take a systemic, or systemwide, perspective when considering financial behaviour and the factors affecting it.

Crucially, a macroprudential approach requires consideration of the impact of linkages and feedbacks both across the financial system broadly and with the real economy. One such feedback is that which can lead to procyclical behaviour within the financial system that might reinforce economic upturns and downturns. For instance, during a financial boom, perceived risk tends to be small, and various mechanisms may create financial leverage that reinforces the upturn (e.g., declines in capital, margin, and provisioning requirements). However, when a period of financial distress occurs, perceived risk increases rapidly, reversing this process and potentially reinforcing the downturn.

In the current difficult financial environment, for example, if banks come under pressure to increase capital, this may reinforce the increased reticence to extend credit that typically occurs during a cyclical downturn, thereby exacerbating the economic recession. Financial markets in Canada and elsewhere have, in fact, indicated a strong preference for higher levels of capital, even in instances where regulatory authorities have not generally required banks to increase capital at the current time. Examining how procyclicality could be mitigated is thus important if the financial system is to help absorb rather than amplify adverse shocks.

A substantial international agenda has emerged with respect to implementing a macroprudential approach and, within that, to reducing the potential for procyclical behaviour in the financial system. In particular, G-20 leaders during the London Summit of 2 April 2009 emphasized the need to identify and take account of macroprudential risks and to mitigate procyclicality—work to be undertaken by various international forums over the course of 2009.

Canadian authorities are participating in international efforts to study and, where appropriate, mitigate procyclical behaviour in the financial system. The reports in this special section of the *Financial System Review* each provide an overview of a particular topic relevant to this work. Note that procyclicality may emerge from a variety of sources in the financial system, including the regulatory framework itself and the procedures and conventions adopted in financial markets and transactions.

*Procyclicality and Bank Capital* examines one of the most active areas of discussion: the possibility that pressures on bank capital may influence the willingness of banks to extend credit and thereby affect the real economy. This might occur if there is a tendency to reduce capital ratios during an upturn, owing to a perceived reduction in risk, but a need to raise them during a downturn, possibly reinforcing the slowing in economic activity. In particular, counter-cyclical capital buffers, which would augment capital during an upturn but allow it to fall when economic and financial conditions deteriorate, may help mitigate the procyclical effects arising from bank capital. Nevertheless, many questions remain regarding the design of such a mechanism.

Loan-loss provisions represent another avenue through which procyclical tendencies may emerge. Loan losses,

and thus provisions, tend to be low during an economic expansion, but both may rise rapidly during an economic contraction. Volatility in loan-loss provisions can affect retained earnings and, consequently, bank capital. *Procyclicality and Provisioning: Conceptual Issues, Approaches, and Empirical Evidence* examines the conceptual issues surrounding loan-loss provisioning and presents evidence on its historical impact on capital. It concludes that provisioning is unlikely a major factor contributing to the procyclicality of capital.

A disturbing aspect of recent financial developments was the extent to which some international financial institutions increased their leverage ratios (defined as total assets to total capital) to very high levels prior to the crisis, consequently raising their vulnerability to the turmoil. Leverage ratios for Canadian banks, which are subject to a ceiling specified by the Canadian regulator (OSFI), were generally lower than those of their peers. *Regulatory Constraints on Leverage: The Canadian Experience* discusses how this may have helped to limit excessive risk taking during the upturn, thus reducing vulnerabilities and procyclical behaviour in the downturn.

*Procyclicality and Value at Risk* examines the means whereby the extensive use of value-at-risk (VaR) measures may have reinforced procyclicality in the financial system. These techniques make ample use of volatility measures to evaluate risk. Since volatility is generally lower during periods of financial calm than in periods of financial distress, VaR measures based on a short moving window can lead to large jumps in perceived risk and, hence, in required capital (against, for example, banks' trading books) when financial turmoil hits. Several potential avenues for mitigating this effect are discussed, including "through the cycle" approaches to estimating VaR.

Margins, or haircuts, are typically applied in financial transactions to provide a measure of protection—cash, which is less than the value of the asset or collateral put up for purchase, is paid at the time of purchase. These margin rules are also often based on VaR measures and, thus, require lower margins during financial booms, when asset prices are rising and volatility is low, than during periods of financial distress, when asset prices may be falling and volatility is high. As discussed in *Procyclicality and Margin Requirements*, this can have the effect of boosting financial activity further during the boom and impeding market liquidity in periods of financial turmoil. There are different possible approaches to mitigating this source of procyclicality, including making margin rules less dependent on near-term market conditions.

Compensation practices at large financial institutions are widely believed to have been a factor contributing to the financial crisis. By possibly embedding incentives that lead to a focus on short-term financial returns without adequately adjusting for risk, they potentially reinforce behaviour that supports excessive risk taking during good

times, exacerbating the development of an asset-price bubble and subsequent financial collapse. *Procyclicality and Compensation* compares the stylized facts regarding the compensation arrangements at major Canadian and U.S. financial institutions.

# Procyclicality and Bank Capital

Neville Arjani

In many countries, including Canada, banks are required by regulation to maintain a minimum level of capital in proportion to the riskiness of their assets. This is intended to absorb unexpected losses and ultimately mitigate the risk of insolvency. The Basel Accord, developed in 1988 by the Basel Committee on Banking Supervision (BCBS), was a significant initiative on this front that introduced risk-based regulatory guidelines for the capital treatment of banks' exposures.<sup>1</sup> Fundamental to the Accord is a guideline promoting a minimum capital-adequacy ratio. Based on this guideline, banks should be required to maintain Tier 1 and total capital equal to *at least* 4 per cent and 8 per cent of the value of their total risk-weighted assets, respectively.<sup>2</sup> The Accord has been adopted by domestic regulators in countries around the world, including Canada. For example, the Office of the Superintendent of Financial Institutions (OSFI) has issued guidelines to chartered banks based on the Basel framework, including the requirement that they maintain a minimum Tier 1 capital ratio of 7 per cent and a total capital ratio of 10 per cent.<sup>3</sup>

A revised version of the Accord—known as Basel II—was recently implemented in most major economies and seeks to improve on the original version in several areas.<sup>4</sup> One key improvement is better alignment of the calculation of banks' risk-weighted assets with actual risk. As discussed

on page 15 of the December FSR (Bank of Canada 2008), however, this change could generate cyclicity in capital requirements, where higher capital is required in bad times and lower capital in good times.<sup>5</sup> This concerns policy-makers, because such cyclicity of capital could lead to procyclicality—that is, it could amplify natural fluctuations in the financial system, and ultimately, undermine financial and economic stability.

This article elaborates on this concern and briefly outlines some features of the Basel II framework that are intended to address it. It goes on to suggest that the addition of an explicit *counter-cyclical* element to the current Basel framework could help to further counteract procyclicality in banks' activities (e.g., lending and market activities) and thus enhance the stability of the financial cycle. In particular, a counter-cyclical mechanism, as defined in this article, would encourage banks to increase their capital base above minimum regulatory requirements during good times—when risk from the perspective of an individual bank is perceived to be low and risk at the system level is likely to be increasing—and allow them to draw down this capital buffer when conditions are weak. The use of counter-cyclical regulatory measures to “lean against the wind” when indications of excesses in the financial system begin to emerge is consistent with a macroprudential view and is gaining attention as authorities look beyond the recent financial turmoil (e.g., Brunnermeier et al. 2009; Goodhart and Persaud 2008). As will be discussed, however, there is still much work ahead in terms of the design of a counter-cyclical regulatory mechanism and also in building an effective policy framework for its implementation.

1 Information on the Basel framework can be found on the Bank for International Settlements (BIS) website at <<http://www.bis.org/bcbs>>.

2 Tier 1 capital generally refers to equity capital and disclosed reserves (including retained earnings) and is viewed to be of higher *quality* than total capital. The latter includes items such as hybrid debt instruments, including cumulative preferred shares and other “innovative” capital instruments, and also longer-term subordinated debt. Total risk-weighted assets encompass exposure to credit, market, and operational risk.

3 These guidelines can be found on the OSFI website at <<http://www.osfi-bsif.gc.ca>>.

4 Canada's major banks began reporting under Basel II in the first quarter of 2008.

5 Illing and Paulin (2004) study the potential cyclicity of capital under the Basel II framework with application to the Canadian banking system.

## BASEL II AND PROCYCLICALITY

Under Pillar I of Basel II, banks have three options for calculating the credit-risk-weighted value attached to assets held in the banking book: the Standardized approach; the “Foundation” Internal Ratings-Based (FIRB) approach; and the “Advanced” Internal Ratings-Based (AIRB) approach.<sup>6</sup> Under the two IRB approaches, risk inputs for each asset—including the probability of default (PD), exposure-at-default, loss-given-default, and maturity—are taken together and mapped into a risk-weighted value for the asset using formulae developed by the BCBS. In the AIRB approach, all risk inputs are provided by banks, based on their internal estimates. Under the FIRB approach, only the PDs are provided by banks, and all other variables represent values set by the national supervisory authority.<sup>7</sup>

A potential problem arises because estimates of risk generally vary over time based on economic and financial conditions. For example, during a period of sustained economic growth, estimated probabilities of default are likely to fall, prompting lower minimum capital requirements per unit of risk-weighted assets under Basel II. This capital relief presents an opportunity for banks to increase their supply of loans or to purchase other assets at a stage of the cycle when lending conditions tend to be easy and asset prices may be rising rapidly. From the perspective of a single bank, putting this excess capital to work seems rational, given its objective of maximizing the return to its shareholders. When many banks collectively follow the same strategy, however, risk in the broader financial system (hereafter referred to as “macroprudential risk”) will increase.<sup>8</sup> That is, the ensuing higher leverage in the banking sector could amplify the severity of a real or financial shock, such that banks’ capital may be insufficient to manage the unanticipated loan losses and asset writedowns that accompany the shock if and when it occurs. Rising default risk associated with a subsequent economic downturn will also raise minimum required capital under Basel II, further adding to this strain.

Since it can be difficult for banks to raise new capital in the midst of such conditions, they may be required to restrict loans or liquidate investments to continue to meet minimum regulatory capital requirements and, ultimately, avoid insolvency. Once again, from the perspective of a single bank, this would appear to be a prudent action. However, when

all banks are forced to engage in this deleveraging process at the same time, the widespread reduction in loans and the excessive fall in asset prices will further aggravate the downturn. This, in turn, could place even greater strain on the capital positions of banks and, ultimately, undermine economic and financial stability.

## BASEL II AND EFFORTS TO COUNTERACT PROCYCLICALITY

The potential of Basel II to induce procyclicality is of key concern to policy-makers, and work is ongoing at the international level to address this. For instance, several measures intended to reduce the cyclical risk sensitivity of minimum capital requirements have already been incorporated into Basel II. These include a requirement for banks using the AIRB approach to measure loss-given-default at levels likely to prevail during an economic downturn;<sup>9</sup> supervisory scope to encourage the use of through-the-cycle estimates of PD instead of point-in-time estimates, which will help to smooth default risk estimates over good and bad times;<sup>10</sup> and a requirement that banks using the IRB approach maintain sound stress-testing procedures in their assessment of capital adequacy, including a stress test for credit risk that considers *at least* the effect of a mild recession.<sup>11</sup>

Moreover, from a macroprudential perspective, there is also growing support for the addition of a *counter-cyclical* “add-on” within Basel II. This is based on the view that the current Basel framework—which focuses on preserving the solvency of individual banks by requiring them to hold capital in accordance with their risk-weighted assets—does not pay sufficient attention to banks’ common exposure to systemwide risk factors. With a counter-cyclical mechanism in place, banks would, for instance, be required to enhance their capital base above the minimum Basel requirement during a cyclical upswing. As mentioned earlier, this is when capital requirements under the current Basel framework are expected to be falling, while macroprudential risk is building. In turn, banks should be allowed to draw on this capital buffer to absorb unexpected losses that may arise in a subsequent downturn.

It follows that this proposal has two main objectives as a means of counteracting procyclicality. First, it should help to constrain the buildup of macroprudential risk during good times, thereby reducing the severity of a real or financial shock if and when one occurs. Second, it should strengthen banks’ balance sheets and the ability of banks to deal with any shocks that do materialize. This would help

6 Use of AIRB requires supervisory approval. OSFI has approved the use of AIRB by Canada’s major banks.

7 For retail exposures, such as personal mortgages and lines of credit, there is no Foundation IRB variant, and banks are required to provide estimated risk inputs based on pools of similar exposures.

8 The article draws from Borio (2003) in distinguishing between the microprudential and macroprudential view. A fundamental distinction between the two is that the former focuses on the prevention of distress at the individual-institution level, while the latter focuses on the prevention of systemwide distress. Moreover, as alluded to above, the macroprudential view recognizes that the collective efforts of individual institutions to improve the health of their balance sheets could result in harmful feedback effects that threaten the stability of the financial system as a whole.

9 See Pillar I of Basel II Framework, paras. 468 to 473. Available at <<http://www.bis.org/bcbs>>.

10 Ibid., paras. 461 to 463.

11 Ibid., paras. 434 to 437. Pillar I states that the objective of this test is not to consider the outcome under a worst-case scenario. Based on hindsight, a more conservative approach to these tests would have been helpful.

to reduce or eliminate economically harmful deleveraging in the downturn and, ultimately, aid in preserving bank solvency. An example of a counter-cyclical add-on is a rule-based mechanism that links capital requirements to the state of the financial cycle and, therefore, to macroprudential risk. This is discussed in more detail below.

## OPTIONS FOR THE DESIGN OF A COUNTER-CYCLICAL MECHANISM

The concept of requiring banks to hold more capital in good times and less in bad times is not new (e.g., Borio, Furfine, and Lowe 2001; Borio 2003; Kashyap and Stein 2004). However, the design of a rule-based, counter-cyclical mechanism is still in its early stages, and broad consensus on its formulation has yet to emerge. Many policy issues relating to the implementation of this proposal have also yet to be resolved.

