June 1994

FROM MONETARY POLICY INSTRUMENTS TO ADMINISTERED INTEREST RATES

The Transmission Mechanism in Canada

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ISSN 0713-7931

ISBN 0-662-22232-6

Printed in Canada on recycled paper

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ACKNOWLEDGMENTS

The authors would like to thank Rohit Gupta for capable assistance with the econometrics, as well as Pascal Farahmand and Mark Farber for help on several points. Charles Freedman, John Kuszczak, David Longworth and Steve Harris provided comments that have materially improved the paper.

ABSTRACT

The authors investigate interest-rate aspects of the transmission mechanism of monetary policy instruments in Canada, focussing on the stability of the relationships between some key interest rates and the instruments of monetary policy. To determine what shifts may have occurred in recent years, they describe movements in rate differentials, apply cointegration tests and estimate error-correction models. Some changes in the short-run behaviour of money market yields, prime lending rates and mortgage rates between the 1980s and the 1990s are apparent. However, the basic links of the interest-rate channel of transmission – from policy instruments through short-term rates to short-term bond rates and administered rates – seem essentially stable.

RÉSUMÉ

Dans la présente étude, les auteurs examinent le profil des taux d'intérêt en tant que courroie de transmission de la politique monétaire au Canada. Ils étudient en particulier la stabilité des relations entre certains taux d'intérêt directeurs et les instruments de la politique monétaire. Afin de déterminer si ces relations ont subi des changements ces dernières années, ils analysent les fluctuations des écarts de taux et procèdent à des tests de cointégration et à des estimations de modèles de correction d'erreurs. Les résultats obtenus permettent de constater certaines modifications dans le comportement à court terme des taux de rendement du marché monétaire, des taux de base des prêts bancaires et des taux hypothécaires au cours des années 80 et 90. Toutefois, les liens fondamentaux des taux d'intérêt comme courroie de transmission de la politique monétaire paraissent essentiellement stables. Ces liens qui proviennent des instruments de politique monétaire se répercutent sur les taux des obligations à court terme et sur les taux administrés par le truchement des taux d'intérêt à court terme.

1 INTRODUCTION

In this paper we discuss the influence of Bank of Canada instruments on interest rates, focussing especially on the posted interest rates on loans and deposits at financial institutions. These are *administered rates*, in the sense that each institution itself decides what rate to post and does not change the rate with high frequency.

We start by outlining the new system of policy implementation designed for zero reserve requirements and describe how it worked during a trying period in late 1992. The primary issue for the purposes of this report is whether the new framework has delivered a satisfactory degree of influence over money market interest rates. We go on to discuss the stability of the links from money market rates to short-term bond yields, which impinge directly on certain administered rates. We outline the relevant features of the markets for several key administered-rate instruments: business loans, savings deposits, and residential mortgages and retail long-term deposits.

Data on yield differentials are used to give a general picture of some of the key facts. Cointegration tests and error-correction models (ECMs) are used to shed light on the dynamics of rate setting and to look at how these may have changed since 1990.

This report contains little on the exchange rate, except to discuss how it has affected the setting of short-term interest rates. However, the exchange rate is a very important component of short-run monetary conditions in Canada. A change in monetary conditions initiated by the central bank may be reflected in a change in the external value of the currency as well as in the level of short-term interest rates. One difficulty in considering the exchange rate in this context is that its response to a policy action tends to be less predictable than that of short-term interest rates, and more dependent on the state of expectations.

2 INFLUENCE OF POLICY ON MONEY MARKET RATES

In this section we describe the influence of the tools of monetary policy – settlement balance management and open market operations – on short-term interest rates. How policy is implemented in the new framework designed for zero-reserve requirements is explained and illustrated. We then go on to analyse the link between money market rates and 5-year bond rates.

2.1 Tools of monetary policy

2.1.1 Settlement balance management

The Bank of Canada's control of the supply of settlement balances to the direct clearers[1] (often referred to as the cash setting) occurs through the daily transfer of government deposits between the government's account at the Bank of Canada and its accounts with the direct clearers.[2] In order to move the one-day rate higher, the Bank will provide a lower level of settlement balances than the level demanded by the direct clearers. The direct clearers will attempt to cover the shortfall through such means as bidding higher rates for deposits, selling liquid assets such as treasury bills, or calling back loans against money market inventory from investment dealers, thereby putting upward pressure on the overnight rate. The opposite occurs if the Bank sets the level of settlement balances above the level demanded by the direct clearers: one-day interest rates ease as direct clearers attempt to employ the excess by lending in the overnight market, acquiring liquid assets or paying off deposits.

1. Direct clearers, aside from the Bank of Canada, are the 13 bank and non-bank deposit-taking financial institutions that participate directly in the clearing and settlement system and that consequently maintain a settlement account with the Bank of Canada.

