BANK OF CANADA
BANQUE DU CANADA

Discussion Paper/Document d'analyse
2008-9

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www.bank-banque-canada.ca

Bank of Canada Discussion Paper 2008-9

July 2008

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ISSN 1914-0568

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Acknowledgements

This paper was originally prepared for the “Central Bank Conference on Monetary Policy Implementation,” Board of Governors of the Federal Reserve System, 27 and 28 February 2008. We thank Jason Allen, Neville Arjani, David Longworth, and Chris Reid for comments, and Guy MacKenzie for assistance. The authors also thank Glen Keenleyside for editorial assistance. Errors and omissions are the responsibility of the authors.

Abstract

The authors present a detailed discussion of the Bank of Canada's framework for the implementation of monetary policy. As background, they provide a brief overview of the financial system in Canada, including a discussion of the financial services industry and the money market. Key features of the large-value payments system, which is integral to the implementation of monetary policy, are also explained. The authors then discuss in some detail the operating framework for the implementation of monetary policy. An assessment of the effectiveness of the Bank of Canada's framework is also provided, including an analysis of monetary policy implementation in the period of financial market stress beginning in August 2007.

JEL classification: E52, E58, G21
Bank classification: Financial institutions; Financial markets; Monetary policy implementation; Payment, clearing, and settlement systems

Résumé

Les auteurs décrivent en détail le cadre qu'utilise la Banque du Canada pour mettre en œuvre la politique monétaire. Ils donnent d'abord un bref aperçu de deux composantes du système financier canadien – soit le secteur des services financiers et le marché monétaire – et exposent les principales caractéristiques du système de transfert de gros paiements, rouage essentiel à la conduite de la politique monétaire. Les auteurs analysent ensuite de façon assez détaillée le cadre de mise en œuvre de cette politique. Ils procèdent enfin à une évaluation de l'efficacité de ce cadre, examinant en particulier la manière dont la politique monétaire a été menée depuis l'apparition de tensions financières en août 2007.

Classification JEL : E52, E58, G21
Classification de la Banque : Institutions financières; Marchés financiers; Mise en œuvre de la politique monétaire; Systèmes de paiement, de compensation et de règlement

1 Introduction

Monetary policy in Canada is designed to achieve an inflation target of 2 per cent within a range of 1–3 per cent, and the proximate target (or instrument) of monetary policy is the overnight rate of interest. The framework within which monetary policy is implemented has evolved over time, influenced by the evolution of the financial system and the legislative environment. The Bank of Canada's framework can be broadly characterized as one with zero reserves and which has a target for the overnight interest rate at the midpoint of a 50-basis-point operating band.[1]

There are close links between the framework for the implementation of monetary policy and the payments system, because ultimately the final positions of system participants settle on the books of the Bank of Canada. And it is through the Bank's influence on the terms of the arrangements with the institutions settling on its books that the Bank influences short-term interest rates. More specifically, the Bank is the ultimate supplier of settlement balances to institutions in a deficit settlement position, and the Bank accepts deposits of excess settlement balances from institutions in a surplus position. As a result, the Bank can set the prices of such loans and deposits, and thus effectively control the overnight interest rate.

The Bank's framework for the implementation of monetary policy is facilitated by the fact that only 14 financial institutions settle their positions directly on the books of the Bank, with the vast majority of institutions settling through these direct participants on an agency basis. The Bank of Canada also uses supplementary tools to support the achievement of its target for the overnight interest rate as needed, most notably a buyback (repo) facility to which the main participants in the money market have access. In addition, the Bank changes the level of settlement balances in the system to reinforce the target rate as needed. The end result is a framework that is fairly simple and yet highly effective. The Bank needs to intervene only infrequently, and is able to control the overnight interest rate with considerable precision.

The rest of this paper elaborates on these considerations. As background, section 2 provides a brief overview of the financial system in Canada, including a discussion of the money market. The large-value payments system is described in section 3, and section 4 discusses in some detail the operating framework for the implementation of monetary policy. Section 5 provides an assessment of the effectiveness of the Bank of Canada's framework, and section 6 offers some conclusions.

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1. Positive levels of reserve requirements in Canada were phased out over two years ending in 1994 and, with the introduction of the Large Value Transfer System in 1999, reserve averaging periods were eliminated.

2 Overview of the Canadian Financial System

2.1 The financial services industry[2]

The Canadian financial services industry is made up of banks, trust and loan companies, credit unions and caisses populaires,[3] life and health insurance companies, property and casualty insurance companies, securities dealers and exchanges, mutual fund companies and distributors, finance and leasing companies, independent financial advisers, pension fund managers, and independent insurance agents and brokers. However, the financial services sector is highly integrated, since different types of institutions offer similar services, and conglomerates offer a variety of financial products. One could generally characterize the Canadian financial system as a universal banking system.

There are numerous financial institutions operating in Canada. For instance, there are 73 banking organizations, comprising 20 domestic banks and 53 foreign banks; the foreign banks consist of 24 foreign bank subsidiaries and 29 foreign bank branches. Credit unions and caisses populaires, of which there are about 1,000 in Canada, are a significant presence as well, particularly in certain regions of the country (such as British Columbia and Quebec). These financial institutions tend to focus on retail and small-business financial services. In addition, there are about 100 life insurance companies operating in Canada, which are also significant providers of wealth-management services.

Nevertheless, a relatively small number of institutions dominate financial services, and the major banks are especially prominent, having a significant presence in virtually all financial service industries in the country, including traditional deposit-taking and lending, as well as trust, insurance, wealth management, and securities activities. For instance, the six largest banks account for over 90 per cent of banking assets in the country and three-quarters of the assets of the deposit-taking sector.[4] Also, the two major life insurance companies rank among the very largest financial institutions in Canada.

In sum, Canadian financial services can be characterized as a highly integrated, universal banking system, dominated by several large financial conglomerates—essentially, the major banks and life insurance companies—although there are numerous financial institutions of various kinds operating in the country.

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2. Appendix A provides more details on the main financial institutions in Canada.
3. Credit unions and caisse populaires are provincially incorporated co-operative financial institutions that are owned and controlled by their members.
4. For an overview of the evolution of banking in Canada, as well as a discussion of efficiency and competition in Canadian banking, see Allen and Engert (2007).

2.2 The money market

The roots of the money market in Canada stem from the 1950s, when the Bank of Canada took a number of steps to foster the development of such markets to improve the implementation and transmission of monetary policy, and to support the Bank's role as fiscal agent for the Government of Canada. The first steps encouraged active market making in Government of Canada securities, including the designation of a class of "jobbers" which, based on their market-making capabilities in Government of Canada securities, were provided with access to a purchase and resale facility to finance their securities at the Bank Rate.[5]

Since that time, the money market has broadened considerably, both in terms of the variety of financial instruments and the range of participants. Once dominated by Government of Canada treasury bills, today the market also includes commercial paper, finance paper, bankers' acceptances (BAX), asset-backed commercial paper, repos, and a range of derivative products, including futures, options, and swaps (Charts 1 and 2). Participants include banks, credit unions and caisses populaires, investment dealers, investment funds, pension funds, trust companies, finance companies, non-financial corporations, retail investors, the Government of Canada, and the Bank of Canada.

Major financial market participants in Canada with a temporary surplus or shortage of funds can transact in the overnight market (a term of one business day) to invest or fund these positions. The interest rate at which these transactions occur is referred to as the overnight interest rate. Banks and investment dealers are the largest lenders and borrowers of funds in the overnight market, primarily due to their market-making activities in a variety of financial assets. While banks continue to rely heavily on wholesale deposits to fund their operations, market-based financing more generally is supported extensively through collateralized transactions, such as repos.