This section lays out a possible design option for a counter-cyclical mechanism. The approach is similar to that taken by Brunnermeier et al. (2009) in that it proposes a macroprudential adjustment to the Pillar I capital-adequacy ratio, using a risk-based multiplier (explained below). The adjustment comes by way of directly including the multiplier in the calculation of the ratio. To illustrate, the equation below is a simplified version of the capital-adequacy ratio under Basel II, where a scaling factor (denoted “A”) is applied to the denominator, which comprises total risk-weighted assets. It deserves mention that the calculation of total risk-weighted assets under the Basel framework—which encompasses a bank’s exposure to credit, market, and operational risk—is left unchanged under this proposal.<sup>12</sup>

$$\text{Minimum capital-adequacy ratio} = \frac{\text{Capital}}{A[\text{Credit RWA} + \text{Market RWA} + \text{Operational RWA}]}$$

In this case, A could be linked to one or more indicators of the state of the financial cycle, such as credit growth or asset prices.<sup>13</sup> The scaling factor will rise above unity during good times, as macroprudential risk builds (requiring banks to hold more capital to maintain the same ratio, all else being equal), and fall below unity during periods of decline, as losses are realized and vulnerabilities are gradually reduced.

It follows that a challenge in the design of this rule will be to find a formulaic expression that allows for the buildup of a capital buffer during the growth stage of the cycle, and the

<sup>12</sup> The application of a scaling factor against *total* risk-weighted assets should help to mitigate the potential for procyclicality stemming not only from a bank’s credit-risk assessment, but also from its assessment of market and operational risk.

<sup>13</sup> Misina, St-Amant, and Tkacz (2008) assess the performance of various measures of credit and asset prices as early-warning indicators of financial system vulnerability, both historically and during the recent financial turmoil.

subsequent decline of this buffer that can keep pace with unanticipated losses during the downturn. Overcoming this challenge is expected to entail careful judgment on the part of regulators—supported by extensive empirical analysis—regarding both the appropriate level of buffer capital that banks should be required to accumulate going into a downturn, as well as how the level of buffer capital should adjust over the course of the downturn. Regarding the latter, it could be argued that, if the capital buffer is allowed to be depleted prior to all losses being realized by a bank, the risk of a subsequent insolvency may be increased. This is because it may be too difficult for a bank to raise fresh capital at a later time while in the midst of reporting losses. Of course, the optimal timing of buffer withdrawal poses a significant challenge to regulators, given that it is virtually impossible to determine the length and severity of a downturn *ex ante*.<sup>14</sup> On the other hand, from a macroprudential perspective, a faster reduction in the capital buffer could help to mitigate any adverse systemwide feedback effects, thereby reducing the extent of banks’ future losses. The chosen solution for a counter-cyclical mechanism should seek to appropriately balance these microprudential and macroprudential concerns.

Another fundamental design issue relates to the choice of anchor variable(s). For example, in the formulation governing the parameter A above, either micro-level variables (i.e., those measured at the individual bank or sector level) or macrofinancial variables could be used. On this point, one might argue that, if the goal of policy-makers is the buildup of a capital buffer in good times that can subsequently be drawn down in bad times—that is, to tie the value of the buffer to the level of macroprudential risk—then macrofinancial variables will serve as a more suitable anchor. For instance, rapid growth in asset prices (e.g., housing, equities) and in private credit are often cited in the literature as conditions preceding financial crises.<sup>15</sup> At the same time, the use of micro-level variables may actually amplify risk at the system level. For example, where individual bank profitability is used as an anchor, poorly managed banks will benefit from relatively lower capital requirements in a cyclical upswing. This, in turn, will allow them to grow their balance sheets further, possibly by taking on ever-greater risk in search of higher returns for shareholders.

One benefit of using micro-level variables as an anchor, such as bank or industry profitability, is that the buildup of a capital buffer will be required when institutions are performing well and are most capable of raising new capital in the market. In contrast, where macrofinancial variables serve as an anchor, a scenario could arise where the

<sup>14</sup> Dickson (2009b) notes that a significant challenge associated with the macroprudential calibration of regulatory policy tools, such as capital requirements, stems from difficulties associated with the prediction of cycles.

<sup>15</sup> Recent examples of this work include Borio and Drehmann (2009) and Laeven and Valencia (2008).

economy is performing well but the banking sector is not. This could make it difficult for banks to raise capital and could lead to deleveraging.

Whether one chooses micro-based or macrofinancial variables as an anchor, a key objective is to identify variables that are robust over time and, perhaps, across countries (see next section), and for which data are generally accurate and readily available. For illustrative purposes, Box 1 outlines the formulation of a scaling factor similar to *A* above, using aggregate private sector credit growth as an anchor variable.

## SELECTED POLICY ISSUES RELATED TO IMPLEMENTATION

In addition to rule formulation, there are several policy-implementation issues that require greater attention.

### Rule-Based or Discretionary Mechanism?

The preceding discussion has focused largely on a rule-based approach. This approach, as opposed to one founded on supervisory discretion, may be preferred because it serves as an effective pre-commitment device, in that supervisors will not be put in the difficult and unpopular position of requesting on an ad hoc basis that banks raise their capital in the middle of an economic boom.<sup>16</sup> On a related note, the consistent application of a rule-based approach will enhance transparency for market participants, potentially making it easier for banks to reduce capital during a downturn without the risk of investors and rating agencies reacting negatively. Where market participants are aware that the buildup and subsequent drawdown of a capital buffer by banks are part of the routine functioning of the Basel framework, they may be less inclined to react in an unfavourable manner.<sup>17</sup>

### Pillar I or Pillar II?<sup>18</sup>

Related to the above point, it is not clear whether a rule-based mechanism must be hard-wired into the calculation of the Pillar I minimum capital-adequacy ratio. Instead, one could envision a similar rule-based approach as a tool under the Pillar II supervisory review process, perhaps as a complement to existing guidelines on macro stress testing.

A tool that helps to determine the buildup of macroprudential risk in the financial system would be useful to supervisors in assessing the extent to which banks' measurement of risk and their calculation of capital take into account system-level considerations.

A Pillar II solution may be quicker to implement, since it avoids having to revisit the design of Pillar I. It also offers relatively greater flexibility for supervisors to implement the rule as they see fit in their respective jurisdictions. This may prove important, especially where practical differences emerge across jurisdictions. For example, differences might emerge in terms of: precise rule formulation; the degree of procyclicality brought about under Basel II, which will be affected by each country's economic and financial structure; and the choice of anchor variables that best capture the buildup of macroprudential risk in each jurisdiction. On the other hand, a Pillar I solution will likely facilitate greater international consistency in the regulation of capital, which would benefit banks that maintain operations in multiple jurisdictions.

There may be other difficulties associated with implementation in Pillar II. First, without being hard-wired into Pillar I as an "automatic" feature, there is always the possibility that the rule will not be enforced, and this could lead to cross-institutional and/or cross-jurisdictional distortions. Second, even where the rule is appropriately enforced under Pillar II, supervisory intervention may take place with a longer time lag relative to an automatically adjusting Pillar I solution. This means that macroprudential risk could build for some time without the presence of accompanying capital buffers. The flip side of this, of course, is that under Pillar II there may be less chance of regulatory capital requirements reacting to false indications of macroprudential risk, since supervisors will have time to explore and confirm the results of the rule before requiring banks to take action. Finally, it would be more difficult to achieve the benefits of investor transparency and pre-commitment under a Pillar II solution. As mentioned, this could hinder the policy's effectiveness, particularly during a downturn when market participants may be demanding greater capital and thus might not look favourably on a capital reduction.

### What Degree of Counter-Cyclicality Is Desirable?

As noted in the December 2008 FSR, another fundamental question is by how much do capital requirements need to be adjusted to counter procyclicality and maximize the improvement in financial stability. A response that is too aggressive will have adverse effects on the efficiency of the financial system, while too lenient a response will leave the system vulnerable to risk. Given the recent introduction of Basel II, a better understanding of the *actual* cyclicality of capital under this framework and its ability to amplify fluctuations in the financial cycle is a crucial first step in determining the formulation of any macroprudential rule

<sup>16</sup> For more on this issue, see Dickson (2009a).

<sup>17</sup> It could also be argued, however, that a rule-based approach will open up opportunities for gaming and arbitrage, which might not arise under a less transparent discretionary regime.

<sup>18</sup> The Basel II framework consists of three Pillars. Pillar I includes guidelines on minimum capital requirements and continues to be based on the concept of a minimum capital-adequacy ratio. Pillar II represents the supervisory review process and is based on a series of guiding principles pointing to the need for supervisory review of banks' assessments of their capital needs, and for appropriate actions to be taken in response to those assessments. Pillar III complements the first two Pillars by encouraging market discipline through the development of a set of disclosure requirements of key information about banks' risk profiles and levels of capitalization.

## Simple Example of a Multiplier Based on Private Credit Growth

In the simplified minimum capital-adequacy ratio shown on page 35, “A” represents a scaling factor to be multiplied by total risk-weighted assets—the sum of credit-, market-, and operational-risk-weighted assets. The objective is to design a formula governing this multiplier such that it will rise above unity as macroprudential risk builds in the system and fall below unity during economic downturns, helping banks to absorb losses and, thus, limiting the potential for harmful deleveraging and/or bank insolvency.

One way of capturing macroprudential risk at a given point in time might be to compare the real growth rate of private credit—comprising household and business credit—with its trend rate. Since credit booms are often cited as preceding financial crises, it seems reasonable to explore this variable as a potential anchor for the multiplier.

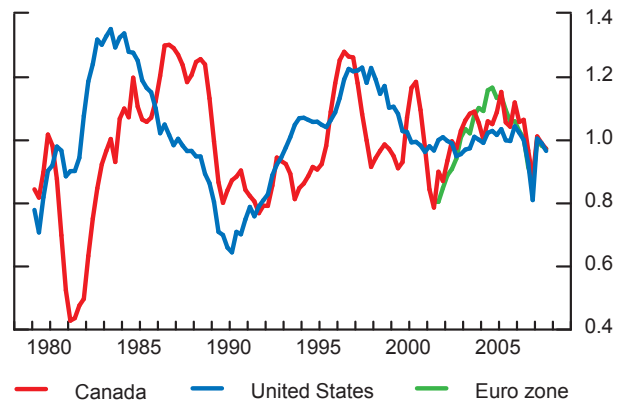
In this example, the current growth of private credit is represented by the year-over-year growth rate, while a simple moving average of this rate over the longer term serves as the trend variable. A separate scaling factor, “B,” is added to the multiplier equation to demonstrate that virtually any magnitude of counter-cyclicalcy can be achieved with this rule, depending on the preferences of policy-makers. More specifically, the multiplier is calculated as follows:

$$A = 1 + B[(Y/Y \text{ growth rate} - \text{moving average of } Y/Y \text{ growth})/100].$$

Chart A shows the value of this multiplier since 1980—a period spanning a number of cycles—for Canada, the United States, and the euro zone. To generate these series, a 10-year moving average was used in the case of Canada and the United States, while a 3-year moving average was used in the case of the euro zone to accommodate the shorter data set. In all cases, the *B* parameter is arbitrarily chosen to equal 5.<sup>1</sup> The pronounced

<sup>1</sup> Although arbitrarily chosen in this illustration, the value of the counter-cyclical parameter (*B*) requires careful consideration by the regulatory authority. The size of *B* will directly affect the size of the swings in *A* (and thus the level of the required capital buffer) over the cycle. On this point, one option might be to use historical values of *A* in determining the appropriate range of the buffer from peak to trough. In the context of the dual objectives of a supervisor, outlined in Kashyap and Stein (2004), the higher the value of *B*, the greater is the risk that productive investment will be foregone during the growth stage of the cycle, with lower risk of insolvency in the downturn as banks will accumulate a higher capital buffer to absorb losses. Conversely, a very low value for *B* will result in the system being left vulnerable to risk in good times, while the risk of insolvency will be increased in bad times (because of a lower accumulated buffer). In this case, foregone productive investment and institution insolvency are likely outcomes.

Chart A: Multiplier based on growth of private credit



Multiplier for Canada and the United States =  $1 + B[(Y/Y \text{ real credit growth} - 10\text{-yr MA})/100]$ ;  $B = 5$ . Multiplier for the euro zone =  $1 + B[(Y/Y \text{ real credit growth} - 3\text{-yr MA})/100]$ ;  $B = 5$   
Sources: Statistics Canada, U.S. Federal Reserve, European Central Bank, and author's calculations

decrease in the value of the Canadian multiplier in the early 1980s is linked to the significant economic downturn that Canada suffered in 1981–82, which resulted in a considerable decline in private credit growth.

Of course, the increasingly global nature of banks' activities means that they could be exposed to macroprudential risk in more than one jurisdiction. Thus, a macroprudential rule focused on conditions in a single country will not reflect the actual risk exposure of a bank that maintains only a portion of its activities there. One way of overcoming this is to build a revised multiplier ( $A^*$ ) that accounts for the share of total risk-weighted assets in each of a bank's active jurisdictions. For instance, the revised multiplier could be calculated as a simple weighted average:

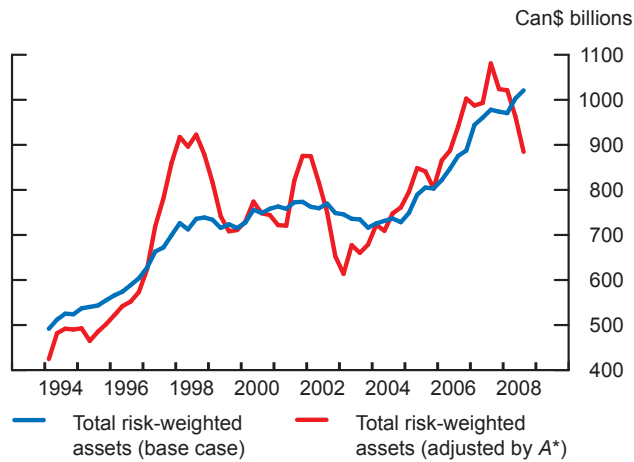
$$A^* = \sum_{i=1}^N s_i A_i,$$

where the calculation of *A* is the same as above, and *s* represents the share of a bank's total risk-weighted assets in each active jurisdiction  $i = (1, \dots, N)$ . Chart B shows the product of this revised multiplier and the total risk-weighted assets of major Canadian banks over time. For this example, it is hypothetically assumed that 80 per cent of major Canadian banks' total risk-weighted

(cont'd)

Box 1 (cont'd)

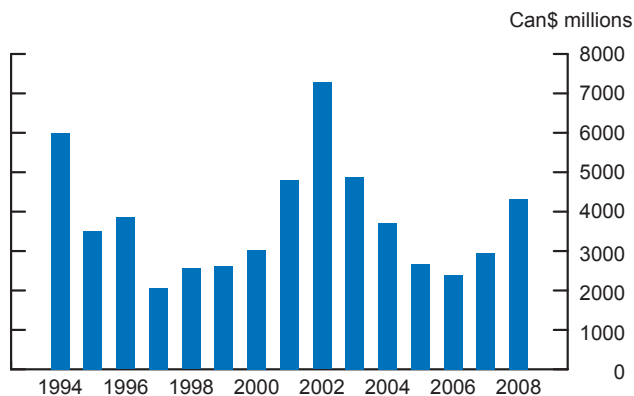
**Chart B: Effect of revised multiplier on risk-weighted assets**



$A^* = 0.80(\text{Cda "A"}) + 0.20(\text{U.S. "A"})$ ;  $B = 5$  in both calculations of  $A$ .  
Sources: OSFI and Bank of Canada

assets originate in Canada, and 20 per cent originate in the United States. Data for Canadian banks' total risk-weighted assets are available from 1994Q1 and reflect Basel I figures up to 2007Q4. The original (base-case) value of total risk-weighted assets is also shown in Chart B.