2. This daily transaction, known as the drawdown-redeposit mechanism, has the effect of sterilizing the impact of the net of government receipts and disbursements as well as altering the level of settlement balances for monetary policy purposes. A drawdown refers to the transfer from the direct clearers to the Bank of Canada, that is, a reduction in settlement balances; a redeposit is the opposite, a transfer to the direct clearers from the Bank, that is, an injection.

Important features in Canada are the one-day lag in payment clearings and the retroactive settlement that follows the clearings: payment items are cleared overnight and settled on the books of the Bank of Canada in the afternoon for value the previous day.[3] Preliminary clearing results are available in the early morning and the Bank of Canada's drawdown-redeposit, effected at around 8:15 a.m., is the final entry determining closing balances for value the previous day. Consequently, a direct clearer may target a specific balance yet rarely attain it, precisely because of random gains or losses in the clearings as well as any surprise from the central bank's drawdown-redeposit transaction.

The new zero-reserves operating framework contains cost incentives that ensure that a cost-minimizing clearing institution will have a determinate target for its clearing balance at the close of the day. This framework was introduced in anticipation of the elimination of reserve requirements on banks and has been in effect since November 1991.[4] It was designed to ensure that the Bank of Canada, in effecting a change in the supply of settlement balances, had at least the same degree of influence over very short-term interest rates as in the previous environment.

In the new system, a direct clearer must maintain an average excess settlement balance of at least zero over a one-month calculation (averaging) period ending the third Wednesday of a calendar month.[5] Any negative balance at the Bank of Canada must be covered with an overdraft loan at the Bank Rate and also be offset with either a non-interest bearing balance with an opportunity cost of the market rate at some other point in the calculation period or with an advance (or fee-in-lieu of an advance) at the

3. Dingle (1986).

4. The new Bank Act, proclaimed on 1 June 1992, stipulated the phase-out of reserves between July 1992 and July 1994. Background to this reform is given in three Bank of Canada Discussion Papers (1987, 1989, 1991).

5. The end of the period was defined this way to avoid technical distortions that could result from month-end or Friday-end dates. The monthly period may have 4 or 5 weeks.

Bank Rate at the end of the period.[6] The cost of a single borrowing from the central bank under this system is therefore roughly equal to the cost of maintaining an equivalent non-interest-bearing excess balance at the Bank of Canada. The expected cost-minimizing, daily balance for a direct clearer without reserve requirements would therefore be zero each day.[7]

In practice, the direct clearers must take into account certain other factors as well, which can make it more complex to determine their actual targets a priori. These factors include

- **non-zero cumulative positions** – Often, as a calculation period evolves, a sizable non-zero cumulative position may emerge for a given direct clearer as a result of successive one-way deviations from its daily targets. The optimal strategy in this event is to aim for a steady elimination of this cumulative balance by the end of the period, that is, to run a daily position proportional to the negative of the existing cumulative position for the rest of the calculation period.[8]

- **remaining requirements to hold deposits at the central bank** – During the transition to zero requirements, banks must hold a minimum reserve equal to the average requirement for the 12 months ending June 1992, reduced in steps every 6 months to zero in July 1994. The marginal requirement on deposits has thus been zero since May 1992. While bank holdings of notes and coin satisfy a large proportion of the remaining requirement, most large banks are

6. Prior to November 1991, chartered banks had a half-monthly averaging period over which to meet their required deposit level at the Bank of Canada and were limited in their borrowings from the central bank by "Rules Governing Advances" (Bank of Canada) rather than by price incentives. Non-banks had no reserve requirements, but were also subject to the administrative rules on borrowings from the central bank. See Howard (1992).

7. Longworth (1989) derives optimal strategies for a uniform distribution of random daily clearing movements.

8. A rule that is optimal in certain circumstances is to target a daily balance equal to $-cum/(n+1)$, where *cum* is the cumulative imbalance (that is, the total of daily excess balances in the calculation period up to the current day), and *n* is the number of days left in the averaging period. See Longworth (1989).

still obliged to hold a deposit at the Bank of Canada larger than their typical daily clearing surprise. This gives them some flexibility in their cash management, since when required deposits are large relative to the variance of the balance, the optimal target is not unique.[9] Required deposits act as a buffer to their position at the central bank: reserves can temporarily fall below the required level without provoking an overdraft loan from the Bank of Canada. Although the reserve requirement raises the *average* costs of a bank, the averaging that goes with it appreciably reduces the *marginal* cost of a shock to their clearing balances.

- **tactical factors** – Direct clearers' cash targets on a given day might be affected by factors that do not fit within a simple formula, such as money market tactics or knowledge about forthcoming large cash flows.

Because of such factors, the Bank of Canada monitors the cash targets of the direct clearers each day by direct communication. It then sets the level of settlement balances, taking into account the direct clearers' estimated closing positions. When the final clearing results become available to the clearing institutions the next morning, they revise their target balances for that day's closing in response to unexpected gains or losses of balances. However, the averaging of settlement balances over a month means that the direct clearers do not always have a strong incentive to respond promptly to policy-induced changes in the overall supply of balances, and thus a short lag between changes in the cash setting and changes in the overnight rate can result.

