



BANK OF CANADA

Financial System Review

June 2005

The Financial System Review and Financial Stability

The financial system makes an important contribution to the welfare of all Canadians. The ability of households and firms to confidently hold and transfer financial assets is one of the fundamental building blocks of the Canadian economy. As part of its commitment to promoting the economic and financial welfare of Canada, the Bank of Canada actively fosters a safe and efficient financial system. The Bank's contribution complements the efforts of other federal and provincial agencies, each of which brings unique expertise to this challenging area in the context of its own institutional responsibilities.

The financial system is large and increasingly complex. It includes financial institutions (e.g., banks, insurance companies, and securities dealers); financial markets in which financial assets are priced and traded; and the clearing and settlement systems that underpin the flow of assets between firms and individuals. Past episodes around the world have shown that serious disruptions to one or more of these three components (whether they originate from domestic or international sources) can create substantial problems for the entire financial system and, ultimately, for the economy as a whole. As well, inefficiencies in the financial system may lead to significant economic costs over time and contribute to a system that is less able to successfully cope with periods of financial stress. It is therefore important that Canada's public and private sector entities foster a financial system with solid underpinnings, thereby promoting its smooth and efficient functioning.

The *Financial System Review* (FSR) is one avenue through which the Bank of Canada seeks to contribute to the longer-term robustness of the Canadian financial system. It brings together the Bank's ongoing work in monitoring developments in the system and analyzing policy directions in the financial sector, as well as research designed to increase our knowledge. The strong linkages among the various components of the financial system are emphasized by taking a broad, system-wide perspective that includes markets, institutions, and clearing and settlement systems. It is in this context that the FSR aims to

- improve the understanding of current developments and trends in the Canadian and international financial systems and of the factors affecting them;
- summarize recent work by Bank of Canada staff on specific financial sector policies and on aspects of the financial system's structure and functioning;
- promote informed public discussion on all aspects of the financial system, together with increased interaction on these issues between public and private sector entities.

The FSR contributes to a safe and efficient financial system by highlighting relevant information that improves awareness and encourages discussion of issues concerning the financial system. The Bank of Canada welcomes comments on the material contained in the FSR.

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June 2005

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Developments and Trends

Notes

The material in this document is based on information available to 27 May unless otherwise indicated.

The phrase “major banks” in Canada refers to the six largest Canadian commercial banks by asset size: the Bank of Montreal, CIBC, National Bank, RBC Financial Group, Scotiabank, and TD Bank Financial Group.

Assessing Risks to the Stability of the Canadian Financial System

The *Financial System Review* is one vehicle that the Bank of Canada uses to contribute to the strength of the Canadian financial system. The Developments and Trends section of the *Review* aims to provide analysis and discussion of current developments and trends in the Canadian financial sector. The first part of this section presents an assessment of the risks, originating from both international and domestic sources, that could affect the stability of the Canadian financial system. Key risk factors and vulnerabilities are discussed in terms of any potential implications for the system's overall soundness.¹

The current infrastructure, which includes financial legislation, the legal system, financial practices, the framework of regulation and supervision, and the macroeconomic policy framework, significantly influences the way in which shocks are transmitted in the financial system and in the macroeconomy, and thus affects our assessment of risks.

Our risk assessment is focused on the vulnerabilities of the overall financial system, and not on those of individual institutions, firms, or households. We therefore concentrate on risk factors and vulnerabilities that could have systemic repercussions—those that may lead to substantial problems for the entire financial system and, ultimately, for the economy. In examining these risk factors and vulnerabilities, we consider both the likelihood that they will occur and their potential impact.

Particular attention is paid to the deposit-taking institutions sector, because of its key role in facilitating financial transactions, including payments, and its interaction with so many other participants in the financial system. For instance, these institutions assume credit risks with respect to borrowers such as households and non-financial firms. Thus, from time to time, we assess the potential impact that changes to the macrofinancial environment may have on the ability of households and non-financial firms to service their debts.

Risk factors and vulnerabilities related to market risks are also examined. The potential for developments in financial markets to seriously affect the financial position of various sectors of the economy and, ultimately, to disrupt the stability of the Canadian financial system is assessed.

1. The second part of the Developments and Trends section examines structural developments affecting the Canadian financial system and its safety and efficiency; for example, developments in legislation, regulation, or practices affecting the financial system.

Financial System Risk Assessment

Overview

This section of the Review presents an assessment of the risks arising from both international and domestic sources bearing on the stability of the Canadian financial system. The objective is to highlight key risk factors and vulnerabilities in the financial system and to discuss any potential implications for the system's overall soundness.

Key Points

- In general, the financial health of Canadian financial institutions, households, and non-financial corporations remains robust.
- Sources of risk to the Canadian financial system remain, however. These include rising global imbalances, the adverse implications of investors' continued search for higher financial returns, and the potential volatility of economic growth in China.
- Preliminary analysis of the trend increase in financial risks borne by the Canadian household sector (partly resulting from the transfer of risks from other sectors) suggests that this trend currently poses only limited risks to the soundness of the domestic financial system.
- Overall, the Bank of Canada concludes that the Canadian financial system remains sound. As well, the likelihood that these risks will be realized in such a way that there will be a significant impact on the Canadian financial system is small.

Globally, financial institutions and other corporations have generally continued to report robust profitability. Capital-adequacy ratios at large international and Canadian financial institutions have continued to improve. The overall financial situation of the Canadian non-financial corporate sector has also remained strong into 2005. Furthermore, Canadian households appear to pose relatively low risks for the Canadian financial system, since both the household debt-service ratio and the level of household indebtedness relative to net assets on a market-value basis remain modest. As a result, the domestic financial system appears, on balance, well positioned relative to the vulnerabilities associated with the currently identified sources of risk.

The major sources of risk include the possibility of a disorderly adjustment of global imbalances, the possibility of a sudden decline in the prices of riskier financial assets, and the potential volatility of economic growth in China. There are also other sources of risk that are judged to be less significant, such as the trend increase in financial risks borne by the Canadian household sector. Although it is difficult to assess the likelihood and near-term impact on the Canadian financial system of the realization of these risks, factors that might inform judgment on these issues are discussed in this section of the Review.

Internationally, global imbalances are a key risk to financial stability. Despite a 19 per cent real effective depreciation of the U.S. dollar from its peak in February 2002, the U.S. current account deficit has continued to widen. This U.S. external deficit is mirrored by current account surpluses elsewhere, especially in Asia. To date, financial markets have handled these developments with relative ease. It is not clear, however, whether this will continue. Further adjustment could take many forms, and under some scenarios could be potentially disruptive to the

Since the release of the last *Financial System Review* in December 2004, the global and domestic financial systems have remained sound.

global economy and financial system. If the U.S. dollar continues to depreciate, international investors, including foreign central banks that have been accumulating U.S.-dollar foreign currency reserves, may become increasingly wary of adding to their dollar exposures. A sudden sell-off of U.S. dollars could have implications for interest rates and for the prices of riskier financial assets, both in the United States and in the rest of the world, including Canada. Studies of past large current account adjustments in advanced countries, however, suggest that market forces usually restore external sustainability without substantial disruption. Such an outcome would undoubtedly allow participants in the Canadian financial system to adjust without significant adverse consequences. Nevertheless, without timely corrective action on the part of key countries, the risk of a disorderly adjustment is likely to grow. In the meantime, the uncertainty about how global imbalances will be resolved remains an important risk for the Canadian financial system.

The possibility of a sudden increase in the price volatility of riskier financial assets and a sudden decline in their prices pose risks to the Canadian financial system. Financial markets have been supported by high levels of monetary stimulus, which has been one factor sustaining investors' continued search for higher financial returns. Over the past few years, there has been a simultaneous appreciation of prices across a range of financial-asset classes, particularly for riskier fixed-income assets. Since March of this year, the prices of riskier assets have receded. Nevertheless, the prices of most risky assets remain high, and this has led to renewed concerns that investor leverage may have resulted in valuations having outpaced fundamentals. As a result, there is a risk that a large-scale reversal in trading strategies may lead to a rapid increase in asset-price volatility and a sudden decrease in asset prices. One catalyst for such a reversal could be a sharp reduction in investor risk appetite, potentially resulting from a disorderly adjustment of global imbalances or from other events with important financial ramifications. The significance of these risks varies across investors, depending on their exposure to riskier asset prices. Major banks play a key role in the domestic financial system, and they appear well positioned to manage potential adverse movements in asset prices. They continue to be well capitalized and use risk-management practices

that should limit the adverse impact of financial market volatility on their financial position.

Rapid economic growth in China over the past several years has focused attention on the possible global financial and economic implications of a sharp economic slowdown, or "hard landing," in China. Given the growing level of integration between Asian economies, a marked slowdown of the Chinese economy could have significant negative repercussions for the prices of commodities that Canada produces and exports globally. A decline in commodity prices would likely lead to downward pressure on the value of the Canadian dollar, thereby softening the burden of lower prices on Canadian commodity producers. If, on the other hand, China's economy continues to grow rapidly, the Canadian financial system could face an alternative set of vulnerabilities. Although continued strong growth in Asian demand for commodities, including oil and other energy products, would benefit Canadian producers, input costs would rise for other Canadian producers, as well as for households. Continued rapid growth in China could also result in overheating of its economy and a sharper downturn. Although each of these scenarios would likely significantly affect the profitability of many industries with a high exposure to international trade, including certain manufacturing industries, our analysis suggests that the overall impact on Canadian financial stability of either scenario would likely be limited.

Domestically, the overall financial situation of the Canadian non-financial corporate sector remained strong into 2005. But the performance of some non-financial industries, notably auto manufacturing, wood and paper, as well as electronic, computer, and clothing and textile manufacturing, has deteriorated recently. These developments represent another source of risk for the Canadian financial system. This deterioration results from a number of developments, including the further strengthening of the Canadian dollar since mid-2004 and substantial increases in input costs. The credit quality of these industries' debts has thus worsened. It is unlikely that Canadian financial institutions with well-diversified portfolios would be strongly affected overall by the deteriorating credit quality in these industries. Thus, the near-term risks they pose to the stability of the domestic financial system are limited.

Regulations and standards designed to improve the ability to manage, monitor, and measure risks in one sector may result in those risks being transferred to another sector, such as households. Some of the risks that have traditionally been managed by banks and pension funds have been transferred to households over the past decade. Furthermore, Canadian households have also voluntarily increased the risks to which they are exposed. The analysis of the potential impact of these increased risks, which is presented in this issue, aims to determine the impact that these changes may have on the stability of the Canadian financial system. This analysis follows up on a study published in the December 2004 issue of the *Review*, which focused on the general financial situation of households. Overall, our preliminary analysis indicates that the increased risk assumed by Canadian households appears to pose only limited risks to the financial system.

Finally, major banks in Canada have reported record profits for the first quarter of 2005, with all three of their major business areas—consumer and commercial banking, wholesale banking, and wealth management—doing very well. Other financial institutions in Canada, such as securities dealers, life, health, and property and casualty insurance companies, also continued to report robust profitability.

Overall, the Bank of Canada concludes that the Canadian financial system remains sound. As well, the likelihood that these risks will be realized in such a way that there will be a significant impact on the Canadian financial system is small.

Highlighted Issue

The potential impact on the domestic financial system of the increased risk borne by the Canadian household sector is discussed in this section.

An increase in the risks assumed by Canadian households

Prepared by Philippe Muller

When assessing the stability of the financial system, it is essential to have a thorough understanding of the transfer of risks between the system's sectors. Regulations and standards designed to improve the ability to manage, monitor, and measure risks in one sector may result in those risks being transferred to another sector, such as households.

Throughout the world, banks, insurance companies, and non-financial corporations that sponsor a pension fund are seeking to reduce the volatility of their balance sheets. Consequently, some risks that have traditionally been managed by these institutions are now being transferred to households. For instance, some firms are considering changing their pension funds to defined-contribution pension plans, in which employees assume the risks associated with benefits. Another example is the use by Canadian banks of securitization, which transfers part of the banks' credit risk to investors (Toovey and Kiff 2003). Canadian households have also voluntarily increased the risks to which they are exposed; for example, by increasing the share of their wealth invested in assets that are subject to market risk.

This rising level of risk has transformed the balance sheets of Canadian households.¹ This section presents the preliminary results of a study that seeks to identify and document the mechanisms by which risks are transferred to Canadian households, as well as to quantify the magnitude of the increase in overall risk assumed

by households. The ultimate goal is to determine the impact that these changes may have on the stability of the Canadian financial system.

Our analysis is based on aggregate data and general indicators of the financial situation of households, and some of the numbers are already several years old. Thus, the analysis does not take into account the variability of conditions confronting households in different income brackets; it may also fail to capture the most recent trends. Because of the growing importance of households in the financial system, the Bank supports efforts to expand the range of data available on Canadian households.²

The analysis begins with a description of the macroeconomic context. It then emphasizes the transformation of pension plans before addressing the potential short-term impact that increased market risk may have on households' assets, liabilities, and net worth. This is followed by an examination of the impact of increased riskiness associated with household balance sheets on the stability of the Canadian financial system.

The macroeconomic context

Inflation in Canada was markedly lower in the 1990s than during the two previous decades. It also became much more stable and predictable, and the volatility of many other macroeconomic variables also diminished considerably (Longworth 2002; Debs 2001; and Crawford 2001). Even though a decline in the volatility of macroeconomic variables is beneficial to households as a whole, this does not necessarily mean that they are exposed to less financial risk. Indeed, it appears that the decline in the volatility of macroeconomic variables has not translated into a decline in the volatility of financial variables, except in the case of fixed-income securities.³ Furthermore, financial innovation, changes to regulation, and social developments have all had an impact on the types of risk to which Canadian households are exposed. These

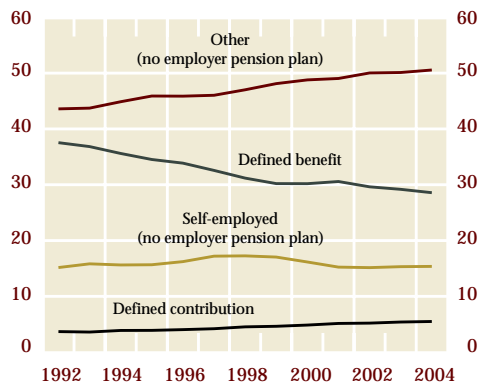
1. The December 2004 issue of the *Review* features a discussion of the overall financial situation of Canadian households. The analysis concludes that the risk posed to the financial system by the potential deterioration of the quality of household credit is minimal. A cyclical increase in interest rates should not significantly affect the credit quality of household debt, and the likelihood of a significant reversal in house prices in major Canadian markets is remote.

2. As well, an OECD working group is currently identifying measures that would improve the coverage of household financial data in national accounts.

3. Borio and Lowe (2002) find that the magnitude of speculative bubbles has recently increased, and they conclude that low and stable inflation could increase the probability that excessive demand will affect the prices of financial assets.

Chart 1 Participation in Pension Plans

As a percentage of employment



Source: Statistics Canada

factors have affected the evolution of the balance sheets of households and pension plans.

The transformation of pension plans

Defined-benefit pension plans generally assume a large share of the risk associated with paying retirement benefits. Conversely, in the case of *defined-contribution* pension plans, this risk falls on the employee. Thus, switching from defined-benefit to defined-contribution plans implies shifting risk from the sponsors of pension funds to households.

There are currently strong pressures on sponsors of pension funds to transform their defined-benefit plans into defined-contribution plans. This is partly attributable to the fact that the most sought-after and mobile segment of the labour market is increasingly demanding defined-contribution pension plans. In fact, skilled workers who expect to change jobs several times over the course of their careers tend to prefer defined-contribution plans, since they are financially more advantageous.⁴ Defined-benefit plans are also facing major supply-side pressures. The deficit position of many plans, changes to accounting practices, and certain judicial decisions may significantly affect the future offer of defined-benefit plans.

An analysis of the various pension plans available in Canada shows a downward trend (-10 percentage points over the past 10 or 11 years) in the number of participants in defined-benefit pension plans (Chart 1). This means that the retirement savings of a growing number of Canadians are exposed to market risk.

Our analysis further indicates that the proportion of workers whose employers offer a pension plan is declining. While over 40 per cent of employees were in an employer-sponsored pension plan in 1992, this percentage had fallen to below 35 per cent by 2004. Households are thus increasingly responsible for saving for their own retirement.

The transfer of risk from firms to households that follows from the reduction in the number of participants in defined-benefit pension plans

4. The financial benefits associated with defined-benefit plans increase slowly in early career. Only during the final six to eight years before retirement do the advantages accumulate rapidly for members of this type of plan.

thus translates into a shift of risk from corporate stockholders to the participants in the various pension plans. So far, this transfer has affected only 10 per cent of Canadian households. Furthermore, it is absolutely essential to conduct a deeper analysis using disaggregated and detailed data on the retirement holdings of Canadian households, so as to obtain a better understanding of the impact of this transformation on households and on the Canadian financial system.

The evolution of the balance sheets of Canadian households

The balance sheets of Canadian households have undergone some interesting changes over the past two decades. First, household balance sheets are much bigger now. The value of household assets doubled between 1990 and 2004, increasing from 343 to 371 per cent of GDP.

In terms of their composition, there has been a rise in the share of total household wealth invested in assets subject to market risk, such as stocks, mutual funds, and principal residence (Table 1). This increase has been at the expense of investments in foreign currencies and deposits, implying that a growing share of household assets are subject to market risk.

Furthermore, the share of household assets in private registered pension plans has experienced strong growth since 1984. Canadian households may therefore be affected by the increase in risks associated with these private plans. To evaluate the scope of this shift, it would first be necessary to identify the number of Canadian households having retirement savings plans and to establish the value of these plans.⁵ In 1999, 71 per cent of Canadians had retirement savings associated with private plans. The amount of Canadians' savings allocated to private pension plans accounted for 29 per cent of total household assets.⁶ Therefore, the increase in risk attributable to retirement savings

Table 1

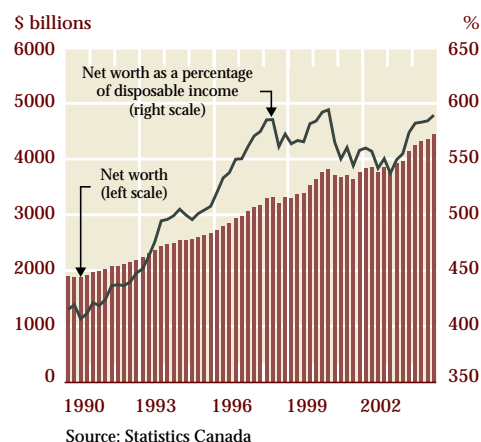
Household Balance Sheet

As a percentage of assets

	1984	1999
Financial	21.10	31.10
Liquid assets	12.80	7.40
Registered savings ^a	4.00	14.20
Stocks/mutual funds	2.20	8.50
Non-financial	78.90	68.90
Value of principal residence	42.30	41.20
Total assets	100.00	100.00
Debts	14.40	15.50
Mortgage on principal residence	8.50	10.20
Net wealth	85.60	84.50

a. Comprises registered retirement savings, registered home ownership savings, registered education savings, and deferred profit-sharing plans
Source: Statistics Canada, *Survey of Consumer Finances* (1984), *Survey of Financial Security* (1999)

Chart 2 Net Worth of Household Sector



5. The Canada and Quebec Pension plans, as well as the Old Age Security Program (OAS) and the Guaranteed Income Supplement (GIS), are government programs available to all Canadians. Consequently, they are excluded from this analysis.
6. Private retirement assets include individuals' savings accumulated in registered retirement savings plans plus the value of savings vested in a company pension plan (Statistics Canada 2001).

plans is relevant to only a limited share of the assets of Canadian households.

An analysis of the distribution of Canadians' pension assets reveals that 76 per cent of Canadian households have retirement savings that total less than \$100,000, and that the remaining 24 per cent possess 84 per cent of all private pension assets. Private retirement savings in Canada are thus highly concentrated in the hands of wealthy households.⁷

In terms of household liabilities, the rising popularity of variable-rate mortgages has established itself as a recent trend. We estimate that in 2004 the share of variable-rate mortgages was slightly below 30 per cent, up from less than 5 per cent in 1999. Mortgage loans represent a very high proportion of the liabilities of Canadian households: 68.4 per cent in 2004 (*Bank of Canada Banking and Financial Statistics* April 2005). Variable-rate mortgages increase the exposure of households to interest rate risk. These additional risks are likely offset by the characteristics of these instruments: short-term rate hikes do not necessarily result in higher payments, and mortgage payments are lower on average.⁸ Moreover, the level of risk assumed appears quite limited, since the proportion of variable-rate mortgages in Canada remains below that in many other industrialized countries.

The net worth of Canadian households (at market prices) has more than doubled since 1990 and has increased more rapidly than real disposable income (Chart 2).⁹ It can be used to determine the impact of all the aforementioned changes on the financial health of households. The volatility of the ratio of this net worth to disposable income represents a measure of the risks assumed by households: An increase in risk generally results in greater volatility (unless diversification yields positive results).

In Canada, data on net worth (at market prices) have been available only since 1990. An analysis

of these statistics does not yield a clear picture of the impact that the increased risk assumed by Canadian households has on the volatility of the overall net worth of households. Because household wealth is strongly influenced by the value of the principal residence, it is possible that an increase in the proportion of assets held in financial instruments reduces the volatility of the total net worth. This would be a benefit of portfolio diversification.¹⁰

In light of the strong growth in the net worth of Canadian households relative to disposable income since 1990, we may infer that they are better placed than before to contend with the increase in financial risk.

Impact on the stability of the financial system

Overall, our preliminary analysis indicates that the increased risk assumed by Canadian households appears to pose only limited risks to the financial system.¹¹

First, this transfer of risks is, in actuality, a redistribution of risks among households. For example, as banks transfer some of their risks onto other participants in the financial system (including households), this amounts to a shift of risks from the banks' stockholders to pension plans, to insurance companies, and to households that own financial assets.¹² Only a small proportion of Canadians directly invest in financial assets, and pension funds hold bank stock in their portfolios. We may further assume that the same Canadians who own bank stock also invest in financial assets and belong to pension funds.¹³ Thus, risks seem to be redistributed primarily between households, and within the portfolios of the wealthiest households.

7. An analysis of the concentration of wealth in Canada leads to the same conclusion.
8. Some variable-rate mortgage contracts allow payments to remain constant even if the short-term rate increases.
9. Net worth is obtained by subtracting liabilities from assets (at market value). Net worth is expressed in terms of disposable income in order to normalize it using an annual measure of households' ability to generate savings.

10. Work by the IMF (2005) has revealed that the volatility of household net worth is lower in countries where the proportion of financial assets in household portfolios is highest.
11. This conclusion is consistent with those of international bodies examining the transfer of risks onto households in other industrialized countries (IMF 2005).
12. Canadian banks have been reducing their credit risk through securitization for several years, giving rise to the purchase of these new securities by pension funds and households.
13. The high concentration of assets among the wealthiest households supports this assumption.

Second, if the newly acquired financial assets generate yields that are weakly or negatively correlated with those of the assets that households already own (such as the family residence), then the acquisition of financial assets could very well yield the benefits of diversification.¹⁴ In fact, yields from the stock market and from fixed-income securities in Canada have been weakly correlated with those generated by real estate since 1990.

Nonetheless, if the redistribution of risks were to be among the lowest-income households, it is possible that a strong variation in asset prices could substantially affect households' ability to meet their debt-servicing obligations and cause an increase in bad debts held by financial institutions. Although unlikely, this possibility underscores the need to improve the frequency and depth of surveys of household balance sheets and to pursue ongoing studies that use disaggregated data on the balance sheets of Canadian households. These data and analyses should make it possible to determine whether particular classes of households have an elevated concentration of assets that have a higher exposure to market risk. This would then allow better determination of the long-term impact of this phenomenon on the Canadian financial system.