**Chart C: Annual credit losses of major Canadian banks**  
(Net of recoveries)



Note: Fiscal year-end for major Canadian banks is the end of October.  
Sources: OSFI and Bank of Canada

Chart B shows the impact of the hypothetical multiplier on the denominator of the capital-adequacy ratio. In terms of the above-mentioned objectives of the multiplier, some points are worth noting. Of particular interest is the period between 2004Q2 and 2007Q2 which, in hindsight, exhibited a buildup of macroprudential risk. Chart B indicates that, for the major Canadian banks to achieve the same capital-adequacy ratio (all else being equal) during this period with the multiplier in place, quarterly capital requirements would have been, on average, about 6 per cent higher. If we look further back, the largest discrepancy between base-case and adjusted risk-weighted assets appears during the late 1990s, when Canadian banks continued to report strong earnings with relatively low credit losses (Chart C) during the Asian financial crisis. In particular, between 1997Q2 and 1999Q2, with the multiplier in place, quarterly capital requirements would have been, on average, almost 18 per cent higher to achieve the same capital-adequacy ratio, all else being equal. Finally, Chart B shows that the amount of capital required would have fallen during 2002 and into 2003—a time when the major Canadian banks reported relatively large credit losses at fiscal year-end as a result of the major economic slowdown that began earlier in the decade.

To reiterate, this analysis is not intended as a proposal, but rather as a means of illustrating some fundamental issues in the design of a counter-cyclical, rule-based mechanism as part of the Basel II framework. Of course, much work remains to be done in this area, not only in terms of testing the performance of other potential anchor variables, as well as other functional forms for the rule, but also in addressing the key policy implementation issues raised in this article, not the least of which is the desirable degree of counter-cyclicality.



and the desired degree of counter-cyclicality. To this end, the Bank of Canada encourages the ongoing work of the BCBS to better understand the behaviour of banks' capital levels through the cycle under Basel II. Moreover, in formulating a rule based on a desired level of counter-cyclicality, one must take into account the net effect of all proposals currently being discussed to contend with procyclicality at both the microprudential and macroprudential levels. Some issues to consider in identifying the desirable degree of procyclicality in practice are outlined in Box 1.

## INTERNATIONAL EFFORTS GOING FORWARD

The issue of procyclicality and bank capital has received a great deal of attention in light of the ongoing global financial turmoil. In response, policy-makers are seeking to address this concern in the near term. As already mentioned, the BCBS continues to monitor the cyclicality of bank capital under Basel II. In November 2008, it published its *Comprehensive Strategy* to address the lessons of the current banking crisis, which includes “building additional shock absorbers into the capital framework that can be drawn upon during periods of stress and dampen procyclicality.”<sup>19</sup> The development of a concrete proposal to achieve this goal will be an important area of work in 2009. The efforts of the BCBS were endorsed more recently by both the G-20 and the Financial Stability Forum (FSF).<sup>20</sup> As progress continues, the need for collaboration at the international level will become even more important.

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- <sup>19</sup> See the BIS website for the BCBS press release at <<http://www.bis.org/bcbs>>.
- <sup>20</sup> See the G-20 Leaders Communiqué, “The Global Plan for Recovery and Reform,” and also the “Report of the Financial Stability Forum on Addressing Procyclicality in the Financial System.” Both were released in April 2009.



# Procyclicality and Provisioning: Conceptual Issues, Approaches, and Empirical Evidence

Miroslav Misina\*

Losses in the loan portfolios of banks tend to follow economic cycles, falling during expansions and rising during downturns. Banks recognize these losses through loan-loss provisioning. Since such charges<sup>1</sup> are a deduction from income, procyclicality of provisions may, all else being equal, lead to an increase in the volatility and procyclicality of bank earnings, retained earnings, and, consequently, bank capital. Reductions in bank capital (or its growth rate) during economic downturns pressure banks to raise additional capital when that may be difficult, and may lead them to sell assets or curtail their lending activities in order to meet regulatory requirements.

Provisioning is only one of the factors that jointly determine the behaviour of bank capital.<sup>2</sup> The contribution of provisioning to the procyclicality of capital depends on the timing of provisions relative to the economic cycle and on the impact of provisioning on capital.

This article examines the conceptual issues underlying the debate on provisioning and procyclicality, describes the approaches currently under discussion at various international forums to address procyclicality arising from the provisioning channel, and presents empirical evidence on the relative impact of provisioning on capital.

## CONCEPTUAL ISSUES

The relationship between provisioning and the economic cycle depends on when provisions are made relative to the

occurrence of losses. Of the range of views that exist, the following are the two extremes:

- Provisions should be set aside only on the basis of losses actually incurred. This amounts to recognition of a factual state rather than its anticipation. In this case, the timing of losses and provisions coincides.
- For every loan granted, an expected loss can be defined, based on the quality of the borrower's credit (measured by their credit rating, probability of default, credit score, etc.). Provisions should be set aside at the time of loan origination to cover the expected loss between the origination of the loan and its maturity. In this case, provisioning does not depend on any evidence of deterioration in credit quality and is unrelated to the actual occurrence of losses.

While these views are more extreme than actual practice, the difference between them illustrates the differing views on provisioning in the accounting and regulatory-capital models.

From an accounting viewpoint, provisions represent reductions in the carrying amount of a loan, or a group of loans, based on evidence of impairment. Although there are some differences across jurisdictions, the accounting model that underlies this reasoning is based on the notion of *incurred loss*.<sup>3</sup>

In contrast, the regulatory model assumes that provisions will be set aside to cover *expected losses* and that capital is then used to cover unexpected losses. Shortfalls in actual

\* I would like to thank Karen Stothers and Richard Gresser (OSFI) for valuable comments and suggestions.

1 Terminology differs across jurisdictions. In the CICA Handbook, the charge is referred to as a "charge for impairment." Internationally, it is more commonly referred to as a "loan-loss provision."

2 Others include the overall performance of a bank as measured by its net income, its dividend policy, tax code, etc.

3 Canadian accounting rules state that "When a loan or portfolio of loans becomes impaired as a result of deterioration in credit quality, the carrying amount of the loan should be reduced. The reduction in the carrying amount should be recognized as a charge in the statement of income in the period in which impairment is identified" (CICA, Sec. 3025). The difference between the evidence of deterioration in credit quality and incurred losses is subtle.

provisions relative to expected losses directly affect capital. The relationship between expected and incurred losses over the business cycle is complex, but, in general, it can be characterized as follows:<sup>4</sup>

- During economic downturns, both expected and incurred losses will increase, but expected losses are likely to increase very early on, whereas actual losses materialize (and are recognized in the form of provisions) at a later time. During downturns, these different dynamics may result in persistent shortfalls and, thus, in reductions in regulatory capital precisely when it may be needed the most.
- During prolonged economic upturns, both expected and incurred losses will tend to be low. It should not be taken for granted, however, that these periods will generate persistent excess provisions over expected losses and, hence, consequent increases in regulatory capital.

The tension between the accounting model and the regulatory model reflects their different purposes: While the objective of the accounting model is to provide an accurate snapshot of the financial situation of an institution at a given moment, the regulatory model is primarily concerned with the soundness of individual institutions and, ultimately, their solvency.

## AN OVERVIEW OF APPROACHES

Given that provisioning is currently subject to the accounting model and that the timing of provisioning based on the concept of incurred loss tends to mimic the timing of economic cycles, the potential for provisioning to reinforce the procyclical elements in the financial system has led to a range of proposals to mitigate this impact. The solutions proposed for dealing with the timing aspects of procyclicality can be grouped into two categories:

- *Solutions within the existing accounting model.* These include using the full fair-value option available within the model or retaining the incurred-cost approach but allowing more scope for expert judgment in its application.
- *Solutions within the regulatory model.* These range from leaving the accounting model intact and working directly on modelling expected losses and their cyclicity, to proposals that the accounting model be abandoned and replaced by some form of “dynamic provisioning.”

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<sup>4</sup> It should be noted that the notion of expected loss within the regulatory model has a range of meanings, from forecasts of losses on non-defaulted assets to estimates of losses on defaulted assets. The discussion in this article does not depend on the precise meaning within that range, nor does it depend on whether one takes a “point-in-time,” or “longer-term-average” view of expected losses, although in the latter case, the dynamics described here would be somewhat muted.

## Solutions within the existing accounting model

One option within the existing accounting model is to replace valuation of loans at amortized cost and provisioning-based loss recognition with the full fair-value option in which changes in value would have a direct impact on financial statements. Aside from the problem of applying the fair-value approach to loans, recent debates among regulators on the role of fair-value accounting in the current crisis suggest that this is not the preferred solution.

The other option is to retain the accounting model based on the incurred loss but make it more flexible. The current system in Canada can be used to illustrate the second option. Canadian provisioning rules exhibit greater flexibility in assessing the deterioration of credit quality than the international standards, while still being consistent with those standards. The key reason for this is that the application of provisioning rules in Canada allows for a greater degree of judgment in assessing the deterioration of credit quality.<sup>5</sup> CICA, Sec. 3025.16 states that “Estimates of the amounts and timing of expected future cash flows from impaired loans reflect management’s best judgment, based on reasonable and supportable assumptions, and take into account the range of possible outcomes.” The built-in flexibility could, in principle, be used to counter the inherently procyclical nature of provisioning or, at the very least, as a means to achieve robust provisioning at all points in the economic cycle.

While additional flexibility is intended to facilitate a more timely and precise assessment of the extent of impairment in the loans portfolio, it could result in earnings management. One way to guard against that risk is to require greater disclosure.

## Solutions within the regulatory model

Solutions within the regulatory model have come to be known generally as “dynamic provisioning.” Despite the frequent use of this term, there seems to be some vagueness regarding its meaning. There are two possible interpretations:

- (i) Any scheme that, relative to the current provisioning regime, leads to increased provisioning during economic expansions and thus generates “reserves” that can be used to cover credit losses in downturns.
- (ii) A provisioning scheme that is based on recognition of the expected losses inherent in a loan at its origination.

The key difference between these two interpretations is that the objective of the first is to relate provisions to indicators of the state of the economy, whereas in the second, provisions are set equal to expected losses. Expected losses are, in turn, a function of the probability of default (PD) and

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<sup>5</sup> This thinking is very much in evidence in OSFI’s guidelines on general allowances (C-5).

loss-given-default (LGD). Both PD and LGD may be a function of a broader set of variables, but the issues here are identical to those encountered when considering cyclical risk-weighted assets and are not specific to discussions of dynamic provisioning. Consequently, the following discussion will be based on the first interpretation.

One possible solution is to leave the accounting model intact and work directly on modelling expected losses and their cyclical nature with respect to the state of the economy. The difference between these losses and accounting provisions can then be converted into either additional provisioning requirements, implemented via a “regulatory provisioning fund,” or via additional regulatory capital requirements. The regulator could, for example, ask financial institutions to adjust their estimates of expected losses upwards during economic expansions, on the premise that these losses are typically underestimated during those periods. The increased gap between expected losses and banks’ provisions can be used as a basis for requiring additional regulatory provisioning, or additional capital to be held, thus creating buffers in good times.

Aside from being difficult to implement and monitor, this solution fails the “use test” by introducing divergence between models of banks’ economic capital and the regulatory capital model. This is contrary to the direction of regulatory changes that started with the Basel Committee’s Market Risk Amendment and culminated in Basel II. That is not to say that this path should be left unexamined or that it cannot be modified, but questions involve the whole regulatory framework, rather than modifications within the existing one.

The alternative is to abandon provisioning based on the accounting model and replace it with provisioning based on expected loss. This proposal, however, runs counter to the basic objectives of the accounting model and raises a host of difficult issues regarding the responsibilities of auditors relative to those of banking supervisors.

## EMPIRICAL EVIDENCE

Regardless of what system is put in place, changes in provisions will affect banks’ net interest income, their returns on equity, and possibly, their capital. This occurs because provisions are deductions from net interest income. As such, an increase in provisions will, all else being equal, reduce the level of interest income and, thus, a bank’s total income. For a fixed ratio of dividend payouts, this will result in lower retained earnings and a reduction in banks’ regulatory capital (via its impact on Tier 1).