The repo market is by far the largest component of the collateralized segment of the overnight market, and is of particular significance owing to its high level of transparency relative to other segments of the market. Repo transactions are an important component of banks' funding and are the main funding vehicle for firms that do not have access to deposits. Other components of the

5. From 1 November 1956 to 24 June 1962, and from 13 March 1980 to 21 February 1996, the Bank Rate was set at 25 basis points above the 3-month treasury bill tender average. Prior to 1 November 1956 and from 1962 to 1980, the Bank Rate was set and announced by the Bank of Canada. Effective 22 February 1996, the Bank Rate has been set at the upper end of the operating band established by the Bank of Canada.

collateralized segment of the overnight market, such as the call loan market—once the primary source of financing for investment dealers—have decreased in importance over time.

The interbank market in Canada, in which financial institutions borrow and lend without collateral, is small and continues to decline as a fraction of the overnight market. This contrasts with the United States, where the interbank market is active and deep. In Canada, the interbank market is used primarily by financial institutions without a broad domestic deposit base, as well as by direct participants in the large-value payments system for end-of-day adjustment transactions.

The London interbank offered rate (LIBOR) is often used to compare short-term funding costs between money markets in developed countries. However, given the absence of an active uncollateralized interbank market in Canada, it is not surprising that the Canadian-dollar LIBOR market is relatively inactive. A better and more comparable indicator of short-term funding costs for Canada is the "Canadian-dollar offered rate" (CDOR), which is compiled from bid rates on bankers' acceptances.[6] Three-month CDOR rates are also used to settle interest rate futures (BAX) contracts, which, while not used to directly raise funds, can be employed for hedging purposes and to speculate on future interest rate movements.

3 The Large Value Transfer System

The Large Value Transfer System (LVTS) is a multilateral netting system owned and operated by the Canadian Payments Association (CPA). The LVTS is also subject to oversight by the Bank of Canada.[7] The LVTS is used to settle about 21,000 payments each day, with a total daily value of $185 billion. While the average value of payments processed by the LVTS is over $8.5 million, participants can submit payments of any size to the system, including small-value payments.

6. CDOR is determined daily from a survey of nine market-makers' bids for various maturities of bankers' acceptances in Canada; the high and low rates are excluded from the sample, and the simple average of the remaining rates is calculated around 10:00 and published at 10:15 (on Reuters) each business day.
7. The CPA is a not-for-profit organization created by an Act of Parliament in 1980. The mandate of the CPA is to establish and operate national systems for the clearing and settlement of payments and other arrangements to make or exchange payments; facilitate the interaction of its clearing and settlement systems with other systems involved in the exchange, clearing, or settlement of payments; and facilitate the development of new payment methods and technologies. The Bank of Canada's role in the oversight of payment, clearing, and settlement systems is discussed in Engert and Maclean (2006).

There are 14 financial institutions that participate directly in the LVTS, in addition to the Bank of Canada. The vast majority of CPA members (110) rely on these participants as agents to clear and settle their payments through the system.[8] In other words, the Canadian payments system has a highly tiered structure, which is not unusual in major payments systems around the world (CPSS 2003).

3.1 Overview of risk controls and certainty of settlement

The key elements of risk control in the LVTS are as follows:

- Individual electronic payment messages are subject to risk-control tests in real time.
- The net amount that each direct participant is permitted to owe is subject to bilateral and multilateral limits. Payment messages that pass the risk-control tests are netted multilaterally in real time on a payment-by-payment basis.
- At the beginning of each day, in accordance with a predetermined formula, direct participants collectively pledge to the Bank of Canada collateral security with a value sufficient to cover the largest net debit possible from a single participant. This collateral can support liquidity advances to settle the system in the event that any one of the participants defaults.
- The Bank of Canada guarantees settlement of the system in the extremely unlikely event that more than one direct participant fails during the LVTS operating day. The guarantee will be exercised only in the event of an unanticipated failure of more than one participant on the same day during LVTS operating hours, and if the amount owed by the failing participants exceeds the value of collateral that has been pledged to the Bank of Canada.[9]
- LVTS participants know their positions with certainty in real time. As well, each direct participant can limit its exposure to any other participant, and each participant knows at all times what its maximum exposure is to any other participant.

These elements provide certainty of settlement for payments that pass the risk-control tests of the system. In turn, this permits LVTS participants to offer *intraday finality* of payments to their customers. As a result, recipients of payments can use these funds immediately upon receipt

8. To be a direct participant in the LVTS, an institution must be a member of the CPA, use the Society for Worldwide Interbank Financial Telecommunications (SWIFT) telecommunications network, have adequate backup capability for its LVTS operations, have a settlement account at the Bank of Canada, and enter into agreements relating to taking loans from the Bank of Canada and to pledging appropriate collateral.
9. More precisely, to invoke the Bank's guarantee, the amount owed by the defaulters must, after being offset by the defaulters' collateral, lead to an "additional settlement obligation" for a surviving participant that exceeds the collateral it has pledged to the Bank of Canada for such purposes. These additional settlement obligations (loss allocations) are calculated according to a predetermined formula.

without any risk of the payments being reversed later.[10] (For more on LVTS risk controls and related considerations, see Appendix B.)

3.2 The link to monetary policy implementation

In the LVTS, electronic payment messages are processed during the day in real time; at the end of each day, participants settle their net LVTS obligations among each other through transfers of settlement balances held at accounts at the Bank of Canada. Because the Bank of Canada can create settlement balances (claims on itself) virtually without limit, it is uniquely placed to provide overnight advances, through its Standing Liquidity Facility (SLF), to meet any settlement balance shortfalls of payments system participants. Conversely, it can also hold any LVTS participant's excess settlement balances as interest-bearing deposits. This mechanism is the fulcrum for the implementation of monetary policy.

4 The Framework for the Implementation of Monetary Policy

The key features of the implementation framework, which are summarized in Table 1, are the target for the overnight interest rate, the operating band for the overnight rate, and supporting instruments of open market buyback operations and settlement-balance management.

4.1 Target for the overnight interest rate

The Bank of Canada uses predetermined dates, known as fixed announcement dates, to communicate the target and the operating band for the overnight interest rate. The announcements are made at 9:00 via a press release.[11] Should this result in a change in the target for the overnight rate, the new rate is in effect on the day it is announced.

- The target for the overnight interest rate refers to the rate on collateralized, market-based overnight transactions.
- The Bank of Canada uses the overnight general collateral (GC) repo rate as its guide to conditions in the overnight market. GC collateral is typically Government of Canada securities.

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10. There is another payments system in Canada, the Automated Clearing Settlement System (ACSS), which does not have the same rigorous risk proofing as the LVTS. The ACSS is used for payments not handled by the LVTS—generally, small-value items such as paper cheques, automated bill payments, and debit card transactions. Direct clearers in the ACSS know the amount of their net ACSS settlement positions in the morning after items are entered into the ACSS clearing process. Those ACSS participants with a negative clearing balance make an LVTS payment to settle their ACSS account, directly or through an agent in the LVTS. That is, ACSS positions are settled on a t+1 basis with an LVTS payment.
11. A daily timetable of key events for the overnight market is provided in Appendix D.

4.2 Operating band for the overnight interest rate

The Bank of Canada's primary influence on the overnight interest rate is through its 50-basis-point operating band for the rate.

- The interest rate charged for overdraft loans (advances under the Bank's SLF) to LVTS participants at final settlement is the upper limit of the operating band. This interest rate is called the Bank Rate.[12]
- The interest rate paid by the Bank of Canada on positive balances after settlement of the LVTS is set at the lower limit of the operating band.
- The Bank of Canada's target for the overnight interest rate is the midpoint of the operating band.

The overnight interest rate typically stays within the band because participants are aware that they will earn at least the Bank Rate less 50 basis points on positive balances, and need not pay more than the Bank Rate to cover negative balances, given the standing facilities at the Bank of Canada.

After the close of client business in the LVTS at 18:00, LVTS participants have a period of one-half hour in which to enter into transactions with each other. This allows participants to reduce their LVTS positions (which resulted from their own transactions and those of their clients) at interest rates typically constrained by the limits of the operating band. In fact, trades are often arranged at the target rate. At 18:30, final settlement of LVTS multilateral positions is effected directly on the books of the Bank of Canada.