Some of these risk transfers also raise certain longer-run issues. For example, with the downward trend in the number of participants in defined-benefit pension plans, the decline in the number of employers offering pension plans since 1990, and the fall in benefits paid by government programs (OAS and GIS) in the wake of efforts to clean up public finances, it has become increasingly important to determine whether Canadian households are saving enough for their retirement.¹⁵ A shortfall in private savings could have negative repercussions for components of the financial system other than households. It could, for example, generate upward pressures on the benefits paid by government pension-supplement programs.

Furthermore, the question of whether households have the ability to adequately manage these increased financial risks merits consideration. It is quite possible that some households are poor risk managers and badly placed to absorb the potential consequences of the risks they incur. This, in turn, raises the need for authorities to promote the financial education of households in order to help them better understand the financial risks to which they are exposed.¹⁶

Even though this preliminary analysis indicates that the increased risk assumed by Canadian households has had little short-term impact on the stability of the Canadian financial system, policies designed to improve the financial stability of systemically important institutions should, nonetheless, take into account the resulting transfers of risk onto households, as well as their capacity to manage and absorb them.

The Macrofinancial Environment

The global economic expansion has continued at a healthy pace in recent months. Nevertheless, the surge in crude oil prices and their volatility since August 2004, together with the further widening of the U.S. current account deficit, have increased economic and financial uncertainty.

The global environment

Against this backdrop of higher crude oil prices and their increased volatility, expectations for global economic growth in 2005 have been revised down since the December 2004 *Review* (Chart 3). Global activity is expected to remain robust, however, owing to the continued strong growth of most emerging-market economies, especially in Asia. Growth also remains solid in the United States. As a result, financial market participants expect the U.S. federal funds rate to rise to between 3.50 and 3.75 per cent by year-end.

Improved corporate profitability and continued favourable financing conditions have contributed to a further decrease in various indicators of financial distress, such as default rates. According to Standard & Poor's, the global corporate default rate for speculative issuers, on a 12-month

14. These benefits are on top of those accruing to the overall financial system from the diversification of risk among the various sectors.

15. See Statistics Canada (2001). This study indicates that 33 per cent of Canadian households had insufficient savings to maintain their standard of living after retirement.

16. See initiatives of the Financial Consumer Agency of Canada (www.fcac-acfc.gc.ca).

Chart 3 Evolution of Consensus Estimates for Annual Growth of Industrialized Economies* in 2005

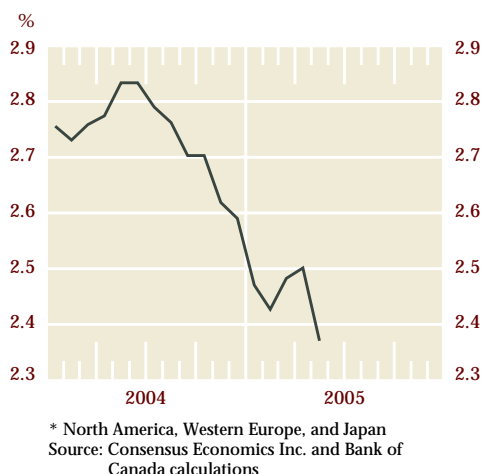


Chart 4 Default Rates on Speculative-Grade Bonds

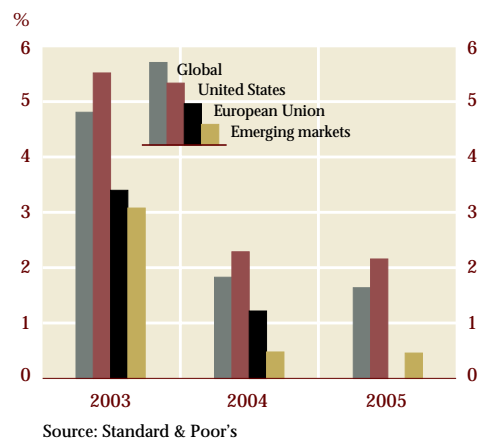
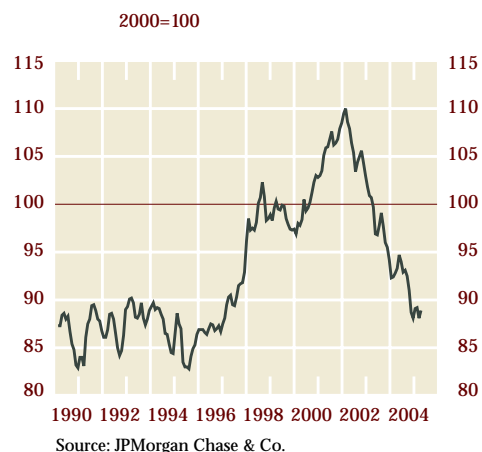


Chart 5 Real Effective Exchange Rate of the U.S. Dollar



rolling-average basis, edged down slightly to 1.6 per cent in April from 1.8 per cent at the end of 2004 (Chart 4).¹⁷

Global imbalances

The June 2004 *Review* highlighted global imbalances as a key risk to international financial stability. A year later, this risk remains. Despite a 5 per cent real effective depreciation in the U.S. dollar since last June and a 19 per cent depreciation since its peak in February 2002 (Chart 5), the U.S. current account deficit has continued to widen. In the fourth quarter of 2004, it moved above 6.3 per cent of GDP, a level viewed by most analysts as unsustainable (Chart 6). The growing deficit partly reflects the low level of U.S. domestic savings, particularly compared with savings in Asia. It also reflects the strength of U.S. demand relative to demand elsewhere. Until now, financial markets have absorbed these developments with relative ease. Notably, long-term bond yields remain low by historical standards, and volatility in the value of the U.S. dollar has been low.

It is not clear, however, how the currently benign situation will evolve. Adjustment can take many forms, and some scenarios could be potentially disruptive to the global economy and financial system. The weakening U.S. dollar has already significantly eroded the value of foreign claims in the United States. If the U.S. dollar continues to depreciate—as most analysts predict it must, to help shrink the deficit to sustainable levels—international investors may become wary of increasing their exposure to the U.S. dollar. However, this tolerance threshold is difficult to evaluate in the context of increasing global trade and economic and financial integration. Moreover, the U.S. economy remains the most productive and flexible among advanced economies. Nonetheless, the prospect of a steep depreciation in the dollar increases the risks of global financial instability.

The U.S. current account deficit is no longer principally financed by inflows of long-term private investment. Gross inflows of foreign direct investment and purchases of corporate stocks (as a percentage of U.S. GDP) have declined considerably from their peak in 1999. This has created a gap in external financing that

17. Over the 1981–2004 period, the default rate averaged 4.9 per cent.

has been filled by greater debt flows (corporate bonds and U.S. Treasuries), which are likely to be more mobile.

Asian central banks, in an effort to prevent their currencies from appreciating, have been actively buying U.S. assets. The rapid accumulation of official reserves by Asian central banks is playing a role both in stemming the dollar's real effective decline and in keeping yields on long-term U.S. issues low (Chart 7). But it has also added to uncertainty about the nature and timing of the eventual global adjustment process.

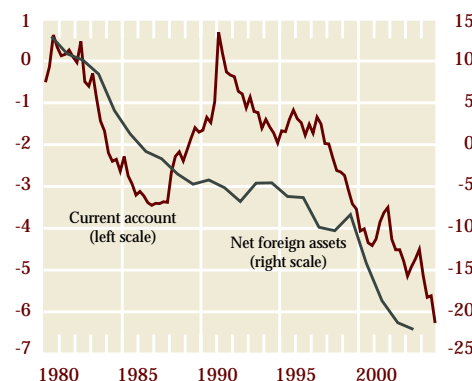
Although Asian central bank holdings of U.S. dollars are already at a very high level (Chart 8), an abrupt cessation of this accumulation of U.S. dollars seems highly unlikely. Over the medium term, however, Asian currencies will have to become more flexible in response to growing domestic pressures, including rising inflation, inflows of speculative capital, and the fiscal costs of continued intervention.

A slowdown in central bank purchases or a loss of confidence on the part of private investors could lead to a disorderly adjustment of external imbalances. A sudden sell-off of the U.S. dollar could have implications for interest rates and asset prices, both in the United States and in the rest of the world, including Canada. U.S. long-term interest rates would likely rise, while the yields of similar maturities in other industrialized countries could potentially fall as a result of a "flight to quality." The economic effects would be complicated, but the current narrow spreads on high-yield corporate debt and emerging-market investments, despite the recent retrenchment since March, suggest these may be among the first affected (Chart 9). Higher interest rates would induce U.S. households to increase their very low savings rate.

It is difficult to evaluate the risk of this scenario, however. Studies by the Federal Reserve Board of large current account adjustments suggest that, in advanced countries, market forces usually restore external sustainability without substantial disruption (Croke, Kamin, and Leduc 2005; Freund 2000). An increase in U.S. savings—through, for example, greater fiscal restraint—combined with increased spending abroad and more flexible Asian currencies would contribute to such an outcome. This would undoubtedly allow participants in the Canadian financial system to adjust without

Chart 6 External Balance: United States

Percentage of GDP



Source: U.S. Bureau of Economic Analysis

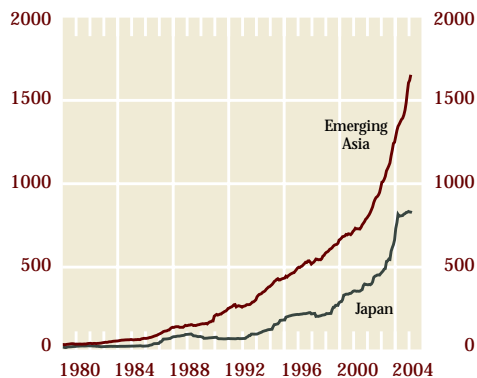
Chart 7 U.S. Interest Rates



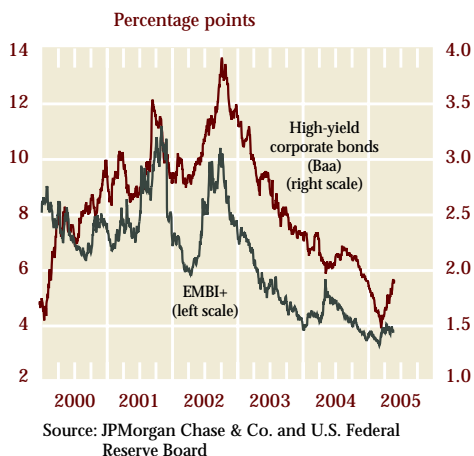
Source: Reuters and U.S. Federal Reserve Board

Chart 8 Asian Reserves

US\$ billions



Source: International Monetary Fund

Chart 9 Bond Spreads Relative to U.S. Treasuries

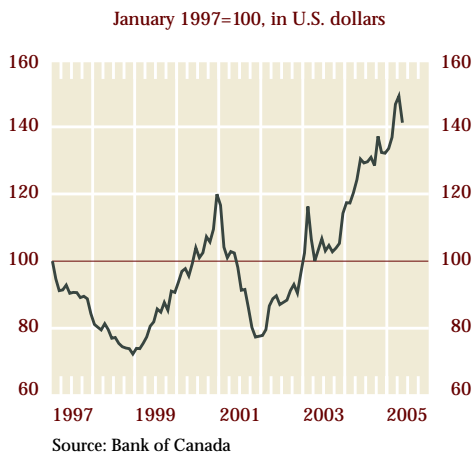
significant adverse consequences. But without timely corrective action by key countries, the risk of a disorderly adjustment is likely to grow.

The Chinese economy and the Canadian financial system

China has experienced rapid economic growth for several years now and has become increasingly integrated with other countries through international trade and financial flows (Chart 10). This has focused attention on the possible global financial and economic implications of a sharp economic slowdown, or hard landing, in China. A dramatic slowdown has become less likely in the near term, since growth in China's real GDP remained robust in the first quarter of 2005, and private forecasters expect growth to moderate only slightly over the remainder of 2005. Nevertheless, given the relatively high level of integration between Asian economies, it is useful to assess the potential impact on the Canadian financial system of a possible hard landing of the Chinese economy at some point in the future.

A hard landing in China would generally put downward pressure on global economic growth. If all other things remain equal, the direct effect on Canadian exports would be relatively limited, given that China's share of total Canadian exports remains low at 2.0 per cent. Far more important would be the indirect effect on the Canadian economy through lower global commodity prices. Many observers have attributed the recent surge in the prices of a range of commodities to strong Asian demand, especially that from China (Chart 11, and Technical Box 2 of the Bank's April 2005 *Monetary Policy Report*). Consequently, a marked slowdown of the Chinese economy could have significant negative repercussions on the prices of the commodities that Canada produces and exports globally.

With Canadian bank claims on Chinese entities being very small (only 0.9 per cent of total bank capital in 2004), the consequences for the financial system of a hard landing in China would depend primarily on the impact of lower commodity prices on the balance sheets of Canadian bank customers. In this regard, it is important to consider the effect of lower commodity prices on the Canadian dollar. Other things being equal, a decline in U.S.-dollar commodity prices would likely lead to downward pressure on the Canadian dollar, softening the

Chart 10 China**Chart 11 Bank of Canada Commodity Price Index: Total**

burden of lower commodity prices on Canadian producers. Moreover, the sustained run-up in commodity prices since 2004 has left most commodity-producing industries relatively sound financially and less likely to experience significant financial stress. At the same time, a modest reduction in commodity prices would help many industries that use commodities.

If, on the other hand, China's economy continues to grow for the next several years at the same average pace that it has over the past two decades, the Canadian financial system could face an alternative set of vulnerabilities. All else being equal, such a scenario should imply continued strong growth in Asian demand for commodities, including oil and other energy products. This would benefit Canadian commodity producers while raising input costs for consumers of Canadian commodities. As in the case of a hard landing, this scenario would likely significantly affect the economic output and profitability of many industries with high exposure to international competition. At the same time, higher world commodity prices would likely be partially offset by an appreciation of the Canadian dollar.¹⁸ However, continued rapid growth of the Chinese economy would likely only postpone an inevitable, and potentially larger, slowdown. Moreover, continued strong growth in China could lead Canadian banks and households to increase their exposure to Chinese investments as they search for higher returns. This would likely result in diversification benefits for Canadian banks, provided that the increase in their exposure to China in coming years was gradual. The cyclical nature of economic growth and commodity prices suggests that increased exposure to sectors dependent on the continued strength of the Chinese economy should be made without compromising the efforts of major Canadian banks to diversify their revenue sources.¹⁹

In view of the present health of the Canadian household and corporate sectors, it appears that the overall impact of a slowdown in the Chinese economy or, alternatively, continued strong

Chart 12 Real GDP Growth: Canada

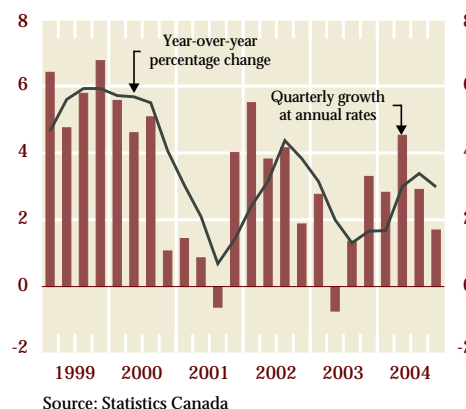


Chart 13 Financial Position of the Canadian Non-Financial Corporate Sector

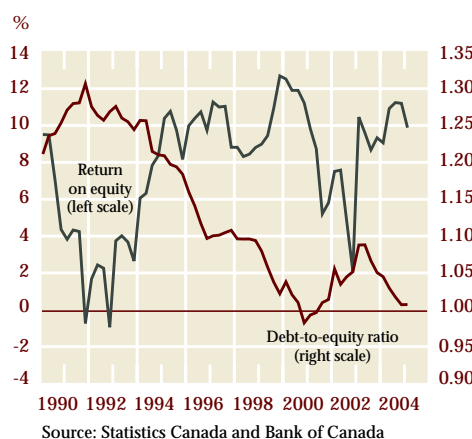
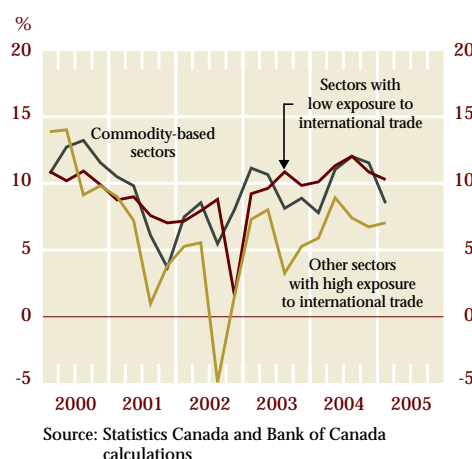
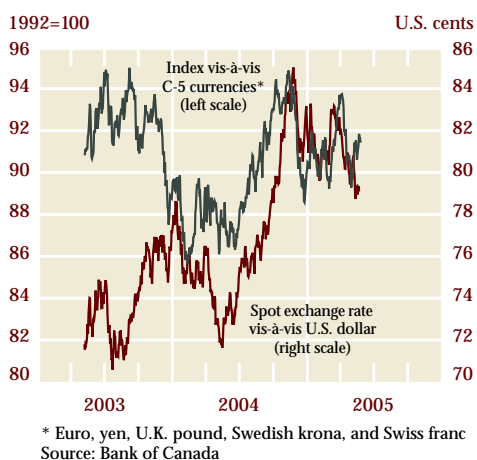


Chart 14 Return on Equity for Selected Sectors



18. See the *Industry* section on page 16 of this issue for a discussion of the impact of the appreciation of the Canadian dollar and oil prices on certain Canadian industries.
19. See page 8 of the December 2003 *Review* for a discussion of the cyclical performance of the Canadian banking sector.

Chart 15 Canadian Dollar Exchange Rate

growth, on Canadian financial stability may be limited, both in terms of trade and of the risks posed to the banking sector.

Canadian developments

Canadian economy

Economic growth in Canada eased in the second half of 2004 (Chart 12). Nevertheless, the Bank expects the economy to move back to its production capacity in the second half of 2006.²⁰ Economic expansion this year and next is expected to be supported primarily by continued substantial gains in final domestic demand. This is likely to be partly offset by the drag on real net exports arising from the past appreciation of the Canadian dollar.

Households

Canadian households have continued to increase their debt levels, thus raising the sensitivity of this sector to adverse developments, such as significantly greater-than-expected increases in interest rates, unemployment, and/or marked declines in house prices. Nevertheless, as our detailed analysis in the December 2004 Review showed, the risks households pose for the Canadian financial system remain low.

Corporate sector

Despite the surge in oil prices and the appreciation of the Canadian dollar, the financial situation of the non-financial corporate sector remained strong in the second half of 2004 and in early 2005. Profitability remained at a high level over the past year, and leverage decreased still further, reaching a very low level in early 2005 (Chart 13).

In particular, most sectors with a low exposure to international trade saw profitability remain quite buoyant (Chart 14).²¹ In some cases, the appreciation of the Canadian dollar in the second half of 2004 may have had a positive impact on rates of return, by further lowering their import costs (Chart 15).

On the other hand, the profits of commodity-producing sectors fell back in the first quarter of 2005 as a result of such factors as losses on

20. See the April 2005 *Monetary Policy Report*.

21. For more analysis of the profitability of the non-financial corporate sector in Canada in 2004, see page 12 of the April 2005 *Monetary Policy Report*.

hedging contracts. Profitability in many other industries with a high exposure to international competition (other than commodity producers) has also fallen back since mid-2004. This deterioration chiefly reflected the adverse impact of the further rise in the Canadian dollar, the surge in the costs of energy and raw materials, and increasing competition from emerging markets, such as China.

Despite the high overall level of profitability, the confidence of large firms has fallen back since the third quarter of 2004 (Chart 16). In contrast, the confidence of small firms has recovered over the past year.

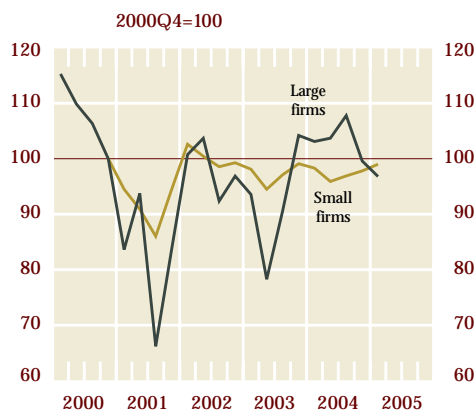
Industry

A limited set of industries, which include auto manufacturing, wood and paper, as well as electronic, computer, and clothing and textile manufacturing, have been subject to considerable financial stress over most of the period since 2001. These industries account for only about 9 per cent of the output of the non-financial business sector, however, and so pose only a limited risk to the financial system.

Output and profitability improved considerably in many of these industries in the first three quarters of last year, as a result of the same factors mentioned in the “Corporate sector” section. But profits eased in most of these industries in late 2004 and early 2005, following the further rise in the Canadian dollar since mid-2004 and substantial increases in the costs of energy and other raw materials. Moreover, the near-term financial outlook for these industries generally remains weak.

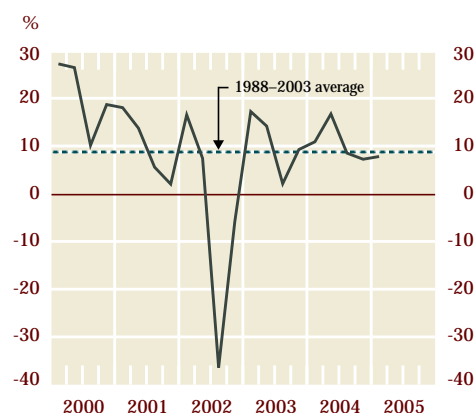
Having decreased considerably since mid-2004 (Chart 17), the profitability of Canada’s auto manufacturing industry is likely to remain lower than average over the near term. Competitive pressures from overseas producers are intensifying, and the profits of auto parts suppliers are being adversely affected by the sharp rise in the cost of steel and other raw materials. Indeed, a number of auto parts companies in Canada (and in the United States) are already having serious financial difficulties.²²

Chart 16 Canadian Business Confidence



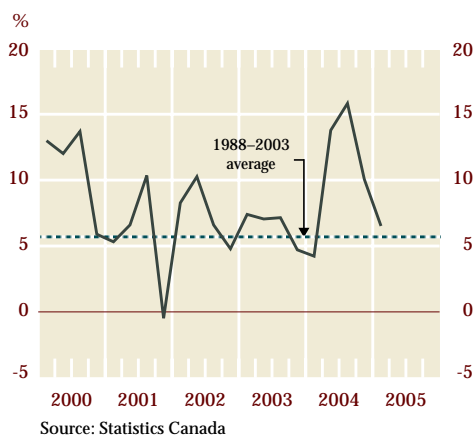
Source: The Conference Board of Canada (large firms) and CFIB Research (small firms)

Chart 17 Return on Equity: Automotive Manufacturing



Source: Statistics Canada

22. See page 19 of this issue for a discussion of the impact on financial markets of the weakening credit position of the North American auto manufacturing industry.

Chart 18 Return on Equity: Wood and Paper Manufacturing

Profitability in the wood and paper industry, after improving markedly in the second and third quarters of 2004, has fallen back since then (Chart 18). Because their product prices are less buoyant, pulp and paper producers have experienced a more severe impact from such developments as the appreciation of the Canadian dollar than building-product companies. As a result, many pulp and paper firms saw their debt ratings downgraded in December 2004 and January 2005.

Rates of return in the electronic and computer manufacturing industry continued to be weak in the second half of 2004 and early 2005 (Chart 19). With the adverse effects of the past rise in the Canadian dollar and intensifying competitive pressures from firms in emerging markets, such as China, profitability is likely to remain low over the near term, despite projected growth in the global demand for high-technology equipment.