Thus, the Bank of Canada has to use judgment both with respect to the actual banking system target for clearing balances and, in the event that a change in the overnight rate is desired, to the size of the system shortfall or surplus (relative to the banks' overall target) most likely to achieve this proximate goal.

9. Longworth (1989).

2.1.2 Open-market operations

The level of settlement balances set by the Bank of Canada may turn out to be inappropriate for achieving a desired effect on interest rates. This may occur for a number of reasons, such as an uneven distribution of balances after the clearings, a change in market expectations about the course of interest rates, or the influence of the foreign exchange market. The Bank might then use open-market operations to offset the undesired rate movement or to give a direct signal of the Bank of Canada's operating objectives.

In order to influence the one-day interest rate, the Bank has two instruments: Special Purchase and Resale Agreements (SPRAs) and the reverse, Sale and Repurchase Agreements (SRAs).[10] The Bank will offer SPRAs to jobbers, a group of designated investment dealers and banks, to limit upward pressure on interest rates. This repo-like transaction at a rate determined by the Bank will reduce the overnight funding requirements of the jobbers as the Bank purchases treasury bills from the jobbers and sells them back the next business day. In the contrasting situation, when the Bank wants to limit declines in the overnight rate, it will extend SRAs, similar to reverse repos, by selling treasury bills and agreeing to repurchase them the next day, again at a rate of its choosing. These transactions are generally arranged with the major banks. Unlike SPRAs, which are virtually always transacted when offered and, at times, for very large amounts, SRA offerings are often declined; they nevertheless usually succeed in putting a floor under overnight lending rates through the signal effect.

When the Bank of Canada's open market operations are directed to rates beyond the one-day term, the intervention is generally in the form of outright sales or purchases of treasury bills in the 3-month area because of the link of the three-month treasury bill rate to the Bank Rate.[11] On the morning prior to tender, the Bank has on occasion also sold "coincident-to-when-issued" bills (that is, bills originally of 6 or 12 months' maturity now

10. Clinton and Fettig (1989).

11. Since March 1980, the Bank Rate, the minimum rate at which the Bank of Canada makes short-term advances, has been set at 1/4 of 1 per cent above the weekly tender rate on 3-month Government of Canada treasury bills.

having the same maturity date as the upcoming 3-month tender) to reinforce its intent. The ability of the Bank to influence rates by adding supply at a specific term is limited to some extent by the small size of its portfolio of treasury bills, roughly 10 per cent of the total outstanding. However, the signal regarding the intent of the Bank is usually quite effective, since open market operations can be reinforced with subsequent settings of settlement balances.

2.2 A period of market turbulence: autumn 1992

In the autumn of 1992, the Canadian dollar came under pressure in currency markets with extreme bouts of volatility in September and again in November. The sharp movements in the value of the Canadian dollar and uncertainties with respect to its future value contributed to volatile adjustments in short-term interest rates. During these periods, the relationship between the Bank's actions and the market was less smooth than usual. In particular, the response to the policy cash settings was at times slower or smaller than expected.

Throughout most of the month of September, neutral cash provision kept the overnight market stable in the face of a depreciating Canadian dollar, but term money market rates rose without resistance from the Bank. When the selling of Canadian dollar assets intensified towards month-end, all short-term rates, including overnight rates, became extremely volatile.

Borrowers financing short Canadian dollar positions were prepared to borrow overnight at sharply higher rates, since expected capital gains on the Canadian dollar position more than outweighed the financing cost. Swap rates on Canadian funds placed overnight in U.S. dollars – known as "southbound" funds – rose steeply, affecting domestic interbank and call rates. On 29 September, call money dealt as high as 12 1/2 per cent and averaged 8 15/16 per cent (up 3 3/4 per cent from the previous day). As overnight rates eased back later in the day, the Bank of Canada transacted SRAs at 6 1/2 per cent (compared with SRAs at 4 5/8 per cent on 24 September) to signal a ratification of higher market rates.

The combination of this action, the lack of assistance through SPRAs at the higher rates early in the day, and the continued volatility in the dollar appeared to generate expectations of further increases in interest rates. The Bank of Canada responded with a large injection of settlement balances on the 30th, but overnight rates remained high on 30 September and SPRAs were offered at the prevailing overnight rate, 10 per cent.

The band of rates within which the Bank used its complementary tools of SRAs (6 1/2 per cent) and SPRAs (10 per cent) was much wider than under normal circumstances, as the objective in these operations was to assist the market to find a range of viable levels. However, the offering rate on SPRAs on the 30th might have had a stronger effect than intended, since the overnight rate remained relatively high, despite continued injections of large amounts of settlement balances for the next two days. For a short period the Bank was reluctant to use SPRAs at a rate below its previous offer, out of concern that the exchange market might misinterpret the action as signalling a resistance to higher interest rates and hence a desire for a lower Canadian dollar. On the morning of 2 October the Bank took the unusual step of announcing that financing assistance, if needed, would be available to dealers at the Bank Rate (7.62 per cent). The clear message was that this indeed was the rate the Bank wanted to lend at; it unlocked the system, without any assistance actually being requested from the central bank.