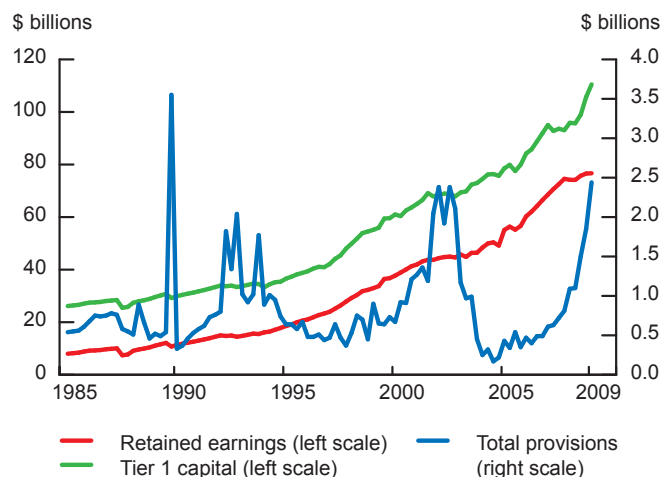
From a regulatory viewpoint, this may not be a desirable outcome. Increased provisioning during economic expansions may increase the reserve fund to absorb expected losses, while, at the same time, eroding the regulatory capital buffers that banks have to absorb the unexpected losses. Under Basel II, an offsetting mechanism is in

place via the stipulation that any excess of provisions over expected losses may be added to Tier 2 capital (subject to an upper limit), while the shortfalls between expected losses and actual provisions are deducted from regulatory capital (50 per cent from Tier 1 and 50 per cent from Tier 2). Although the net effect is difficult to determine precisely, the asymmetric treatment of excesses and shortfalls implies that additional provisioning is likely to affect the composition of regulatory capital, moving it away from high-quality Tier 1 and into Tier 2. Moreover, it is not clear whether the offsetting effects of Basel II would be capital-neutral or would result in a net change (decrease or increase).<sup>6</sup>

The net impact of the offsetting rules is difficult to determine, but one can get an idea of the extent to which provisioning affects capital by examining historical evidence. It should be noted that provisioning will affect capital only to the extent that it affects retained earnings. Chart 1 shows the retained earnings, Tier 1 capital, and total provisions of the major Canadian banks for the period 1985Q1 to 2009Q1.

**Chart 1: Trends in provisioning and bank capital**

Major Canadian banks



Sources: Bank of Canada and OSFI

Although there is a clear relationship between the stock of retained earnings and Tier 1 capital over this period, the relationship between provisions and retained earnings is less clear. The correlation between changes in retained earnings and provisions is negative,<sup>7</sup> but the overall impact of provisioning on retained earnings and capital is small.

<sup>6</sup> These links between regulatory capital and excesses/shortfalls in provisioning point to the need to examine various provisioning and capital requirements jointly rather than in isolation, and to ensure the consistent treatment of expected losses in these proposals.

<sup>7</sup> The correlation between quarter-to-quarter changes in retained earnings and provisions is -0.37; the correlation between the year-over-year changes in retained earnings and provisions is -0.31.

This is mainly because of the difference in relative magnitudes: on average, provisions represent less than 2 per cent of Tier 1 capital (about 4 per cent of the stock of retained earnings). Thus, even the sharp increase in provisions in 1989Q4 of about 560 per cent relative to 1989Q3, resulted in a decrease in retained earnings of about 10 per cent and in capital of about 5 per cent.<sup>8</sup>

In contrast, the 1.5 per cent decline in Tier 1 capital in 2002Q4 relative to 2002Q3 was accompanied by an 11 per cent decrease in provisions. It is thus important to keep in mind that the focus of provisioning is on credit risk in the banking book and, as such, does not deal with other types of risk, such as market risk. Recent events show that market-related losses can weaken banks' positions and affect not only their market-related activities, but also their ability and willingness to expand their banking book activities, even when there is little evidence of significant deterioration in the performance of banking book assets.

These findings suggest that provisioning might not be a significant contributing factor to the procyclicality of capital and that if provisioning were to be used to counter the procyclicality of capital, significant increases in provisions would be needed. There are, however, limits to what can be achieved, and these are determined by the income generated by a bank. For example, although magnitudes vary over time, provisions represent around 7 per cent of the net income of Canadian banks. Thus, a doubling in provisions would be expected to have a noticeable impact on net income, while not having a visible impact on capital, nor would it address the changes in capital coming from other sources of risk.

## CONCLUSIONS

The foregoing discussion implies that, when it comes to the timing of provisioning relative to the economic cycle, either more flexibility within the accounting model or provisioning within the regulatory model might make a difference. In terms of the quantitative impact, our findings suggest that provisioning is likely not a major contributing factor to the procyclicality of capital and that there are limits to what can be accomplished through additional provisioning determined by the net income generated by a bank.

These findings are based on Canadian data and are country specific. A cross-country study to determine whether they hold more broadly would be of great interest. Further study of the issue of flexibility within the accounting standards is also needed. The ongoing work by the Basel Committee's Policy Development Group to review **Basel II capital incentives** to raise provisions over the expansionary part of the credit cycle and to promote enhanced accounting standards is directly relevant to moving the debate forward and reaching an overall assessment.

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<sup>8</sup> This change was due to a simultaneous recognition by Canadian banks of impairment in loans to less-developed countries.

# Regulatory Constraints on Leverage: The Canadian Experience

Allan Crawford, Chris Graham, and Étienne Bordeleau\*

The Basel capital framework plays an important role in risk management by linking a bank's minimum capital requirements to the riskiness of its asset portfolio. Nevertheless, owing to model and data limitations, these calculations may not fully capture the actual level of risk. For example, as economic conditions improve during the upswing of a cycle, there may be a tendency for risk assessments to be overly optimistic. The opposite tendency may occur during a downturn. As a result, risk-adjusted capital ratios may not fully reflect risk exposures and future vulnerabilities in the financial system. Vulnerabilities can be worsened when changes in risk assessments from optimistic to pessimistic create a need to raise additional capital under stressful conditions.

Internationally, one reaction to these concerns has been to consider ways to improve the methods used to quantify risks. Another strategy is to supplement the information in risk-weighted measures of capital adequacy with other indicators such as an unweighted leverage ratio (defined as an assets-to-capital multiple). Although a simple leverage ratio has its own limitations, it may serve a useful complementary role since it is not distorted by the potential biases in risk-adjusted measures.<sup>1</sup>

As part of Canada's capital-adequacy regime, banks and other federally regulated deposit-taking institutions have been subject to a regulatory ceiling on the unweighted leverage ratio since the early 1980s. This leverage requirement was retained even after implementation of the risk-adjusted measures under Basel I and Basel II. Because measures of risk are imperfect, the Canadian regulator (OSFI) believes that the leverage ratio can function as an objective measure to complement the risk-weighted Basel

capital requirements (Dickson 2009). Moreover, a leverage constraint helps to prevent banks from expanding their balance sheets excessively by accumulating assets with low Basel risk weights.<sup>2</sup> These pressures could be greatest during the boom phase of a cycle. Thus, a leverage requirement may be a useful tool for moderating procyclical forces in the financial system.

The imposition of regulatory leverage ceilings has recently been identified by international committees as one of many potential policy options to mitigate procyclicality and strengthen the resiliency of the global financial system. Currently, few countries have formal leverage constraints. In addition to Canada, U.S. commercial banks have been subject to leverage requirements for several decades, and Switzerland recently introduced leverage limits for large banks. In this article, we review lessons from Canada's experience with regulatory leverage constraints over the past 25 years. This includes a discussion of how the limits may have affected the recent evolution of bank leverage and procyclical pressures in the Canadian financial system.

## CANADIAN REGULATORY LIMITS ON LEVERAGE

The average leverage ratio of major Canadian banks rose steadily from the early 1960s to 1980, when it peaked at about 40 (Chart 1). Against this backdrop of high and rising leverage, the statutory authority to set a maximum leverage ratio was granted in 1980. From 1982 to 1991, a formal limit of 30 was placed on the assets-to-capital multiple for large banks. However, in practice, the effective leverage constraint was below 30 over this period, as the regulator

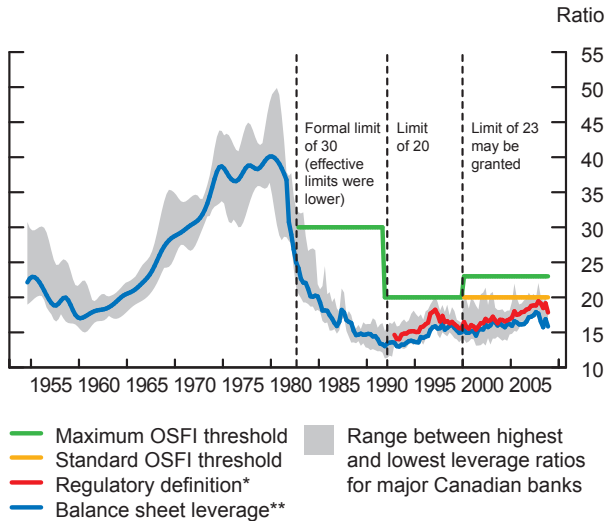
\* Jim Armstrong also contributed to this article.

<sup>1</sup> As noted by Hildebrand (2008), a leverage ratio "serves as a safety valve against the weaknesses and shortcomings of risk-weighted requirements."

<sup>2</sup> Even if the risk weights are appropriate, excessive growth in assets and leverage could increase a bank's reliance on potentially volatile short-term sources of market funding and, therefore, expose it to significantly higher levels of funding-liquidity risk.

used its discretionary power to establish lower actual limits for individual banks. In 1991, a formal upper limit of 20 was imposed, and this ceiling remained in effect until 2000 when it was decided that banks meeting certain conditions could receive an authorized multiple as high as 23.

**Chart 1: Leverage history of major Canadian banks**



\* On-balance-sheet assets plus certain off-balance-sheet items as a ratio of regulatory capital  
 \*\* On-balance-sheet assets to shareholders' equity plus subordinated debt  
 Source: OSFI

The regulatory measure of leverage in Canada is the ratio of total balance sheet assets and certain off-balance-sheet items to total regulatory capital (adjusted net Tier 1 and Tier 2 capital).<sup>3</sup> The off-balance-sheet items include all direct contractual exposures to credit risk—including letters of credit and guarantees, transaction-related contingencies, trade-related contingencies, and sale and repurchase agreements. These off-balance-sheet exposures are included at their notional principal amounts.

Various factors are considered when setting the assets-to-capital limit for individual institutions, including operating and management experience, earnings, asset diversification, type of assets, and appetite for risk (OSFI 2007). The standard limit is 20, but a lower level may be set for individual institutions. Based on the above criteria, a newly established bank will usually have a very low limit (as low as 5), and many small banks are subject to limits that have kept their assets-to-capital multiples in the range of 10 to 12.

<sup>3</sup> Since quarterly data for the regulatory definition of leverage are not available before 1993, Chart 1 also reports an alternative measure that is the ratio of total on-balance-sheet assets to shareholders' equity and subordinated debt. The two measures have followed similar trends over the period during which data for both series are available, although the level of the regulatory measure is about 0.9 higher on average.

Since 2000, banks in good standing have been allowed to increase their limit to a multiple as high as 23, if they meet a set of preconditions and provide a satisfactory forward-looking business case. For example, the institution must demonstrate that it does not have undue risk concentrations, and the business case must link the higher limit to lower-risk activities (such as residential mortgages and well-secured repo transactions). Five of the six major banks have had their limits set at 23 for at least part of this period.

Banks try not to operate too close to their limit, particularly if their balance sheet tends to be volatile (as a result, for example, of heavy trading activities). If an institution operating at a higher authorized multiple exceeds that limit, or allows its risk-based capital ratios to drop below the risk-based capital targets, OSFI will reduce that institution's limit and will require it to submit an action plan for achieving the lower multiple. The institution will also be required to operate at or below the lower level for four consecutive quarters, before being reconsidered for an increase in its multiple. These provisions create an economic incentive for banks to operate with a buffer that balances the expected gains from higher leverage against the expected costs of exceeding the limit after encountering a shock. The size of the desired buffer may also increase with the perceived variance of potential shocks. One implication of the buffer is that the regulatory limits may be constraining behaviour, even if observed leverage is not at the authorized maximum.

## THE IMPACT OF REGULATORY LIMITS

We now examine trends in historical leverage ratios to assess how regulatory limits may have affected the evolution of leverage at major Canadian banks.

### Levels of leverage

The average leverage ratio at major banks exceeded 30 continuously over a 10-year period starting in the early 1970s and reached a peak of 40 in 1980 (Chart 1). Individual institutions had ratios as high as 50 over that period. With the introduction of regulatory limits, aggregate leverage declined dramatically in 1983 to a more moderate rate of 25, and it fell further over the second half of the 1980s. It is likely that the leverage constraints contributed to this downward trend. As noted earlier, although the formal limit was an assets-to-capital multiple of 30 until 1991, the effective limits for individual banks were set at lower levels over this period (particularly after 1985).<sup>4</sup> Since 1985, the average leverage ratio has remained consistently below 20.

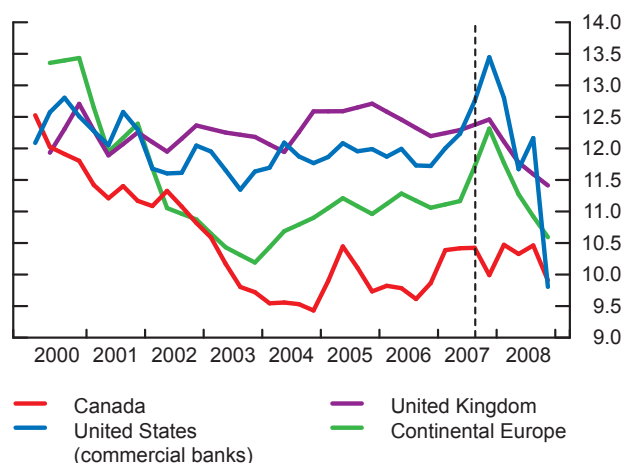
International comparisons provide some perspective for evaluating the role of leverage constraints in recent years.

<sup>4</sup> Data for the effective leverage constraints are not available for the 1980s; however, anecdotal information suggests that they were below 25 after 1985.



Table 1 compares the changes in risk-weighted Tier 1 capital ratios and unweighted leverage ratios during the years leading up to the financial crisis. To facilitate comparison, the Tier 1 ratio is inverted so that an increase implies higher risk-weighted leverage. To achieve a consistent definition across countries, leverage is defined as the ratio of on-balance-sheet assets to shareholders' equity. Thus, if the leverage ratio rises by more than the inverted Tier 1 ratio, it would be explained by two potential factors: (i) an increase in the ratio of unweighted assets to risk-weighted assets, and/or (ii) Tier 1 capital rising at a faster rate than shareholders' equity. While explanation (i) could reflect a shift towards safer assets, it may also occur if the risk weights were not adequately capturing an increase in the true risk exposures. To isolate the relative importance of these two factors, Table 1 also reports changes in the ratio of unweighted assets to Tier 1 capital.