4.3 Reinforcing the target rate through buyback operations

If required to reinforce the target rate during the course of a day, the Bank of Canada will intervene in the overnight market with open market buyback operations with primary dealers at the target rate.[13] The typical intervention time is at 11:45 to encourage market participants to trade with each other during the morning, when a large proportion of daily funding activity occurs.

12. An overview of the Bank of Canada's SLF is provided in Appendix C.
13. Primary dealers are the subset of government (debt) securities distributors that the Bank of Canada deals with when conducting SPRAs and SRAs. Primary dealers have a number of responsibilities, which include maintaining a certain share of the Government of Canada debt securities markets, and market making in these securities. Eight of the 12 primary dealers are also direct participants in the LVTS.

If the overnight interest rate is generally trading above the target rate, the Bank will intervene to provide intraday liquidity with special purchase and resale agreements (SPRAs), commonly referred to as "repos" or "specials." On the other hand, if the overnight rate is generally trading below the target rate, the Bank will intervene to withdraw intraday liquidity with sale and repurchase agreements (SRAs), commonly referred to as "reverses." If necessary, to further reinforce the target for the overnight interest rate, the Bank is prepared to enter into multiple rounds of open market operations, and to conduct those operations outside of the regular time, including earlier in the morning. Buyback transactions are typically conducted with Government of Canada securities.[14]

4.4 Settlement-balance management (cash setting)

Since the introduction of the LVTS in 1999, the level of settlement balances in the system typically has been targeted at zero or greater. Any participant in the LVTS with a deficit position is therefore aware that there is at least one participant in the system with an offsetting surplus position that is a potential counterparty for transactions at market rates. Currently, the Bank typically targets a small positive amount of settlement balances ($25 million), thus alleviating transactions costs and other frictions from the end-of-day process and reducing the need for participants to take frequent small advances from the Bank.[15]

However, the Bank may adjust the targeted level of settlement balances higher or lower if warranted by conditions in the overnight market. Over the years, several adjustments have been made to the target level of settlement balances (Chart 3). These changes have often been in reaction to periods when the Bank has observed persistent pressures on the overnight interest rate, causing it to deviate above or below the target rate, or when temporary technical pressures occurred, as at quarter-ends when banks typically require increased liquidity. As discussed below, during the recent market turbulence, the Bank set target balances well above the $25 million level.

Unlike many other countries that predominantly use repos to add (or withdraw) liquidity to (from) the system, the Bank of Canada uses the transfer of government deposits to affect the level of settlement balances.

14. The securities that the Bank of Canada can purchase or sell are conditioned by the Bank of Canada Act and are currently under review.
15. The current typical target level of settlement balances of $25 million was announced on 17 May 2007.

- To maintain the desired level of settlement balances, the Bank of Canada (which is the federal government's banker) must neutralize the net impact of any public sector flows between the Bank's balance sheet and that of the financial system. (Public sector flows include government receipts and disbursements, the Bank of Canada's own transactions, and those of its clients.)
- This neutralization (and any change in the level of settlement balances) is effected through the transfer of government deposits from/to the government's account at the Bank of Canada to/from LVTS participants and other selected market participants, through the LVTS.
- The transfer is made through a twice-daily auction of federal government (Receiver General) balances, the first at 9:15 and the second—at which only LVTS participants are eligible—at 16:15, when all flows affecting the Bank of Canada's balance sheet are known.
- The difference between the amount auctioned and the amount maturing equals the amount of the neutralization and the change in the level of settlement balances in the system. For example, if the government were to receive $100 million net in taxes into its account at the Bank of Canada, in the absence of any neutralizing action, settlement balances in the system would decline by this amount. The Bank would therefore arrange a net increase of $100 million in the government deposit auction to leave the system unchanged. Similarly, in this case, a net increase of $200 million in the government deposit auction would increase the level of settlement balances in the system by $100 million. On the other hand, if the Bank transacted $100 million in SPRAs, there would be an offsetting net reduction of $100 million in that day's government deposit auction to maintain an unchanged settlement-balance setting.

The Bank typically neutralizes the cash impact on the system of any market buyback operation. However, there are occasions when there is an unintentional difference between the target level of settlement balances and the actual level of settlement balances. These differences result from the inability to completely neutralize public sector flows, either because net government receipts are lower than expected or because the net impact of the Bank's SPRA actions exceeds the amount of the maturing Receiver General deposits (i.e., the Bank is unable to withdraw liquidity at the end of the day and settlement balances are higher than the target level).[16]

16. To be clear, if SPRA operations were not neutralized, LVTS participants would hold deposits with the Bank of Canada at the Bank Rate less 50 basis points. The Bank has the option of not fully neutralizing SRA operations and may thus leave the system in a deficit position at the end of the day, requiring one or more participants in the LVTS to take an advance at the Bank Rate under the Bank's SLF.

In these circumstances, the fact that the actual level of settlement balances deviates from target appears to have very little effect on the average overnight interest rate that day. However, pre-announced changes to the target level of settlement balances do have a clear affect on market participants' behaviour and the overnight interest rate.[17]

Table 1
The Framework for the Implementation of Monetary Policy

Target for the overnight interest rate	At 9:00 on fixed announcement dates, the Bank communicates the target for the overnight interest rate. If this results in a change in the target for the overnight rate, the new rate becomes effective on the day announced.
Operating band	The upper limit, which is the target overnight interest rate plus 25 basis points, is the rate at which the Bank of Canada provides overdraft loans at the end of LVTS settlement. This is the Bank Rate. The lower limit, which is the target overnight rate minus 25 basis points, is the rate paid on deposits by the Bank of Canada at the end of LVTS settlement.
Operations reinforcing the target interest rate	If required, the target for the overnight interest rate is reinforced intraday through the use of open market buyback operations at the target rate: either "repos" (if the overnight rate is trading above target) or "reverses" (if the overnight rate is trading below target). Although these operations typically occur at 11:45, the Bank can conduct open market operations outside of this time period and can conduct more than one round of these operations, if necessary.
Settlement-balance management	Effected through transfer of government balances from/to the Bank of Canada to/from the LVTS and other participants in government auctions. Transfer of government balances used to: • neutralize the impact of market buyback operations and of public sector flows to/from the Bank's balance sheet (if the level of settlement balances is unchanged), and • adjust the level of settlement balances.
	Transfer of government deposits (balances) effected through the twice-daily auctions of government balances for same-day value. The neutralization of public sector flows and any change in the level of excess settlement balances is effected by the difference between the amounts auctioned and the amounts maturing.

17. Operationally, the target level of settlement balances is announced to LVTS participants the previous day unless it is a day when the Bank cannot fully neutralize operations. Then, the *actual level* of settlement balances is announced the same day, just before the afternoon auction of federal government deposit balances.

5 An Assessment of the Framework for the Implementation of Monetary Policy

The Canadian approach to implementing monetary policy imposes a relatively small footprint on Canadian money markets and financial institutions, while keeping the overnight interest rate quite close to the monetary policy target rate and supporting liquidity in the money market. The absence of reserve requirements removes the typical administrative burdens on Canadian banks related to reserve maintenance, and also has other advantages (Bank of Canada 1999; Clinton 1997; Longworth 1989).

Ordinarily, the current system requires the Bank of Canada to perform a minimal amount of market operations. There is the daily transfer of government deposits related to achieving the target settlement balances, but the Bank can go several days without carrying out buyback operations. The Bank conducted SPRA/SRA operations on 72 days per year, on average, over the January 1999 to January 2008 period (Chart 4). From 2001 to 2005, the Bank performed SPRA/SRA operations on fewer than 30 days per year.[18] Similarly, in practice, SLF advances tend to be relatively infrequent and small. For example, in the three months from mid-May to mid-August 2007, SLF advances from the Bank were outstanding on 18 of 58 days; the median value of those outstanding SLF advances was $7.5 million, and the average value was $40 million. (SLF advances are considered by market participants to be unexceptional and without stigma.)

How closely the central bank can keep, on average, the effective or reference rate to the target policy rate is one measure of the effectiveness of its framework for the implementation of monetary policy.[19] As Charts 5 to 7 demonstrate, the volatility of the reference overnight interest rate relative to the target rate is quite low in Canada compared with similar measures for the United States and the euro zone, as is the standard deviation of the difference. This information is summarized in the first panel of Table 2.