Chart 19 Return on Equity: Electronics and Computer Manufacturing

Profitability in the clothing and textile manufacturing industry was considerably lower than normal in 2003 and 2004, as production fell sharply following increased penetration of the Canadian market by low-cost producers in such countries as China and India. Further restructuring is likely this year, following the removal of all remaining quotas on imports of clothing and textile products by member countries of the World Trade Organization.

Elsewhere, the overall financial position of the Canadian air transport industry appears to be improving because of reduced competition following the cessation of operations by Jetsgo. As well, Canada's cattle industry will receive support, following the federal government's announcement of new financial assistance for the farm sector.

More generally, it is unlikely that Canadian financial institutions with well-diversified portfolios would be strongly affected by the deteriorating credit quality in these industries.

The Financial System

Financial markets

Developments in financial markets since 2003 have been influenced by high levels of both monetary stimulus and risk appetite among investors.²³ Over the past few years, these factors have contributed significantly to a simultaneous appreciation across a range of financial-asset classes, particularly riskier assets. Since March of this year, however, the prices of riskier assets have receded, partly reflecting the removal of some monetary stimulus in certain industrialized countries and a decrease in the risk appetite of investors (Chart 20).

This decline in the prices of riskier assets was orderly and was modest relative to the significant price appreciation since early 2003. But sources of risk to global financial markets remain, including high oil prices, the possibility of a disorderly adjustment of global imbalances, and the adverse implications of investors' continued search for higher financial returns.

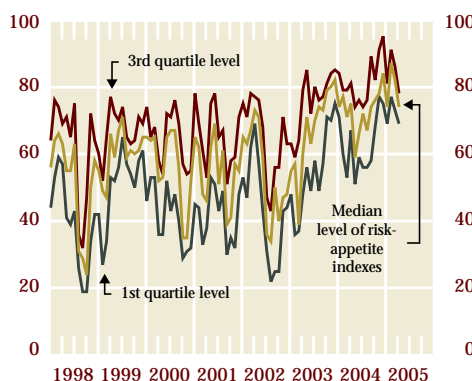
Adverse implications of investors' continued search for higher financial returns

Over the past few years, an environment of low nominal returns, along with strong fundamentals, has encouraged investors to raise the proportion of riskier assets in their portfolios. The risk to the financial system resulting from the appreciation in the prices of riskier assets was assessed in the June 2004 issue of the *Financial System Review*. Since that time, the prices of riskier assets, such as corporate and emerging-market bonds, along with income trusts and emerging-market equities, have risen further. Since March 2005, however, growth in corporate earnings has slowed, there have been tentative signs of another "soft patch" in global growth driven by persistently high oil prices, and the credit position of two large auto manufacturers has weakened further.²⁴ This has

23. See the report on page 37 of this issue for a survey of indexes used to measure investor risk appetite, as well as an explanation of the concept of "risk appetite."

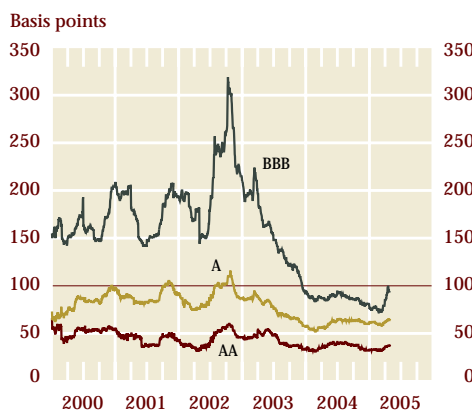
24. See the discussion on page 19 on the weakening credit position of two large auto manufacturers, which contributed to a reversal in the prices of some risky assets in March through May 2005.

Chart 20 Indexes of Investor Risk Appetite*



* Values are taken from the 11 indexes depicted on page 41 of this issue. Values of these are ranked each month, and the upper and lower bounds charted above correspond to the value of the 1st and 3rd quartile indexes.
Source: Bank of Canada calculations

Chart 21 Yield Spreads on Canadian Corporate Bonds



Source: Merrill Lynch

Chart 22 Value at Risk for Trading Portfolios: Major Banks*



* 99 per cent VaR probability threshold for all institutions, for trading portfolios only
Source: OSFI

resulted in a reversal of much of the price appreciation of riskier assets since June 2004.

Despite this recent retrenchment, the prices of most risky assets remain similar to those at the time of the June 2004 *Review*. Spreads on corporate bonds are narrower, with Canadian investment-grade bonds trading at spreads about 5 basis points narrower than one year ago (Chart 21). Similarly, spreads on emerging-market bonds, as measured by JPMorgan's Emerging Market Bond Index, remain over 120 basis points lower than in June 2004. As a result of the low levels of yields even for these riskier assets, recent evidence suggests that investors seeking to meet their objectives for total returns, such as pension funds, have increasingly turned to investments in real estate and other asset classes, such as transportation and power supply infrastructure, commodities, private placements, and hedge funds. The high prices of riskier assets have led to renewed concern that ample global monetary liquidity and investor leverage may have caused valuations to outpace fundamentals.

A rise over time in the yields on government bonds globally would reduce the need for investors to acquire riskier assets to achieve their goals for total returns. This would erode the profitability of leveraged positions designed to take advantage of the low interest rate environment. (See Box 1.)

There is a risk that a large-scale unwinding of trading strategies may lead to a rapid increase in asset-price volatility. One catalyst for such a reversal could be a sharp reduction in investor risk appetite, potentially resulting from a disorderly adjustment of global imbalances or from other events with important financial ramifications.

In Canada, an assessment of the market risk assumed by the major banks, as measured by the value at risk that they report for their trading portfolios, suggests that the market exposure of these institutions has been trending lower, despite increasing revenues from trading-related activities (Chart 22). Canadian banks also use stress testing, a risk-management tool that can mitigate the impact on financial institutions of low-probability, extreme, but plausible, events. (See Box 2.) In addition, capital maintained to cover overall risks remains well above regulatory benchmarks. Major banks thus continue to be well capitalized and appear well positioned

to manage potential adverse movements in asset prices.

Nevertheless, other Canadian investors, including households and pension funds, should prepare for the possibility of some further decline in financial-asset prices.

The weakening credit position of two large auto manufacturers

The weakening financial positions of General Motors Corporation (GM) and Ford Motor Credit Co. (Ford) resulted in a series of credit-rating downgrades. GM is now rated below investment grade by both Standard & Poor's and Fitch, while Ford is rated below investment grade by S&P. As a result, a sharp increase in the spreads on GM and Ford corporate bonds ensued, with GM's 30-year benchmark increasing by about 200 basis points. Information from credit default swaps (CDSs) for General Motors Acceptance Corporation (GMAC) indicates that the premium on 5-year CDSs, which represents the underlying credit quality of GMAC, has increased from about 230 to roughly 600 basis points. The downgrade of GM's and Ford's debt to non-investment grade may cause the spread to widen even further, since investors who are unable to hold non-investment-grade debt may be forced to sell bonds issued by GM or Ford in accordance with their investment mandate.

Because GM and Ford are two of the world's largest corporate borrowers of marketable debt, large movements in their spreads can significantly affect credit markets. To date, the Canadian corporate bond market has been relatively unaffected. However, spreads in U.S. corporate markets have widened since the most recent GM and Ford profit announcements. Yield spreads on corporate issues in the United States are about 30 basis points wider in the all-investment-grade category (from BBB to AAA) since March 2005. While a significant part of this movement can be attributed directly to GM and Ford, other related industries have seen the spreads on their issues widen, but to a much lesser extent.

The timing of the increase in corporate spreads coincides with a broader, but so far generally modest, fall in the prices of riskier assets. While the recent adjustment in asset prices can be attributed to various factors, the future impact of the weakening credit position of the two large auto manufacturers on corporate spreads could

Box 1

Carry Trades: A Backgrounder

During the past few years of very low policy interest rates in many industrialized countries, the carry trade has once again become an increasingly popular trading strategy. This note discusses the mechanics of carry trades and the potential risks they pose for financial stability.

Although there are many different variations on the carry trade, they all involve borrowing at a low rate (the “funding rate”) and lending at a higher rate. For example, through their core business activities banks are able to benefit from an upward-sloping yield curve by borrowing at low short-term rates and investing at higher long-term rates. They do this by taking deposits, on which they pay a short-term rate of interest, and lending them out in the form of mortgages or other loans or by buying longer-term bonds. The risks inherent in this strategy come from movements in both short- and long-term interest rates. For example, the profitability of a carry trade is reduced if the funding rate increases. In addition, there is price risk associated with movements in longer-term yields. Because of its longer duration, the price of the investment asset is quite sensitive to movements in longer-term rates, with increases resulting in capital losses. Since 2003, with the federal funds rate at very low levels, some investors have been funding themselves in the U.S. overnight market and investing in emerging-market bonds, commodities, and other high-yielding assets.

Carry trades can also be made across currencies, by borrowing in a market where interest rates are low and investing in another where yields are higher. In addition to the risks mentioned above, this strategy exposes the investor to currency risk resulting from fluctuations in the bilateral exchange rate. For example, this type of carry trade was popular in the 1990s, when many investors borrowed in the Japanese overnight market at about 1 per cent and bought longer-term U.S. Treasury bonds yielding 5 per cent or higher. If the yen weakened, this trade became even more profitable.

For a carry trade to be profitable, certain equilibrium conditions must not hold. First, the pure-expectations hypothesis of the yield curve must not hold over the investment horizon. The pure-expectations hypothesis argues that expected future short-term interest rates are embedded in current long-term rates and that an investor should be indifferent between holding a long-term bond until maturity or investing in a succession of shorter-term bonds. In other words, the overall return from a classic interest rate carry trade

should be zero.¹ Second, uncovered interest rate parity must not hold over the investment horizon.

Under uncovered interest rate parity, the currency of the country where interest rates are lower (the currency in which a trader borrows) is expected to appreciate relative to the currency in which the trader invests by an amount that exactly eliminates any excess profit arising from the difference in the level of interest rates between the two countries. However, these equilibrium arbitrage conditions have been empirically found not to hold over long samples.

There is the potential for either a rise in short-term rates, which would cause the large-scale unwinding of carry trades, or a sharp reduction in investor risk appetite. Both would create system-wide disturbances in financial markets. In particular, simultaneous attempts by investors to reduce their positions can lead to a significant decrease in market liquidity and a rise in volatility in affected markets. One such example is the reaction of the bond market to rising short-term policy rates in the United States in early 1994. There was a large sell-off in the U.S. Treasury bond market, as investors unwound the carry trades that they had previously made to take advantage of the large spread between longer-term Treasury yields and the federal funds rate.

A second example of the unwinding of carry trades causing an increase in volatility occurred in October 1998. At the time, carry trades involving borrowing in the Japanese overnight market and investing in riskier assets had been made. On 7 October, the Japanese yen appreciated by almost 7 per cent. Many market participants attributed this movement to the unwinding of carry trades as news spread of the potential collapse of the hedge fund Long Term Capital Management. This led to the selling of riskier and less-liquid assets and an unwinding of short yen positions.

Such events highlight the risk that, without adequate market liquidity, unfavourable price movements can be caused by large-scale attempts to exit carry trades and result in large unexpected losses.

While market reaction to recent increases in the federal funds rate has so far been orderly, past experience indicates that the unwinding of carry trades can sometimes contribute to heightened financial market volatility.

1. The pure-expectations hypothesis of interest rates assumes that there is no term premium. Alternatively, a positive term premium is assumed under the expectations hypothesis.

Box 2**BIS Stress-Testing Survey**

During 2004, the Bank of Canada conducted a survey on the stress-testing practices of Canadian banks on behalf of the Committee on the Global Financial System of the Bank for International Settlements (BIS).¹ The survey was an update of one conducted in 2000 and was followed by interviews with bank risk managers.² The process was intended to determine how stress testing is evolving, identify key perceived risks, and gain a better understanding of potential innovations and challenges. This survey report was published in January 2005 (BIS 2005).

The increased integration of stress testing into the risk-management frameworks of financial institutions has important implications for financial markets. From a systemic perspective, enhanced risk management helps to ensure that the consequences of stress events are reduced, because financial institutions are better protected and less likely to contribute to a wider crisis. The following is a summary of the key findings for the Canadian banks surveyed.

Use of stress testing

Stress tests are used mainly to complement other risk measures, such as value at risk. Stress testing is used to study low-probability, extreme, but plausible, events in order to better understand the prospects for large losses. It tends to suit markets subject to illiquidity, price gaps, or other problems, such as a lack of historical data, that limit the usefulness of other risk measures. Stress testing has become an integral part of risk management at Canadian banks and is generally used as input into management decisions on exposure limits.

The survey results indicate that each major Canadian bank regularly conducts between 15 and 35 stress tests, typically on a daily or weekly basis. These vary from simple sensitivity measures, such as a 10 per cent appreciation of the Canadian dollar, to more sophisticated scenarios comprising many individual shocks. Tests include sensitivity to variables such as equities, interest rates, foreign exchange rates, and commodity prices, as well as to the volatilities of these variables.

Several *historical scenarios* are commonly used. These include the 1987 stock market crash, the 1994 tightening by the U.S. Federal Reserve, the 1997 Asian crisis, the 1998 Russian debt default, and the increase in oil prices during the 1990–91 Gulf War.

Hypothetical scenarios tend to be complex and highly customized, and some are loosely based on historical events. The most common hypothetical scenarios relate to equity prices, interest rates, exchange rates, and commodity prices. *Sensitivity tests* vary from simple shocks involving only one risk factor to complicated scenarios involving many risk factors. For example, most banks have designed sensitivity tests related to a rise or fall in interest rates, exchange rates, and/or energy prices.

Recent developments

Technological advances have allowed more frequent and detailed stress testing, as well as more refined tests. Recently, attention has shifted to the development of more realistic and meaningful tests and a better understanding of the tests, recognizing the trade-off between high levels of detail and ease of understanding. Stress testing has gained acceptance as a tool that senior management can use to better understand risks.

Banks were asked to indicate which scenarios received the most attention from management in the past year. Attention was focused on the implications of (i) an increase in interest rates, such as the 1994 episode of tightening by the Fed; (ii) a widening of credit spreads, such as the 1998 Russian default episode; and (iii) an equity market shock.

Future innovations

Stress testing for the loan portfolio is currently separate from that for market risk. Stress testing for risk across all business lines appears to be the next focus and is a work in progress for some banks. The need for greater integration of credit and market risk stress tests is widely recognized.

Challenges include the fact that positions can be maintained on a number of trading systems, and therefore in some institutions it is difficult to use current IT systems to carry out the stress tests. Data can also pose problems in terms of accuracy and adequacy. It can be a challenge to properly incorporate new financial products (especially derivatives) into the tests, because they are complicated and historical data are limited.

Overall, the stress-testing experience of Canadian banks is comparable to that of other foreign international banks.

1. Stress testing is defined in Box 1 of the December 2003 *Financial System Review*.
2. The BIS survey was forwarded to the six largest Canadian banks in June 2004.

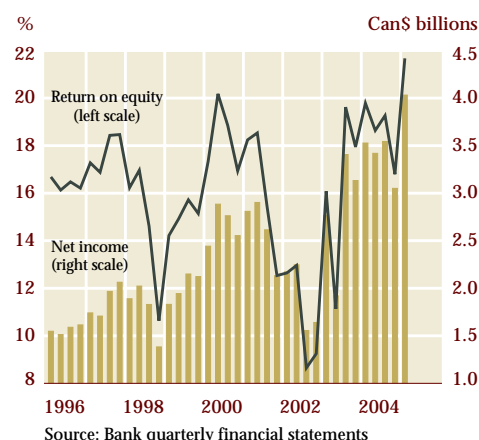
potentially affect the prices of riskier assets more generally by negatively affecting the risk appetites of investors around the world. In fact, part of the widening of the emerging-market EMBI+ spread in March coincided with that of the GM profit announcement (recall Chart 9). Similarly, the growth in credit-risk-transfer instruments, such as credit default swaps, since the late 1990s, has potentially increased the linkages between different types of asset markets. Such linkage would heighten the possibility that volatility in one market (e.g., corporate debt markets) could spill over into other markets. (See Reid 2005 in this issue for a discussion of the financial system effects of CDSs.)

Financial institutions

In aggregate, the major banks reported record profits for the first quarter of 2005 (Chart 23). The diversity of the banks' operations has continued to contribute to their strong financial performance, with all three major business areas—consumer and commercial banking, wholesale (corporate and investment) banking, and wealth management—doing very well.

Although financial strength provides banks with a buffer should economic growth slow or credit quality deteriorate, this sector still faces near-term risks. One risk that may affect Canadian banks relates to the implementation of regulatory changes over the coming years. In an international survey conducted for the Centre for the Study of Financial Innovation, and released in February 2005, responses from 440 market participants, regulators, and other observers of the financial sector from around the world indicated that the main risk facing international banks this year pertains to the implementation of new regulations. The process of implementing regulatory changes could have adverse financial repercussions for banks. It could raise operational risks, for example.²⁵

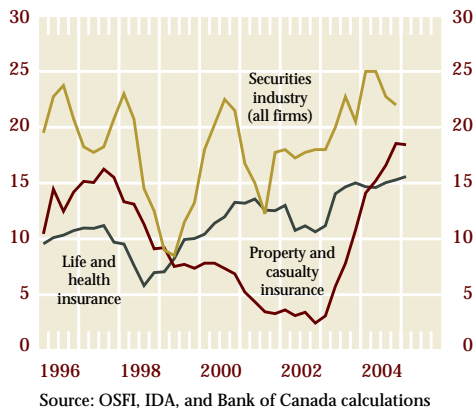
Chart 23 Bank Profits



25. The BIS considers important types of operational risk to include breakdowns in internal controls and corporate governance; major failure of information technology systems; and errors in execution, delivery, and process management.

Chart 24 Return on Equity

4-quarter moving average



These regulatory changes, which should enhance the stability and efficiency of the global financial system, when firmly in place, include the implementation of the new capital-adequacy framework for banks known as Basel II.

The securities industry in Canada reported strong fourth-quarter results in 2004, boosting profits for the year to a record high of \$3.9 billion. The two main drivers for growth in the Canadian securities industry in 2004 were the wealth-management business and investment banking. These drivers boosted the return on equity in 2004 for securities dealers not owned by banks, those for which financial performance is not included in the bank profits discussed above (Chart 24). Other financial institutions in Canada, such as life, health, and property and casualty insurance companies, have also continued to report robust profitability.

Important Financial System Developments

This section of *Developments and Trends* examines structural developments affecting the Canadian financial system and its safety and efficiency.

Key Points

- The reliability of corporate financial reporting is vital for investor decision making and financial market efficiency.
- Regulatory initiatives to enhance corporate financial reporting, with a view to increasing transparency and accountability, should also consider the relevance of the information reported and the costs of providing it.
- The adoption of new technology, together with new entrants to the Canadian residential mortgage market, has provided consumers with increasingly flexible mortgage features and competitive interest rates.

Highlighted Issues

Two efficiency-related financial system issues are discussed in this section: the increase in the level and accuracy of corporate financial reporting and the changing landscape of the Canadian residential mortgage market.

Corporate financial reporting: The regulatory response in the United States and Canada

Prepared by Lorie Zorn

The reliability of corporate financial reporting is vital for investor decision making and, ultimately,

for financial market efficiency. Confidence in the integrity of capital markets provides firms with greater access to capital and thus supports economic growth. But when establishing more demanding reporting requirements, it is important that regulators consider the implementation costs, as well as the benefits of the new rules.

Frauds at Enron and WorldCom have focused attention on the level and accuracy of financial reporting. U.S. regulators acted quickly by passing the Sarbanes-Oxley Act (SOX) in July 2002, which set new U.S. standards for corporate governance, accounting, and financial reporting. The Canadian response has been more measured, with members of the Canadian Securities Administrators (CSA) proposing various rules to improve investor confidence over the course of 2003–2005.²⁶

Although they have publicly endorsed the intent of SOX, a number of stakeholders contend that this regulatory initiative imposes unnecessarily high costs without commensurate benefits to investors. Specifically, their concerns include the inadequate treatment of differences in firm size and complexity, inundating investors with too much information, and the diversion of corporate resources from core business activities. Many argue that these aspects of SOX do not adequately recognize the role of profit in driving competition and motivating investors.

One of the most contentious elements of SOX is Section 404, which requires a management report and auditor attestation on the effectiveness of a firm's internal operational and financial controls. The rules apply to companies registered with the U.S. Securities and Exchange Commission (SEC), and, for most, the rules

26. For an account of various initiatives aimed at restoring investor confidence, see Armstrong (2003) and Crow (2004).

came into effect for fiscal years ending after 14 November 2004.

When the SEC's final rule on SOX 404 was published in June 2003, the document included a discussion of benefits and costs. Although "not readily quantifiable," the SEC listed the benefits as devoting more resources and attention to internal control; identifying weaknesses in advance of a system failure; facilitating the continued, orderly, and timely flow of information to investors and the marketplace; and minimizing fraud. While SOX has certainly increased the focus on internal controls, as the SEC had anticipated, it may take longer for the other benefits to materialize. In terms of costs, the SEC's original estimates for compliance with SOX were forecast at US\$1.2 billion, or \$91,000 per company. The SEC recognized that this did not include costs for auditor attestation or any indirect costs, such as reduced incentives for companies to publicly raise capital in the United States.

There is anecdotal evidence that implementation costs for SOX 404 are rapidly mounting, and that the legislation may be affecting capital market behaviour. Recent surveys of U.S. companies have found that the average incremental cost of implementing SOX 404 thus far is much higher than originally estimated, particularly for smaller firms. There have also been reports that more companies than usual will be late in filing their annual reports in order to complete testing of their accounts and controls, and that fewer companies may be engaging in merger and acquisition activity in order to avoid additional SOX-related obligations. This may be further exacerbated by difficulties in obtaining accounting advice as auditors strictly adhere to the requirement for independence.

The media have reported that many smaller firms and foreign issuers, to which the regulations do not yet apply, are considering delisting their shares and/or deregistering with the SEC to avoid the anticipated administrative, legal, and accounting costs of compliance. This potential withdrawal of corporate activity from public scrutiny could work against the original intent of SOX to reduce financial abuses. Firms with more than 300 U.S. shareholders are still subject to SEC rules, including SOX, and European business groups in particular have been lobbying the SEC to loosen this provision.

There have also been indications that credit ratings may be negatively affected and that share prices may fall for those firms that do report inadequate internal controls. Because auditors may be applying overly strict interpretations of SOX to avoid potential liability issues, and because procedural controls may not necessarily eliminate financial fraud (i.e., ethical behaviour is equally important), these firms could be more heavily penalized than is warranted by the risk of fraud resulting from inadequate controls.

In response, the SEC has consulted affected parties and is reviewing implementation experiences with SOX 404 with the aim of helping firms to reduce their compliance costs. Following a roundtable discussion in April, both the SEC and the Public Company Accountability Oversight Board (PCAOB) issued additional guidance to management and auditors aimed at reducing the burden of implementing SOX 404.²⁷ An advisory committee has been set up to examine the impact of SOX, as well as other federal regulations, on smaller public companies and to recommend ways to scale regulation based on size. This summer, a task force of the Committee of Sponsoring Organisations (COSO) will publish guidelines to help smaller companies. The SOX 404 compliance deadline for smaller firms and foreign private issuers has been extended twice, with the latest extension granting these companies an extra year, to 15 July 2006, before these requirements apply.

In Canada, regulators have taken more time to develop enhancements to financial disclosure. Canadian firms with U.S.-listed securities are subject to SOX. For those that are not, a number of CSA rules—seen to be the main Canadian response to SOX—came into force in March 2004. These included continuous-disclosure obligations, audit requirements, and rules on the certification of issuers' filings (the latter was not adopted by British Columbia), but not management and auditor assessments of internal controls.

In February 2005, after further study, members of the CSA²⁸ announced its proposed rules on internal control over financial reporting and

27. The PCAOB guidance for auditors focused on the scope of the internal-control audit and the required amount of testing of a company's financial reporting.

