

A Fundamental Review of Capital Charges Associated with Trading Activities

Grahame Johnson

Introduction

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

The existing structure of capital requirements distinguishes the framework for trading-book capital, which is designed to capture market risk, from the banking-book framework, which captures credit risk. While both elements are to be strengthened in the wake of the crisis, the framework for trading-book capital involves some complex and distinctive issues that are currently being examined at the international level. An initial step was taken in July 2009 when the BCBS introduced changes to the framework for capitalizing trading activities (often referred to as Basel 2.5). Although these changes increase the amount of capital required, they do not explicitly address a number of other issues in the current framework for market-risk capital. Recognizing this, the BCBS also announced that it would embark

on a fundamental review of the risk-based capital framework for trading activities. This review is currently being undertaken by a subcommittee of the BCBS (the Trading Book Group), with Canadian representation from both the Bank of Canada and the Office of the Superintendent of Financial Institutions. The group will work toward delivering a robust framework that provides appropriate capital charges for the full range of risks that financial institutions face in their trading activities.

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

The Current Prudential Regime for Trading Activities

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

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

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

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

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

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

Banks have two options for determining capital charges for trading-book positions. The first is the standardized-measurement method (SMM). Under this relatively simple framework, positions are aggregated into various supervisory-specified categories (or buckets), against which predefined capital charges are applied. The second option is the internal-models approach (IMA), which is based on value at risk (VaR) models that have been approved by bank supervisors.³ Banks have some flexibility in the precise nature of the model, but the minimum standard is a VaR calculated at the 99th-percentile, one-tail confidence interval, over a 10-day holding period.

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

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

Banks must use a minimum of one year of historical data to estimate the statistical behaviour of the risk factors. A multiplier (with a minimum value of three) is then applied to this value, partly in recognition of the fact that most financial time series have fat tails, with severe negative events occurring more frequently than the statistical models would suggest. The actual capital charge is then calculated as the greater of the previous day's charge and the average of the daily charges over the past 60 days. Under the IMA, the statistical models are further supplemented by stress tests designed to capture the impact of severe events.

What Went Wrong?

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

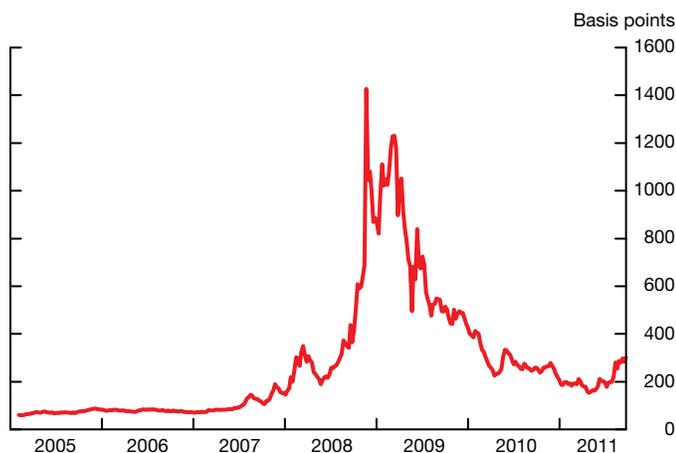
Events since 2007 have made it clear, however, that the current framework is insufficient to fully address the range of products and risk factors that now exist in the trading books of large banks. For a number of international institutions, actual losses for a range of positions in the trading book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

Inability to properly capture credit risks

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

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

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



Source: Bloomberg

Last observation: 23 September 2011

Issues with the standardized-measurement method

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

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

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

hedging (since the offsetting position attracts an additional capital charge).