**Chart 2: Inverted Tier 1 capital ratio**



Sources: Bloomberg and bank financial statements

**Table 1: Changes in Inverted Tier 1 Capital Ratios and Leverage**

(2003Q4 to 2007Q3)

	Canada	U.S. commercial banks	U.S. investment banks	United Kingdom	Europe
Inverted Tier 1 ratio <sup>a</sup>	0.7	1.2	n.a.	0.2	1.5
Unweighted leverage ratio					
- UWA <sup>b</sup> to Tier 1 capital	2.3 <sup>c</sup>	1.5	n.a.	-5.1	18.3
- UWA to shareholders' equity	1.2	-0.3	8.1	7.0	5.9

a. Ratio of risk-weighted assets to Tier 1 capital

b. UWA is unweighted on-balance-sheet assets.

c. The change is 2.6 using the Canadian regulatory definition of leverage.

The inverted Tier 1 ratios show small increases for both Canadian banks and major international peers over the period up to the third quarter of 2007 (Table 1 and Chart 2).<sup>5</sup> However, the trends for unweighted leverage ratios are less uniform across countries.<sup>6</sup> Measured by the ratio of unweighted assets to shareholders' equity, the average leverage ratio in Canada rose by only 1.2 during those years, in contrast to the significantly greater increases at major banks in a number of countries not subject to

regulatory constraints (Table 1 and Chart 3).<sup>7,8</sup> As noted previously, U.S. commercial banks are also subject to leverage requirements. Leverage at those institutions was stable in recent years, whereas leverage at U.S. investment banks (not subject to these constraints) began trending sharply upwards starting in 2004.

The combination of stable Tier 1 ratios and sharply rising leverage at some banks illustrates that risk-adjusted capital requirements were not sufficient to prevent a significant cyclical buildup of leverage in some countries in the pre-crisis period. This experience provides several lessons. First, in light of subsequent developments, it suggests that some risks were not being measured properly over this period. For example, weaknesses of risk-assessment methods led to the underpricing of risks in the trading book, which would have contributed to risk-adjusted capital ratios remaining relatively stable while leverage increased sharply at banks with high trading book activity (see CGFS 2009). The pronounced divergence between weighted and unweighted ratios in some countries also suggests that a simple leverage ratio would be a useful tool to complement the risk-weighted measure.<sup>9</sup>

<sup>5</sup> The international comparisons use data for six major Canadian banks, ten large national and regional U.S. commercial banks, five large U.S. investment banks, six major U.K. banks, and nine major continental European banks.

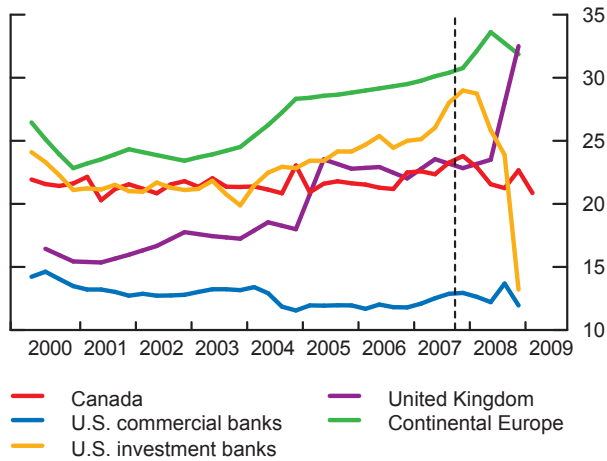
<sup>6</sup> Accounting differences can affect international comparisons of measured leverage. For example, U.S. GAAP practices allow reporting of net derivative positions on the balance sheet, whereas Canadian GAAP and International Financial Reporting Standards (IFRS) require reporting of gross derivative positions. This difference means that the level of leverage at U.S. banks is understated relative to Canadian leverage.

<sup>7</sup> The average leverage ratio increased to 30 at the world's 50 largest banks (CGFS 2009).

<sup>8</sup> When measured as the ratio of unweighted assets to Tier 1 capital, leverage in the United Kingdom fell over this period (Table 1). Since the risk-adjusted Tier 1 ratio was virtually unchanged, this implies that there was a shift towards assets with higher risk weights. The difference between the two unweighted U.K. measures indicates that shareholders' equity decreased as a proportion of Tier 1 capital. The net effect is that the ratio of on-balance-sheet assets to shareholders' equity rose relative to the inverted Tier 1 ratio.

<sup>9</sup> Hildebrand (2008) uses recent Swiss experience to emphasize the complementary role of a leverage ratio: "Looking at risk-based capital measures, the two large Swiss banks were among the best-capitalised large international banks in the world. Looking at simple leverage, however, these institutions were among the worst-capitalised banks. With the benefit of hindsight, we clearly should have put more emphasis on the risks of excessive leverage."

**Chart 3: Banking sector leverage\***



\* Ratio of on-balance-sheet assets to total shareholders' equity  
Sources: Bloomberg and bank financial statements

While it is difficult to quantify the effect of the leverage constraint, the above evidence suggests that it helped to mitigate the cyclical buildup in leverage in Canada.<sup>10</sup> The relatively low levels of leverage at the start of the financial crisis have meant that Canadian banks have faced less pressure to deleverage than some of their international counterparts, thereby mitigating the procyclical movements in the current downturn. Since the start of the financial crisis, the leverage ratio has moved within a narrow range in Canada. Elsewhere, capital injections have led to sharp reductions in leverage at U.S. investment banks, whereas increases in the notional value of derivative assets pushed the leverage of U.K. banks higher through the end of 2008 (Chart 3). Declines in capital caused by writedowns contributed to leverage remaining comparatively high for major banks in continental Europe.

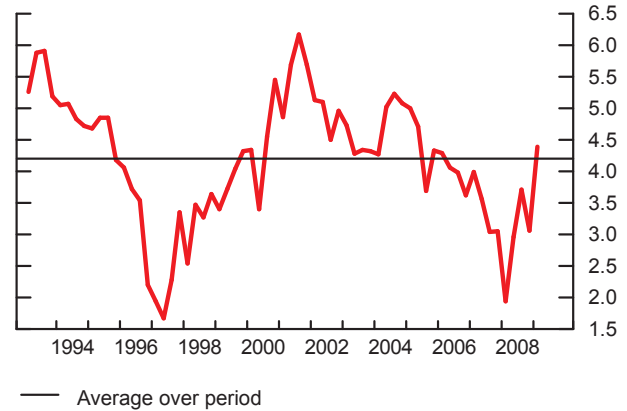
### Trends in leverage buffers

As noted earlier, a bank will maintain a buffer as it balances the incentives to expand leverage against the costs of exceeding the limit. During the upswing of a credit cycle, it is expected that the leverage buffer would tend to decrease, but the need to satisfy the leverage constraint on an ongoing basis should ultimately restrain further decreases. To consider these questions, we examine how the buffer moves over a cycle and whether bank behaviour changes as leverage approaches the regulatory limit.

Chart 4 shows that the buffer between a bank's actual leverage and its authorized limit varies over time.<sup>11</sup> The typical buffer was elevated in the early 1990s in the aftermath of a recession and shrank when the economy strengthened. The average buffer moved up again in 2001 as output growth weakened and as the maximum assets-to-capital multiple was raised to 23 for qualifying institutions. It then fell back closer to the sample average in the following years.

**Chart 4: Average buffer between actual leverage and its limit varies over time**

Major Canadian banks



Source: OSFI

The buffer has a moderate negative correlation with a simple indicator of cyclical credit conditions, indicating some tendency to decline during boom periods.<sup>12</sup> However, there is empirical evidence that procyclical movements in leverage are mitigated by adjustments in behaviour. If some development pushes leverage too close to the authorized limit (as might occur during the upturn of a credit cycle), some banks tend to react by quickly raising the buffer in subsequent quarters.<sup>13</sup> This pattern is further evidence that the regulatory limit has helped to constrain procyclical increases in leverage ratios.

### OTHER ISSUES

Several issues have been raised regarding potential adverse incentives arising from the use of unweighted leverage constraints. These issues are briefly reviewed in light of the Canadian experience.

<sup>11</sup> Chart 4 reports leverage buffers starting in 1993 because quarterly data for the regulatory measure of leverage are not available for previous years, and information on the effective leverage constraints at individual banks is not available before 1991.

<sup>12</sup> The average buffer exhibits a correlation coefficient of -0.35 with the trend in aggregate real credit growth (measured by the current four-quarter growth rate).

<sup>13</sup> Crawford, Graham, and Bordeleau (2009) provide further statistical analysis, using data for individual banks.

<sup>10</sup> The discussion of leverage buffers in the next section provides further guidance on the impact of the regulatory constraint.

A common criticism of a leverage ratio defined to include only on-balance-sheet assets is that it creates an incentive for banks to move assets off their balance sheets to bypass the leverage constraint. The Canadian regulatory measure does include some off-balance-sheet items (specifically, direct contractual exposures). Regarding other types of off-balance-sheet activity, securitized assets of major banks are currently a relatively small percentage (about 10 per cent) relative to their total on-balance-sheet assets. The gap between the regulatory definition of leverage and an augmented measure including securitized assets has risen somewhat in recent years, although part of the increase reflects a change in the reporting of securitization data (Chart 5).<sup>14</sup> A range of factors has led to greater securitization in many countries, so it is difficult to gauge to what extent the increase in Canada reflects incentives arising from the leverage constraint as opposed to other factors. Overall, the diversion of activity to off-balance-sheet assets does not appear to have significantly affected the trends for the regulatory measure in Canada. Nevertheless, broadening the coverage of off-balance-sheet assets in the regulatory definition of leverage would be a useful issue for future review.

A second potential concern is that banks will shift the mix of activity towards riskier assets as a way to boost their income when the leverage constraint is limiting overall balance sheet growth. In Canada, the ratio of risk-weighted assets to total balance sheet assets has been falling—not rising—in recent years, although the risk-measurement

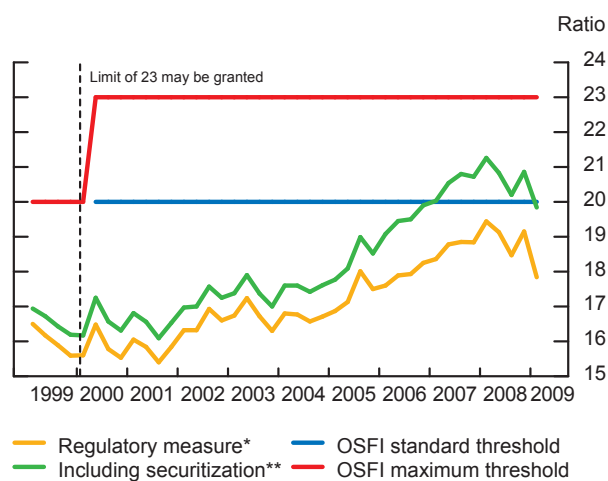
issues discussed previously may suggest some caution when using this indicator. Realized losses since the beginning of the crisis could also be used as an indicator of risk-taking behaviour before the crisis. All else being equal, the hypothesis predicts that jurisdictions with a leverage constraint (and thus an inducement to invest in riskier assets) would tend to have higher losses during the downturn. However, the available data show that capital market writedowns and loan losses at Canadian banks have been lower (relative to shareholders' equity) than for many of their international peers. Thus, despite the incentive to shift towards riskier assets when the constraint is binding, there is little evidence that this type of behaviour was prevalent in the years leading up to the financial crisis. This suggests that other aspects of the supervisory regime have mitigated the potential adverse effects on risk-taking behaviour.

## CONCLUSIONS

This article reviewed some lessons from the Canadian experience with leverage constraints over the past 25 years. The role of a leverage constraint is to act as a complement—not a substitute—for risk-weighted measures of capital adequacy. More broadly, it should be viewed as one component of the regulatory regime, rather than as a substitute for other risk-management and supervisory practices. Leverage at major Canadian banks was relatively stable during the years leading up to the financial crisis, in contrast to the significant increases at banks in a number of countries without leverage constraints. There is also evidence that some banks tend to raise their leverage buffers quickly when a shock pushes leverage too close to the authorized limit, which suggests that the limit helps to constrain increases in leverage during the upturn of a credit cycle. Relatively low levels of leverage at the start of the crisis have reduced the pressure for deleveraging during the downturn.

Various international groups, including the recent G-20 Working Group (2009) and the Basel Committee on Banking Supervision, have included a non-risk-based supplementary measure of capital adequacy on their lists of policy options to reduce procyclicality and strengthen the resiliency of the global financial system. When designing a supplementary leverage requirement, it will be important to mitigate the risk that it will create incentives for banks to shift activity to off-balance-sheet instruments or riskier assets. Strategies to achieve this objective would include selecting an appropriate definition of the regulatory measure, and designing the risk-weighted and simple leverage requirements in ways that avoid arbitraging behaviour.

**Chart 5: Leverage of major Canadian banks**



\* On-balance-sheet assets plus certain off-balance-sheet items as a ratio of regulatory capital  
 \*\* Includes unrecognized securitization of banks' own and third-party assets. Coverage of securitization data was broadened in 2006 (see footnote 14).  
 Source: OSFI

<sup>14</sup> Data collected on third-party securitized assets were expanded in 2006 to include all vehicles sponsored or administered, rather than only those with recourse provisions.

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# Procyclicality and Value at Risk

*Peter Youngman*

In the years leading up to the financial crisis, banks around the world, including those in Canada, became more heavily involved in financial markets. Securities and derivatives that banks actively buy and sell in financial markets make up the “trading book.” Prudential regulations governing the trading book differ in many important respects from those governing the “banking book,” which is the more traditional stock of loans and mortgages originated and held by banks. In the initial phase of the current financial crisis, banks suffered severe losses from instruments held in the trading book: in many cases, several times what standard models would have predicted (Standard & Poor’s 2008). Given the significance of the trading book to international banks and its prominent role in the recent crisis, it is important that regulatory reforms aimed at reducing the procyclicality in the financial system address rules regarding trading book capital.