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18. The Bank performed SPRA/SRA operations on 22, 9, 4, 6, and 29 days in 2001, 2002, 2003, 2004, and 2005, respectively. In 2006 and 2007, the Bank of Canada carried out SPRA/SRA operations on 62 and 82 days, respectively.
19. The reference overnight interest rate used here is the Canadian overnight repo rate average (CORRA), which is the weighted average of overnight general collateral repo trades that occurred through designated interdealer brokers between 6:00 and 16:00. The Bank of Canada uses (and publishes) two measures of the collateralized overnight interest rate as proxies for the overall average cost of overnight funding: the CORRA and the overnight money-market financing rate. The CORRA is limited to transactions performed in the general collateral repo market, and provides a transparent intraday and end-of-day measure of the level of the overnight interest rate.

Table 2
Difference Between Reference and Target Rates
(basis points)

	Average	Standard deviation	Maximum
January 1999 to January 2008			
Canada	2.50	4.67	40
U.S.	5.99	12.40	181
Euro zone	10.07	14.55	100
January to July 2007			
Canada	1.58	2.01	6
U.S.	2.24	3.10	16
Euro zone	7.50	6.42	39
August to December 2007			
Canada	3.72	5.03	16
U.S.	13.28	20.24	119
Euro zone	12.24	16.77	59

5.1 Monetary policy implementation during recent market stress

Starting in August of 2007, Canada, like other major industrialized countries, experienced substantial stress in its money markets. Specifically, the financial market turbulence caused a sharp decrease in liquidity in short-term funding markets, including the market for overnight funds.

To meet the increased demand for overnight liquidity during this time, the Bank of Canada used its standard tools for implementing monetary policy. In the initial stages of this period, starting on 9 August, the lack of liquidity caused the rate on overnight loans to move above the target for the overnight interest rate. This increase in volatility in the overnight market in Canada is highlighted in the lower panel of Table 2, which shows an increase in the average deviation of market overnight rates from the target overnight rate relative to the first half of 2007. In the United States and the euro zone, the overnight interbank rate also deviated significantly from the respective target policy rates (Table 2). Not only did the collateralized overnight market move above the target rate in Canada during the early part of this period, but the spread between the

uncollateralized overnight market and the collateralized overnight market also widened significantly (Chart 8). This market response was not unique to Canada.

In response, the Bank announced that it would provide sufficient liquidity, and it engaged in multiple rounds of repos, providing overnight funds to the primary dealers at the target overnight rate in exchange for Government of Canada securities. Given the increased demand for liquidity during this period, the Bank also increased the level of settlement balances to $500 million beginning 15 August. The target level of settlement balances subsequently varied over the period in relation to pressures observed on the overnight lending rate (Chart 9). In fact, the SPRA transactions were not always fully neutralized and the actual amount of settlement balances on many days exceeded the target level.[20]

Although the volatility in the overnight market rate subsided relatively quickly after the initial onset of the turmoil, the term segment of the money market in Canada remained under stress until early January 2008. For example, spreads between 3-month bankers' acceptances and overnight index swaps of the same maturity ranged between 25 and 60 basis points during the period. This was quite high relative to the pre-turmoil period, in which spreads ranged between 5 and 10 basis points. The strains in the term bank funding market were alleviated after the coordinated efforts of central banks, including the Bank of Canada, to provide term funding in their respective jurisdictions in December 2007.

The Bank of Canada announced on 12 December that it would enter into term purchase and resale agreements extending over the calendar year end, and broadened the list of eligible securities for these transactions to include not only Government of Canada securities but also those securities guaranteed by the Government of Canada, issued or guaranteed by a provincial government, as well as bankers' acceptances and bearer deposit notes with a maturity of less than 180 days. Two term purchase and resale agreements were conducted through an auction process: on 13 December, $2 billion maturing on 10 January 2008, and on 18 December, $2 billion maturing on 4 January 2008.

Work is currently under way to review liquidity provision during periods of market stress, including other forms of term lending and potentially broadening the list of eligible assets and

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20. On 15 August, the Bank responded by temporarily expanding the list of securities acceptable for SPRA transactions to include those securities that are eligible as collateral for the SLF. Subsequently, as the overnight pressures eased, and since SPRA under the expanded list had been utilized on only 15 and 16 August, the Bank of Canada restored the standard terms for SPRA on 7 September, accepting only Government of Canada securities.

counterparties. With respect to overnight operations, the Bank has indicated that it will broaden the collateral accepted for its SLF to include asset-backed commercial paper and U.S. treasury bills, and will review other forms of collateral as well.

6 Concluding Remarks

The Bank of Canada affects financial variables through its influence on the overnight interest rate by setting a target rate at the midpoint of a 50-basis-point operating band, and through a framework that is designed to hold the rate within this band. Changes in the Bank's target for the overnight interest rate influence, through the transmission mechanism for monetary policy, other short-term interest rates, the exchange rate, and, ultimately, economic activity.

The Bank's framework is highly effective in allowing the Bank to control the overnight interest rate with considerable precision. This likely reflects the interplay of several factors. First, the operating band for the overnight rate, with the Bank's lending rate as the upper bound and the Bank's deposit rate as the lower bound, creates strong incentives that directly affect the behaviour of payments system participants and, indirectly, other participants in the money market. Second, there is a small number of direct participants in the large-value payments system, which lowers search and transactions costs for payments system participants, which, in turn, facilitates trading; this enables the effective management of payments system participants' clearing and settlement balances. Third, cheques settle (on t+1) through the LVTS (see footnote 10), which means that there is no float. Fourth, the Bank of Canada requires that all government payments be made by 15:00, and so by 15:30 the Bank is able to determine the aggregate flows between the financial system and itself. Fifth, LVTS participants know with certainty intraday (in real time) their net positions in the system. The effect of these conditions is to eliminate uncertainty in the system with regard to participants' settlement-balance positions and their associated funding needs.

Finally, it is worth noting that transitory disturbances in the money market in Canada are effectively addressed by these features, particularly the symmetric 50-basis-point operating band for the overnight interest rate, and the provision of Bank lending and deposit facilities at the upper and lower bounds of this band. This seems to be more effective compared with the buffering effect of a conventional reserve-averaging period, particularly in unremunerated reserve systems.

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Chart 1
Outstanding Money Market Securities