The slow responses to changes in settlement balances in part reflected the continued existence of the chartered banks' required deposits, which reduce the incentive to target day-to-day settlement balances precisely. With three weeks still remaining before the end of the calculation period to reduce a cumulative excess settlement balance, some banks may have chosen to delay lending, on expectations of yet higher rates later in the period. However, other factors also played a role. Banks had difficulty forecasting the flows that would impact their account, especially those arising from heavy use of lines of credit and month-end tax payments, including payments of the recently introduced Goods and Services Tax (GST). Cautious targeting resulted, with many direct clearers trying to maintain a cushion against negative swings. As well, given the volatility of random

flows, the clearers tended to treat any one-day clearing gain that could not be explained as susceptible to reversal the next day, and they delayed employing those balances.

During November, renewed currency weakness made it difficult for the money market to find a viable trading range for short-term interest rates, and this resulted in widening bid-ask spreads. To settle the market, the Bank used SPRAs at the Bank Rate, which although below the prevailing market rate, was viewed as the most neutral rate. Thereafter, open market operations were used to encourage upward adjustments in rates, with SRAs offered on four occasions in the month and bills sold on seven occasions.

During the exchange rate volatility in the autumn of 1992, the Bank's ability either to achieve or to prevent large movements in overnight rates in a single day was sometimes limited. The Bank believed at times that open market operations might give out a misleading signal – this would have been a problem regardless of the change in the operating framework. As for the occasional surprisingly sluggish reactions of the banks to increased provision of settlement balances, they were in some part due to the sizable reserve requirements that a few banks still have. The responses should be more predictable after the transition to the zero requirement is complete.

2.3 From money market rates to 5-year bond rates

Although a floating exchange rate regime allows for independent movement of domestic interest rates against those in other countries, the broad similarity of monetary policies and inflation rates in Canada and the United States over the long term has resulted in a corresponding broad similarity in movements of long-term bond rates in the two countries. There is considerably less correspondence in short-term rates, however, as monetary conditions have differed significantly at times.

Theoretically, given the high degree of substitutability between Canadian and U.S. financial instruments, interest rates in Canada at all

terms to maturity can be written as equal to those at the same term in the United States, adjusted for the expected rate of change in the exchange rate.[12] However, attempts to model the expected change in the exchange rate, for example, using the difference in inflation rates, have not proved successful.[13] Traditional estimated equations for bond yields in Canada have therefore been based simply on nominal interest rates, using distributed lags on equivalent U.S. bond yields and on domestic money market rates. These equations pick up some historical correlations that have been rather stable, but they would be expected to shift in the event of a major divergence in expectations for inflation or the exchange rate between Canada and the United States.

In such an equation, the longer the term of the bond, the lower the weight on the short-term domestic rate is likely to be, and the greater the weight on the U.S. long-term rate. Consistent with this, Boothe et al. (1985) found that whereas the domestic short rate had about the same effect as the foreign rate on the Canadian rate at the 1-year maturity, it had about half as much effect at the 5-year maturity. Thus, short-term monetary conditions should have a fairly large impact on 1-year yields, and some impact on 5-year yields. In turn this would make mortgage credit an important channel for the transmission of monetary policy.

To see if this channel might have been altered by a shift in the way the term structure has been determined, we investigated the predictive performance of equations estimated up to 1990 over the period since then. Equation (1) is a typical example:

12. This abstracts from the risk premium on Canadian rates compared with those on U.S. rates. Boothe et al. (1985) provide a discussion of this factor.

13. This doubtless reflects the fact that historically, inflation rates between Canada and the United States have not been widely divergent over long periods, so that the exchange rate has not had a systematically long-run trend.

$$RGOV5_t = 0.55 + 0.20RTB3_t - 0.14RTB3_{t-1} + 0.12RTB3_{t-2} - 0.07RTUS3_t \quad (1)$$
$$(3.37)\ (6.67) \qquad (4.91) \qquad (5.70) \qquad (2.41)$$

$$+ 0.87RUS5_t - 0.56RUS5_{t-1} - 0.12RUS5_{t-2} + 0.64RGOV5_{t-1}$$
$$(17.53) \qquad (8.15) \qquad (2.75) \qquad (13.29)$$

$R^2 = 0.98$ SEE = 0.34 Durbin h = –1.55; critical values at the 0.95 confidence level are ±1.65.

This equation is estimated from month-end data ranging from January 1980 to June 1990.

Chow F = 0.67 for H_o: unchanged coefficients over July 1990 to August 1993; critical F at the 0.95 confidence level is 1.96.