There is widespread agreement that, prior to the crisis, banks did not set aside sufficient capital to cover risks related to the trading book, especially credit, liquidity, and event risk. The Basel Committee on Banking Supervision (BCBS) has proposed amendments to strengthen capital requirements for the trading book (BCBS 2009b, 2009c) that would increase capital to cover these risks. The proposals may also moderate procyclicality, but more work remains to be done in overhauling the framework for measuring trading book risks, with particular focus on the systemic consequences of prudential capital requirements.

## CURRENT FRAMEWORK FOR TRADING BOOK CAPITAL

Capital requirements for the trading book are based on the “Market Risk Amendment” (MRA) to the Basel I accord (BCBS 1996, 1997). Value-at-risk (VaR) models are the foundation of the MRA, and are an early example

of the internal-models approach of Basel II, whereby banks are permitted to compute regulatory capital based on their own models, subject to certain qualitative and quantitative standards.<sup>1</sup>

Simply stated, a VaR model is a model of the distribution of future profits and losses of a bank’s trading portfolio. VaR models combine information on a bank’s trading positions across various products with statistical estimations of the probability distribution of the underlying market factors and their relation to each other. The final output of a VaR model is a VaR estimate, which is defined as the maximum amount of money that a bank would expect to lose over a defined period and with a defined confidence level. For example, if a bank has a 99 per cent, 1-day VaR of \$100 million, this means that 99 times out of 100, the bank’s trading portfolio should not lose more than \$100 million the next day. Put another way, one day out of 100, the bank should expect to lose \$100 million or more.

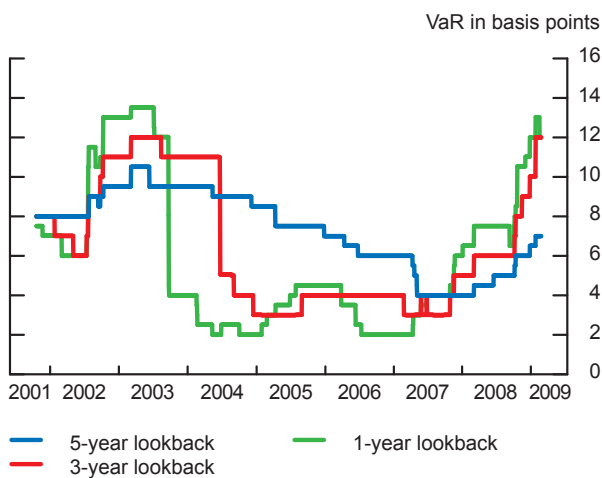
VaR models came into widespread use in the 1990s, as the trading activities of large international banks increased dramatically. The MRA does not specify the exact type of VaR model that a bank must use, but it does specify that banks must hold capital equivalent to three times the 99 per cent VaR with a 10-day holding period, averaged over the past 60 trading days. Banks must also use a minimum of one year of data to estimate the statistical behaviour of the market risk factors. Today, major banks use complex computer models to aggregate trading positions across the bank and to model the joint probability distribution of hundreds, or even thousands, of risk factors.

<sup>1</sup> The MRA also provides the option of using a standardized approach. Large financial institutions, including the major Canadian banks, use the internal-models approach for assessing general market risk, although some use the standardized approach for determining specific risk in part, or all, of their trading portfolios.

## THE PROCYCLICALITY OF VaR MODELS

Value-at-risk models have several widely recognized shortcomings and have been heavily criticized by academics and practitioners. While banks have developed many variants of VaR models, all of them still rely on historical data to estimate the probability distribution of future outcomes. Most banks use a relatively short period of data (the “lookback period”) to estimate the probability distribution of market factors, and some use weighting schemes, whereby within the lookback period, more recent data points are given a higher weight. These techniques can ensure that estimated VaRs accurately reflect the stylized fact that many financial time series exhibit time-varying volatility. In this sense, such VaR models are “risk sensitive,” in that they relate capital to current estimates of risk. This risk sensitivity results in VaRs that are cyclical: rising and falling with market volatility. Charts 1 and 2 show daily VaR estimates for Canadian equity and corporate bond markets, estimated with different lookback periods.<sup>2</sup>

**Chart 1: One-day 99% VaR for BBB corporate bonds**

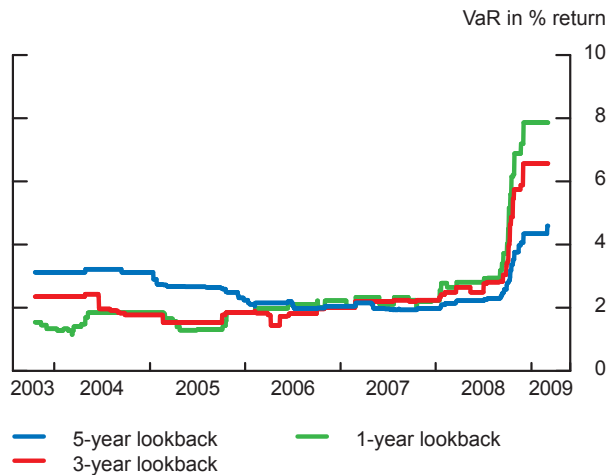


Sources: Bloomberg, Merrill Lynch, author's calculations

Note the sharp rise in VaRs since late 2008. A bank using VaR to set trading limits would use an increase in VaR as a signal to reduce its trading positions. From the perspective of that bank, the reduction in trading positions during a high-volatility period will reduce risk.

This type of dynamic is troubling if many market participants react to increased volatility in the same way. The herding hypothesis (Persaud 2001) holds that when many financial institutions use VaR to set risk limits, its cyclical

**Chart 2: One-day 99% VaR for S&P/TSX Composite Index**



Sources: Bloomberg, author's calculations

properties generate destabilizing effects in financial markets, whereby declines in asset prices cause VaRs to increase, which, in turn, leads to breaches of the VaR-based risk limits. Institutions respond to the limit breaches by closing out the risky positions, thus exacerbating the initial price decline and causing more volatility. Thus, the use of risk-sensitive measures that reduce risk for individual firms can create more risk in the system as a whole. While it is unlikely, at least in the short run, that firms react mechanically to increases in VaR, there is some evidence that this dynamic was at work during the current crisis (Longworth 2009).

Another observation from Charts 1 and 2 is that a longer lookback period produces more stable VaR estimates that do not fall as quickly in quiet times, nor rise as sharply in crisis periods. The use of a longer lookback period may reduce short-run forecasting accuracy, but could reduce systemic risk by discouraging an excessive buildup of trading positions during quiet periods in the markets. With smaller trading positions, volatile periods in the markets would not be as damaging.

Other criticisms of VaR models centre on the difficulties in modelling financial asset prices, especially in the tail of the distribution, which is particularly relevant for risk management. While VaR models can be improved to better account for the statistical properties of financial time series, no model is perfect.

The MRA adjusted for some of the weaknesses discussed above. Setting the capital requirement on the average VaR over the past 60 days, instead of on yesterday's VaR, tends to smooth sharp changes in VaR coming from changes in market volatility (Jorion 2002). Multiplying the VaR by three is an adjustment that may account for the fact that most financial time series are known to have “fat tails,” and that

<sup>2</sup> The historical simulation approach was used to compute the VaR used in the charts. This is one of the methods commonly used by banks. The VaR computed for the S&P TSX Index assumes a long position; the VaR for corporate bonds uses the Merrill Lynch BBB corporate bond index and assumes a long position in spreads versus Government of Canada bonds.

some positions would not be able to be liquidated within the assumed 10-day holding period. In addition, the MRA stipulated that banks using internal models for trading book capital “must have in place a rigorous and comprehensive stress testing program.” Stress testing has long been suggested as a way for risk managers to better understand exposures and to assess the impact of tail events, which may not be well captured by VaR models.

## VAR MODELS AND FINANCIAL INNOVATION

Over time, financial innovation shifted the focus of banks’ trading activities away from traditional instruments and towards more complex securities and derivatives, such as collateralized debt obligations and credit default swaps. Compared with traditional instruments like government bonds and interest rate swaps, these new instruments had higher levels of credit and liquidity risks. In addition to long-standing doubts about VaR and its potential feedback effects on markets, prudential regulators were concerned that existing VaR models, which were focused on “general risk,”<sup>3</sup> were poorly suited to capturing the risks of these new products. This, in turn, led to a concern that the market risk framework gave banks incentives for “regulatory arbitrage,” i.e., moving positions from the banking book to the trading book in order to benefit from lower regulatory capital charges (BCBS 2005).

Reflecting these concerns, the BCBS published a revised framework for the trading book in April 2005, often called Basel 2.5 (BCBS 2005). The changes sought to reduce incentives for regulatory arbitrage by establishing a new capital requirement, called the “incremental default risk” charge (IDR), which would cover credit risk in the trading book. A later document (BCBS 2007) laid out detailed qualitative and quantitative standards for the IDR, which were to be implemented in 2010. The new measures proposed by the BCBS, discussed below, have supplanted the IDR.

## MITIGATING PROCYCLICALITY IN CAPITAL REQUIREMENTS FOR MARKET RISK

The financial crisis exposed some problems in the framework for managing market risk. Many banks posted trading losses well in excess of their VaR estimates, even exceeding the losses generated by stress scenarios (BCBS 2009a). In response to the weaknesses demonstrated by the financial crisis, the BCBS’s Trading Book Group set out to strengthen these capital requirements. The group published two documents proposing amendments to the trading book capital framework (BCBS 2009b, 2009c). Final versions of the amendments are expected in September 2009, with implementation planned for the end of 2010. The

<sup>3</sup> “General risk” refers to the risk of loss owing to changes in default-free interest rates, overall credit spreads, FX rates, broad equity market indexes, and commodity prices.

BCBS has indicated that the implementation date could be extended if necessary to avoid increasing capital requirements during a stressful period (BCBS 2009d).

The documents propose major changes to capital requirements for the trading book. Among the most prominent are:

- A new “stress VaR” charge for general and specific market risk. The stress VaR is the VaR of current trading positions using an estimation window that includes a stressful period relevant to the bank’s trading positions. The stress VaR would be multiplied by three and added to the existing VaR-based capital charge.
- A new Incremental Risk Charge (IRC). The IRC will cover default and migration risk on credit products in the trading book. The IRC will cover non-securitized credit products<sup>4</sup> using a 99.9 per cent confidence level and assuming a constant level of risk over a 1-year horizon. Securitized products are not eligible for the IRC. They will be subject to a capital charge taken from the securitization framework for the banking book. Capital requirements for credit-risky positions in the trading book will be based on the same soundness standard as in the banking book, but the unique characteristics of the trading book will be taken into account in computing capital.<sup>5</sup>
- An explicit requirement for banks to model all relevant pricing factors as risk factors in the VaR model, unless approval is obtained from the supervisor.

Adoption of the proposed amendments would significantly increase trading book capital. An increase is widely thought to be necessary, but it comes at a time when banks’ capital is already under pressure. Members of the BCBS will be conducting quantitative impact studies in their respective countries, which should give the BCBS further insight into the appropriate timing for implementing the changes. The impact studies could also highlight areas where the proposals could have an adverse impact on market liquidity, for example, by reducing the willingness of banks to make markets in certain products.

The impact of the changes on procyclicality is difficult to assess. The new IRC should reduce incentives for regulatory arbitrage, which seems to have been an important source of procyclicality. The new stress VaR charge would prevent capital from falling too much in periods of low market volatility but would not reduce the procyclicality of

<sup>4</sup> This would include, for example, corporate bonds and single-name credit default swaps.

<sup>5</sup> In particular, the constant level of risk assumption is designed to provide some capital relief for holding positions in a trading book, where positions can be reduced in response to a decline in credit quality. Thus, the IRC charge need not be computed assuming that all positions will be held over the 1-year horizon, but rather that positions could be liquidated after a period of time, called the liquidation horizon. The minimum liquidation horizon is set at three months. Additionally, existing VaR models and the IRC take into account risk reduction that arises from hedging positions, in contrast to the banking book, where capital charges are additive.

other components of trading book capital, namely, the general- and specific-risk VaR models and the new IRC. The higher level of capital required for trading activities may also reduce the ability of banks to make markets in some instruments, thus reducing market liquidity.

## FUTURE PRIORITIES FOR POLICY-MAKERS

Given the widespread concern of policy-makers about procyclicality and feedback effects, and given the prominence of trading losses during the financial crisis, more work remains to be done on the overall framework for trading book capital. One possibility is for further refinements to existing VaR models, such as stress VaR, or more medium-term “through the cycle” approaches to estimating VaR.

Given the inherent limitations of VaR modelling, an alternative would be to reduce its central role in a regulatory framework for capital.<sup>6</sup> A revised framework could work from a principles-based approach, designed to capture all types of trading risk to an acceptable soundness standard, giving due consideration to the pitfalls of VaR modelling. For example, stress testing, currently part of Pillar II, could be brought into Pillar I capital requirements. Model-based capital requirements could be supplemented by simple position limits, analogous to the use of a leverage ratio for overall bank capital. This type of principles-based approach should be more resilient to financial innovation, ensuring that new risks are taken into account as they develop.

To complement microprudential reforms, policy-makers could address macroprudential concerns by developing tools to assess the evolution of trading positions and leverage in the financial system. This assessment could be used to identify systemwide vulnerabilities that, in turn, could feed back into the quantitative assessment of capital adequacy.

## CONCLUSION

Value-at-risk models—the foundation of regulatory capital requirements for the trading book—have serious weaknesses, including the potential for inducing procyclicality in markets. Recent initiatives taken by the Basel Committee on Banking Supervision address some of the key weaknesses in the existing framework, but more remains to be done. Capital regulation could be improved by exploring the overall approach to risk management in the trading book, with particular attention to the systemwide implications of prudential regulation.

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<sup>6</sup> See Finger (2009) for a discussion of this issue.



# Procyclicality and Margin Requirements

Nadja Kamhi

This article explores the extent to which margin requirements induce procyclicality. Margin refers to the amount of equity (i.e., cash) as a share of total assets purchased on credit. The terms “margin” and “haircut” are often used interchangeably. A haircut refers to the percentage discount on the value of collateral that determines the amount of a loan (i.e., credit). A feature common to both is that they determine the maximum amount of leverage. The higher the margin, or haircut, the lower the maximum amount of leverage. The term “margin” is used throughout this article. Margin rules that stipulate lower margin requirements during boom times (liquid markets, low volatility) and higher margin requirements during down times (illiquid markets, high volatility) induce procyclical behaviour. For the definition, and the broader implications of procyclicality on market prices, see p. 31.