28. Excluding British Columbia

related certification requirements. Similar to SOX 404, an evaluation of internal controls by management and auditors would be required, along with management's disclosure and certification of any material weaknesses in internal controls or fraud that they uncover. The announcement indicated the importance of harmonizing Canadian and U.S. certification requirements, given the connection between the two markets, and given the importance of maintaining the international reputation of Canadian markets. It also acknowledged the time and costs required for implementation, in light of U.S. experience so far.

At the same time, the CSA released an independent cost/benefit study of the proposed internal-control requirements. The study concluded that only for large issuers (at least \$500 million in assets) are the measured costs and benefits of the proposed legislation approximately equal.²⁹ However, the report cautions that the benefits are difficult to quantify and may therefore be underestimated.

To address anticipated concerns about costs and about the limited availability of appropriate expertise, the proposed Canadian rules would allow internal-control requirements to be phased in between 30 June 2006 and 30 June 2009, according to an issuer's market capitalization. While certification requirements would be imposed on all reporting issuers other than investment funds, reports evaluating internal controls would be required only from (non-venture) TSX-listed companies. The CSA has encouraged public comment, particularly with respect to the issuers to which the rules should apply; the appropriateness of the phase-in period; and the assessment of the benefits, costs, and alternatives. Consensus has not been reached among the provincial securities regulators regarding the suitability of the proposed rules, and different alternatives to the CSA rules are still being considered by certain provinces.

The release of the CSA's proposal occurred alongside a continuing and very public U.S. debate about corporate reporting requirements. This has given Canadian stakeholders the

opportunity to benefit from the U.S. experience in shaping Canadian standards for corporate financial disclosure. Regulations that attempt to maximize the benefits of increased transparency and accountability, while considering the relevance of the information reported and the costs of providing it, will support the integrity and efficiency of capital markets in Canada.

Developments in the Canadian residential mortgage market: New technology, competition, and strategies

Prepared by Jim Day and Greg Tkacz

Some noteworthy changes in Canada's \$600 billion residential mortgage market have taken place over the past 10 years. New competitors have adopted new technology using a pricing strategy that differs from that of banks, preferring to offer their lowest mortgage rate up front without negotiations. The major banks have responded to this competition by offering discounts on posted rates to creditworthy borrowers to bring their mortgage rates in line with those of the new entrants. These developments have benefited Canadians by providing mortgage features that are increasingly flexible and rates that are competitive across institutions.

The 1970s and 1980s: Banks and trust companies

During the 1970s and 1980s, not much differentiated the mortgage offerings of the financial institutions. Term options and payment features were limited, and the differences in mortgage rates at banks and at trust companies were negligible. There is little evidence of widespread discounting of mortgage rates by banks or trust companies during that time. In the late 1980s and 1990s, many trust companies were acquired by banks or went out of business.

The 1990s: New competition (virtual banks and mortgage brokers)

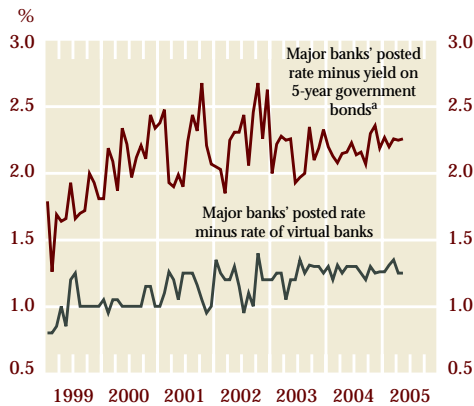
In the late 1990s, the popularity of the Internet as a means of banking brought a new kind of bank to the fore: the virtual bank. ING DIRECT and President's Choice Financial are two of the more prominent virtual banks in Canada.

Although independent mortgage brokers have existed in Canada since at least the 1970s, they were not a major force in the mortgage business

29. For smaller Canadian issuers (i.e., with less than \$50 million in assets), the benefits of compliance do not exceed the costs; for mid-size companies (up to \$500 million in assets), the evidence is inconclusive.

Chart 25 Five-Year Mortgage Rate

Monthly data



a. The swap-adjusted yield on 5-year government bonds is used as a proxy for the banks' cost of funds.

Source: Bank of Canada and ING DIRECT

until the past few years, when many of the smaller players combined to form “super-brokers.” Mortgage brokers do not originate mortgage loans, they just bring borrowers and lenders together, and, in many cases, the ultimate lender is one of the banks, although these brokers have no ties to any one mortgage extender. Brokers receive volume pricing from the banks and are able to offer a competitive rate to customers without negotiation. In 2003, 26 per cent of home buyers used a mortgage broker, compared with 14 per cent in 1999, according to a CMHC survey.

Different strategies: Everyday low price vs. negotiated discounts

The “everyday-low-price” strategy of the virtual banks has increased their share of the Canadian mortgage market.³⁰

Major Canadian banks post national interest rates for their mortgage products, but their chosen strategy appears to be negotiation of the actual rate charged on a customer-by-customer basis. Discounts offered by major banks from their posted rates were modest in size (about 25 basis points) in the early 1990s and were offered to a minority of new customers. Anecdotal evidence also indicates that a significant number of the mortgage customers of major banks in the 1998 to 2000 period were not receiving mortgage rate discounts. Today, however, most consumers have come to expect a discount, and it is not uncommon for creditworthy borrowers to obtain large discounts (of 125 basis points or more) from posted 5-year mortgage rates. The major banks appear to have become more aggressive in trying to prevent a loss of market share through the use of discounts and special “no haggle” offers.

The effective mortgage interest rate is measured by the posted rate minus the discount. While major banks have increased mortgage rate discounts for creditworthy borrowers, their posted rates also appear to have increased over time, relative to the cost of funds for mortgage providers (Chart 25). It would therefore be incorrect to conclude that the increase in discounts represents an equivalent decrease in effective mortgage rates. Rather, the result of the increase in both discounts and the spread between posted

30. The overall market share of virtual banks remains modest at about 2.5 per cent.

bank mortgage rates and their cost of funds appears to be that the maximum discounted rate offered by banks is now broadly in line with the rate being offered without negotiation by the virtual banks and mortgage brokers.

Use of technology

Increased knowledge and Internet availability of credit reports and credit scores from major credit-reporting agencies have improved the negotiating position of borrowers with their banks. The ease of finding and comparing mortgage rates on the Internet has also helped borrowers to obtain a competitive rate.

Conclusion

New competition has been beneficial for consumers, giving them more choice and access to lower mortgage rates without negotiating. While the major banks retain the majority share of the residential mortgage market, the presence of the new Internet banks and mortgage brokers has changed the way that banks market their mortgage products. Over the past 10 years, major banks appear to have become more aggressive in trying to attract and retain creditworthy customers through mortgage rate discounts. Today, most bank customers are obtaining an effective mortgage rate that is competitive with that of the virtual banks and mortgage brokers. This points to a healthy Canadian mortgage market, one in which mortgage features are increasingly flexible and rates are competitive across institutions.

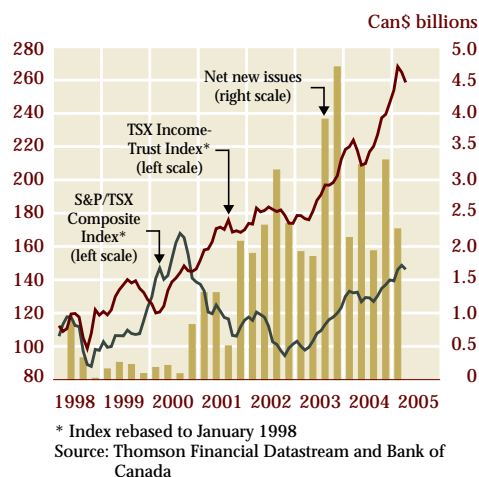
The Financial System

Financial markets

During the past six months, there have been several legal and regulatory developments that are likely to affect financial markets over the longer term. For instance, the federal budget introduced in February 2005 proposed the elimination of the 30 per cent foreign property limit on pension investments. This change would likely affect the efficiency of the Canadian financial market in a number of ways (Box 3).

As well, there have been two important developments that are expected to increase investing interest in income trusts (Chart 26).

Chart 26 Income Trusts



Box 3

The Impact on Canadian Capital Markets of the Foreign Property Rule and Its Proposed Elimination

The Foreign Property Rule (FPR) was introduced in 1971 as a provision of Canada's Income Tax Act. It restricts the amount of foreign assets that can be held in tax-deferred savings plans, including Registered Pension Plans (RPPs) and Registered Retirement Savings Plans (RRSPs). Over time, the limit was increased from 10 to 30 per cent of assets. Recently, in its 2005 budget, the federal government proposed the elimination of the FPR¹. During the years in which the FPR was in place, investors developed innovative means by which to increase their foreign exposure above that allowed under the FPR.

One common means of increasing foreign exposure above the limit set by the FPR involves the use of derivative securities. One popular strategy involves purchasing foreign equity index futures, posting a small margin, and investing the remainder in Canadian T-bills. Because futures represent a contract rather than an asset, an investment fund that implements this strategy is deemed to hold 100 per cent Canadian content, even though its investment returns are determined largely by the return on foreign equities. A similar strategy can be followed using total return swaps or forward contracts in the over-the-counter market.² Mutual funds using these strategies are known as Registered Savings Plan "clone funds." The growing number of such funds over the years gives an indication of the popularity of these strategies for all registered plans. By early 2005, they numbered in the hundreds and, at \$27 billion, represented approximately 5 per cent of mutual fund assets under management.³

There are, however, some drawbacks to using derivatives to increase the foreign exposure of a portfolio. In addition to the direct costs associated with derivative transactions, this type of strategy can be complex and subject to limited liquidity, and is not a perfect substitute for direct foreign exposure.

Another approach to increasing foreign exposure is often referred to as "double dipping" or "stacking." It involves investing the maximum amount allowed directly in foreign content and then investing additional funds in investment funds classified as Canadian content, but which can each hold foreign assets up to the maximum allowed under the FPR. This strategy, while allowing an increase in foreign exposure

beyond the limit set by the FPR, still means operating within a ceiling on foreign exposure.

What effect has the Foreign Property Rule had on the efficiency of Canadian capital markets? Fried and Wirick (1999) conservatively estimate the direct cost to investors in terms of an increased management expense ratio (MER) of approximately 8 basis points for international equity funds. This estimate does not take into account the forgone risk-adjusted returns that investors would have earned had they been able to fully diversify into foreign markets. Indeed, some mutual fund companies reacted immediately to the federal government's 2005 budget announcement by decreasing MERs on clone funds by up to 45 basis points to bring them into line with underlying (unconstrained) funds. While many of these clone funds may disappear, others may restructure and provide valuable services to investors, such as fully currency-hedged foreign exposure.

Although it is impossible to predict all of the implications of the proposed removal of the Foreign Property Rule, several outcomes are likely. One probable efficiency gain is a gradual increase in the aggregate foreign exposure, and thus the diversification, of Canadian investors. The extent to which this will occur, however, is uncertain, since both Canadian and international experience suggests that considerable "home bias" exists, even in the absence of restrictions on foreign investment. As of September 2004, for example, Statistics Canada data indicate that trusted pension funds held, on average, only 25 per cent of the book value of their assets in foreign investments (excluding strategies aimed at increasing foreign exposure involving the use of derivative securities)—below the 30 per cent limit. It is also likely that higher demand for foreign assets will, over time, make Canada a more attractive place in which to raise capital for foreign issuers of debt and equity. Finally, increased competition for Canadian investment assets from foreign fund managers could lead to further decreases in MERs for Canadian-based mutual funds.

1. The legislative measure to make this change effective has yet to receive parliamentary approval.
2. See Kolb (2000) for more information on these types of financial products.
3. Taken from Morningstar.ca and IFIC

First, in December 2004, the Ontario government passed legislation limiting the liability of trust beneficiaries.³¹ The theoretical liability issue was seen as a key obstacle to institutional investors, such as pension funds, investing in the income-trust market. Prior to the legislation, holders of income-trust units faced a theoretical risk of personal liability in the event of a lawsuit against the trust, which could imply potential losses in excess of the amount invested in the trusts. The new law now puts income-trust investors on a similar footing as equity shareholders.

Then in January 2005, Standard & Poor's and the Toronto Stock Exchange announced their intention to include income trusts in the S&P/TSX Composite Index. On 18 May, they announced an implementation plan and transition schedule for doing so. The transition is expected to be complete by March 2006. Indexed funds linked to the S&P/TSX Composite Index would thus have to invest in income trusts, since returns on income trusts have differed significantly from those on the current S&P/TSX Composite Index (Chart 26).

There have also been developments with respect to efforts aimed at enhancing the integrity of Canadian secondary debt markets, and these are discussed in Box 4.

Financial institutions

Canada's Commissioner of Competition has appointed an advisory panel to help assess the role that efficiencies should play in the administration and enforcement of the Competition Act in the context of Canada's evolving economy. The Advisory Panel on Efficiencies will consider the general economic and business implications of the current treatment of efficiencies under the merger provisions of the Competition Act (which applies to all industries) and will also comment on the characteristics that Canada's competition policy framework should have in order to ensure that efficiencies are properly addressed. The panel's report is expected to be published in June 2005.

Box 4

Code of Conduct for the Canadian Fixed-Income Marketplace

Policy-makers and the financial community, recognizing that public trust in the integrity of financial markets is essential to their efficiency and stability, have developed standards of conduct to guide the actions of market participants. Examples include the ACI-Financial Markets Association's Model Code, a set of guidelines that was adopted in 2001 by the Canadian Foreign Exchange Committee and others as the standard for best market practices in the domestic foreign exchange marketplace, and the Investment Dealers Association's (IDA) code of conduct for trading in wholesale debt markets (IDA Policy No. 5).

IDA Policy No. 5 was developed in 1998 by the IDA, the Bank of Canada, and the Department of Finance to safeguard the integrity, liquidity, and efficiency of Canadian fixed-income markets. This set of guidelines formally applies to investment dealers that are members of the IDA, and its standards are intended to serve as a guide to all other market participants.

The IDA is currently revising its code of conduct for trading in wholesale debt markets and is developing a new set of standards for participants active with retail investors. Both sets of guidelines are expected to come into force later this year. IDA Policy No. 5A will apply to institutional investors, while standards for retail debt markets will be contained in IDA Policy No. 5B. The revised code of conduct for wholesale debt markets will provide market participants with improved guidance on the types of trading activities that are prohibited. This includes any activity that is "fraudulent, manipulative or deceptive," or that "takes unfair advantage of customers, counterparties or material non-public information."

31. Other provinces, such as Alberta and Quebec, also have legislation limiting liability for trust beneficiaries.

Clearing and settlement systems

Settlement in the CLS Bank of foreign exchange trades in four additional currencies (the Hong Kong dollar, the South Korean won, the New Zealand dollar, and the South African rand) began on 7 December 2004. This brings the total number of CLS-eligible currencies to 15. The CLS Bank is now regarded as the best practice in dealing with the risk associated with foreign exchange settlement. Three years after the launch of CLS operations in 2002, the majority of large Canadian banks still do not settle their foreign exchange trades through the CLS Bank. However, most of the major banks have indicated that they intend to start participating in the CLS Bank by the end of 2005.

On 3 February 2005, the Canadian Payments Association introduced a new rule and two new settlement streams in the Automated Clearing Settlement System (ACSS) to accommodate the clearing and settlement of electronic online payments. These are designed to facilitate the development of alternative Internet payment services that will allow consumers to pay for their Internet purchases by debiting their bank accounts directly.

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Reports

Introduction

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

Risk appetite is one factor that determines the demand for risky assets, and this demand can have implications for the allocation of capital to productive uses. Large changes in risk appetite may also have undesirable consequences for financial stability. Credit booms and increased investment in risky assets resulting from high investor appetite for risk could ultimately lead to an increase in non-performing assets held by all investors, including financial institutions. In *A Brief Survey of Risk-Appetite Indexes*, the authors provide an overview of various published indexes for measuring risk appetite and assess the signals that they provide about changes in risk appetite. The survey focuses on the possible application of the information contained in these indexes to the monitoring of financial stability.

A significant feature in the evolution of credit markets around the world has been the development of instruments to transfer credit risk. One of these is the credit default swap (CDS). A CDS can be thought of as insurance against default on a loan or bond. CDSs can potentially add to the completeness of corporate debt markets and increase the efficiency of financial systems. CDSs can also contribute to financial stability by facilitating the ability of investors to hedge credit risk and gain diversification, as well as by allowing credit risk to be held by those most willing to bear it. In *Credit Default Swaps and the Canadian Context*, the author describes the basic mechanics of a CDS, assesses the potential impact of CDSs on market efficiency, and considers the implications of the growing CDS market for financial stability. The current state of the CDS market in Canada is also assessed, together with its future outlook, including the increasing participation of major

Canadian banks and the larger Canadian pension funds.

A key financial instrument to emerge from the field of structured finance is the collateralized debt obligation (CDO). These instruments can be defined as the pooling of assets, the tranching of liabilities that are backed by the asset pool, and the delinking of the credit risk of the collateral asset pool from the credit risk of the CDO originator. In the current environment of low returns on investments, CDOs are increasingly attracting the interest of institutional investors because of their superior yields relative to conventional fixed-income instruments. Globally, the growth in the CDO market has been explosive, and major Canadian banks have been actively involved in the creation and distribution of these products through their global investment banking arms. The report *Understanding the Benefits and Risks of Synthetic Collateralized Debt Obligations* highlights the positive contribution of CDOs to the efficiency of the financial system, but also points out that these instruments raise potential risks, in particular, those related to the complex models used by rating agencies to assign ratings to these structures.

A Brief Survey of Risk-Appetite Indexes

Mark Illing and Meyer Aaron*

The risk appetite of investors may prove to be an important concept in the analysis of financial stability. Most macro-economic and asset-pricing models incorporate an assumption about risk appetite. The phenomenon is also often cited in the media and by public figures as a factor influencing financial markets.¹

Theory suggests that a low appetite for risk translates into a higher cost of capital, potentially limiting business investment, while a high appetite for risk can produce booms in credit and asset prices, sowing the seeds of eventual recessions and stress on the financial system. The Asian financial crisis of 1997, the aftermath of the Russian debt default of 1998, and the collapse of high-technology share prices in 2000 are a few examples of events that appear to be related to systemic changes in investors' appetite for risk.

Not surprisingly, a growing number of financial institutions and organizations have been developing measures of risk appetite in an effort to quantify this phenomenon. These range from the International Monetary Fund's risk appetite index, used for market surveillance (IMF 2003), to indexes developed by private financial institutions to enhance trading returns.

In this article, we provide an overview of the methodologies underlying various measures of risk appetite available in the public domain. Using simple qualitative criteria, we find that these measures do not always tell the same story, even though all purport to be measuring the same thing. We therefore conclude that the measure-

ment of risk appetite is highly sensitive to the chosen methodology and underlying theory. Consequently, it seems premature to rely on any particular index when assessing risk appetite in the financial system.

Concepts

Investors can display various attitudes towards a given level of risk: disliking risk (risk averse), being neutral to risk (risk neutral), or loving risk (risk loving). These attitudes are summarized by the Arrow-Pratt coefficient of risk aversion in classical economics.

Although most economists equate risk appetite with the Arrow-Pratt coefficient, a broader definition posits that risk appetite also incorporates risk *perceptions* (i.e., the degree of risk that investors believe they are faced with).² The empirical challenge arises from the fact that both attitudes and perceptions are intangibles and must therefore be inferred from the data. This typically requires making some strong assumptions.

Empirical Approaches

Most of the indexes surveyed treat risk appetite as a combination of attitudes and perceptions. Various frameworks are used to assess the changes in risk appetite typically inferred by changes in a representative risk premium or by changes in portfolio holdings. Since price data are more readily available than portfolio data, changes in risk premiums are usually taken to be the primary indicator of changing risk appetite.

Although the indexes surveyed have different titles, the concept of risk appetite is implicit in

1. See Dodge (2003), Kennedy (2002), Greenspan (1999, 2004), and Bernanke (2003).

* The authors would like to thank Miroslav Misina for contributing to our discussions and understanding of risk appetite.

2. See Cochrane (2001), Gai and Vause (2004), and Misina (2003) for a more detailed development of these concepts.

their methodology and interpretation. These measures are variously referred to as indexes of “risk aversion,” “risk appetite,” “investor confidence,” and “investor sentiment.” Generally, they measure risk appetite either by looking at a specific aspect of markets (and sometimes a specific market) or by combining information from various markets into a composite measure. They all purport to describe risk appetite in equity markets, or in all markets including the equity market. We categorize the indexes into two groups: *atheoretic* and *theory-based*.

Atheoretic indexes aggregate information from various financial markets using statistical methods. These include: the JPMorgan Liquidity, Credit, and Volatility Index (LCVI), the UBS Investor Sentiment Index (UBS), the Merrill Lynch Financial Stress Index (ML), and the Westpac Risk Appetite Index (WP).

Since these measures combine many different types of risk (liquidity, credit, and market risks), the subcomponents do not always move together. The stated benefit of combining the components is to capture overall risk appetite. Box 1 contains a list of each index’s components and a brief description of their methodologies.

Theory-based indexes originate from economic or financial models and typically focus on specific markets. These include: the Tarashev, Tsatsaronis, and Karampatos Risk-Appetite Index, developed at the Bank for International Settlements (BIS); the Gai and Vause Risk-Appetite Index, developed at the Bank of England (BE); the Credit Suisse First Boston Risk-Appetite Index (CSFB); the Kumar and Persaud Global Risk-Appetite Index (GRAI), used by both the IMF and JPMorgan; the State Street Investor-Confidence Index (ICI); and the Goldman Sachs Risk-Aversion Index (GS). A brief description of each is given in Box 2.

Finally, the Chicago Board Options Exchange Volatility Index (VIX) is included in the analysis. The VIX is commonly treated as a quick and easy proxy for risk appetite, because it is derived from S&P 500 options, which investors buy and sell to change the amount of risk to which they are exposed. The VIX is also a component of all four atheoretical indexes and is based on the same underlying data as the BIS and BE indexes.

Qualitative Assessment

In Chart 1, the various indexes are rebased to a common scale.³ Higher values can be interpreted as indicative of greater risk appetite. Most of the indexes are available only from late-1998 onwards. Nonetheless, this five-year period witnessed several interesting episodes of extreme investor optimism and pessimism that widely affected the global financial system.

Specifically, one would expect the indexes to signal a high degree of risk appetite during the bull markets of the late 1990s and 2003. Conversely, a signal of low risk appetite should appear during the 1998 Russian debt crisis, the bear market of 2000 to 2002, and the aftermath of 11 September 2001. Table 1 lists the indexes and their respective signals of risk appetite during these five episodes.⁴

All of the indexes identify the Russian crisis as a period of low risk appetite. Also, as expected, most of the indexes indicate high risk appetite at some point in 2003. The results for the other episodes are less consistent, with the BE, BIS, GRAI, and WP each giving at least one contradictory signal. On the other hand, the CSFB, ML, and UBS give the expected signal in four or more cases. It should be noted that some of the indexes were designed to perform well “in sample” with respect to recent financial crises, but their value in anticipating new crises may be limited.

Despite this apparent conformity, most of the indexes are volatile and, as a result, often give multiple signals in a given period and seemingly spurious signals during periods where no systemic events can be identified. The timing of the signals is also highly variable across the indexes, with some reacting more quickly than others.

Most of the measures are positively, but not highly, correlated with one another (Table 2).⁵ This suggests that even if the indexes generally

3. The units of each index are arbitrary, so these transformations do not change their interpretations.
4. The signal thresholds are based on one standard deviation from the mean of each index (for the period 1999 to 2004) and are scored as being correct if they crossed this threshold during the term of the specific episode.
5. The correlations are statistically significant at the 5 per cent confidence level in 34 of the 55 pairs.