The implied steady-state equation is
$RGOV5 = 1.53 + 0.50RTB3 - 0.19RTUS3 + 0.53RUS5$

Definitions in equation (1):

RTB3	Government of Canada 3-month bill rate
*RGOV*5	Government of Canada 3 –5 year bond rate
RTUS3	U.S. Treasury 3-month bill rate
RUS5	U.S. Treasury 5-year rate

The negative sign on the current U.S. treasury bill rate is correct from the viewpoint of the expectations theory, which says that the long-term Canadian rate should be equal to an average of current and future short-term rates in Canada. If it is assumed that expected inflation rates in the two countries are similar, then expected short-term rates beyond some point in the future should converge to the forward rates implicit in the U.S. yield curve. In the calculation of these implied forward rates, actual U.S. short-term rates are *subtracted from* U.S. longer-term rates – hence the negative sign.[14]

14. This statement relies on an approximation. The precise calculation is non-linear – see, for example, Malkiel (1966, 22).

The strength of the foreign influence, even in the short run, is evident in that the contemporaneous coefficient and t-statistic for the U.S. long-term rate is much larger than those for the domestic short-term rate.[15] The implied steady-state effect on the Canadian 5-year bond rate of a one-point increase in both the domestic bill rate and the two foreign rates is, taken together, about 0.82 of a point. (The difference from unity is statistically significant on the basis of an F test.)

The Chow test indicates no significant shift in the coefficients of the equation after 1990. Out-of-sample prediction errors of the equation are neither large nor systematically biased in one direction – indeed, the mean error for the 12 months ending August 1993 from a dynamic simulation initialized in July 1990 is just a couple of basis points. Thus, given the levels of short rates in Canada and bond yields in the United States, the yield curve is not unusually steep.

This result suggests that confidence in the Canadian bond market has held up quite well in the face of the unusual and well-known uncertainties that have surfaced over recent years. These have included, especially, the failure of two attempts to resolve the impasse over the constitution of Canada and the federal elections that eventually took place in October 1993. Other adverse elements have included deteriorating government finances at both the federal and provincial levels, a large external deficit, and downgrades of Canadian borrowers by credit rating agencies.

If one looked for positive factors that have helped maintain confidence against all this, the main item would be the disinflation program introduced jointly, in 1991, by the central bank and the Minister of Finance.[16] It appears that the determined pursuit of the inflation-reduction

15. This cannot be directly compared to the estimates of Boothe et al. (1985), since they used theoretical rates for points on the yield curve, as opposed to the average actual 3- to 5-year rate used here. Also, their estimation period ends in 1982. There were some unusually prolonged divergences in short-term interest rates between the two countries in the late 1980s. These are covered in the present estimation period.

16. A description of the background, purpose and results of the Canadian targets for inflation reduction is in Freedman (1993). See also *Bank of Canada Review* (March 1991).

targets has been having some useful effect on the way interest rate expectations are formed. However, it clearly takes a demonstrated record over a period of some length to move inflation expectations favourably; there is little evidence in Canada that the announcement of the targets by itself gave a boost to confidence in the value of money.

3 PRIME LOAN RATES

In this section we describe key aspects of the market for business credit in Canada, especially as they relate to the cost of funds and to intermediation spreads. We develop an econometric model for the prime rate and analyse the unusually low prime rate spreads of 1991–92.

3.1 Banking structure and developments

The six largest banks have accounted for around 80 per cent of intermediated business loans, or more than 60 per cent of total short-term business credit.[17] As in the classical monopolistic competition model, pricing strategies are based on calculations about competitors' reactions, and typically one bank – not always the same – has emerged as a price leader.

Although since the adoption of weekly resetting of the Bank Rate there is no significant news in Bank Rate changes per se, banks nevertheless often wait until the Bank Rate goes up before raising their prime lending rate, to take advantage of an opportune time for the announcement.

Banks try to avoid frequent changes in the prime rate, and they fund prime-related loans more often with 1-month or 3-month term deposits than with overnight deposits.

Information on the actual range of charges is not public, but it appears that the prime rate remains a reliable indicator of the cost of borrowing from banks. The rates charged for the great majority of business loans are linked directly to prime. The tendency in the United States for the highest quality borrowers to pay a lower rate than prime, based on the wholesale cost of funds, has not been widespread in Canada.[18] In addition,

17. The banks' share of total business credit, including common stocks and corporate bonds, has been around 20 per cent.

18. The information for the United States is documented in the Federal Reserve Statistical Release E.2 "Survey of Terms of Bank Lending." Unfortunately, there has been no such survey for Canada.

there is evidence that the margins above prime charged to more risky borrowers are smaller in Canada than in the United States.[19]

Chart 1 shows the main components of domestic currency short-term business credit – bank loans, bankers' acceptances (BAs) and commercial paper – in real terms. The decline in the aggregate since 1990 is concentrated in BAs and commercial paper, with bank loans just about constant. This was due to first, anticipations of further near-term declines in the cost of borrowing, which discouraged issuing marketable paper and hence committing to the existing rate; and second, to competitive pricing by the banks. (At the same time, firms have been issuing large volumes of bonds and equities, as a result of which total business credit continued to grow. The willingness to lock in bond rates 3 per cent or more higher than going short-term rates suggests that firms are concerned that the decline in the latter might not be sustained over the long term or that they put a high value on secure access to funds over a lengthy period.) Thus, while there have been large substitutions by borrowers between sources and a deceleration in the growth of total credit, there is no evidence in aggregate data of a bank credit crunch.