Many financial transactions employ margin requirements, including those carried out by clearing houses and futures exchanges, as well as repo agreements and security-lending transactions. This article reviews margin requirements as they apply to margin accounts and to capital requirements for the proprietary inventory positions of investment dealers in Canada. It begins with a high-level overview of the rules, followed by an examination of their procyclical aspects, and concludes with some recommendations.

## RULES FOR MARGIN ACCOUNTS AND PROPRIETARY INVENTORY CAPITAL

The rules governing margin accounts administered by investment dealers are set by the Investment Industry Regulatory Organization of Canada (IIROC) and are outlined in Dealer Member Rule 100.<sup>1</sup> Rule 100 generally applies to

parties that do not qualify as an “acceptable counterparty” or an “acceptable institution” and that are therefore classified as “other.”<sup>2</sup> Retail investors, unregulated financial firms, corporations with a net worth below \$75 million, and trusts or private partnerships with less than \$100 million in net assets are among the parties that fall into this category. Since “acceptable” parties are, in most cases, exempt from IIROC-imposed minimum margin rules, any margin requirement is entirely at the discretion of their investment dealer. The IIROC is currently reviewing this exemption.

Investment dealers are required to hold regulatory capital against their proprietary inventory positions, and this amount is also calculated using the margin rules detailed in Rule 100. In both cases, for margin accounts and for regulatory capital purposes, the objective of these rules is to set margin rates at levels that appropriately account for exposure to market risk. A high-level description of these rules as they relate to fixed-income and equity securities is provided below.

## FIXED-INCOME SECURITIES

Margin requirements for bonds, debentures, treasury bills, and notes are generally higher for securities with longer maturities, lower credit ratings, and for unhedged positions. For example, a Government of Canada bond with a maturity between 1 and 3 years carries a margin of 1 per cent, while a corporate bond of high credit quality and the same maturity is margined at 6 per cent. Margin requirements for other types of debt, foreign exchange, and derivative securities are also defined in IIROC Dealer Member Rule 100. These minimum margins are temporarily increased when price volatility increases beyond specific thresholds. This

<sup>1</sup> IIROC Rule 100 is applied to a much wider set of financial instruments and, combined with other rules, has a broader set of applications than described in this article.

<sup>2</sup> See General Notes and Definitions to IIROC Dealer Member Form 1 on the IIROC website for the definitions of acceptable counterparty and acceptable institution.

temporary increase, the bond margin surcharge, is 50 per cent of the margin normally required.

## EQUITIES

Current IIROC margin requirements for equities and warrants traded on major stock exchanges are set according to a “market price per share” methodology. Generally, for securities that are trading at or above \$2 per share, the required margin is 50 per cent. If the securities are among the approximately 500 (highly liquid, low volatility) exempt securities, the margin is 30 per cent for client account positions and 25 per cent for Dealer Member capital requirements. Margin requirements go up to 60 per cent and 80 per cent for all securities that trade below \$2 and \$1.75 per share, respectively. Securities priced below \$1.50 have a margin rate of 100 per cent (i.e., they cannot be carried on margin).

### Equity margins based on the VaR method

Value at risk (VaR) is a widely used method for determining regulatory capital requirements (see “Procyclicality and Value at Risk” on p. 51) as well as margin rates. It allows one to calculate the expected amount of loss, given a desired confidence level and a specified holding period. The IIROC plans to introduce a method for calculating equity margins that is based on a single-position VaR. This new approach to margin rates, referred to as “basic margin rate,” will also utilize measures of price risk and liquidity risk to arrive at margin rates for each equity security listed in Canada or the United States. More specifically, price risk will be assessed based on the highest level of daily price volatility calculated using trading data for the most recent 20, 90, and 260 days. Liquidity risk will be assessed based on the average daily traded volume and the public float value of securities.

## THE PROCYCLICALITY OF MARGIN REQUIREMENTS

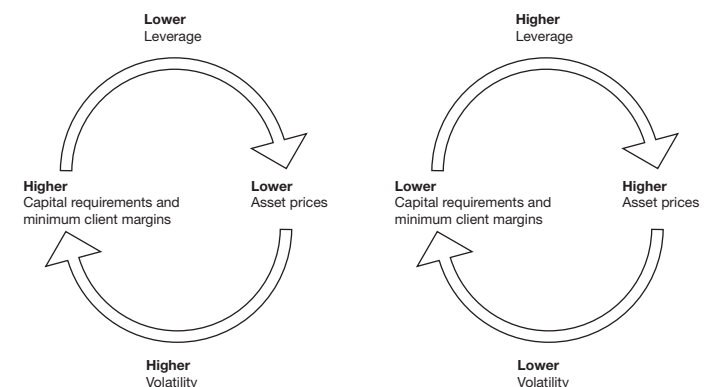
Client margin accounts are inherently procyclical, irrespective of margin rules. The minimum required margin for listed stocks trading at a price greater than \$2 is 50 per cent of market value (30 per cent for highly liquid stocks). Thus, up to half of the total investment (or 70 per cent for liquid securities) may be borrowed from the investment dealer. The amount of the loan stays fixed, while the marked-to-market value of the portfolio fluctuates with market conditions. As the marked-to-market value of the investment grows, investors may take on more risk without contributing additional capital (i.e., purchase additional assets and drive the price up further). In contrast, as the marked-to-market value of the investment declines, investors are faced with margin calls and must deposit additional funds at a time when their portfolio is declining in value. Investors may choose to sell assets to meet margin calls,

causing a further decline in asset prices. Thus, because of daily marking to market of securities positions and the use of leverage, margin accounts are inherently procyclical, regardless of the type of margin rules applied. When margin rules themselves are also procyclical, the effects are amplified.

Margin rules that prescribe higher margins during periods of increased price volatility, or as the prices of securities decline, exacerbate procyclicality. A case in point is the bond margin surcharge that is triggered when there is a significant increase in the volatility of bond prices. Since increased price volatility is often a by-product of illiquid markets and general market turmoil, the margin surcharge could serve to propagate the downturn because securities may need to be sold to meet the increased requirements for regulatory capital or margins. Margins on equity securities also exhibit procyclicality, since they progressively increase as the price of the security declines below \$2. About half of TSX-listed securities currently trade at or below \$2.50. Although their public float value is small, this is a significant increase compared with early 2007. The new margin rules for equities have not yet been implemented, but the proposed methodology would make these rules even more procyclical, since the margins would be closely tied to the near-term price volatility and liquidity of the securities.

Procyclicality will cause the regulatory capital requirements of investment dealers to rise during periods of increased volatility and to fall during boom times when volatility is subdued. Likewise, client margin rates will rise (fall) with increased (decreased) volatility. The resulting decrease (increase) in the leverage of firms and investors would cause asset prices to fall (rise). Subsequently, volatility is likely to rise (fall), feeding the propagation mechanism illustrated in Figure 1.

Figure 1: The procyclicality of asset prices: An illustration



## PRACTICAL CONSIDERATIONS

IIROC Rule 100 sets the *minimum* required margins on margin accounts held at investment dealers. In practice, the margin rates set by investment dealers may be, and often are, higher than the required minimum. Rates are typically determined based on a combination of quantitative and qualitative characteristics. The quantitative model factors in characteristics of the asset such as asset type, term, price volatility, and liquidity, as well as the costs of investment dealers (e.g., clearing house collateral requirements). The qualitative aspect relates to the prevailing sentiment and/or subjective criteria and has the potential to make margin rates highly procyclical. From the perspective of the investment dealer, increasing margin rates reduces leverage and may be especially important during times of increased volatility. It is thus not surprising that since the start of the market turmoil, margins on a wide range of equity securities have gone up (in some cases, to 100 per cent), resulting in a large number of margin calls. Likewise, for fixed-income securities, estimates by Citibank suggest that average margins for investment-grade bonds in the United States have risen to about 18 per cent from 2 per cent (Citigroup Global Markets 2009). In Canada, margins on investment-grade bonds are currently close to 15 per cent, but comparisons over time and across asset classes are difficult, owing to a lack of official data.

## MITIGATING PROCYCLICALITY

One way to mitigate the procyclicality of margin rules is to make them less dependent on near-term market conditions. This involves determining price volatility and, hence, margin rates, using long historical data sets, making sure that past extreme events are captured in the data. If there are no extreme events in the data, then stress tests can be used to simulate such outcomes. This should lead to less variability in required minimum margin rates. It may, however, lead to higher margins on average.

As far as customer margin accounts are concerned, higher but stable margin rates would have the desired effect of reducing leverage, thereby making investors less susceptible to the sudden swings in wealth that encourage procyclical behaviour.

Finally, since investment dealers can impose margin rates above the minimum levels required, they are likely to do so during market downturns, thereby increasing the procyclicality in the system. To mitigate this behaviour, regulators could increase their monitoring of margins to prevent unjustified and reactionary increases, or provide dealers with guidelines for applying margins with a “through-the-cycle” perspective.

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## Procyclicality and Compensation

Étienne Bordeleau and Walter Engert\*

The design of compensation arrangements is typically aimed at aligning the interests of a firm's decision makers with those of shareholders to maximize profits and share value over some time horizon. As a result, compensation arrangements invariably embed incentives that can influence firm behaviour. More specifically, performance-based compensation mechanisms, intended to align the behaviour of decision makers with shareholders' interests, can establish a range of incentives, particularly with regard to the time frame over which decision makers maximize profits and shareholder return. In the case of financial institutions, such compensation arrangements, focused, for example, on short-term returns or not adequately adjusted for risk, could contribute to behaviour that exacerbates the development of asset-price bubbles and leads to subsequent financial collapse, as seen recently in a number of financial systems around the world.

Of course, such compensation-based incentives do not operate in isolation from other influences on the behaviour of decision makers, such as the risk-control function of the institution, which could mitigate the effects of any perverse incentives from compensation arrangements. In practice, the net effect of these potentially competing influences on firm behaviour depends partly on their relative strengths within the firm. For instance, can the risk-control function adequately constrain risk taking in a specific unit of a bank motivated by the prospect of large cash bonuses tied to the annual operating profits of that unit? Importantly, the broader environment in which the financial institution operates, including regulation and market conditions, also influences the overall effect of the incentives embedded in compensation arrangements. In sum, the ultimate effect of

compensation arrangements on risk-taking behaviour and, in turn, the development of asset-price bubbles, is complex and probably varies over time and with circumstances.

Nevertheless, compensation practices at large financial institutions are widely believed to have contributed to the financial crisis that began in 2007. For example, a recent report of the Financial Stability Forum (FSF) (discussed further below) argues that high short-term profits led to the payment of generous cash bonuses to employees at financial institutions without adequate regard for the longer-term risks implied by such practices. The report further notes that "multiple surveys find that over 80 per cent of market participants believe that compensation practices played a role in promoting the accumulation of risks that led to the current crisis."

In the next section, some stylized facts regarding the compensation arrangements at major Canadian and U.S. financial institutions are compared. However, a thorough assessment of various compensation practices and their effects on risk-taking behaviour should take into account a range of influences, including accounting, tax, and regulatory aspects, which can vary over time and across countries. The recently published *Principles for Sound Compensation Practices*, formulated by the FSF, are included at the end of this article. These principles are meant to guide supervisory oversight of compensation practices at financial institutions around the world.

### STYLIZED FACTS ON EXECUTIVE COMPENSATION AT CANADIAN AND U.S. BANKS

This section presents data indicative of broad patterns in executive compensation at Canada's five largest banks and at a sample of major U.S. financial institutions, including

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## Banks and Data Sources

The Canadian banks considered here are the five largest banks: RBC Financial Group, Bank of Montreal, CIBC, TD Bank Financial Group, and Scotiabank. These banks hold 90 per cent of the assets of the Canadian banking sector and about three-quarters of the assets of the deposit-taking sector. The major banks also play a key role in virtually all aspects of financial services in Canada. Data on executive compensation at Canadian banks are from management proxy circulars prepared for the banks' annual meetings.

The U.S. commercial banks are selected from the top 20 U.S. banks in terms of assets as of 31 December 2004. Most of these banks have had a business mix broadly similar to that of the Canadian banks, benchmarked in a specific manner. That is, most of these U.S. banks have

made a similar proportion of their revenue from retail banking. The U.S. commercial banks in this study are: Citigroup Inc., JPMorgan Chase & Co., Bank of America Corp., Wachovia Corp., Wells Fargo & Co., Washington Mutual Inc., U.S. Bancorp, SunTrust Banks Inc., National City Corp., Branch Banking & Trust Corp., Fifth Third Bancorp, Keycorp Limited, and The PNC Financial Services Group Inc. These institutions account for almost 80 per cent of the assets of the U.S. banking sector. The U.S. investment banks considered are Bear Stearns, Lehman Brothers Inc., Merrill Lynch & Co., Morgan Stanley, and The Goldman Sachs Group Inc. Data for the U.S. financial institutions are drawn from the ExecuComp database, maintained by Standard & Pooors.

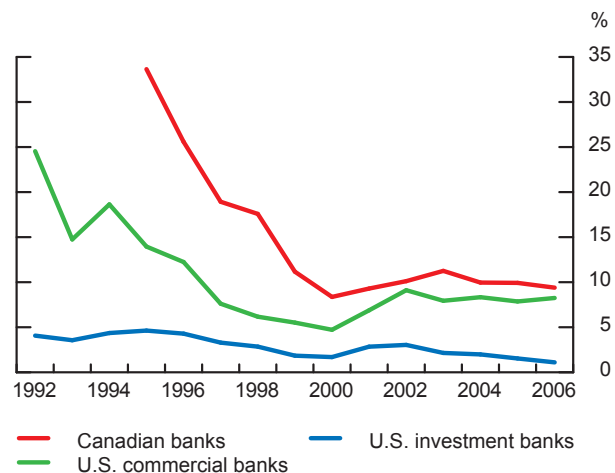
U.S. commercial and investment banks. (Box 1 provides information on the specific institutions covered and the data sources.) The focus here is on the compensation of the five top-ranking executives at these institutions, as identified in the proxy circulars for annual meetings and in the ExecuComp database.<sup>1</sup>

Chart 1 illustrates the evolution of executives' fixed (base) salaries relative to their total compensation at Canadian banks and U.S. financial institutions. Generally, the relative importance of fixed salary has been declining at all of these institutions. Notably, executives at U.S. investment banks have had relatively little in the way of fixed pay for many years—for example, about 2 per cent since 2000. Canadian banks, in contrast, have tended to have a higher, although also decreasing, share of executive compensation in the form of fixed pay, and this proportion has been stabilizing at around 10 per cent since the turn of the century. The relative importance of fixed pay at U.S. commercial banks has generally been trending somewhat below that at Canadian banks.