Box 1**Methodologies of Atheoretic Indexes**

The components of the four atheoretic risk-appetite indexes considered in this article are listed in the accompanying table. For a complete description of each variable and the justification for its inclusion in a particular index, we refer the interested reader to the references listed at the end of this article.

Generally speaking, these variables are common measures of broad financial market risks (such as bond spreads, implied volatilities, and swap rates). Others are anecdotally suggestive of risk appetite. For example, one often reads that the price of gold, the value of the Swiss franc, or the Treasury-euro-dollar spread increase when investors are “fleeing to safety.” Similarly, during such episodes, low-risk assets tend to perform better, in terms of returns, than high-risk assets.

The obvious criticism of the atheoretic approach is that these variables are influenced by numerous factors in addition to changes in investors’ risk appetite.

A further complication is how to aggregate the variables and interpret the final values of the indexes. All four indexes transform their underlying data so that each variable has roughly the same variance and, therefore, a more or less equal weight in the final index.

The UBS (Germanier 2003) and ML (Rosenberg 2003) approach is to subtract a rolling mean from each variable and divide this term by a rolling standard deviation (this is sometimes called a “ σ -score”). The LCVI (Kantor and Caglayan 2002) transforms each variable into a percentile based on its historical distribution. The WP (Franulovich 2004) converts each variable to a daily percentage change, averages these values, backwardly iterates an index based on these average changes, and then converts the index into a σ -score.

Components of Atheoretic Indexes

Variables	LCVI	UBS	ML	WP
Fixed-income market				
Spreads on U.S. high-yield bonds	X	X	X	X
U.S. swap rates	X		X	X
U.S. Treasury-eurodollar spread			X	
U.S. Treasury bid/ask spreads	X			
Spreads on emerging-market bonds	X	X		X
Equity market				
VIX ^a	X	X	X	X
Low-risk/high-risk equity price ratio		X	X	
U.S. equity put/call ratio			X	
U.S. equity short sales/open interest			X	
Foreign exchange market				
Implied currency volatilities	X	X		X
Swiss franc/Australian dollar ratio			X	
Other market variables				
Gold price		X	X	
Treasury/equities total returns ratio		X	X	
GRAI ^b	X			

a. Chicago Board Options Exchange (2004) implied volatility index for the S&P 500

b. Global Risk Appetite Index (Kumar and Persaud 2002)

Box 2

Methodologies of Theory-Based Indexes

Tarashev, Tsatsaronis, and Karampatos (2003) Risk-Appetite Index, developed at the Bank for International Settlements (BIS)

The BIS method begins by estimating the statistical distribution of future asset returns from the historical patterns of asset prices using a GARCH model. Implied volatilities are then calculated using option prices with different exercise prices. From this, a volatility “smile” is mapped into a “subjective” probability distribution of the future payoffs.

The value of the index is the ratio of the left tails of the two distributions (i.e., the ratio of the statistical downside risk to the subjective downside risk). The BIS uses monthly equity market data.

Gai and Vause (2004) Risk-Appetite Index, developed at the Bank of England (BE)

The BE approach is very similar to the BIS method. The key difference is that the BE uses the ratio of the full distributions rather than just the ratio of the left tails.

Kumar and Persaud (2002) Global Risk-Appetite Index (GRAI)

To construct the GRAI, assets are first ranked by their riskiness (proxied by the variance of past returns) and then ranked by their excess returns (proxied by the difference between future and spot prices measured at a single point in time). The key premise is that the correlation between the ranking of risk and the ranking of excess returns should be close to zero for changes in asset riskiness. This correlation should be positive for increasing risk appetite and negative for decreasing risk appetite. The GRAI uses daily foreign exchange rate data. The index methodology is used by both the IMF and JPMorgan in their respective risk-appetite indexes.

The Credit Suisse First Boston Risk-Appetite Index (CSFB) (Wilmot, Mielczarski, and Sweeney 2004)

The CSFB is similar to the GRAI. The index compares risk (past price volatility) and excess returns across assets. The value of the CSFB on a given day is the slope coefficient obtained from the cross-sectional linear regression of risk and excess returns. The more positive the slope, the greater the risk appetite. The CSFB is based on daily data for 64 indexes of bonds and equities in developed and emerging markets. Daily indexes of local currencies are used for developed markets, while daily U.S.-dollar indexes are used for emerging markets.

State Street Investor-Confidence Index (ICI) (Froot and O’Connell 2003)

The ICI is also similar to the GRAI but is applied to quantities rather than prices. Higher risk appetite should be observed through increased holdings of risky assets and vice versa. These portfolio shifts can occur in times of increasing or decreasing prices. Hence, the ICI claims to be able to differentiate between changes in risk appetite and changes in risk. The index is calculated monthly using State Street’s proprietary database of institutional investor portfolios.

Goldman Sachs Risk-Aversion Index (GS)

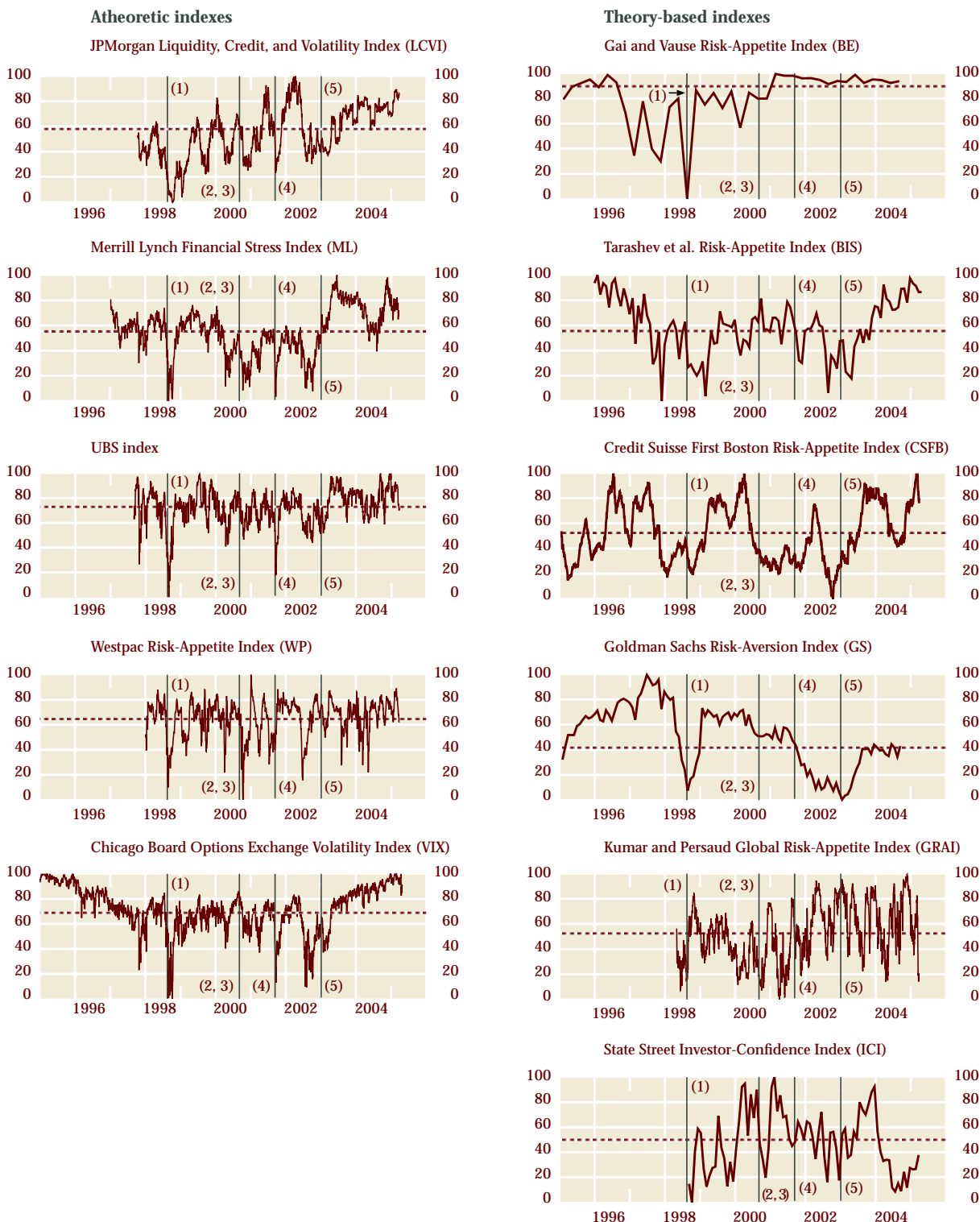
The GS uses a standard consumption model of capital-asset pricing, where the Arrow-Pratt coefficient of risk aversion is allowed to vary over time. The premise derives from the observation that the “volatility of excess returns from holding stocks over bonds appears to be substantially higher than the volatilities of T-bills and consumption, and only a time-varying risk aversion level can explain such [a] differential” (Goldman Sachs 2003). The GS uses monthly data on real U.S. per-capita consumption, the real rate on 3-month U.S. Treasury bills, and the inflation-adjusted S&P 500 Index.

Characteristics of Theory-Based Indexes

	BIS	BE	GRAI	CSFB	ICI	GS
Interpretation of values:						
Level	X	X			X	X
Change			X	X		
Underlying data from ^a :						
Equity	X	X		X	X	X
Fixed income				X		X
Foreign exchange			X			
Frequency ^b :						
Quarterly		X				
Monthly	X				X	X
Daily			X	X		

a. The methodologies could be equally applied to other asset markets, provided the requisite data existed.

b. The BIS and BE methodologies could be applied to daily data, although this would be computationally intensive.

Chart 1 Risk-Appetite Indexes

Note: Variables rescaled such that 100 equals maximum "risk appetite" and 0 equals minimum "risk appetite" over the period 1996 to 2004. The dotted horizontal line depicts the average of each index over this period.

Vertical solid lines correspond to:
 (1) 1998 Russian debt default
 (2) Peak of 1990s bull market, 2000

(3) Start of 2000–2002 bear market
 (4) Terrorist attacks of 11 September 2001

(5) Start of 2003 bull market

provide the expected signal of risk appetite, these signals are not consistently the same across indexes.⁶

Interestingly, the theory-based measures are either orthogonal to one another (having small and non-significant correlations) or negatively correlated. Recall that the BIS, ICI, and GS are all based on equity market data, yet they have some of the lowest cross-correlations. As well, the CSFB measure is orthogonal to the GRAI, even though both use a similar risk-return framework.

Of course, the absence of correlation may simply reflect different information sets and design objectives for the various indexes. One of them may still be an appropriate measure of overall risk appetite even if it is not highly correlated with any of the others.

Conclusions

The ability to measure the appetite of investors for risk is an appealing proposition, given the recent spate of systemic financial shocks (such as the Asian and Russian crises and the bursting of the high-tech bubble). This explains the growing interest in the measurement of risk appetite and the proliferation of indexes. If all of these indexes truly captured changes in risk appetite, however, we would expect them to provide similar signals. Our survey indicates that this is generally not the case. Consequently, it seems premature to rely on any given index when assessing risk appetite in the financial system.

Further research is needed to explore the empirical properties of these indexes and their theoretical underpinnings. The index that proves most useful from a central bank perspective will be the one that establishes a (possibly non-linear) link between the level of risk appetite and changes in the supply of credit, asset prices, business investment, or more broadly, the functioning of the financial system.

6. Many of the measures that are significantly correlated with the VIX include it as a component.

Table 1

Risk-Appetite Signals

This table characterizes the signal given by each index during five periods (L for low, — for neutral, and H for high risk appetite).

	1998 Russian crisis	1990s bull market	2000 bear market	11 Sept. 2001	2003 bull market
Expected signal:	Low	High	Low	Low	High
BE	L	L	—	H	H
BIS	L	—	H	L	H
CFSB	L	H	L	L	H
GRAI	L	L	L	—	H
GS	L	H	—	—	—
ICI	L	H	—	—	H
LCVI	L	—	—	L	H
ML	L	—	L	L	H
UBS	L	H	—	L	H
VIX	L	—	—	L	H
WP	L	—	L	H	—

The signal thresholds are ± 1 standard deviation from the mean of each index over the period 1999 to 2004.

1998 Russian crisis refers to Russia's debt default and subsequent turbulence in global markets over the August to October period in 1998.

1990s bull market refers to the 15 months leading up to February 2000.

2000 bear market refers to the third quarter of 2000, which marked the start of the broad-based collapse of share prices in the high-tech sector.

11 Sept. 2001 refers to the month following the terrorist attacks of 11 September 2001.

2003 bull market refers to the rebound in equity markets, the prices of emerging-market bonds, and the prices of high-yield corporate bonds during 2003.

Table 2

Correlation Matrix

Per cent

	BE	BIS	CFSB	GRAI	GS	ICI	LCVI	ML	UBS	VIX
BIS	25*									
CFSB	-41**	34**								
GRAI	42**	0	-2							
GS	-60**	24*	43**	-55**						
ICI	21*	15	3	-9	0					
LCVI	54**	29**	19	30**	-55**	10				
ML	16	20	59**	27*	5	-2	54**			
UBS	28**	31**	44**	21*	4	13	54**	75**		
VIX	11	71**	66**	3	27*	4	48**	66**	68**	
WP	24*	2	12	27*	-11	12	40**	32**	57**	23*

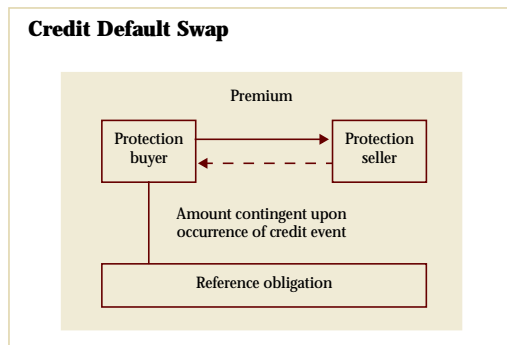
Asterisks denote significance at the 5 per cent (*) and 1 per cent (**) confidence levels. The sign of the cross-correlations is adjusted where appropriate such that a positive value indicates positive correlation of risk appetite, and vice versa. Pairwise, correlations involving the BE are calculated quarterly, while all others are monthly.

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Credit Default Swaps and the Canadian Context

Christopher Reid



A significant aspect of the evolution of credit markets has been the development of credit-risk transfer through the use of derivatives.¹ Globally, one of the fastest-growing derivative products is the credit default swap (CDS). This article describes the basic mechanics of a CDS, assesses the impact of CDSs on market efficiency, and considers the implications of the growing market for CDSs for financial stability. Finally, the current state of the CDS market in Canada is assessed, together with the outlook for the future.

The Mechanics of a Credit Default Swap

A credit default swap can be thought of in simple terms as default insurance on a loan or bond (the “reference obligation”). A CDS provides the buyer with compensation should a prespecified credit event occur.² In return for this protection, the seller receives a premium in the form of an annuity until the time of the credit event or the maturity date of the swap (see diagram). In theory, a CDS premium represents a pure measure of the underlying credit risk that can be either bought or sold. It should, therefore, be closely related to a bond yield spread or to the excess yield over a risk-free rate.³

1. A derivative, in the broadest sense, is a financial instrument whose payoff depends on another financial instrument. A credit derivative is a specific contract that transfers credit risk between counterparties without transferring ownership of the underlying asset (unless a “credit event” occurs).
2. Credit events include failure to pay, bankruptcy, reputation/moratorium, obligation acceleration, and restructuring. Credit events applicable to a CDS contract vary depending on region and on the credit rating of the reference obligation.
3. This relationship ignores the differences in funding risk.

A CDS allows investors who hold a pre-existing amount of marketable corporate debt to alter their exposure to credit risk without altering the underlying portfolio. However, as is discussed below, a pre-existing position is not necessary, and a CDS can be used to create a synthetic exposure to credit risk.

As is discussed later, altering credit-risk exposure through the use of a CDS can be more cost-effective than transacting in the secondary market. As a result, the use of CDSs is becoming a universal mainstay of portfolio management.

Impact of CDSs on Market Efficiency

Theory suggests that the presence of an active market for credit derivatives should add to the overall liquidity of the credit market, since derivatives are linked to the underlying security by an arbitrage condition, rendering the two products substitutes (albeit imperfect ones). An increase in liquidity should translate into efficiency-related gains, such as lower transactions costs and greater price discovery. The reality of the Canadian market, however, is that efficiency gains from CDSs have likely been modest to date.

It is important to note that a CDS is not simply an insurance product that pays if a credit event occurs. A CDS also represents a market price on the probability of such an event (and the associated recovery rate) and as such is a dynamic and tradable asset. More specifically, investors would be willing to buy a CDS without owning the underlying asset if they expected the credit risk of the underlying asset to increase, hence raising the value of the insurance against default. Adopting a long CDS position without owning the reference obligation, in addition to lending at the risk-free rate, is akin to selling short a bond of the same reference entity but without the need to borrow the security in the repurchase market.⁴ Shorting corporate bonds can be difficult, since they typically trade infrequently and because the market for corporate debt is relatively small compared with govern-

ment or agency markets. The CDS market thus represents an attractive alternative for an investor who wants to short a corporate bond in a cost-effective manner. CDSs enable participants to take alternative views (long or short) on the fundamental value of a corporate bond. This, in turn, implies that more information is captured in corporate bond prices, hence increasing the efficiency of the corporate bond market.

CDSs addressed two shortcomings of the market for credit derivatives: a lack of standardization and a lack of price transparency. Kiff and Morrow (2000) suggest that the complexity and lack of standardization of credit risk have resulted in credit derivatives being less of a commodity than, for example, interest rate derivatives. This has been an impediment to the growth of this market. The lack of standardization might therefore suggest that credit derivatives may not garner the efficiency gains associated with other derivative products. To overcome this obstacle, CDSs have been designed with the specific purpose of creating a standardized instrument. As a result, credit default swaps are now the most actively traded credit derivative product. In 2003, \$1.9 trillion in gross notional amount was sold globally (Fitch Ratings 2004a), and they have become a benchmark in pricing credit.⁵ Furthermore, CDSs now represent a building block for a new generation of products, such as synthetic collateralized debt obligations (CDOs), single-tranche CDOs,⁶ and CDS indexes (Box 1).

Although CDSs trade on an over-the-counter basis, a number of brokers provide quotes, thus providing a medium for price discovery. Price transparency is less of an issue with CDSs than with other forms of credit-risk transfer. For example, collateralized debt obligations and asset-backed securities are usually aimed at buy-and-hold investors, making it difficult to find accurate pricing in the secondary market.

Continued improvements in liquidity and product development should translate into further efficiency gains. Global liquidity in CDSs

4. In practice, this arbitrage relationship does not strictly hold because of differences in the liquidity of the various components. This difference is referred to as the "basis" and is typically small.

5. Rather than using a corporate bond spread to price a CDS, the information flow is increasingly in the other direction. That is, CDS spreads are now used, more so in Europe and increasingly in the United States, to express indicative levels in marketing new debt offerings.

6. For more details on synthetic and single-tranche collateralized debt obligations, see Armstrong and Kiff on page 53 of this *Review*.

Box 1**A New Product: CDS Indexes**

The introduction of CDS indexes allows investors to buy and sell exposure to a basket of CDS contracts, making it easier to take a position in specific credit markets or market segments.

Owning a CDS index is similar to owning a portfolio of single-name CDSs. The price of the index reflects an equally weighted average of CDS spreads for a predetermined basket of CDS contracts (usually 100 to 125 names per portfolio). The indexes are first grouped by geography and exist for North America, Europe, Japan, and emerging markets. They are then broken down further by the credit quality of the reference obligation (e.g., North American High-Yield). Unlike perpetual equity indexes, CDS indexes have a fixed composition and maturity date, with a new index launched twice a year.

Initially, there were two major CDS indexes: iBoxx and Dow Jones TRAC-X. Both provided products for Europe, the United States, and Asia. The presence of two competing platforms hampered liquidity and was viewed as limiting the growth of the CDS-index market. In April of 2004, a merger was announced between iBoxx and TRAC-X's European and Asian index products. The merged indexes are now referred to as the Dow Jones iTraxx. The North American credit indexes were not included in this initial arrangement but were later merged and now trade as the Dow Jones CDX indexes.

Both the iTraxx and CDX indexes are supported by the dealer community as a way for investors to gain access to diversified credit exposure. The strong support of the dealer community has created liquidity, which is, in turn, cited as a key reason for this product's success. A study by the BIS states that the liquidity of CDS indexes has remained robust even when the markets for the underlying single-name CDSs are less liquid. Not surprisingly, the depth of the market and speed of transaction are given as key reasons for the success of this product. However, the current volume of notional trades in the North American indexes remains relatively small compared with the volume of more established interest rate derivative products.

A CDS index does not currently exist for Canada, and only eight Canadian reference entities are included in the various North American indexes. The universe of liquid CDSs on Canadian-based entities is too small to create a diversified index.

with a single underlying reference obligation has improved significantly over the past two years.⁷ However, some challenges remain. Liquidity in distressed names⁸ has been problematic in the past, with liquidity evaporating even in the top names (Fitch Ratings 2004b). This suggests that the CDS market is still in its developing stage and continues to suffer from structural demand/supply imbalances.

The range of single-name CDS products, while growing, still remains limited. Globally, the market for CDSs remains predominately focused on investment-grade corporate entities despite growth in other areas. In addition, CDS contracts are based on standard time frames, which facilitate liquidity, but this usually results in a duration mismatch between the derivative and the underlying asset. The market for CDSs is most liquid in the five-year sector, although there has been some effort to expand the maturity spectrum to 10 years.

Implications for Financial Stability

The impact of credit derivatives on the financial system has been the subject of some debate. While CDSs clearly add to the stability of the financial system in some areas, they present a potential risk in others.

The efficiency gains associated with CDSs should allow for more accurate pricing of credit risk, which should improve a financial institution's overall risk management. CDSs may even increase the willingness of lenders to take on credit risk, thus reducing the probability of possible credit crunches. More directly, the benefits of CDSs to stability are related to the increased ability to hedge, the possibility of greater diversification, and the ability to transfer risk to those most willing to bear it.

CDSs enable financial-asset managers to better hedge and alter credit risk. Altering credit risk by buying and selling corporate debt in the secondary market can be expensive and difficult to accomplish on a timely basis. CDSs can reduce portfolio volatility by allowing greater access to hedging of credit risk. In Canada, however,

7. A CDS can also be written on a basket of underlying securities.

8. This refers to the liquidity of CDSs written on companies with deteriorating credit positions.

liquid CDS contracts currently exist only for companies whose debt is already liquid and actively traded. Therefore, the contribution that CDSs can make to the stability of the Canadian financial system by allowing easier hedging of credit risk is probably fairly small at this stage. But if Canada's CDS market continues to grow, the increasing ability to hedge credit risk could contribute to the stability of the Canadian financial system.

The use of CDSs can also improve the management of credit risk by allowing greater diversification and an increased ability to take on credit risk. This is particularly true for banks, whose credit exposure would otherwise reflect their loan books and who, as a result, may not be optimally diversified. Credit derivatives have also been used in Canada to achieve diversification on an international basis without contravening foreign-content rules for pension plans. This increase in diversification added to stability by reducing the unsystematic risk of investor portfolios. However, the proposal in the February 2005 federal budget that the foreign-content rule will be eliminated, would imply a reduction in the demand for CDSs to achieve this kind of diversification.

Finally, CDSs make it easier to transfer credit risk. This allows greater dispersion of credit risk to a wider range of investors and to those most willing to bear it. In the wake of several high-profile defaults in 2002 (e.g., Enron and Worldcom), Alan Greenspan, Chairman of the U.S. Federal Reserve Board, argued that credit derivatives helped diversify the losses across a greater number of stakeholders, thereby reducing the amount of stress on the financial system (Greenspan 2002).

Despite their benefits, CDSs also pose potential risks to the stability of the financial system. Credit derivatives are by design highly leveraged, which can lead to concentration of risk. The immediacy and magnitude of this risk are, moreover, hard to quantify because of a lack of transparency. Market participants have acknowledged these shortcomings and are actively working towards mitigating these risks.