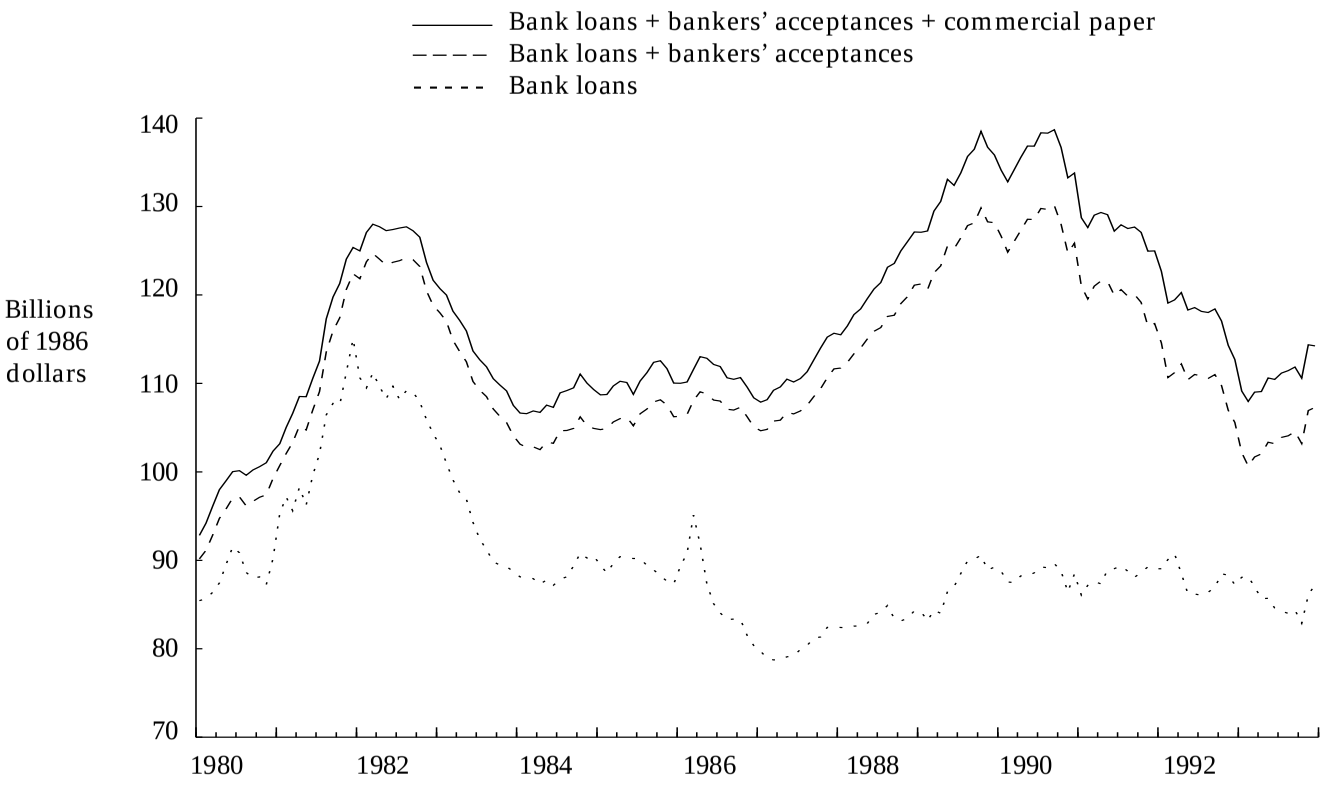
3.2 Marginal cost of funds used for business loans

The effective marginal cost of the funds used for business lending is not mechanically related to other short-term interest rates. In a period of strong loan demand, the rate on wholesale short-term deposits, the volume of which can be quickly adjusted, plays a primary role. However, when loans have been sluggish or the banks have had large holdings of liquid assets, as has been the case in Canada for the past couple of years, the effective marginal cost of lending is more likely to be the yield foregone on assets such as treasury bills and commercial paper.

19. A study by the Loan Pricing Corporation of New York found that "relative to the American loan market, Canadian lenders seem to overcharge their highest quality customers by about 20 basis points, while they undercharge poorer quality borrowers by 70 basis points." (Burns Fry Limited, Research report, Financial Services, 29 March 1993). In responses reported in *The Globe and Mail*, Canadian bankers did not dispute this finding, which they attributed to strong competition among lenders in Canada, rather than to undisciplined risk-pricing.