Chart 1 and subsequent charts suggest some degree of convergence in the pay practices of these groups of banks. Notably, all the Canadian banks in the sample began cross-listing their equity on the New York Stock Exchange in the mid-1990s (with the exception of Scotiabank, which cross-listed in 2002). According to Southam and Sapp (2008),

<sup>1</sup> As pointed out by some observers, decision makers further down the institutional hierarchy may have compensation arrangements generating incentives that differ somewhat from those of the top executives considered here. At the same time, other things being equal, one might expect that the incentives offered to the most senior executives would influence decision making at lower levels of the organization as well.

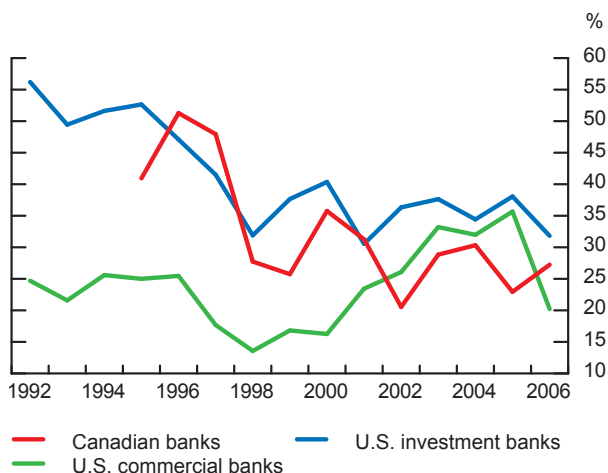
**Chart 1: Fixed pay as a share of total compensation**



such cross-listing tends to encourage convergence of Canadian compensation towards U.S. practices. That is, enhanced integration associated with cross-listing reduces segmentation in the market for executive pay and encourages convergence in compensation structure and levels. At the same time, the increased prominence of variable performance pay might also reflect the growing importance of higher-variance revenues from financial market sources (as opposed to more traditional banking business) for commercial banks, particularly Canadian banks.

The next three charts consider elements of variable performance-based pay, that is, annual cash bonus, restricted stock grants, and stock options. Chart 2 shows

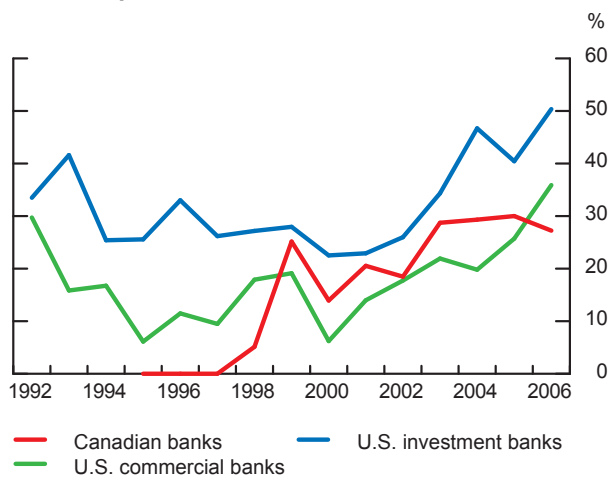
**Chart 2: Annual cash bonus as a share of total compensation**



that reliance on annual cash bonuses has declined over the sample period at Canadian banks and at U.S. investment banks, but has increased in relative importance at the U.S. commercial banks considered here, especially since 2000. Nevertheless, U.S. investment banks have relied the most on annual cash bonuses to compensate their top executives.

Chart 3 considers reliance on restricted stock grants. Such stock grants are compensation paid in the form of the employing institution's equity, where that equity is vested over a period of generally three (sometimes four) years. That is, certain rights associated with ownership of such stock are suspended for this period, such as the right to liquidate these positions. Chart 3 indicates that all institutions have been making greater use of restricted stock grants as a

**Chart 3: Restricted stock grants as a share of total compensation**

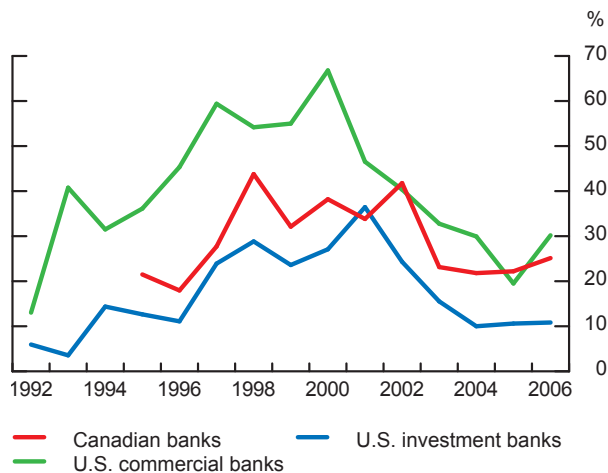


means of executive compensation over the sample period, particularly since 2000.

Stock options are widely used to compensate executives at financial institutions. These plans work similarly at major Canadian banks and at U.S. commercial and investment banks. A key common feature appears to be a vesting period of four years. More specifically, in the first year after receiving options, an executive could exercise, at most, a maximum of 25 per cent of the options. The remaining 75 per cent could be exercised in segments of 25 per cent per year over three years. It is important to note that such stock options appear to have a long duration, for example, 10 years. However, stock options are typically exercised substantially earlier than their maximum duration (e.g., in five to seven years).<sup>2</sup> Another common feature is that when executives depart, they have between 30 and 60 days to exercise their remaining options; otherwise, they are forfeited.

Reliance on stock options is illustrated in Chart 4, which suggests that in the first part of the sample period, there was growing use of stock options to compensate executives at financial institutions, followed by a general decline in their importance since the early 2000s.<sup>3</sup> This pattern reflects broader trends associated with heavy use of stock options as executive compensation in general through the 1990s, which has been associated with some concern

**Chart 4: Stock options as a share of total compensation**



<sup>2</sup> Documents supporting the ExecuComp database (at Standard & Poors' Compustat website) indicate that executives rarely wait until the expiration date to exercise their options. The rule of thumb used in that database is that options are exercised after 70 per cent of the eligible term of the option.

<sup>3</sup> The ExecuComp database provides values for the stock options paid to executives of the U.S. institutions in the sample by applying a modified Black-Scholes formula for American-style options. The same methodology was applied to value Canadian stock options paid to Canadian bank executives.

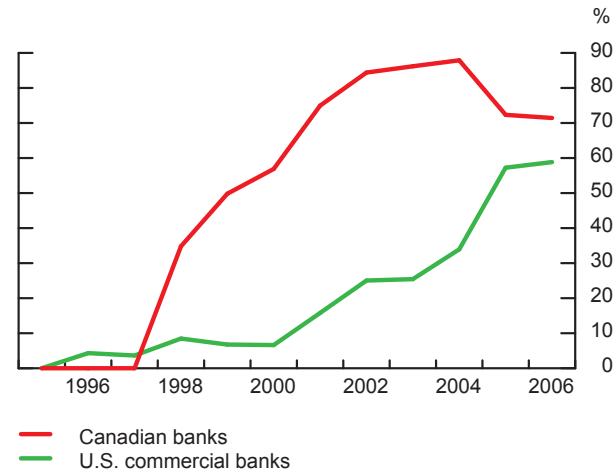
about their adverse effects on risk-taking behaviour, particularly at commercial banks. (See, for example, Chen, Steiner, and Whyte 2006, and Sanders and Hambrick 2007, who consider the case of U.S. banks.)

When considering different forms of variable performance-based compensation, such as those discussed above, the specific aspects of the compensation programs are, of course, important. For example, stock options that are in-the-money when granted would be similar to ordinary equity in terms of upside payout but would reduce compensation in the event of poor performance of the firm. Also, longer vesting periods associated with stock grants and options can improve their risk-mitigating properties. Similarly, where cash bonuses are paid, deferral of payouts (similar to vesting) and clawback features in the event of poor subsequent results can also provide risk-mitigating incentives. In addition, accounting, regulatory, and tax considerations may favour different forms of compensation, and these may vary by jurisdiction and over time.<sup>4</sup>

An important factor to consider when assessing the incentive effects of executive compensation arrangements is the amount of the decision makers' personal wealth that is at risk in the event that the institution makes imprudent decisions.<sup>5</sup> Of course, this is partly the point of providing compensation in the form of equity, such as restricted stock grants, particularly when vesting periods are long (say 5 to 10 years). Minimum share ownership requirements stipulate how much equity of the employing institution an executive must own indefinitely. Such a provision, for example, could require executives to hold equity worth 10 times their base salary indefinitely. Note also that such equity-ownership requirements at Canadian banks extend for a brief period (1 to 2 years) after retirement, providing some incentive to make prudent decisions even if retirement is imminent.

All the commercial banks considered here (except Washington Mutual) require their senior executives to own shares. As well, while the broad features of such programs seem to be similar across the various institutions, the amounts of required share ownership vary. Chart 5 shows the average minimum requirements for share ownership for chief executive officers (CEOs), given stock market valuations, weighted by total compensation, relative to total CEO compensation, for the Canadian and U.S. commercial banks in the sample.<sup>6</sup> These data also include shares owned by executives through compensation in the form

**Chart 5: Minimum requirements for share ownership as a share of total compensation**



of stock grants that must be held indefinitely (as long the CEO is in office). Chart 5 suggests that Canadian banks have required significantly greater stock ownership relative to total compensation on the part of their senior executives than have comparable U.S. commercial banks, although this gap appears to have been closed recently.

Some of the features noted above suggest that compensation arrangements at major Canadian banks have had some relatively attractive attributes with regard to risk-taking behaviour, most notably, relatively large requirements for minimum share ownership. At the same time, the data surveyed have indicated convergence in the characteristics of executive compensation at major Canadian and U.S. banks. It must be stressed, however, that the particular effects on risk-taking behaviour of the various compensation practices discussed here, and the empirical implications of the differences over time or across the groups of institutions, are unclear. As observed above, other factors, such as the specific design of compensation arrangements, as well as the effectiveness of institutional risk management and prudential supervision, are also important features that condition the effects of the incentives created by particular compensation arrangements. These various considerations suggest that any oversight of compensation arrangements should take into account a range of factors, including governance.

## PRINCIPLES FOR SOUND COMPENSATION PRACTICES

As emphasized by Jensen, Murphy, and Wruck (2004), “while executive compensation can be a powerful tool for reducing the agency conflicts between managers and the firm, compensation can also be a substantial source of agency costs if it is not managed properly.” The recently published *Principles for Sound Compensation Practices*, formulated by the FSF, aim to provide for effective

<sup>4</sup> For example, certain provisions of the U.S. Sarbanes-Oxley Act (2002) appear to have made the use of stock options as a compensation mechanism less attractive in the United States (Chhaochharia and Grinstein 2009).

<sup>5</sup> In a prescient paper, Rajan (2005) argues that it is important to provide the right incentives for managers at financial institutions, so that they are not too myopic in their investment strategies and so that they internalize the risks that they take, by putting their personal wealth at stake. In a similar way, historically, in Canada (and elsewhere), bank shareholders were subject to double liability to sharpen incentives to discourage excessive risk taking. (See, for example, Hickson and Turner 2004.)

<sup>6</sup> Such data do not appear to be readily available for investment banks.



management of compensation through several channels.<sup>7</sup> These Principles, which are reproduced below, are meant to guide supervisory oversight of compensation practices at financial institutions around the world. Note, however, that some aspects of the Principles may have already been incorporated by financial institutions and supervisors.

### Effective governance of compensation

The boards of directors of major financial firms should exercise good stewardship of their firms' compensation practices and ensure that compensation works in harmony with other practices to implement balanced risk postures. The Principles need to become ingrained over time into the culture of the entire organization.

1. The firm's board of directors must actively oversee the compensation system's design and operation.
2. The firm's board of directors must monitor and review the compensation system to ensure the system operates as intended.
3. Staff engaged in financial and risk control must be independent, have appropriate authority, and be compensated in a manner that is independent of the business areas they oversee and commensurate with their key role in the firm.

### Effective alignment of compensation with prudent risk taking

An employee's compensation should take account of the risks that the employee takes on behalf of the firm. Compensation should take into consideration prospective risks and risk outcomes that are already realized.

4. Compensation must be adjusted for all types of risk.
5. Compensation outcomes must be symmetric with risk outcomes.
6. Compensation payout schedules must be sensitive to the time horizon of risks.
7. The mix of cash, equity, and other forms of compensation must be consistent with risk alignment.

### Effective supervisory oversight and engagement by stakeholders

Firms should demonstrate to the satisfaction of their regulators and other stakeholders that their compensation policies are sound. As with other aspects of risk management

and governance, supervisors should take rigorous action when deficiencies are discovered.

8. Supervisory review of compensation practices must be rigorous and sustained, and deficiencies must be addressed promptly with supervisory action.
9. Firms must disclose clear, comprehensive, and timely information about their compensation practices to facilitate constructive engagement by all stakeholders.

The FSF has agreed that implementation of these principles should begin immediately and will be reinforced through supervisory efforts at the national level. National authorities, working through the FSF, will ensure coordination and consistency of approaches across jurisdictions.

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<sup>7</sup> The FSF brings together senior representatives of central banks, supervisory authorities, treasury and finance departments, international financial institutions, international standard-setting bodies, and committees of central bank experts. Its mandate is to assess vulnerabilities affecting the international financial system, identify and oversee action needed to address these vulnerabilities, and improve coordination and information exchange among the various authorities responsible for financial stability.