The ability to establish a leveraged position means that risk positions can be accomplished without a large investment in the underlying financial asset. This, in turn, implies a greater ability to easily take on a large amount of risk,

which may translate into a significant loss. In the past, highly leveraged products, particularly new products that may not be well understood by all investors, have led to some notable financial stresses.⁹

The ability to establish a leveraged position using credit derivatives implies not only that risk can be more widely dispersed, but equally that it can also become more concentrated. CDSs effectively increase the amount of outstanding long and short credit positions. Since these increases are directly proportional to each other (shorts equal longs), the net amount of credit risk in the financial system remains unchanged. But the overall increase in credit positions in the financial system could lead to a greater concentration of risk among a few participants, which could potentially exacerbate the impact of a credit event on the financial system.

Market participants have been trying to lessen this risk by improving collateral and netting arrangements. In a recent assessment of global credit derivatives markets, the Bank for International Settlements (BIS) concluded that there does not seem to be any evidence that the transfer of credit risk has led to an increase in the concentration of risk (BIS 2004). The BIS notes, however, that there is insufficient information to assess the impact of credit-risk transfer on the stability of the financial system.

The BIS concluded that balance sheets and financial statements do not provide a sufficiently clear assessment of a firm's activities in transferring credit risk, and it is therefore not possible to track the redistribution of risk or to properly identify concentrations. This lack of transparency is particularly acute for risk taken on by unregulated market participants, such as hedge funds, which are increasing their presence in the credit derivatives market. The lack of transparency may limit the ability of the market to discipline publicly traded companies that use leverage in an inappropriate manner.

The CDS Market in Canada

Quantifying the growth of CDS activity in Canada remains difficult, because CDSs are private bilateral contracts, and participation in data collection is voluntary. Notional amounts of CDS

9. One example would be interest rate derivatives and the bankruptcy of California's Orange County.

Table 1

Notional Amounts of Outstanding Credit Default Swaps for Three Participating Canadian Banks (as at year-end 2004)

US\$ millions

Counterparty	Bought	Sold
With reporting dealers	20,465	26,511
With other financial institutions	41,290	59,626
Banks and securities firms	40,529	48,200
Insurance and pension funds	329	89
Hedge funds	0	0
Other	432	537
Non-financial customers	3,631	10,010
Total	65,386	81,402

contracts outstanding are currently available for only three of Canada's five largest banks, and for only one date: year-end December 2004 (Table 1). Owing to data limitations, this article also draws on informal interviews with market participants and information available from rating agencies. From the available evidence, it can be deduced that Canadian participation in CDSs is currently limited.

Credit default swaps written on Canadian entities trade on a U.S.-dollar basis and over-the-counter (no organized exchange). Therefore, the current state of the CDS market in Canada is based on financial institution transactions in CDSs, as well as on the breadth of contracts written on Canadian-based entities.

North American banks, brokerages, and dealers together held US\$2.7 trillion in outstanding credit derivative positions in 2003, with slightly over a trillion dollars of this total in the form of CDSs (Fitch Ratings 2004a). Although a country-specific breakdown is not available, conversations with Canadian securities dealers suggest that the outstanding positions of Canadian institutions likely represent only a small percentage of these totals. Indeed, for the three Canadian banks for which data are available, only US\$150 billion in single-name CDS contracts outstanding (both long and short) are reported.

Despite the lower level of activity compared with U.S. financial institutions, the major Canadian banks are increasingly active in all aspects of the credit-risk-transfer market. Recently, Canadian banks have broadened their activity to include the use of the CDS market to manage credit risk in their loan portfolios. CDSs are also becoming a source of revenue from intermediation, since Canadian dealers have increased their participation in trading CDSs.

Non-financial corporations are one of the largest counterparties with the reporting banks. They use CDSs mainly to hedge future funding requirements. If a company's credit conditions worsen, making funding more expensive, this cost may be offset with the protection of a pre-existing CDS position.

Some of the larger Canadian pension funds have also entered the CDS market as a way of gaining synthetic credit exposure. Anecdotal evidence suggests that to further diversify their portfolios, these funds have been most active in the deeper, more liquid credit derivatives,

which are based on foreign rather than domestic companies. As a result, the extent of their participation may be understated by their outstanding positions with reporting banks, which is quite modest.

Interestingly, international insurance companies are, overall, among the most active participants globally in the CDS market, while Canadian insurance companies are only modestly active, either domestically or internationally. Also of note in terms of international comparisons, reporting Canadian banks have no CDS positions with hedge funds, which are large participants in the CDS market in both Europe and the United States.

Over the past two years, dealers have witnessed strong growth in the demand for CDSs by Canadian-based institutions. Dealers express confidence that activity in CDSs outside the interdealer market will continue to increase as new accounts put documentation in place, augment their expertise, and enhance their financial systems in order to be able to deal in this product.

Quotations for CDSs are available for as many as 160 Canadian-based reference entities. Trading activity among these 160 names can be broken down into three tiers. The top tier includes five to ten names that are extremely liquid and in which there is a regular two-sided market. Approximately 20 additional Canadian names trade on a semi-regular basis. The bid/ask spreads of the first and second tiers are typically around 5 basis points (however, this may be indicative only for small volumes). The liquidity of the remaining 130 Canadian-based entities, or the third tier, is essentially nil, with any trade in these names being difficult to find. Approximately 2,100 reference obligations trade globally (Fitch Ratings 2004b); therefore, CDSs written on Canadian-based entities represent only a very small fraction of the global market.

Growth of CDSs in Canada

The Canadian corporate debt market represents about 1.2 per cent of the global corporate market (Merrill Lynch 2004). While CDSs written on Canadian-based entities form a relatively new market that continues to grow, its share of the global CDS market is comparable to Canada's share of the global corporate bond market. The growth of CDSs in Canada should continue

to be closely linked to the global growth of CDSs (in proportion) and to changes in Canada's share of the global corporate market. While Canada's corporate debt market is only a small percentage of the global market, it is important to note that both CDSs and the Canadian corporate debt market have also grown rapidly over the past 5 to 10 years (Anderson, Parker, and Spence 2003).

Key factors in the growth and liquidity of CDSs are the amount of credit information available to investors and the amount of outstanding debt. Both are correlated with the size of the corporate market. The use of CDSs results in the transfer of credit risk to those who often do not share a lending relationship with the underlying entity. Therefore, the new holder of credit risk does not have access to the same level of fundamental credit knowledge as the loan originator. As a result, there is an increase in the dependence on credit-rating agencies and independent analysis to obtain credit information. Since both the rating process and internal analysis are costly, it is not surprising that the most actively traded CDSs on Canadian reference entities include some of Canada's largest companies.

In addition to the impact of the size of the Canadian corporate debt market on the development of a CDS market, its composition may be a factor. The recent global search for yield by investors has, in part, driven the strong growth of CDSs written on high-yield debt. The high-yield market in Canada is much smaller than that of the United States (Anderson, Parker, and Spence 2003), which may further help to explain the difference in the rate of adoption of CDSs.¹⁰

Conclusions

Credit default swaps have become one of the most widely used credit derivatives because they address two shortcomings of the credit derivatives market: a lack of standardization and a lack of price transparency. CDSs also add to the completeness of the corporate debt market by increasing the ability of investors to short corporate bonds, which augments the information content

10. In terms of the reporting banks, the notional amount of CDS positions on debt that is either unrated or rated BB and below was roughly 15 per cent of total positions outstanding.

of corporate bond pricing and the efficiency of the market. Although hard to quantify, CDS activity in Canada to date has probably had a limited but positive effect on market efficiency. Credit derivatives in general should add to the overall liquidity of the credit debt market, which in turn should lead to lower transactions costs and greater price discovery.

CDSs contribute to financial stability by facilitating the ability to hedge credit risk and improve diversification, as well as by allowing credit risk to be held by those most willing to bear it. While CDSs contribute to financial stability, they also pose the risk that leverage will be employed to concentrate rather than diversify credit risk.

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Understanding the Benefits and Risks of Synthetic Collateralized Debt Obligations

Jim Armstrong and John Kiff

Financial technology supporting the field of “structured finance” has developed rapidly since the mid-1990s. The key financial instrument to emerge is the collateralized debt obligation (CDO). Structured finance instruments, such as CDOs, can be defined by three key characteristics: (i) pooling of assets; (ii) creating tranches of liabilities backed by the asset pool and having different levels of risk; and (iii) delinking of the credit risk of the collateral asset pool from the credit risk of the originator (BIS 2005).

It is estimated that, in 2003, total global issuance of CDOs and other asset-backed securities stood at about US\$1.4 trillion, compared with less than US\$300 billion in 1997 (BIS 2005, 17). A growing proportion of this market is represented by the new generation of “synthetic” CDOs, which transfer risk through pools of credit derivatives contracts rather than through portfolios of securities.

From the perspective of financial stability, the rapid growth, unique features, and growing complexity of these instruments raise some interesting issues. This article highlights the positive contribution that CDOs make to the efficiency of the financial system as new instruments that help to complete markets. However, the article also points out that these instruments represent new and novel risks for investors. Assessing and pricing the risks in these structures requires complex models, whose results are highly sensitive to certain assumptions, and concerns about “model risk” are explored.

In Canada, the large banks have been actively involved in the creation and distribution of these products through their global investment banking arms. Globally, CDOs are increasingly attracting the interest of institutional investors, such as insurance companies, pension funds, and hedge funds, because their yields are superior

to those of conventional fixed-income instruments, and their various tranches can offer investors unique risk/return combinations. Canadian institutional investors have only recently started to use these instruments, but this is expected to increase rapidly.

The Origins of the CDO: A Special Class of Asset-Backed Security

In Canada and globally, securitization has become a mainstream source of financing for corporations over the past 15 years. The essence of the securitization technique is the transfer of a pool of assets or credits—and the credit risk entailed—from an originating institution into a stand-alone, special-purpose vehicle with a finite life. The institution then sells one or more tranches of asset-backed securities (ABSs) to investors to fund the purchase of the assets.

The motivation for tranching is to create at least one class of securities or notes—often referred to as the senior tranche—whose credit rating is higher than the average rating of the pool of assets. In addition, there is typically a subordinated or junior tranche, which provides credit enhancement and absorbs most or all of the pool’s expected losses.

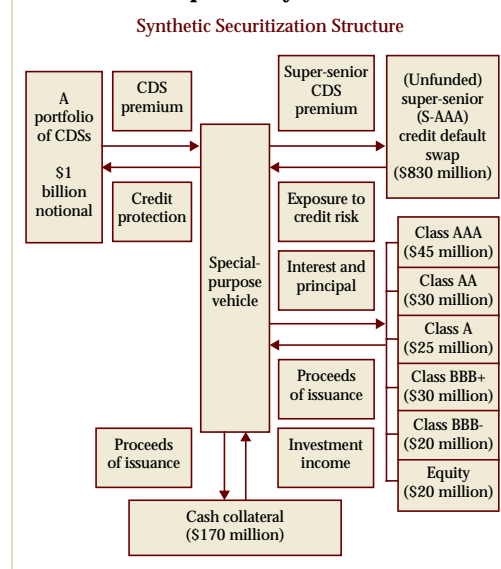
In traditional securitizations, the assets in the pool tend to be relatively homogeneous (for example, household loans, such as residential mortgages and credit card loans), and the number of tranches on the liability side tends to be small, usually comprising just the senior and subordinated tranches. The relative homogeneity of the asset pool permits credit risk in these pools (i.e., the expected losses) to be estimated with relatively reliable statistical techniques based on the “law of large numbers.” The assets in the pool are segregated—typically in a trust

arrangement—to secure the ABS, and they are understood to be insulated from and independent of the affairs of the firm or firms that originated and sold the assets.

Structured finance instruments such as CDOs, which transfer the credit risk on a reference pool of assets to tranche investors, while conceptually similar to traditional securitizations, are quite different in certain respects. First, the pools of assets or credits tend to be quite heterogeneous, having much more complex credit-risk properties than the pools underlying basic securitizations. (See Chart 1 for an example.) Second, these credits tend to be mainly corporate in nature, such as corporate bonds, loans, or single-name credit default swaps. Third, with respect to the liabilities, there are often many more tranches than for a traditional securitization. These typically include a AAA-rated senior tranche (and possibly a super-senior tranche), one or more lower-rated mezzanine and subordinated tranches, and an unrated junior or “equity” tranche.

Drawing heavily on their traditional securitization origins, the first generation of CDOs were typically “cash” CDOs. This is because the assets in the pool were cash securities, such as bonds and loans, rather than synthetic ones, such as credit default swaps (CDSs), which are derived from underlying cash securities.¹ Cash CDOs were structured primarily as “balance-sheet CDOs,” which tended to be initiated by financial institutions, such as banks and, to a lesser extent, by non-financial corporations that wished to sell their own assets or transfer some of the risks inherent in these assets. The transactions were motivated by the desire to reduce the balance sheet, obtain cheaper funding, improve liquidity, or (in the case of regulated financial institutions) reduce regulatory capital requirements. Transferring some of the risks in a loan portfolio to a CDO structure (or through other risk-transfer instruments) to obtain capital relief is sometimes referred to as regulatory arbitrage.²

Chart 1 Example of a Synthetic CDO



1. These instruments were sometimes referred to as collateralized bond obligations (CBOs) and collateralized loan obligations (CLOs), depending on the nature of the collateral. However, since the collateral was increasingly mixed together, the structures began to be referred to generically as CDOs.
2. See Kiff and Morrow (2000) for a discussion of regulatory arbitrage.

Increasingly, however, CDO transactions were initiated as arbitrage CDOs, where the CDO vehicle acquires assets in the open market, rather than from an originating institution (Lucas 2001, 6). Arbitrage CDOs tend to be organized by asset managers and institutional investors rather than by financial institutions. The investors in the high-risk equity or first-loss tranche earn a relatively high rate of return by taking advantage of the arbitrage opportunity—the difference between the return earned on the asset pool in the CDO (adjusted for losses caused by defaults) and the interest paid to the debt holders.

The Emergence of Synthetic CDOs

Synthetic CDOs emerged in 1997 as a refinement of cash CDOs. Cash CDOs have a reference portfolio made up of cash assets, such as corporate loans and bonds. For synthetic CDOs, the reference portfolio is made up of credit default swaps. A credit default swap allows institutions to transfer the economic risk but not the legal ownership of underlying assets. The credit default swap has rapidly developed into the largest and most liquid credit derivatives instrument in global markets. See Reid (2005) in this issue and Kiff and Morrow (2000) for more details on credit default swaps.

Thus, the synthetic CDO, invested in pools of CDSs, represents the convergence of two financial technologies: securitization and credit derivatives (Chart 1). Through the CDO vehicle, the individual counterparties of the CDS contracts in the asset pool essentially buy protection. In exchange for this protection, the CDO receives a stream of premium payments—analogueous to the interest payments it would have received on a cash CDO—and passes them through to the tranche investors in the CDO. The CDO thus effectively buys protection from these investors.

Because funds raised from investors in the various synthetic CDO tranches are not used to purchase loans or bonds (since exposures are instead being acquired through credit default swap contracts) they are typically invested in a cash collateral account of risk-free liquid assets, such as government bonds. This risk-free pool is there to absorb losses on the CDS reference portfolio, as well as to provide investment income. The premiums earned on the credit

default swaps are analogueous to the spreads over the risk-free rate that would have been earned on a pool of corporate loans or bonds.

Note that in Chart 1 the structure also has an unfunded super-senior tranche—a feature of many synthetic CDOs. Investors in this tranche do not put up cash but instead are paid a premium to enter into a credit default swap with the CDO. Thus, a “synthetic liability” has been created that is analogueous to the synthetic assets in the pool. This tranche, which has only the most remote chance of experiencing a credit loss (equity, mezzanine, and AAA tranches would have to be exhausted first), is paid a spread (premium) that is compressed even lower than that which a AAA investor would earn.³

Why the trend to synthetic instead of cash structures? Through the CDS market, synthetic structures typically have access to a more diverse range of credits than cash structures. Credit default swaps can theoretically be written in any amount with respect to any issuer (corporate or sovereign) that has issued debt instruments, such as bonds or loans. Thus, synthetic structures tend to facilitate greater portfolio diversification (Tavakoli 2003, 8).⁴

On the liability side, the super-senior tranche (which, with its “AAA plus” credit rating, has no counterpart in the world of cash securities) results in very cost-effective financing costs for the CDO. This tranche typically represents a very large percentage of the par value of the liabilities; for example, in the structure in Chart 1, it accounts for \$830 million of the \$1 billion issue. The larger the super-senior tranche, the greater the effective leverage of the structure.⁵

Credit-Protection Structures

An important part of the “risk-proofing” of CDOs—both cash and synthetic—is their credit-protection structure. In terms of their credit structure, CDOs may be classified either as cash

3. The super-senior investor is generally perceived as providing protection to the CDO against only the most extreme systemic event.
4. This can also lead to more favourable ratings from the credit-rating agencies for a given pool.
5. The counterparty to the CDO on these super-senior transactions is often a AAA-rated “monoline” insurance company. Such insurance firms specialize in providing guarantees of this type.

flow or market value. This distinction refers to the mechanisms by which the structure protects debt holders from credit losses.

The most common structure is cash flow. Here, the objective of the CDO manager is to generate cash flow for the senior or mezzanine tranches without the need to actively trade the credits in the asset pool. In fact, trading in these structures tends to be severely restricted. Cash flow from the pool (interest and premiums, as well as principal) after estimated credit losses is judged to be sufficient to pay the tranche investors.

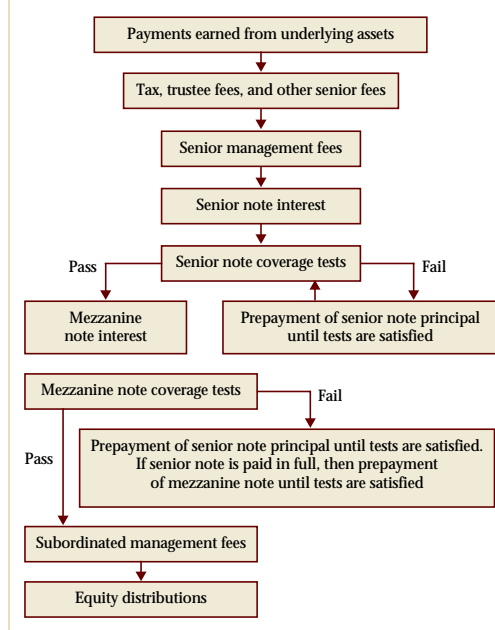
Payments earned from the underlying assets in the pool are distributed in a strict order of priority (determined in detailed transaction-specific documentation) often referred to as a “waterfall.” Chart 2 presents a simplified example of this payments distribution. Typically, the fees of the asset managers and trustees are paid first. Then, interest owed to the senior debt holders is paid. At that point, two broad types of coverage tests usually take place. The first is a *par value test*. Typically, the par value of collateral must exceed the value of the debt by a certain percentage called a trigger point. The second test is an *interest coverage test* to determine whether a certain minimum ratio of interest earned to interest paid out is being maintained. If the CDO passes these tests, cash continues to flow down to the less-senior debt holders. However, if one or both tests fail, cash payments are diverted to pay off the senior holders until the required covenant ratios are restored.

In contrast, market-value structures depend on the ability of the CDO manager to generate a sufficient return on the market value of the collateral. Coverage tests are also conducted regularly for these structures. But they are based on the market value of the portfolio rather than on the par value, as is the case for cash-flow structures.

What Happens When a Credit Event Occurs?

When there is a “credit event,” such as a default or rating downgrade, with respect to one or more credits in the reference portfolio, the trustee withdraws sufficient funds from the cash collateral account to compensate the protection buyers (i.e., the counterparties on the credit default swaps) for their losses. Credit support is “layered.” The equity/first-loss tranche absorbs

Chart 2 Example of a Payments “Waterfall”



initial losses, followed by the mezzanine tranches, which absorb some additional losses, and lastly by the senior and super-senior tranches. These last two tranches are expected to be insulated from losses except under the most extreme circumstances.

How Does a CDO Create Value?

Why do CDOs exist, and why do investors buy them when it appears, at first glance, that all they do is re-package existing credit-risk instruments and transform them into different payment structures? The economic value or surplus generated by a CDO is evidenced by the fact that spread income from the reference portfolio can compensate investors in the CDO tranches and also pay structuring and asset-management fees (BIS 2004). For the economics of a CDO to work, the weighted average return on the credits in the pool minus the weighted average cost of all liabilities, expenses associated with arranging the CDO, and expected credit losses must be positive, and also sufficiently positive to attract equity investors.⁶

There are various explanations of how CDOs generate value. These are related to both the asset side and the liability side of the CDO structure. We first examine the asset side.

For balance-sheet CDOs, an important part of the explanation has been the opportunity for regulatory capital arbitrage (see page 54). But this factor is becoming increasingly less important and will largely disappear with the implementation of Basel II in 2007.⁷ CDOs also try to take advantage of arbitrage opportunities arising from market segmentation. For example, it has been observed that the spread differentials on certain ratings categories of cash securities and CDSs may sometimes be higher than warranted by expected loss (BIS 2005; Ashcraft 2005). CDOs can accumulate those assets and issue tranches against them, which would pay the normal market spread. The excess spread would be incremental value, which would go to the equity investors in such CDOs.

In addition, CDOs help investors overcome market imperfections associated with the illiquidity of the markets for bonds, loans, and credit default swaps (Gibson 2004). Most corporate bonds trade infrequently and loans even less so. CDS markets may now, in some cases, be more liquid than the underlying cash markets. It is generally acknowledged that the aggregate cost of creating a large CDO by a specialist asset-management firm or investment bank is significantly less than that of investors individually paying high bid/ask spreads in these markets in order to assemble individual portfolios that meet their risk/return payoffs.

More value-added is derived from the process of creating multiple tranches on the liability side. In its simplest form, a CDO basically serves the purpose of carving up the aggregate credit portfolio into various tranches, each with their own risk/return characteristics. This tranching creates unique opportunities for investors interested in engaging in CDO transactions at risk/return levels in line with their particular appetites and preferences (Adams, Jhoo, and Wong 2004, 12). Also, pooling and tranching may serve to mitigate asymmetric information and incentive problems that might exist in other forms of credit-risk transfer (Mitchell 2004).

Thus, it is argued that CDOs serve to complete markets; that is, they synthesize combinations of risk and return that did not exist previously. By pooling and tranching, borrowers or risk shedders—represented in the pool of cash assets or credit default swaps—get access to financing or risk transfer from investors to whom they would not normally have access. For example, an institutional investor may want exposure to a certain sector—say, high-yield bonds, which, in the cash markets, are always non-investment grade—but is constrained under its investment guidelines to buying investment-grade bonds. That investor can participate in the senior (AAA) tranche of a CDO of high-yield bonds.

Assessing the Risks of CDOs

Any very successful financial innovation, such as the CDO, will normally offer important benefits to various economic agents. The benefits are usually evident, but the risks are more subtle and require thorough analysis.

Ratings agencies typically go through a two-step process in reviewing the risks of a CDO

6. Recall that equity investors have the right to this residual return after all other debt holders are paid.

7. A prime objective of the Basel II agreement from its inception has been to eliminate such arbitrage opportunities.

structure for the purpose of determining a rating, which, in turn, determines the tranche pricing (Fender and Kiff 2004). In the first stage, analytic models are used to determine the risk in the underlying pool of assets. This involves “default risk,” essentially estimating the distribution of potential credit losses in the pool. The second stage is the process of structural analysis, which involves understanding the “non-default” risks arising from the CDO’s structure. It is this structure that transforms the credit risk embodied in the pool of assets into a distinct set of risk characteristics on the liability or tranching side. This analysis involves a detailed understanding of the “payments waterfall” (Chart 2) and requires the accurate modelling of the distribution of cash flows from the asset pool to the various tranche holders.⁸

Modelling Credit Risk: Assessing the Risk in the Asset Pool

In the first stage of the analysis, the main factors that the ratings agencies use to determine the expected credit-loss distribution of a portfolio are estimates of: (i) probabilities of default (PDs) of the individual obligors in the pool and how these vary over the life of the transaction; (ii) recovery rates or losses-given-default (LGD); and (iii) default correlations within the pool, which determine the tendency of multiple defaults to occur within a given time (BIS 2005, 21). Credit-risk modelling (using Monte Carlo simulations) transforms assumptions about PDs, recovery rates, and correlations into an overall assessment of an asset pool’s credit quality.