Chart 1

Canadian dollar short-term business credit (deflated by the CPI)



On the demand side, two substitutes for bank loans are open to corporate borrowers: commercial paper and BAs. Very large borrowers have access to the commercial paper market, while all corporations above a certain size can, at the cost of a stamping fee, use BAs. The rates on BAs are very close to those on commercial paper.[20] Both groups of borrowers switch with alacrity between bank and paper financing to take advantage of whichever is cheaper at the moment. Corporate borrowers will also often switch on the basis of interest rate expectations: if rates are expected to decline in the near future they will tap bank loans to avoid locking into the current rate for 1- or 3-month money, whereas if an increase in borrowing costs seems imminent, they will go to the paper market.[21]

It follows that the banks pay close attention to their own cost of funds, as represented by interest rates on wholesale deposits and to some extent by rates on liquid assets, and to the competing interest rates available to their clients in the market for corporate paper. In Canada, yields on short-term money market paper are the best available measures of both the cost of funds and competing rates for business loans. Banks watch BA rates particularly carefully, often using these rates to impute costs in calculating net returns to their corporate banking centres.[22] Since in their rate setting decisions banks calculate what these rates might be over the next few weeks, as well as the actual value, the 3-month rate might better capture

20. Substitutability between loans and BAs is also high on the supply side, as banks will readily set up a BA facility for a large firm that prefers credit in that form to a straight loan. They are treated in the same way as loans for capital requirements of the Bank for International Settlements. In Canada the conventional definitions of bank credit aggregates include BAs.

21. Small businesses, in contrast, do not in general have good alternatives to bank credit. The slump in property prices has recently made this form of credit less accessible too, since the banks have become very hesitant to increase their exposure to real estate. Previously, real estate had been readily accepted as collateral against many small business loans.

22. Time series on interest rates for wholesale domestic term deposits in Canada are not collected. At times when banks are flush with funds, such as over the past couple of years, they do not post competitive rates for 1-month and 3-month money – although they will still use the overnight deposit market for short-run financing. In periods where the banks actively raise funds through certificates of deposit (bearer term notes), the rates are very close to those on BAs.

the influence of the money market than the 1-month rate, given the longer horizon for expectations that it embodies.

3.3 Spreads between prime and money market rates

Table 1 shows data on differentials between the prime lending rate *RPRIME* and four other short-term rates:

R90	90-day commercial paper rate
BA30	30-day banker's acceptance rate
RBANK	Bank Rate (since 1980 set 25 basis points higher than the weekly auction rate on 3-month treasury bills)
ROVER	overnight rate

The first three rates are as of Wednesday, while the overnight rate on the CANSIM data base is the average for the week ending Wednesday.

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Table 1
Prime rate differentials
Mean (standard deviation) in basis points, weekly data

Prime rate minus	January 1982-June 1990	July 1990-August 1993
R90	122 (47)	98 (46)
BA30	135 (41)	103 (42)
RBANK	119 (44)	87 (38)
ROVER	139 (68)	93 (56)

Over the 1982–90 period the standard deviation of the spread was least for the *BA30* spread, although the standard deviations for *RBANK* (which follows a 3-month rate) and the 90-day paper rate were not much higher. The standard deviation of the prime-overnight spread in Table 1 is significantly greater, despite the fact that for *ROVER* week-average data are used, which are less variable than Wednesday data. This table also shows that the spread between 1- and 3-month market rates has narrowed from about 1 1/4 per cent in the 1980s on average to 1 per cent for the period 1990–93.

Despite the narrowing, the spreads have not moved outside previous historical norms (the standard deviation for the 1982–90 period is almost 50 basis points). This is evident visually in Charts 2 and 3, where it can be seen that the fluctuations in prime relative to *R90* over recent years have precedents in the 1980s.

3.3.1 Is there a floor to the prime rate?

Only under the post–1945 credit controls has the prime rate ever been below 5 per cent. This has given rise to the question as to whether, at 5.50 per cent, it might be near a structural floor at which it might stick, even given a further sizable decline in money market rates. At some point a floor must exist, since deposit rates cannot be less than zero and since non-interest costs, including the deposit insurance premium, have to be covered.

However, some of the conditions that created a bottoming out at 5 per cent in the past no longer apply: first, before 1967 the banks used to act as a cartel in setting rates; second, they used to rely much more on retail deposits, the cost of which was not sensitive to declines in market interest rates below a certain level; third, large borrowers used to have less scope to go to the market directly; and fourth, many service costs previously absorbed within interest rate revenues are now covered by specific fees.