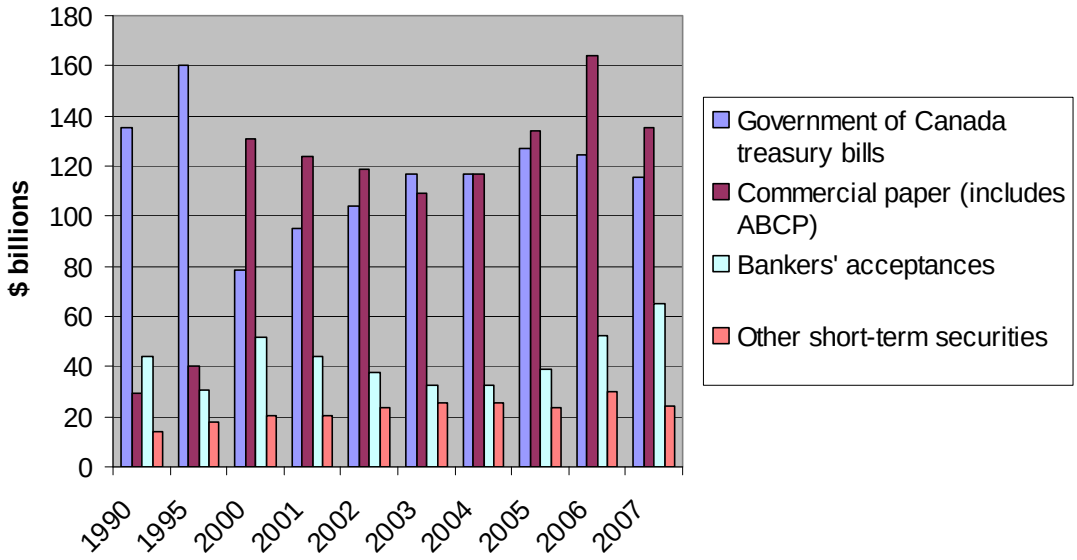


Chart 2
Average Open Interest on Interest Rate Futures

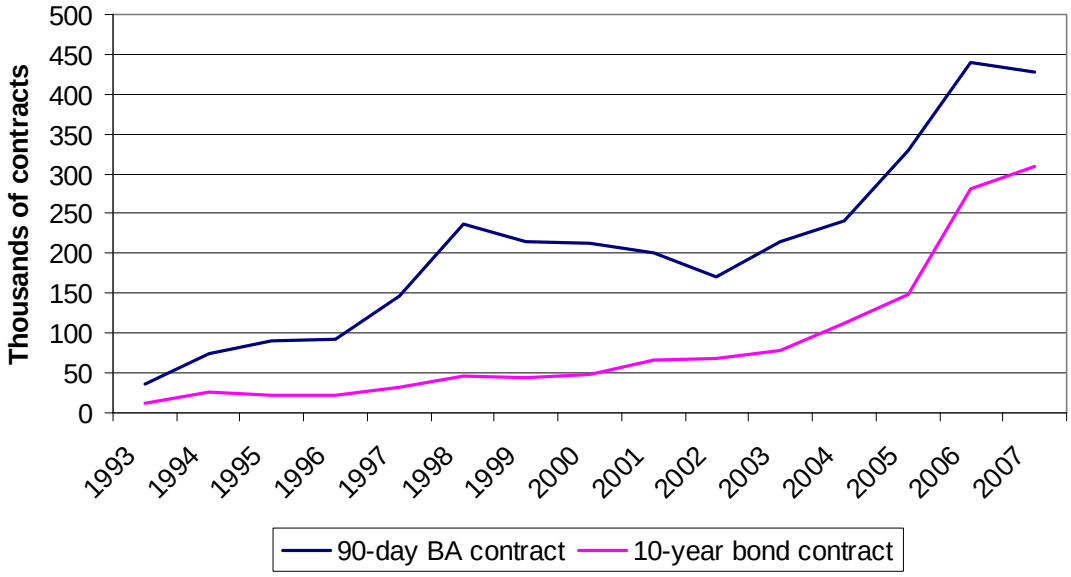


Chart 3
Target Level of Settlement Balances
January 1999 to July 2007
millions of dollars