In addition to the expected losses of CDOs, “unexpected loss” or loss volatility can be substantial and is driven mainly by two factors: single-credit concentration and, again, default correlation. Concentration (i.e., the lumpiness of the portfolio) is linked to idiosyncratic risks. The greater the concentration, the more the portfolio is exposed to idiosyncratic risk. Default correlation, on the other hand, relates to systematic risk and reflects the sensitivity of PDs to common factors and, therefore, individual obligors’ exposure to undiversifiable or business-cycle

risks. It is vital to note that the estimated loss distributions of a portfolio—expected and unexpected—are highly sensitive to assumptions about default correlation.

Because of the complexity of the transactions, the rating and pricing of CDOs necessarily involve “model risk.” Each of the three major global rating agencies—Standard & Poor’s, Moody’s, and Fitch Ratings—deals with this in broadly similar but different ways. Fender and Kiff (2004) recently reviewed this issue, documenting some of the key features of the models used by the rating agencies to evaluate the credit risk of CDO collateral pools and how differences in model specifics can influence the credit-risk assessment of individual pool tranches. The study shows that the use of different modelling approaches may, in theory, lead to different rating outcomes for individual tranches, particularly when differences in correlation assumptions are taken into account.

Their work also highlights the importance of correlation assumptions for estimating expected losses and, potentially, CDO tranche ratings. Getting these assumptions right is, therefore, one of the key challenges for the rating agencies in dealing with pooled credit risk and is critical for ratings accuracy. The authors find that differences in correlation assumptions and modelling approaches, when combined, can lead to meaningful differences in tranche ratings, unless compensated for by differences in other parts of the rating process. See Box 1 for an example.

The authors suggest that the resulting model risk needs to be understood by investors and argue against exclusive reliance on CDO ratings in taking investment decisions. In addition, continuing investor demand for more than one rating per tranche may be justified to help avoid inappropriate risk-adjusted returns.

Involvement by Canadian Institutions

The large Canadian banks have been actively involved in the creation and distribution of these products through their global investment banking arms. However, Canadian institutional investors have only recently started to invest in these instruments. Their participation is expected to rise rapidly in the next few years, as investor interest in alternative asset classes accelerates.

8. Other structural risks assessed by the ratings agencies include risks associated with third-party participants in the CDOs, as well as legal and documentation risk.

Box 1

The Importance of the Correlation Assumption to CDO Credit Ratings

The accompanying chart shows the various potential loss distributions that underlie a typical CDO. In this case, the underlying exposure consists of a diversified portfolio of five-year credit default swaps referenced to 120 investment-grade (rated AAA to BBB) obligors with an average rating of A. Using Standard & Poor's (S&P) rating methodology, a five-year senior tranche rated AA– can be issued off of this pool if at least 4.1 per cent of all of the underlying portfolio's losses are absorbed by less-senior tranches.

These losses can be viewed as “potential” loss distributions, because their shapes are driven by different assumptions regarding the default correlations between the 120 CDSs. For instance, S&P assumes a very high correlation between the defaults of obligors that are in the same industry sector, but zero correlation across sectors. Moody's, on the other hand, typically assumes a slightly lower intra-sector correlation and a non-zero but low inter-sector correlation.¹ Fitch Ratings uses empirically driven obligor-to-obligor-specific correlations, which tend to be higher than those used by S&P and Moody's.

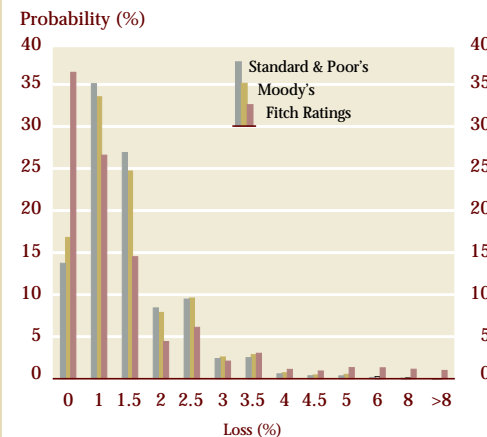
As the chart shows, the correlation assumptions have an important impact on the shape of the potential loss distributions. That is, the tail is thickest for the higher-correlation Fitch assumption, relative to those associated with the lower-correlation Moody's and S&P assumptions. The thickness of the tails is important to the senior tranche ratings, because they are most vulnerable to these extreme losses, i.e., the scenarios where total losses exceed 4.1 per cent.

Using S&P's correlation assumptions, the senior tranche's probability of default (PD) works out to around 0.9 per cent, which is the same PD associated with a five-year, AA– corporate bond. Hence, the tranche is rated AA– by S&P. However, if the heaviest Moody's correlation

assumption is used, the senior tranche's PD works out to about 1.3 per cent, which would map into an A– corporate bond rating. The Fitch correlation assumption is high enough that it could actually map into a subinvestment-grade rating (below BBB–).

Of course, there is more to rating a CDO tranche than just analyzing loss distributions, but the example highlights the potential significance of just one key quantitative parameter.²

Potential CDO Loss Distributions



1. For more details on the correlation assumptions, see Fender and Kiff (2004). Essentially, the default correlations are driven by assumptions regarding the correlations of the asset side of the balance sheets of the underlying corporate obligors.

2. More details on other dimensions of the CDO rating process can be found in Fender and Kiff (2004).

A more recent development has been the offering to retail investors of CDO-like income trusts.⁹ For example, in November 2004, RBC Dominion Securities issued an \$85 million offering of “Global DiSCS Trust 2004-1” retail-targeted investment trust units. In August 2004, National Bank Financial and CIBC World Markets led an offering of \$100 million of “Global DIGIT” investment trust units. In both cases, very highly rated tranches were created from large pools of diversified fixed-income securities and credit default swaps. These were somewhat different from traditional CDOs, in that there were effectively only two tranches: a senior and equity tranche. But the motivations and the nature of the pools made them more like CDOs than traditional securitizations.

The credit ratings of such investment trusts can also be quite sensitive to model and parameter assumptions. While this would be well understood by typical institutional CDO investors, many retail investors, to whom these securities are being targeted, may not fully understand the risks inherent in these instruments. In addition, these structures appear to have been rated by only one rating agency, whereas it would seem prudent to have a second opinion for all investors but especially for retail ones.

Conclusions


Developments in structured finance since the late 1990s have been impressive; the myriad forms of CDOs—which pool and tranche risks—seem to be beneficial from the point of view of completing markets. But these structures entail complex risks, and the models the rating agencies use to price them are also very complex. It is incumbent upon all types of investors to understand the model risk inherent to these instruments and to require more than one rating service for their risk assessment.

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Policy and Infrastructure Developments

Introduction

The financial system and all of its various components (institutions, markets, and clearing and settlement systems) are supported by a set of arrangements, including government policies, that influence its structure and facilitate its operation. Taken together, these arrangements form the financial system's infrastructure. Experience has demonstrated that a key determinant of a robust financial system is the extent to which it is underpinned by a solid, well-developed infrastructure. This section of the Review highlights work in this area, including that related to relevant policy developments.

The Canadian financial-services industry has evolved substantially in the past 15 years. Technological innovations and changing demographics, as well as significant changes in the macroeconomic environment, have driven this change. In addition, the policy framework that conditions financial sector behaviour in Canada, including the financial safety net, has evolved considerably since the 1980s. The financial safety net makes a crucial contribution to financial stability by providing regulators with a set of incentives to act in a timely and effective manner in response to troubled financial institutions. In the article, *On the Evolution of the Financial Safety Net*, the author provides a selective review of key innovations affecting prudential supervision and deposit insurance in Canada over the past 15 years.

On the Evolution of the Financial Safety Net

Walter Engert

In the past 15 years, the financial-services industry has evolved substantially, driven by technological innovations and changing demographics, as well as by significant changes in the macroeconomic environment. There has also been significant development of the policy framework that influences financial sector behaviour in Canada.¹

An important part of this policy framework is the so-called “financial safety net,” which consists of prudential supervision, deposit insurance, and the central bank’s lender-of-last-resort function. This paper reviews some of the key measures that have affected the financial safety net during the past 15 years, with a focus on deposit insurance and the prudential supervision of deposit-taking institutions.² This history can be interpreted as a long evolution towards a regime with clearer goals and improved incentives to act with regard to troubled institutions, along with greater authority to act.

Improved Incentives

Prior to a series of reforms beginning in the late 1980s, the supervision of deposit-taking institutions had been compromised by ambiguity about the role and mandate of supervision and by weak incentives to respond effectively to troubled institutions.³ This, in turn, increased deposit insurance liability and losses of the

Canada Deposit Insurance Corporation (CDIC).

Accordingly, in the late 1980s, the federal government began a series of reforms that have improved supervisory incentives, which are presented here selectively in rough chronological order.

A role for other agencies

A repeated theme in reviews of supervision (in Canada and elsewhere) has been the need to strengthen the incentives and ability of the supervisor to deal effectively with failing financial institutions. For example, strengthening the supervisor’s will to act was a central concern following the failures of the Canadian Commercial Bank and the Northland Bank in the mid-1980s.

As a result, the Estey Commission (1986) recommended merging deposit insurance and banking supervision to strengthen the incentives of the supervisor to deal promptly with troubled institutions. In the mid-1980s, the House of Commons Finance Committee also recommended that deposit insurance and banking supervision be consolidated. The Committee argued that consolidation would improve the supervisory system because the body responsible for deposit insurance has a strong incentive to minimize its loss.

In 1992, following the collapse of another deposit-taking institution, Central Guaranty Trust, the House Committee argued that the supervisor should be explicitly directed, as a corporate objective, to minimize the costs of the deposit insurance fund. As before, the motivation was to improve the supervisor’s incentives to act in a timely and effective manner when confronted with a troubled financial institution, by aligning the incentives of the supervisor with the need of the deposit insurer to control losses.

1. On these various points, see Daniel (2002–2003), Engert et al. (1999), Freedman and Goodlet (1998), and Freedman and Engert (2003).
2. For a discussion of the Bank of Canada’s lender-of-last-resort function, see Bank of Canada (2004) and Daniel, Engert, and Maclean (2004–2005).
3. Changes in market structure (such as increased entry) also contributed to the challenges facing the supervisory regime. At that time, the banking supervisor was the Office of the Inspector General of Banks, which was subsequently replaced by a new organization.

Although the specific recommendations to consolidate deposit insurance and supervision were not accepted, a principal insight was applied.⁴ That is, the government established ways to allow the views of safety-net agencies with potential exposures to troubled financial institutions to influence supervisory decision making. Accordingly, a supervisory structure was established that assigned interdependent roles and responsibilities to the supervisor, the deposit insurer, and the lender of last resort.⁵

More specifically, in 1987, the multi-agency Financial Institutions Supervisory Committee (FISC) was created, with the head of the newly formed Office of the Superintendent of Financial Institutions (OSFI) as the chair. The Superintendent was joined by the Chair of CDIC, the Governor of the Bank of Canada, and the Deputy Minister of Finance.⁶ The role of the FISC is to regularly discuss matters related to the supervision of financial institutions, bank-holding companies, and insurance-holding companies, including the development of strategies to deal with troubled financial institutions.

The members of the FISC have a strong interest in the sound conduct of supervision (from various perspectives). And the creation of the FISC increased the scope for these interested agents to influence supervisory decision making. The Bank of Canada and CDIC were also given the authority to require OSFI to conduct an inspection of a financial institution, or to hire a third party to conduct an inspection, if either judged it necessary, in view of their potential exposures to troubled financial institutions.

As a result of these developments, incentives for the supervisor to act were sharpened, as were incentives to improve supervisory policy and practice. In addition, these arrangements provide the supervisor with the support of the FISC agencies when dealing with problem institutions.

Changing roles for the deposit insurer

As suggested above, the deposit insurance function aligns well with incentives for sound supervision. Put differently, offering a deposit guarantee requires effective prudential supervision to mitigate moral hazard and insurance loss.⁷ In the absence of a well-functioning bank supervisor to control deposit insurance liability, one would expect that a deposit insurer would itself develop (independently) that capacity, provided that it had the authority and means to do so. And over the past 15 years, CDIC has developed a range of supervisory powers to mitigate the liability associated with deposit insurance, following the earlier failures of the supervisory framework to adequately manage that liability.

In 1987, Parliament expanded CDIC's mandate from that of a simple paybox institution (confined to paying the claims of creditors after a member is closed) to one aimed at reducing or averting a threatened loss to CDIC. Accordingly, CDIC was given the power to act as an inspector, receiver, or liquidator of a member institution, either directly or through an agent.⁸ In the 1990s, CDIC also developed the *Standards of Sound Business and Financial Practices*, with associated reporting requirements for member institutions. (These standards were recently repealed; see footnote 10.) As well, CDIC instituted a system of differential premiums (whereby insured institutions pay premiums related to the assessed risk posed to CDIC).

In the mid-1990s, CDIC and OSFI jointly established a policy of early intervention when dealing with troubled institutions. This policy sets out a series of graduated supervisory interventions that CDIC and OSFI can take with regard to a troubled institution, according to increasing

4. According to the federal government's "Blue Paper" (1986), CDIC was retained as a separate body to facilitate the retention of private sector expertise on CDIC's board of directors and to preserve CDIC's relationship with provincial authorities responsible for the supervision of CDIC-insured provincially chartered institutions.

5. For more on this, see the federal government's "Blue Paper" (1986).

6. The Commissioner of the Financial Consumer Agency of Canada became a member of the FISC in 2001.

7. For more on managing the liability associated with deposit insurance, see Merton and Bodie (1992) and Demirgüç-Kunt and Kane (2002). On the motivation and practice of deposit insurance (a large literature), see Garcia (1999, 2000) and Financial Stability Forum (2001), for example.

8. In practice, OSFI currently conducts annual examinations of CDIC-member institutions chartered by the federal government (the vast majority of members), and CDIC or its agent (typically OSFI) may conduct annual inspections of member institutions that are chartered by provincial governments. CDIC may also conduct (directly or through an agent) special examinations of its members, at its discretion.

seriousness. (This is discussed further below.) Additional amendments to the CDIC Act, made in 2001, encourage CDIC to make its own determination of the risk posed by member institutions (CDIC 2002). Finally, CDIC has had the authority to assess the acceptability of new entrants to the deposit-taking industry.

These various measures have provided CDIC with the means to act on its incentives to minimize deposit insurance liability. Importantly, in practice, this has also led to increased collaboration with OSFI, and so has influenced the conduct of supervision.⁹

However, particularly in view of the range of reforms made to the safety net over the past 15 years (see also below), these developments have also led to questions about overlap in supervisory arrangements and associated costs. Accordingly, in the budget of 23 February 2005, the federal government announced that it will clarify the roles and responsibilities of CDIC and OSFI and eliminate unnecessary overlap between the two agencies.¹⁰

The supervisor's mandate

Incentives have also been improved through a legislative change that sharpened the role of the supervisor, which in the past had often been misinterpreted as preventing all institution failures. Notably, in 1996, OSFI's governing legislation was amended to improve the incentive structure of prudential supervision by making

OSFI's mandate more clearly focused. Prior to this change, the role of the supervisor was essentially to enforce the provisions of the various financial-institution acts (such as the Bank Act), which set out the permitted and prohibited activities of regulated institutions.

More specifically, the OSFI Act was amended to indicate that the objectives of OSFI with respect to financial institutions are

- to supervise financial institutions in order to determine whether they are in sound financial condition and are complying with their governing statute law and supervisory requirements under that law;
- to promptly advise the management and board of directors of a financial institution in the event that it is not in a sound financial condition or is not complying with its governing statute law or with supervisory requirements under that law, and in such a case, to take, or require the management or board to take, the necessary corrective measures or series of measures to deal with the situation expeditiously;
- to promote the adoption by management and boards of directors of financial institutions of policies and procedures designed to control and manage risk; and
- to monitor and evaluate system-wide or sectoral events that may have a negative impact on the financial condition of financial institutions.

In pursuing its objectives, OSFI is directed to protect the rights and interests of depositors, policyholders, and creditors of financial institutions, having due regard for the need to allow financial institutions to compete effectively and take reasonable risks. And the OSFI Act recognizes that boards of directors and managements of financial institutions are responsible for the management of risk, and that financial institutions can fail.

As a result of these changes, OSFI emphasizes in its publications that its mandate is to safeguard depositors and other creditors from undue loss. (See, for example, the *OSFI Annual Report 2001–2002*.) As well, OSFI stresses that financial institutions operate in a competitive environment that necessitates the management of risk, and

9. The working relationship and information-sharing arrangements between CDIC and OSFI have been conditioned by agreements developed between the two agencies.

10. According to the budget documents (Government of Canada 2005), the government will maintain the key roles and responsibilities of CDIC, while consolidating several supervisory functions within OSFI. OSFI will be primarily responsible for interacting with federal financial institutions. It will assess institutions against OSFI guidelines, replacing the assessment of institutions against CDIC's *Standards of Sound Business and Financial Practices*, which have been repealed. Furthermore, OSFI will become solely responsible for reviewing new entrants to the financial sector and for developing prudential rules and guidelines. As part of these reforms, CDIC and OSFI are also expected to work together to streamline their administrative and corporate service functions.

that financial institutions can experience financial difficulties that can lead to their failure.¹¹

Authority to Take Control

Critical to the development of clearer goals and sharper incentives in the safety net has been the establishment of greater powers to respond to troubled institutions. In 1996, the Superintendent of Financial Institutions was given the power (through amendments of the various financial-institution acts) to take control of an institution's assets, or of the institution itself, and to restructure or close the institution for a variety of reasons that suggest threats to its viability (David and Pelly 1997; Bank Act; Office of the Superintendent of Financial Institutions Act).¹²

This change was of fundamental importance. It was a significant innovation in the supervisory framework, increasing the authority of the supervisor and underpinning the supervisor's ability to intervene in the affairs of a troubled financial institution. This power can be seen as the lynchpin of the supervisor's improved operating framework (based on structured, early intervention, which is discussed below). This authority and its derived measures also establish reinforcing incentives for financial institutions to avoid risks that could cause them to become subject to supervisory intervention.

Under certain conditions, the Superintendent can take control of the assets of an institution for 16 days. As well, the Superintendent can extend this 16-day period, take initial control of the assets for longer than 16 days, or take control of the institution itself, unless the Minister of Finance considers that these actions are not in the public interest.

11. Former Superintendent Palmer (2000) noted that the new mandate made clear that OSFI was expected to detect problems earlier and move faster to resolve them, either by requiring the institution to fix the problems or by closing the institution before the savings of depositors and policyholders were eroded. Palmer added that this mandate led to a fundamental transformation of OSFI.

12. In 1992, provisions had also been established to allow Governor-in-Council orders to vest in CDIC the shares or subordinated debt of a federally chartered CDIC member, to facilitate the institution's restructuring.

There are seven circumstances in which the Superintendent may take control of assets or of an institution itself:

- the institution has failed to pay its liabilities or, in the opinion of the Superintendent, will not be able to pay its liabilities as they become due and payable;
- in the opinion of the Superintendent, a practice or state of affairs exists that is materially prejudicial to the interests of the institution's depositors or creditors;
- the assets of the institution, in the opinion of the Superintendent, are not sufficient to adequately protect depositors or creditors;
- any asset appearing on the books or records of the institution is not, in the opinion of the Superintendent, satisfactorily accounted for;
- the regulatory capital of the institution has, in the opinion of the Superintendent, reached a level or is eroding in a manner that may detrimentally affect depositors or creditors;
- the institution has failed to comply with an order of the Superintendent to increase its capital; or
- the institution's deposit insurance has been cancelled by CDIC.

Once in control of an institution's assets, the Superintendent may take all necessary measures to protect the interests of the institution's depositors and creditors, pursuant to the mandate of OSFI, and OSFI can control access to the institution's assets, including cash and securities.

An Improved Operating Framework

Structured, early intervention

Consistent with the changes discussed above, the operating framework of prudential supervision has also evolved. The clearer goals and sharper incentives governing the safety net and the greater powers of safety-net agents (both CDIC and OSFI) have led to an improved operating framework based in part on "prompt, corrective action." Indeed, according to OSFI, safeguarding depositors from undue loss is best

achieved by intervening in a failing deposit-taking institution in a timely manner.

In the mid-1990s, OSFI and CDIC jointly introduced a program of early intervention, which is formalized in the *Guide to Intervention for Federal Financial Institutions* (OSFI 2002a). The guide describes the potential interventions of OSFI and CDIC in response to a troubled institution, depending on the institution's situation. The latter is characterized by four stages of increasing seriousness, each exemplified by specific problems set out in the guide.

This framework is broadly consistent with the analysis in past reviews of banking supervision, such as Estey (1986), which stressed the problems of supervisory forbearance, and with academic research emphasizing the importance of mandatory, prompt, corrective action by supervisors.¹³ The OSFI/CDIC program differs from the academic literature, however, by giving judgment a relatively larger role (instead of mandatory action). This underscores the importance of the incentives conditioning these supervisory judgments.

The stages of the *Guide to Intervention for Federal Financial Institutions* can be summarized broadly as follows.

Stage 1. Early warning: Deficiency in policies or procedures or the existence of practices or conditions that could lead to the development of problems described at Stage 2.

Stage 2. Risk to viability or solvency: Problems that, although not serious enough to present an immediate threat to financial viability or solvency, could deteriorate into serious problems if not addressed promptly.¹⁴

Stage 3. Viability or solvency is in serious doubt: Problems are at a level where they pose a material risk to viability or solvency in the absence of mitigating factors, such as unfettered access to financial support from a strong financial-institution parent, or unless effective corrective measures are applied promptly.

Stage 4. Non-viability or insolvency is imminent: Severe financial difficulties exist, resulting in failure or imminent failure to meet regulatory capital requirements in conjunction with an inability to rectify the situation within a short time. Alternatively, the conditions for the Superintendent to take control of the institution are met (described above).

As noted, each stage is associated with a range of increasingly severe interventions that could be taken by OSFI and CDIC, at their discretion, to address the situation. An institution, including its board of directors, is notified if it is "staged" according to this scheme; however, such information is not made public.

A procedural, risk-based approach for supervision

In 1999, OSFI introduced an approach that focuses on evaluating an institution's material risks and the quality of its risk-management practices (OSFI 2003). Application of this framework begins with the identification of an institution's significant activities and a judgment of the risk inherent in each activity; that is, the likelihood and significance of an adverse impact from that activity on an institution's capital or earnings. Such so-called inherent risk is assessed as being "low," "moderate," or "high."

OSFI then evaluates the quality of the risk-management process that the institution has in place for each significant activity by examining various control functions, including financial analysis, compliance, internal audit, risk management, and executive and board oversight. The overall quality of risk management for each significant activity is then judged as being "strong," "acceptable," or "weak," by qualitatively aggregating across the control functions.

The net risk for each significant activity is then determined as a function of the assessed level of inherent risk (low, moderate, or high), as mitigated by the assessed quality of risk management (strong, acceptable, or weak).

Finally, OSFI provides a judgment with regard to the direction of net risk ("decreasing," "stable," or "increasing") and prepares an overall composite risk rating that reflects net risk, direction of risk, and other salient factors, such as capital and earnings. The composite ratings broadly correspond to the stages set out in the *Guide to Intervention for Federal Financial Institutions*, so

13. On the academic literature concerning prompt, corrective action, see, for example, Benston et al. (1986) and Benston and Kaufman (1997).

