Procyclicality and Bank Capital

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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.[1] 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.[2] 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.[3]

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.[4] 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 cyclicality in capital requirements, where higher capital is required in bad times and lower capital in good times.[5] This concerns policymakers, because such cyclicality 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 cyclicality 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.[6] 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.[7]

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.[8] 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;[9] 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;[10] 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.[11]

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.[12]

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

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.[13] 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 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.[14] 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.[15] 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

12 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.

13 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.

14 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.

15 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.[16] 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.[17]

Pillar I or Pillar II?[18]

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

16 For more on this issue, see Dickson (2009a).

17 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.

18 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.

Box 1

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.

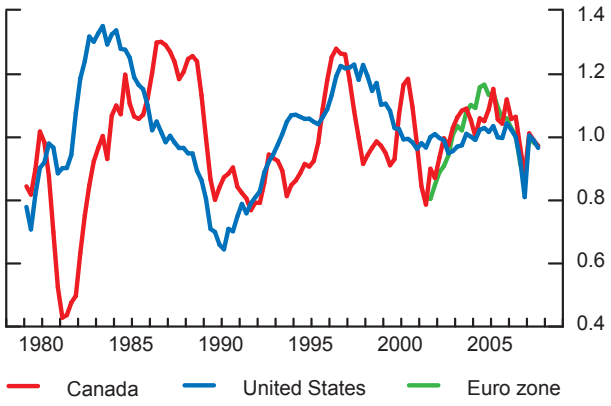
One way of capturing macroprudential risk at a given point in time might be to compare the real growth rate of private credit—comprising household and business credit—with its trend rate. Since credit booms are often cited as preceding financial crises, it seems reasonable to explore this variable as 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-cyclicality can be achieved with this rule, depending on the preferences of policy-makers. More specifically, the multiplier is calculated as follows:

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

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.[1] The pronounced

Chart A: Multiplier based on growth of private credit



Multiplier for Canada and the United States = 1 + *B*[(Y/Y real credit growth – 10-yr MA)/100]; *B* = 5. Multiplier for the euro zone = 1 + *B*[(Y/Y real credit growth – 3-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:

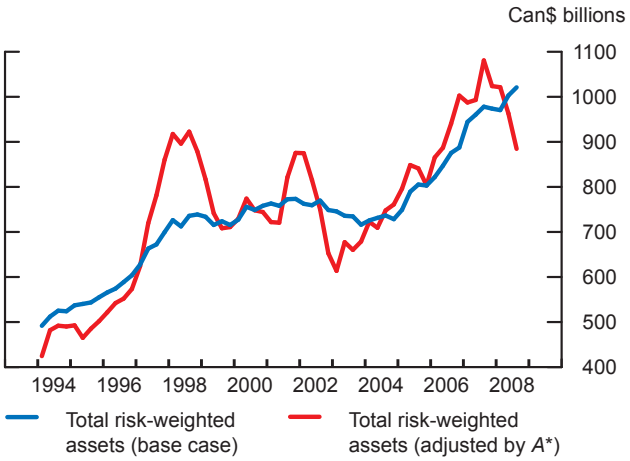
$$A^* = \sum_{i=1}^{N} s_i A_i,$$

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,…,*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)

1 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.

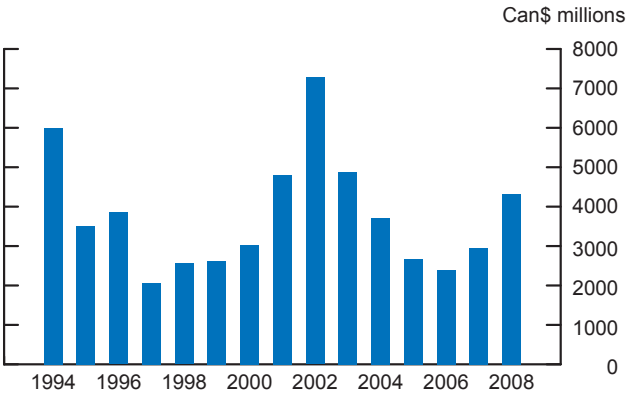
Chart B: Effect of revised multiplier on risk-weighted assets



A^* = 0.80(Cda "A") + 0.20(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."[19] 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).[20] As progress continues, the need for collaboration at the international level will become even more important.

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19 See the BIS website for the BCBS press release at <http://www.bis.org/bcbs>.

20 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.