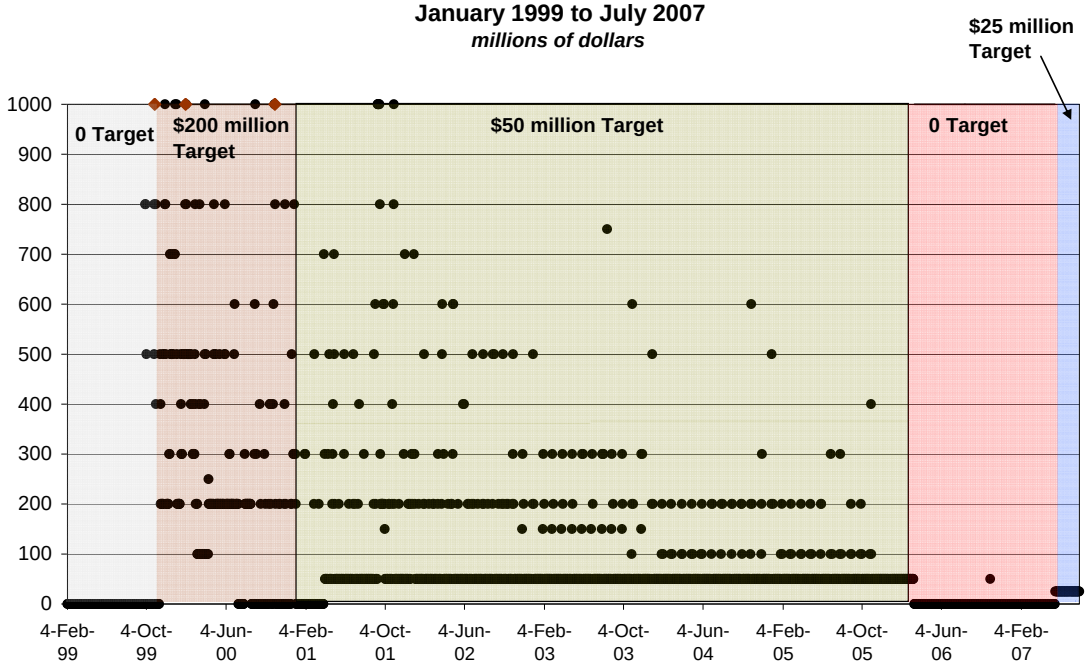


Chart 4
SPRA and SRA Operations
millions of dollars

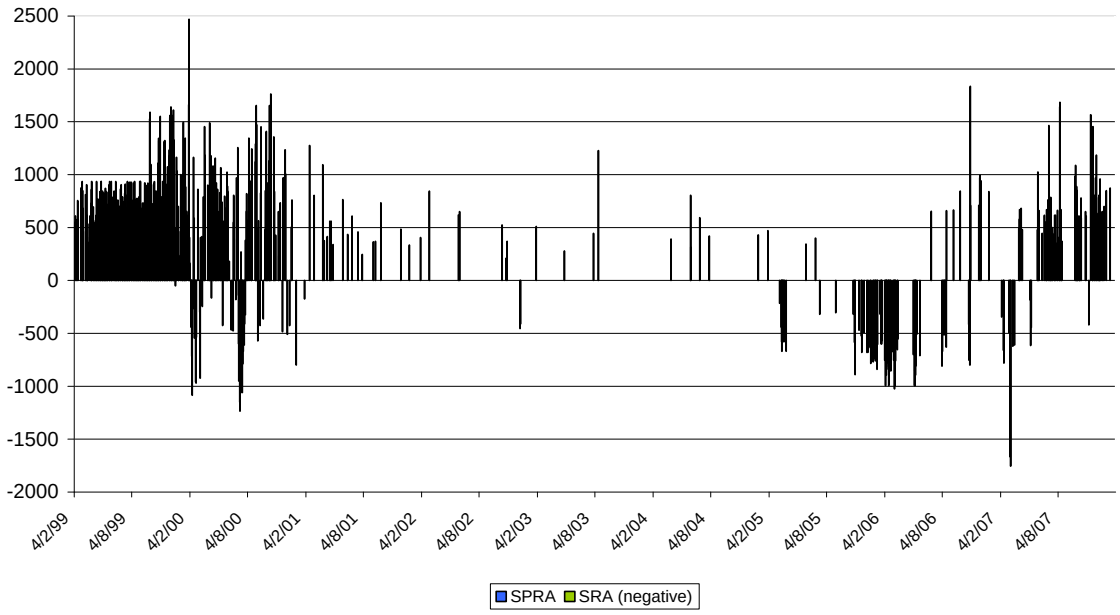


Chart 5
Absolute Basis-Point Deviation in Canada

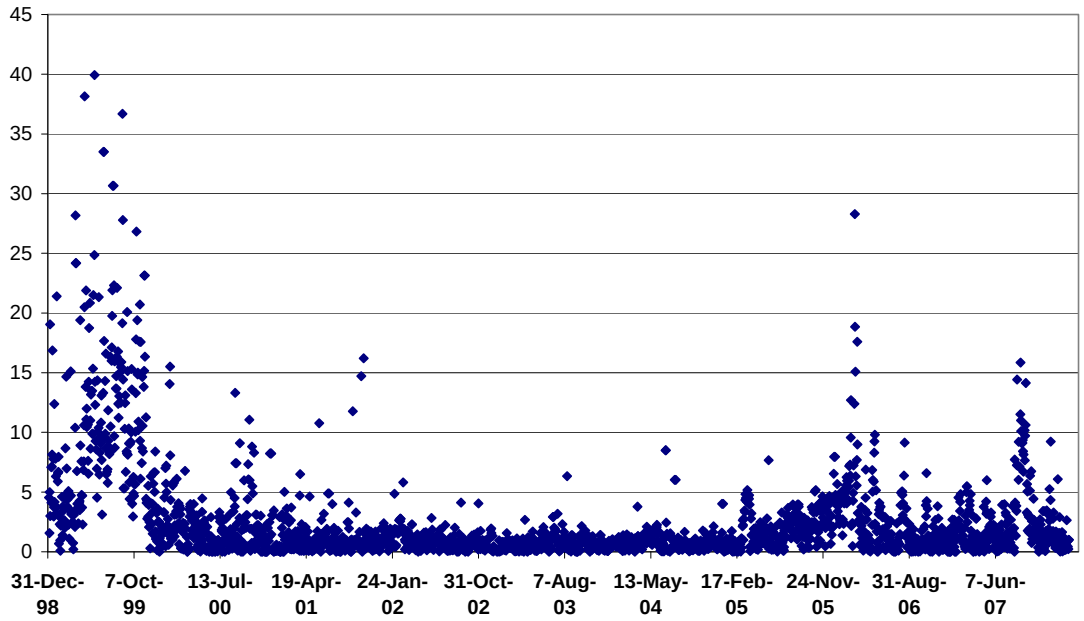


Chart 6
Absolute Basis-Point Deviation in the United States

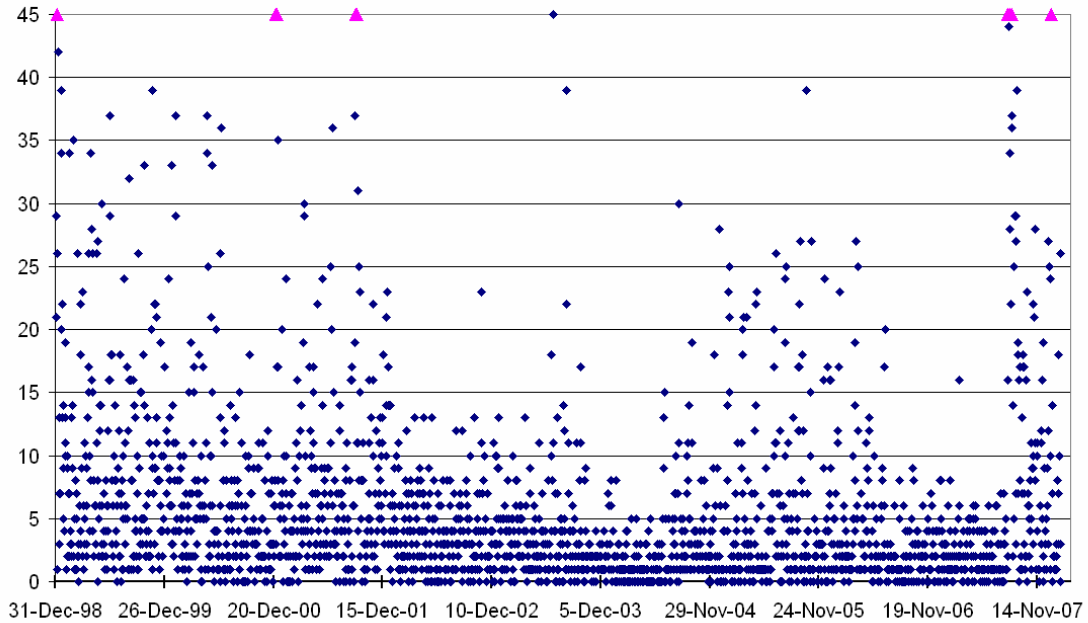


Chart 7
Absolute Basis-Point Deviation in the Euro Zone

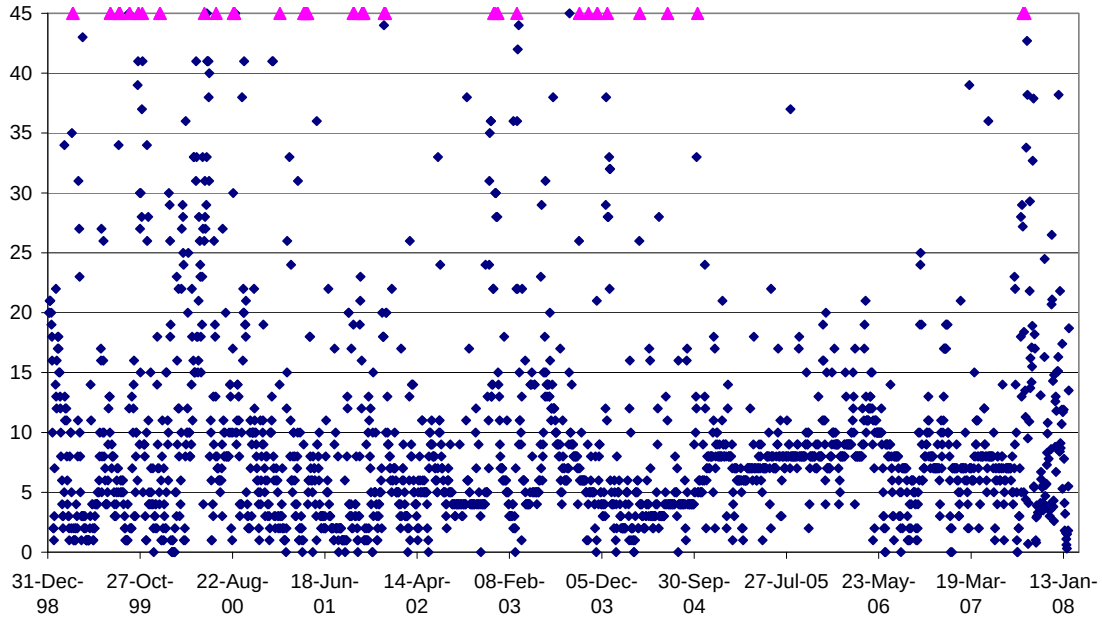


Chart 8
Spread between Overnight LIBOR and CORRA
in basis points

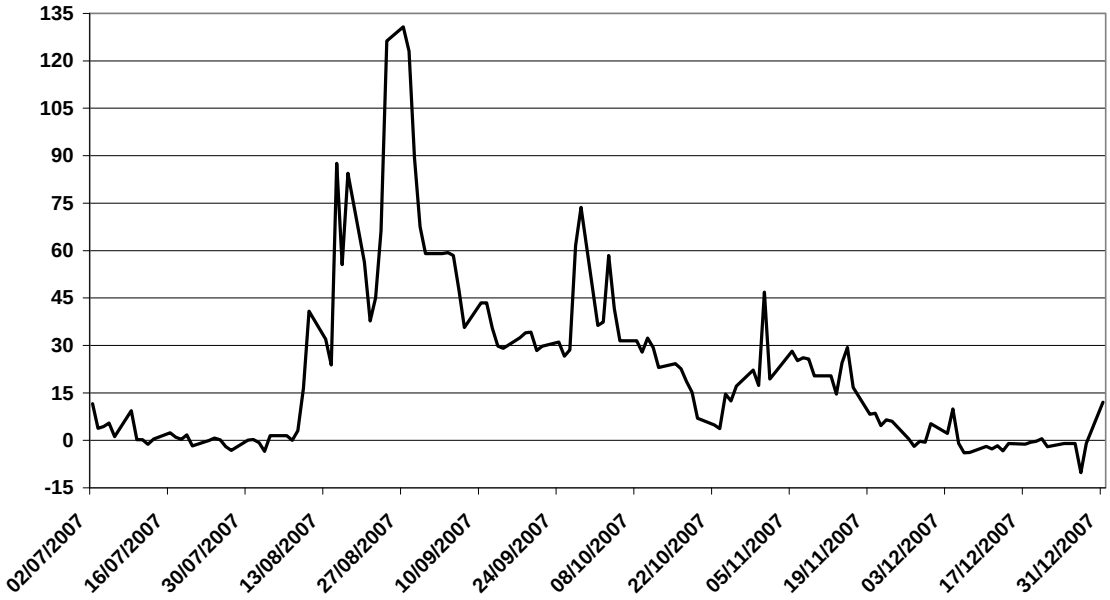
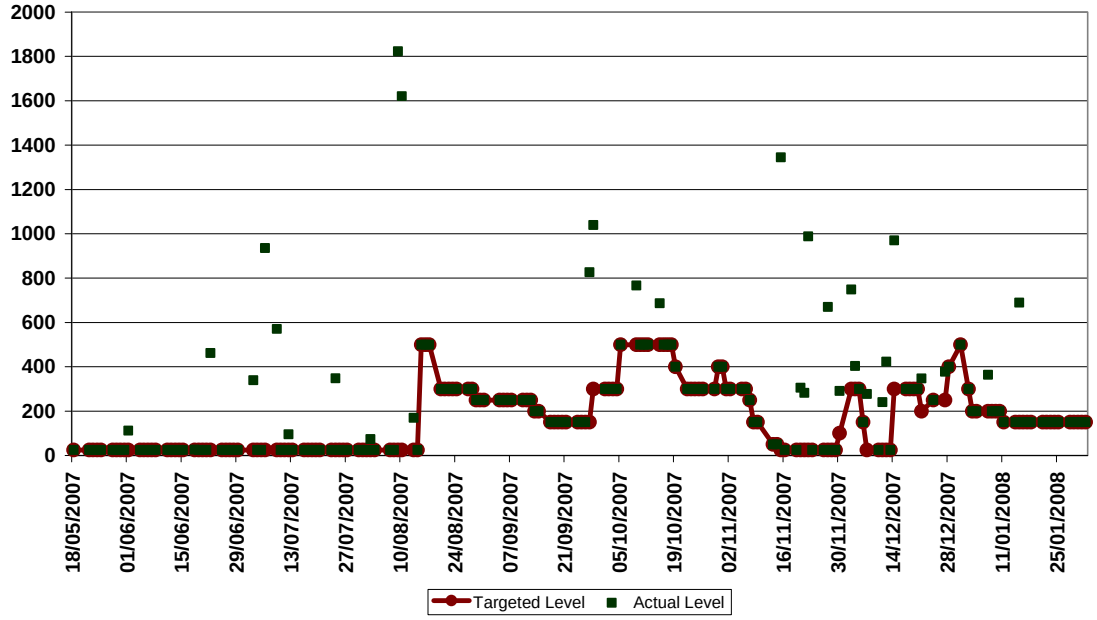


Chart 9
Targeted and Actual Level of Settlement Balances
millions of dollars



Appendix A: The Financial Services Sector in Canada[1]

The Canadian financial services industry is made up of banks, trust and loan companies, credit unions and caisses populaires, insurance companies, securities dealers and exchanges, mutual fund companies and distributors, sales finance and leasing companies, independent financial advisers, pension fund managers, and independent insurance agents and brokers.

A.1 Deposit-taking institutions

Deposit-taking institutions include banks, trust and loan companies, and credit unions and caisse populaires. The banking sector includes 73 banks, comprising 20 domestic banks, 24 foreign bank subsidiaries, and 29 foreign bank branches. However, the six largest banks dominate financial services in Canada, accounting for over 90 per cent of total bank assets and about three-quarters of the assets of the deposit-taking sector. The banks also play a major role in virtually all parts of financial services in Canada, including insurance and securities markets.

The banks operate through an extensive network that includes about 9,000 branches and 16,500 automated teller machines (ATMs) across Canada. They also provide a range of services beyond deposit taking and lending. As well, the banks are major participants in securities markets, involved in raising equity and debt for customers, and in the mutual fund sector. Indeed, three of the 10 largest mutual fund companies and all of the large securities dealers are bank owned. Banks also own insurance companies.

Trust and loan companies offer similar services to banks, including accepting deposits and making personal and mortgage loans. Trust companies can also administer estates, trusts, pension plans, and agency contracts. While banks are not permitted to undertake these activities directly, the largest trust companies are subsidiaries of the major banks.

Credit unions and caisse populaires differ from banks in that they are provincially incorporated co-operative financial institutions that are owned and controlled by their members. These institutions are particularly prominent in certain regions of the country, such as British Columbia, Saskatchewan, Quebec, and parts of the Atlantic provinces. Their ownership and corporate governance are based on co-operative principles, and each individual credit union and caisse populaire maintains a separate identity.

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1. This appendix draws on the Department of Finance Canada website at <http://www.fin.gc.ca/access/fininste.html>.

Because of their autonomous local structure, credit unions and caisse populaires are generally much smaller in terms of asset size than other deposit-taking institutions. They are part of a three-tiered structure composed of credit unions, provincial centrals (whose main purpose is to provide liquidity support to local co-operatives), and a national association that provides liquidity support for provincial centrals and acts as a group clearer in the payments system. At the end of 2003, the credit union sector consisted of about 600 credit unions and almost 700 caisse populaires, with almost 3,600 locations and more than 4,500 ATMs.