14. Viability (an ambiguous term) appears to refer to a dynamic interpretation or view of solvency. That is, viability refers to the likelihood or expectation of an institution remaining solvent. Therefore, at any time, an institution can be solvent, but not viable.

that an institution judged to have a high composite risk rating, for example, is likely to be at an advanced stage, with associated supervisory interventions.

OSFI provides each supervised institution with the assessments and ratings that emerge from this process. As with information regarding staging under the *Guide to Intervention*, these reports are confidential.

Concluding Remarks

The evolution of the safety net over the past 15 years can be interpreted as a series of fundamental changes to the incentive structure and powers of the regime which, in turn, have motivated improvements in the operating framework of the safety net. The key measures have been the following.

- Establishing a clear mandate for the supervisor, focused on protecting the interests of depositors and other creditors. This mandate also recognizes that financial institutions can fail.
- Creating the authority and obligation for the supervisor to act promptly with regard to troubled institutions so as to achieve its mandate. This includes providing OSFI with the power to take control of a financial institution before it is insolvent and establishing an appropriate range of instruments with which to act.
- Providing the authority and means for other agencies in the safety net to influence the supervisory process. Notably, there has been an increased reliance on the incentives to mitigate deposit insurance liability.
- These measures have motivated an improved operating framework based on a program of structured, early intervention.
- In turn, these changes have sharpened financial institutions' incentives to manage risk appropriately, in part to avoid becoming subject to supervisory intervention.

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Research

Summaries

The Efficiency and Soundness
of Banking Systems

Introduction

Bank of Canada staff undertake research designed to improve overall knowledge and understanding of the Canadian and international financial systems. This work is often pursued from a broad, system-wide perspective that emphasizes linkages across the different parts of the financial system (institutions, markets, and clearing and settlement systems). Other linkages of importance may include those between the Canadian financial system and the rest of the economy, as well as those with the international environment, including the international financial system. This section summarizes some of the Bank's recent work.

The three articles presented in this section focus on research related to the efficiency and soundness of banking systems. In particular, they address issues pertaining to the performance of the Canadian banking industry, as well as bank failures and resiliency in Latin America and East Asia.

A key question in financial institution policy is whether larger banks can achieve greater efficiency and reduce production costs. Indeed, Bank of Canada Governor David Dodge asked in a December 2004 speech, "How can we enhance our policy framework to provide greater incentives for innovation by encouraging competition while, at the same time, giving our [financial] institutions the scope to improve efficiency?"¹ In *Efficiency and Economies of Scale of Large Canadian Banks*, the presence of economies of scale and efficiency in the Canadian banking industry is assessed statistically. Using detailed disaggregated industry data over the period 1983 to 2003, the authors account for the impact of technological and regulatory changes on the banking industry. In particular,

Canadian banks are modelled as producing multiple outputs, including non-traditional activities, such as security underwriting and wealth management, using multiple inputs. The inclusion of non-traditional bank activities, which now generate more than half of the total revenues of the Canadian banking industry, in a cost function for banks allows for a more appropriate statistical assessment of whether "bigger is better" from an efficiency perspective.

Expansion through acquisitions has been a feature of the financial sector in both Canada and the United States for decades. Acquisitions are of interest for financial sector efficiency and stability partly because of their potential impact on industry costs and performance. Over the past several years, six major Canadian banks have established significant operations outside Canada. Given the extent of these investments and the trend for Canadian banks to look abroad for expansion opportunities, it is important to assess whether it is firms that are successful domestically that increase their degree of internationalization (DOI), or whether, in fact, it is the DOI that improves performance. Such research is thus particularly relevant for Canadian banks seeking to enhance their performance through expansion. In *Degree of Internationalization: An Analysis of Canadian Banks*, the link between performance and DOI is tested using quarterly data on the foreign-asset exposures of Canadian banks over the period 1994 to 2003.

During the 1990s, countries in East Asia and Latin America experienced acute episodes of systemic banking crisis that compromised a substantial share of their banking sectors and caused enormous negative macroeconomic consequences. In the third article, *Bank Failures and Bank Fundamentals: A Comparative Analysis for Latin America and East Asia during the 1990s*, the author provides systematic cross-country

1. "Financial System Efficiency: A Canadian Imperative," Remarks to the Empire Club of Canada and the Canadian Club of Toronto, Toronto, Ontario, 9 December 2004.

empirical evidence as a basis for assessing the degree of resilience of the banking sectors in both regions during the crisis periods. In particular, he looks at whether systemic shocks pushed mainly those banks that were weakest before the onset of the crisis to fail, rather than provoking bank failures through a persistent decline in bank fundamentals resulting from the crisis periods. The issue of the resilience of the banking sector in emerging-market economies (EMEs) to systemic shocks assumes particular relevance for banks in industrialized countries that have asset exposures in EMEs. Banking-sector resilience in EMEs is also related to the DOI discussed in the second article, since the participation of foreign banks in EMEs has been found to increase stability in these markets.

Efficiency and Economies of Scale of Large Canadian Banks

*Jason Allen, Queen's University, and Ying Liu, Bank of Canada**

This study measures the efficiency and economies of scale in the Canadian banking industry. Efficiency is defined as a bank's cost level compared with that of a "best-practices" bank of similar size, controlled for the type of banking activity and the input prices it faces.¹ Economies of scale occur when a bank can lower its average cost by increasing output.

Measures of efficiency and economies of scale can provide important insights to managers making operational decisions, as well as to policy-makers in the debate on regulatory issues. Measuring efficiency allows us to compare the cost structure of banks both laterally and over time. A knowledge of the systematic differences in efficiency can help regulators to better understand the banking industry. Measuring economies of scale on the basis of existing business conditions and technology allows us to statistically assess whether "bigger is better" for banks.

Research into the efficiency and economies of scale of financial institutions has a long history in the United States and Europe. Northcott (2004) provides a detailed summary of the current theoretical and empirical literature on efficiency and competition and how it relates to the Canadian banking industry. Studies on U.S. banks find that, on average, banks are approximately 80 per cent as cost-efficient as a best-practices bank, while studies on economies of scale point primarily to moderate scale effects in smaller banks.

There is less empirical work on Canadian banks, owing to a limited amount of data. Murray and White (1983) find economies of scale in a cross-

section of credit unions in British Columbia, while Nathan and Neave (1992) find mixed results on the size of scale effects. When examining a cross-section of banks, McIntosh (2002) finds economies of scale, using aggregate panel data for five of Canada's major banks.

Key Features

The study outlined here is the first to use detailed disaggregated panel data on Canadian banks to answer questions about efficiency and economies of scale. Furthermore, the lengthy time period considered—1983 to 2003—allows us to examine the impact of technological and regulatory changes on the banking industry. Existing studies typically use cross-sectional data or, less frequently, a set of panel data covering a short time period. The disaggregation of the data is critical and allows Canadian banks to be modelled as producers of multiple outputs. We adopt the intermediation approach in which banks minimize costs by producing multiple outputs using multiple inputs. These inputs include capital, labour, and deposits. Banks produce loans (consumer, mortgage, and business) and engage in securities investment and non-traditional banking activities (e.g., deposit account services, security underwriting, and wealth management).

Incorporating non-traditional activities into a bank's cost function is a relatively new idea.² Most studies measure the output of banks by their traditional activities, such as lending, which generate interest income. But banks have been moving into non-traditional activities that generate non-interest income. Chart 1 shows the rapid growth of non-interest income relative to interest income. Estimating a bank's

1. This is sometimes referred to as the X-efficiency.

* This article summarizes a recently published Bank of Canada working paper (Allen and Liu 2005).

2. See Clark and Siems (2002) for an example using U.S. data.

cost function without including non-traditional activities could lead to incorrect inferences about efficiency and economies of scale.

The long time period covered by the disaggregated data used here provides some insight into the effects of technological and regulatory changes on banks' cost-minimizing behaviour. Freedman and Goodlet (1998) note that the financial-services industry has recently been undergoing significant technological changes that affect the way services are provided, the instruments used to provide them, and the nature of the financial-service providers. Regulatory changes can also affect the banks' cost structure. Calmès (2004) suggests that changes to the Bank Act in 1987, 1992, and 1997 may have encouraged the trend towards direct financing; i.e., financing done in financial markets rather than through financial intermediaries. At the same time, banks have been increasingly involved in non-traditional, typically market-oriented activities.

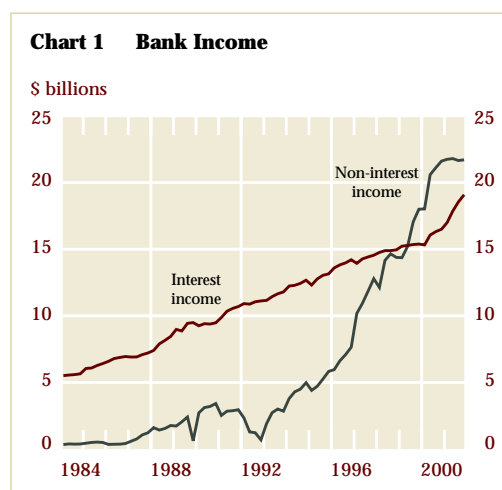
Methodology

The analytical framework used to examine efficiency and economies of scale in the Canadian banking industry is the translog cost function, first proposed by Diewert (1971) and Christensen, Jorgenson, and Lau (1971). The translog cost function is a flexible functional form that allows for multiple outputs and does not impose restrictions on the production function. Thus, restrictions, such as Cobb-Douglas technology, can be formally tested.

More specifically, a firm's cost-minimization problem can be written as a general cost function:

$$C = f(q, w) + \xi + \varepsilon, \quad (1)$$

where C is a bank's costs; q is a vector of a bank's output; w is a vector of input prices that a bank faces; and $f(q, w)$ is a translog function, consisting of the individual and cross-product terms of q and w . Efficiency measures are generated from ξ , while ε is assumed to be identically, independently distributed (i.i.d.). Inferences regarding the scale economies of banks are drawn from the derivative of C with respect to q . This specification is applied to a panel of six Canadian banks over the period 1983 to 2003.



We estimate the translog cost function using four different econometric techniques: (i) a time-varying fixed-effects panel model, estimated by ordinary least squares (OLS); (ii) a stochastic cost-efficiency frontier model, estimated by maximum likelihood (ML); (iii) a system of seemingly unrelated regressions (SUR), using generalized least squares (GLS); and (iv) a time-varying fixed-effects model, including leads and lags of the explanatory variables, estimated by dynamic ordinary least squares (DOLS). Multiple techniques are used to ensure robustness, given that each technique has advantages and disadvantages. The interpretation of our findings is based on all four models, which generate consistent results. That said, we place more emphasis on the results from method (iv), because unit-root and cointegration tests suggest that there is cointegration in our panel. Kao and Chiang (2000) argue that, in this case, the technique using DOLS is the most appropriate estimator to use.

To capture the possible effects of technological change on the banks' cost structure, two methods are used. First, a time trend and a squared time trend are added to equation (1). (It is assumed that banks are subject to the same technological shocks over time.) Second, technological changes are allowed to affect banks differently through the inclusion of a time trend and a squared time trend in the fixed-effect term of each bank. The effect of regulatory changes is then investigated by including dummy variables representing the date when regulatory changes took place.

Data

The data used for this study consist of quarterly observations for the six largest banks in Canada from the first quarter of 1983 to the third quarter of 2003. The data set is from the consolidated balance sheets and income statements collected by the Office of the Superintendent of Financial Institutions. The data at the aggregate level are published in the *Bank of Canada Banking and Financial Statistics*.³ All variables are deflated by the GDP deflator.

Three input prices are included: labour, capital, and deposits. They are measured, respectively, as the average hourly wage of bank employees,

the expenses on real estate and fixtures divided by the total stock of these items, and the effective interest rate that a bank pays on its pool of deposits. A bank's output is divided into five categories: consumer loans, mortgage loans, non-mortgage loans, other financial assets on a bank's balance sheet, and an asset-equivalent measure of a bank's non-traditional activities.

Measuring a bank's non-traditional activities is challenging because of the lack of data. We adopt the asset-equivalent measure introduced by Boyd and Gertler (1994). Assuming that non-traditional activities yield the same rate of return on assets (ROA) as traditional activities, the assets that are required to produce non-interest income can be calculated by dividing non-interest income by the ROA of traditional activities.

Conclusions

The assumption that banks face constant returns to scale is rejected. Unit costs fall as output increases in all models. Depending on the model and the assumptions, the results suggest that banks can reduce average costs by 6 to 20 per cent by doubling each of the five outputs, while the preferred model (using DOLS) suggests that the estimates are closer to 6 per cent. These estimates are slightly higher than those found in previous studies on large U.S. banks.

Our findings suggest that, all else held constant, Canadian banks could enjoy cost savings from becoming larger. This does not necessarily imply that the same cost savings would arise from bank mergers, because the business mix and input prices are likely to change after a merger. Even if cost savings can be achieved by joining two banks, those savings may not be passed on to consumers. Whether savings are passed on depends on the market structure and contestability in banks, topics that merit further research.

Our findings regarding efficiency suggest that the measure of the inefficiency of Canadian banks is approximately 0 to 20 per cent and that this range has been decreasing over time. This range is close to those found in studies on U.S. banks (of all sizes).

Larger banks appear to rank higher in efficiency than smaller banks. Given that scale economies are already accounted for in the model, this

3. Disaggregated data are confidential.

result may stem from differences in other factors, such as management skills and the speed with which new technologies are adopted. This finding seems to suggest that, in addition to scale economies, banks may realize extra cost savings by being bigger.

Finally, technological and regulatory changes are found to have had beneficial effects on the cost structure of banks over time. The analysis also suggests that banks that adopt newer technologies are likely to be more cost-effective than those using older technology.

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Degree of Internationalization: An Analysis of Canadian Banks

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The role of banks as intermediaries in global financial markets continues to evolve in response to regulatory reform, financial product innovation, and advances in information technology. A popular perception of this process is that banks have become more globalized, as witnessed by their ever-expanding operations in foreign jurisdictions. A simple question emerges: Does greater internationalization lead to better performance for Canadian banks?

Sullivan's (1994) seminal study offers a simple framework in which to measure the link between the degree of a bank's internationalization and its performance. His study is based on the premise that, as firms increase their share of operations abroad, and thus their degree of internationalization (DOI), they also experience higher levels of performance. DOI can be measured as the share of total sales, assets, income, or employees located outside a company's home country.¹ Performance can be measured as Tobin's Q, return on investment, return on equity, or profitability.

Objectives

This study has two objectives. First, we argue that the framework suggested by Sullivan must be implemented carefully. Its methodology implicitly assumes that internationalization is the "cause" of the observed value of firm performance—that is, increasing DOI has a direct impact on firm performance. Although it is partly true that causality may move from DOI to performance, this assumption ignores a very important aspect of international business theory: that firms go abroad to exploit firm-specific advantages. That is, firms develop techniques and

products that give them some competitive advantage, which then allows the innovating firm to perform well in the domestic market. These firms then move abroad through foreign direct investment (and other methods) to exploit these firm-specific advantages. Since the firms that are doing well domestically are the most likely to move abroad, we expect superior performance before the move is made. Not explicitly accounting for this initial success may result in attributing too much significance to DOI.

The second objective is to formally account for risk in the analysis. Studies that use DOI as a predictor of firm performance implicitly assume that an increase in performance is a good thing for firms. Although this may seem obvious, the risk associated with the firms' foreign operations and how they compare with their domestic operations must also be taken into account. If the movement abroad increases the risk profile of a particular firm's operations, then an increase in performance is the minimum that would be expected by shareholders. The relevant question would relate to whether the increase in performance is sufficient to compensate shareholders for the increased risk. This study addresses that question directly.

Data and Methodology

Using quarterly data on the foreign-asset exposure of Canadian banks over the period 1994 to 2003, we test the link between performance and DOI, focusing on domestic banks operating in Canada, six of which have a significant DOI. The data on foreign-claims exposure are taken from the consolidated quarterly report on banking statistics collected by the Bank of Canada. Every bank operating in Canada provides quarterly statistics of the total asset exposure to each foreign jurisdiction in which it operates, on a fully consolidated basis. This covers all claims,

1. See Contractor, Kundu, and Hsu (2003) for an excellent survey of the DOI literature.

including deposits to other financial institutions; loans to financial institutions and firms; and securities, both government and corporate, made outside and inside Canada. These foreign claims of domestic Canadian banks are adjusted to account for exchange rate revaluation. The data cover the exposures of all Canadian banks to over 150 jurisdictions between 1994 and 2003. Additional bank balance-sheet data are also used, including assets, market capitalization, and other bank-specific characteristics.

We use a rigorous statistical methodology to test whether it is firms that are doing well that increase their DOI, or whether it is the DOI itself that improves their performance.²

We also examine whether just the degree of international operations is needed to test the relationship between DOI and performance, or if a breakdown of the level of risk involved is also required. We do this by breaking down the foreign investments; first, by country and, second, by the type of claim. We are thus able to compare the effect on performance of holding the least risky types of foreign claims, such as U.S. government securities, with that of holding the most risky, such as loans to businesses in developing countries. The ability to distinguish between the types of foreign-asset claims is very important, since it introduces one of the most basic principles of finance: that the higher the risk associated with an investment project, the higher should be its expected return. Tests of the relationship between DOI and performance that do not address this issue are averaging these two effects.

Results and Implications

The analysis suggests that there is a significant (but weak) positive relationship between DOI and performance, thus confirming one of the main theoretical predictions of international business. But the composition of foreign claims, in terms of risk, is important. Banks that take on more risk (i.e., more loans rather than greater

claims in the form of securities) often have higher returns.

The implications for bank managers and their boards are clear. If internationalization is believed to somehow improve firm performance, then corporate strategists may be led to believe that expanding abroad will cause improvements in firm value. Moreover, to the extent that firm values are high to begin with, because of firm-specific advantages, then corporate strategists will realize that internationalization is a reflection of underlying firm-specific advantages and, hence, of high market values. The results of this study suggest that if firms decide to move abroad to improve performance, and if this decision is based only on the positive relationship between DOI and performance, then such a strategy may not result in improved performance.

This is because the impact on firm performance must take into account the risk profile of the companies' operations. If the expansion of multinational activities does not result in greater risk in the firm's operations, then a positive impact of DOI on performance can be interpreted as a good result. On the other hand, if the movement abroad also increases the risk exposure of the firm, then the increase in performance must be sufficient to compensate for the greater risk.

The implication for regulators is that not only is the degree of internationalization an important determinant of bank performance but so is its composition. Regulators must therefore consider the potential impact of banks' decisions to allocate their portfolios between domestic and foreign claims. This will assist regulators in ensuring safe and efficient financial markets.

2. Two approaches are taken. First, we attempt to control for bank characteristics that may be correlated to the level of DOI and performance; second, we implement generalized method of moments (Arellano and Bond 1991) estimation to control for the endogeneity of the relationship between DOI and performance.

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Bank Failures and Bank Fundamentals: A Comparative Analysis for Latin America and East Asia during the 1990s

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During the 1990s, countries in East Asia and Latin America experienced acute systemic banking crises that compromised a substantial share of their banking sectors, requiring government intervention at considerable cost.¹ These episodes have renewed interest in academic and policy circles about the contribution of individual bank weaknesses to bank failures during systemic banking crises. This issue is particularly relevant for industrialized countries like Canada, given the exposure of their banking sectors to foreign assets in emerging markets (EMs). Specifically, the overall EM portfolio of banks in industrialized countries could be affected if problems in the banking sector of one country spread to others because of contagion.

To date, the empirical literature on bank failures in EMs has focused mainly on the characteristics of failed banks relative to non-failed banks. However, no systematic cross-country empirical evidence is available to assess whether it was mainly the weakest banks (defined in terms of their fundamentals related to solvency and liquidity) that failed during the crises. In this context, the purpose of this study is to examine the episodes of systemic banking crisis during the 1990s in Latin America (Argentina, 1995; Mexico, 1994; and Venezuela, 1994) and East Asia (Indonesia, Korea, Malaysia, the Philippines, and Thailand in 1997), using bank-level data to answer the following questions: (i) To what extent did the financial conditions of individual banks explain bank failures? (ii) Did only the weakest banks, in terms of their fundamentals, fail in the crisis countries?

Methodology

First, the individual probabilities of bank failure are estimated as a function of bank-level fundamentals related to solvency, liquidity, profitability, and asset quality. This is done by using cross-sectional multivariate logit models to evaluate whether bank-level heterogeneity is important in explaining cross-country bank failures (i.e., if crisis countries had weaker banks *ex ante* than non-crisis countries, rather than just having worse shocks *ex post*). Second, based on the estimated individual probabilities of bank failure (propensity scores), the distribution for failed and non-failed banks in the crisis countries is analyzed by evaluating the degree of overlap between the distribution of both groups to assess whether it was mainly the weakest banks that failed in the crisis countries. In addition, the average of the propensity scores for failed and non-failed banks is computed to determine the relative contribution of only bank-level fundamentals to the likelihood of failure.

Results

The results for East Asia and Latin America show that bank-level fundamentals not only significantly affect the likelihood of a bank failure, but also account for a significant proportion of failed banks (between 50 and 60 per cent). The results thus support the view that failed banks in the systemic banking crises in EMs during the 1990s suffered from fundamental weaknesses in their asset quality, liquidity, and capital structures before the onset of the crisis. However, bank-level fundamentals are not enough to explain cross-country differences in crisis outcomes.

Regional differences appear when the distribution of the estimated probabilities of failure is analyzed. The results for East Asia show little

1. Examples include recapitalization and restructuring costs (Caprio and Klingebiel 2003).

overlap in the distribution of propensity scores between failed and non-failed institutions in the crisis countries. This suggests that systemic shocks—macroeconomic and liquidity shocks—destabilized banks whose fundamentals were the weakest before the shock. However, the results for Latin America show a considerable overlap in the distribution of propensity scores between failed and non-failed banks in the crisis countries. This would suggest that a fraction of banks that were relatively non-weak before the onset of the crisis may have been forced to fail in the context of unexpected aggregate shocks to the system. An analysis of the banks' survival time that takes into account the effect of banking-system and macroeconomic variables over the crisis period shows that the failure threshold of this group of ex ante relatively non-weak banks was shifting during the crisis period. This explains the quality difference between failed and non-failed banks in Latin America.

These results suggest areas for further research on the issue of regional asymmetries in the degree of the banking sector's resilience to systemic shocks that are associated with either macroeconomic or liquidity shocks or both. Such research should assess whether the banking sector in Latin America is less able to withstand or absorb unexpected systemic shocks than the banking sector in East Asia. Using banking-system and macroeconomic variables, Kaminsky and Reinhart (1998) find that East Asia and Latin America have different regional patterns for systemic banking crises, with those in Latin America being more volatile and severe than those in East Asia.

Policy Implications

These results suggest that the supervision of financial systems in EMs could be strengthened by putting emphasis on the traditional financial ratios associated with the CAMEL rating system,² at least as near-term indicators of bank vulnerabilities. The latter does not preclude the use of market-based indicators (e.g., deposit interest rates and interest rate spreads) to identify bank vulnerabilities, as part of an early warning system.

Banking regulation and supervision should also take into account the influence of macroeconomic developments on individual banks (i.e., assess the financial institution's exposure to systemic shocks) in order to make the banking (financial) system more robust to such shocks. For this purpose, it will not only be necessary to continue conducting macro-prudential analysis related to banking supervision and to the Financial System Assessment Programs (FSAPs), but also to reform the regulatory framework, ensuring that bank exposures to macroeconomic sources of risk are properly accounted for. This would include, for example, the exposure of banks to foreign currencies and their loan concentration to a particular economic sector (e.g., real estate).

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2. CAMEL stands for Capital, Asset quality, Management, Earnings, and Liquidity.