Issues with the internal-models approach

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

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

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

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

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

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

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

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

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

Significant differences between the SMM and the IMA

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

The boundary between the trading book and the banking book

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

This incentive to move positions can work in both directions. For example, credit exposures generally require a lower amount of capital if held in the trading book (given the use of internal models that allow for the benefits of hedging). This provides a strong motivation to securitize credit and hold it in the trading book, even if it is ultimately impossible to sell the exposure. The banking book, on the other hand, does not require assets to be marked to market, which would allow institutions to avoid recognizing (temporary) losses. For securities that have seen sharp declines in market price (which the bank views as temporary), there is an incentive to move these positions

to the banking book, where the short-term loss would not have to be recognized. Highly rated sovereign government bonds present an example of this second arbitrage opportunity. In a volatile market, a portfolio of high-grade sovereign bonds could require a significant capital charge in the trading book (based on movements in the market price of the bonds); yet if the holding was moved to the banking book, the securities would have a risk weight of zero and would therefore require no capital.

Lack of adjustment to counterparty credit valuation

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

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

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

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

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

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

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

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

Outstanding Issues Not Addressed in Basel 2.5

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

The boundary between the trading book and the banking book

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

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

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

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

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

Revised standardized approach

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

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

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

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

Revised models-based approach

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

Benefits of diversification

In contrast to the SMM approach, where it is widely accepted that increased recognition of the benefits of hedging is desirable, there is a risk that the IMA may allow a significant overestimation of the benefits of diversification across risk factors or asset categories, especially in times of stress. This is particularly likely if the bank has full discretion on whether and to what extent to recognize these benefits. This concern is best illustrated by considering a range of possible modelling approaches. At one end of the spectrum, a bank runs a single comprehensive model that captures all risk factors and uses internally generated correlation factors to determine diversification benefits across categories. Under this approach, the amount of diversification benefit that the bank can recognize is based on the calibration of its model and is beyond the influence of the regulator.¹³ If this model is calibrated over a relatively limited historical period, it would not capture correlation behaviour during stressed periods and could significantly overestimate these benefits. At the other end of the spectrum, the firm could run a unique model for every position (or risk factor). This would produce a large number of capital charges, which would then be aggregated according to a supervisory-specified formula. Under this extreme, the regulator has full control over the degree of diversification benefit allowed (through the parameters of the aggregation formula). Such a complete level of supervisory control over the recognition of diversification benefits would also be undesirable, however, since this approach would likely not recognize legitimate diversification effects and would be so dominated by supervisory-imposed parameters that it would essentially be a replication of the SMM. Finding the right balance between these two extremes is an important question: the 2009 revisions break the trading-book capital into market risk and credit risk (and aggregate

through straight addition—no diversification benefit is allowed). Taking a more granular approach is another possibility.

Recognizing liquidity in risk models

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

Addressing shortcomings of VaR-based models

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

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

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

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

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

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

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

Conclusion

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

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

References

- Basel Committee on Banking Supervision (BCBS). 1999. "Performance of Models-Based Capital Charges for Market Risk: 1 July–31 December 1998." Available at <<http://www.bis.org/publ/bcbs57.pdf>>.
- . 2005. "Amendment to the Capital Accord to Incorporate Market Risks." Available at <<http://www.bis.org/publ/bcbs119.pdf>>.
- . 2006. "International Convergence of Capital Measurement and Capital Standards: A Revised Framework." Available at <<http://www.bis.org/publ/bcbs128.pdf>>.
- . 2009. "Revisions to the Basel II Market Risk Framework." Available at <<http://www.bis.org/publ/bcbs158.pdf>>.
- . 2011. "Messages from the Academic Literature on Risk Measurement for the Trading Book." BCBS Working Paper No. 19.
- Financial Services Authority (FSA). 2010. "The Prudential Regime for Trading Activities: A Fundamental Review." Discussion Paper No. 10/4.
- Pengelly, M. 2010. "Banks Struggle with Basel 2.5." Risk.net, 3 September. Available at <<http://www.risk.net/risk-magazine/feature/1730975/banks-struggle-basel>>.
- Persaud, A. 2001. "Sending the Herd off the Cliff Edge: The Disturbing Interaction Between Herding and Market-Sensitive Risk Management Practices." In *Market Liquidity: Proceedings of a Workshop Held at the BIS*, 233–40. BIS Paper No. 2. Basel: Bank for International Settlements.
- Youngman, P. 2009. "Procyclicality and Value at Risk." Bank of Canada *Financial System Review* (June): 51–54.