A.2 Insurance companies

The life and health insurance sector comprises about 100 companies providing group and individual life and health insurance, as well as group and individual retirement and wealth-management products such as annuities, pension plans, registered retirement savings plans, and registered retirement income funds. The sector is somewhat less concentrated than the banking sector, with the four largest companies accounting for about 70 per cent of the sector's domestic general assets. However, the two largest life insurers (which are not bank affiliates) are among the very largest financial institutions in Canada.

The property and casualty insurance sector includes over 200 companies. Product lines include automobile, property, and liability insurance, with a few companies selling a limited amount of sickness and accident insurance and underwriting, as well as a small amount of aviation and marine insurance. The five largest insurers account for less than 35 per cent of total domestic assets, and the top 10 companies have an estimated market share of about 50 per cent. Foreign companies play a significant role, accounting for over 60 per cent of the sector's net premium income in 2003.

A.3 Mutual funds and the securities industry

The mutual fund sector consists of the manufacturers of mutual funds and the distributors, with a number of mutual fund companies involved in both segments of the business, notably those owned by the banks and the credit unions/caisses populaires. At the end of 2003, there were over 70 mutual fund companies sponsoring close to 1,900 mutual funds, and close to 200 firms involved in the sale of funds. The majority of mutual funds are either managed by the manufacturers (50 per cent) or by bank-owned companies (35 per cent).

The securities industry is made up of integrated, institutional, and retail firms, with institutional firms providing services exclusively to institutions, such as insurance companies and pension funds, and retail firms offering services to individual or retail investors. The integrated firms, which represent mainly the securities-dealer affiliates of the six largest domestic banks, offer

services that cover all aspects of the industry, including raising debt and equity capital for clients, and serving retail investors. In 2003, there were 207 securities firms operating in Canada, with the six largest integrated firms accounting for over 70 per cent of total industry revenue.

A.4 Sales finance and leasing

The sales finance and leasing sector finances equipment and vehicles primarily through leases. Under this arrangement, the leasing company retains the ownership of the leased equipment or vehicle, until the end of the lease, at which time the lessee can purchase the equipment or vehicle or return it to the lessor without further obligation. Many of these companies are subsidiaries that help finance purchases of their parent company's products. After banks and credit unions, the finance and leasing sector is the most important supplier of debt financing to Canadians. It is estimated that this industry has over $100 billion in financing in place, with small and medium-sized businesses representing approximately 60 per cent of its customers.

Appendix B: LVTS Payment Tranches and Risk Controls

The LVTS contains two payment streams, Tranche 1 and Tranche 2, which have different characteristics and risk controls. Participants can send payments through either stream, subject to relevant risk controls. Tranche 1 payments must be financed dollar-for-dollar by the paying participant, with Tranche 1 funds already received by the participant or by intraday credit secured by eligible collateral pledged by the participant.

Given the heavy collateral requirements of Tranche 1, it is a relatively expensive means for participants to send payments. Accordingly, Tranche 1 tends to be reserved for situations in which insufficient credit is available in Tranche 2 for time-critical payments to be made. (Tranche 2 is much less expensive; see below.) Tranche 1 payments account for only about 15 per cent of the value sent over the LVTS—about $25 billion per day.

In Tranche 2, bilateral credit limits and multilateral net debit caps, along with a collective collateral pool, are used to control risk. A bilateral credit limit constrains exposures between any pair of system participants. Specifically, each participant in the LVTS can provide a bilateral credit line to any other participant, and this limit determines the maximum payment obligation that the recipient of the line can owe to the provider of the line. In addition, a multilateral debit cap limits the exposure that each participant can present to the system as a whole.

A participant's multilateral cap (Tranche 2 net debit cap) is calculated as the sum of all the bilateral credit lines that it has received multiplied by a fixed proportion, which is currently equal to 0.30. The value of 0.30 is determined by the effectiveness of the netting in the system. (The multilateral netting of a set of bilateral transactions leads to a multilaterally netted balance that is a fraction of the underlying bilateral positions; the systemwide parameter corresponds to this fraction.)

In Tranche 2, a collateral pool also helps to manage risk and facilitate settlement of the LVTS in the event of a participant default. Each participant must pledge collateral to the system equal to the largest bilateral credit limit that it has provided to any other participant multiplied by the same systemwide parameter, 0.30. Given the design of the system, aggregate Tranche 2 collateral is always at least as large as the single largest possible net debit (payable) position in the system. As a result, in the event of the default of any single participant, the system would be able to settle.

As well, the collateral pledged by each participant is sufficient to cover the largest possible loss it could sustain in the event of any single participant failure. In effect, participants prepay their potential loss allocations, which are proportional to the bilateral credit lines provided to other participants. In turn, this provides incentives to participants to manage their exposures in the LVTS prudently. (Recent work shows that losses from a participant failure in the LVTS are very likely to be small and readily manageable by system participants [McVanel 2005; Ball and Engert 2007].) In practice, only a few billion dollars of collateral are needed to support about $160 billion per day in Tranche 2 payments. As a result, Tranche 2 accounts for most—about 85 per cent—of the payment value sent over the LVTS.[1]

1. For more on the design and operation of the LVTS, see Arjani and McVanel (2006), and Arjani and Engert (2007).

Appendix C: The Bank of Canada's Standing Liquidity Facility[1]

As part of its activities as lender of last resort, the Bank of Canada supplies liquidity via its Standing Liquidity Facility (SLF) to direct participants in the LVTS.[2] Under its SLF arrangements, the Bank provides collateralized overnight loans to direct participants in the LVTS that experience temporary shortfalls in their settlement balances. These routine loans provide participants with a reliable source of liquidity should they need to fund their end-of-day payment obligations. (In practice, end-of-day advances extended by the Bank to LVTS participants tend to be relatively infrequent and small.)

C.1 Terms and conditions of the SLF[3]

The interest rate charged by the Bank of Canada on overnight loans (the Bank Rate) is set at 25 basis points above the Bank's target for the overnight interest rate. All loans provided under the Bank's SLF are made on a secured basis, which is required by the Bank of Canada Act. The collateral eligible to secure SLF advances (currently under review) is the same as that eligible for intraday credit in the LVTS.

Eligible collateral comprises the following:

- securities issued by the Government of Canada;
- Government of Canada stripped coupons and residuals;
- securities guaranteed by the Government of Canada (including Canada Mortgage Bonds and National Housing Act mortgage-backed securities with a minimum pool size of $25 million, changed from $75 million effective 5 June 2008);
- securities issued or guaranteed by a provincial government;
- bankers' acceptances and promissory notes, including those of foreign issuers (maximum term 364 days) with a minimum issuer credit rating of R1 (low) by the Dominion Bond Rating Service (DBRS) or A-1 (mid) by Standard and Poor's (S&P) or P1 by Moody's Investors Service (Moody's);
- commercial paper and short-term municipal paper, including those of foreign issuers (maximum term 364 days) with a minimum issuer credit rating of R1 (low) by DBRS or A-1 (mid) by S&P or P1 by Moody's;

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1. This appendix is based on Bank of Canada (2004) and Daniel, Engert, and Maclean (2004–2005).
2. See footnote 8 in the main text.
3. The terms and conditions associated with the Bank's SLF are set out in the Bank of Canada's "Rules Governing Advances to Financial Institutions," available at <http://www.bankofcanada.ca/en/financial/rules_05.pdf>. Collateral eligible to secure an SLF advance is currently under review.

- corporate, municipal, and foreign issuer bonds with a minimum long-term issuer credit rating of A (low) by DBRS or A- by S&P or A3 by Moody's;
- Special Deposit Accounts held at the Bank of Canada. A Special Deposit Account comprises interest-bearing balances deposited with the Bank by direct participants in the LVTS;
- effective 31 March 2008, asset-backed commercial paper (ABCP) of eligible programs, with a minimum of two credit ratings, at least two ratings that are either R1 (high) by DBRS, A-1 (high) by S&P, P1 by Moody's, or F1+ by Fitch Ratings; and
- effective 25 June 2008, marketable securities issued by the United States Treasury (bills, notes, and bonds, including TIPS).

These securities are valued at market value less an appropriate margin to protect the Bank principally from market risk. The framework that the Bank uses to determine the appropriate margins focuses on broad classes of issuers (such as Government of Canada securities, provincial government securities, and private sector obligations). Margins are larger for less creditworthy classes of issuers and for longer maturities.[4]

C.2 Access to Bank of Canada settlement accounts and the SLF

The CPA's bylaws require direct participants in the LVTS (and in the ACSS) to be members of the CPA and to maintain settlement accounts at the Bank of Canada. The Bank decides on a case-by-case basis whether to provide a particular institution access to a settlement account and to its SLF arrangements. In general, access would be given to an institution that is a member of the CPA provided that the institution:

- participates directly in the LVTS or the ACSS;
- in the case of ACSS direct clearers, settles all net ACSS positions with LVTS payments;
- provides the Bank with valid and enforceable first-priority security in collateral of a type that is acceptable to the Bank;
- provides acceptable legal documentation to support the Bank's security interest in pledged collateral; and
- accepts the collateral terms and conditions that may be set by the Bank.

4. Margins range from 1 per cent to 15 per cent. For more information, see the Bank of Canada's website at <http://www.bankofcanada.ca/en/financial/securities.pdf >. Along with eligible collateral, the haircuts applied by the Bank of Canada are currently under review.

In the case of a foreign bank branch, the Bank would also seek favourable legal opinions regarding the applicability of the laws of its home country to the Bank's ability to establish a valid security interest in collateral that is pledged.

Finally, upon receiving an application for a settlement facility, the Bank would notify the institution's regulator that the institution intends to open a settlement account with the Bank of Canada.

Appendix D: The Overnight Market Timetable

0:30	LVTS opens for CLS and related payments
6:00	LVTS opens for all transactions (non-CLS participants open by 8:00)
9:00	Fixed announcement date: Via press release, announce level of the target for the overnight interest rate (and Bank Rate)
9:15	Bidding deadline: (cut-off time for bids) for Receiver General (RG) term deposit auction (for LVTS participants and other eligible bidders); results approximately five minutes later
11:45	SPRAs or SRAs offered and transacted (if any)
15:00	Cut-off time for presentation of government items, Bank of Canada client, and bank note transactions
by 16:00	Call for tender for afternoon RG deposit auction
16:00	Payment exchange for the securities settlement system, CDSX begins
16:15	Bidding deadline for final RG deposit auction (for LVTS participants only)
16:20	Release of afternoon RG auction results Release of final cash setting for Day *t* and target cash setting for Day *t* +1
by 17:00	Call for tender for next morning's RG deposit auction
18:00	Close of LVTS client (third-party) transactions
18:00-18:30	Pre-settlement trading between LVTS participants
18:30	LVTS settlement period begins
19:30 or earlier	LVTS settlement completed and accounts posted at the Bank of Canada (typically completed by 18:45)