In short, the banks face a much more competitive environment than they did when the prime rate was last at 5 per cent, and they are much more strongly influenced by money market rates. Even so, as rates on

Chart 2
Prime rate and 90-day paper rate

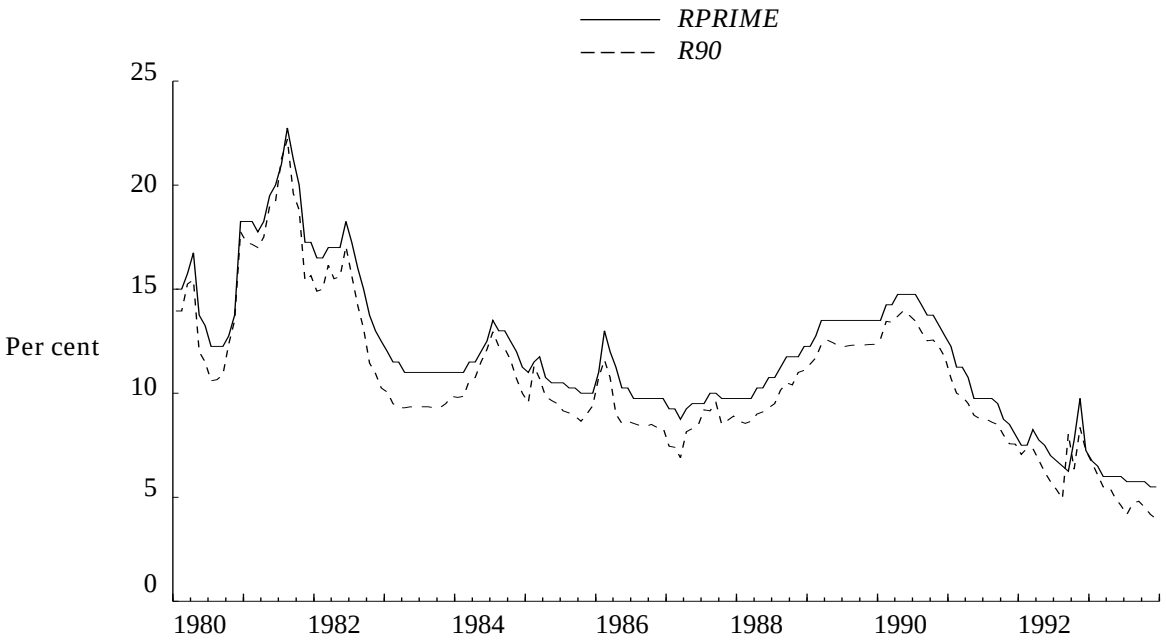
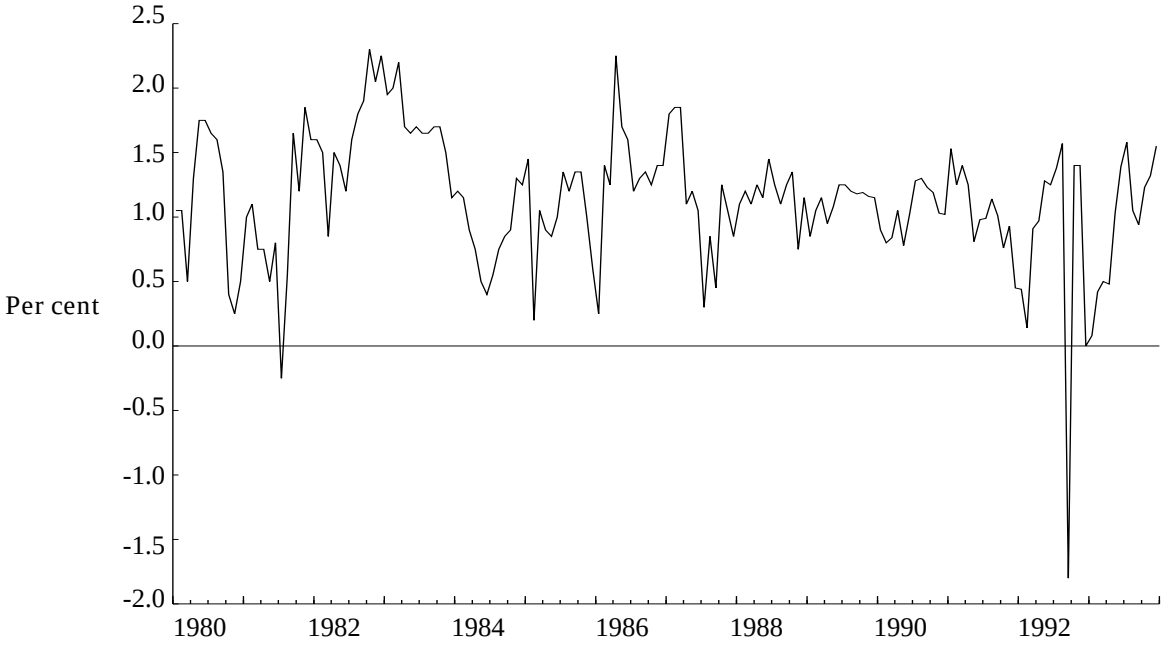


Chart 3
Prime – 90-day paper rate differential



small savings deposits are currently already close to zero, if the prime rate were to fall one-for-one with a large decline in market rates, it would imply a compression of the overall net return on assets. It is therefore an open question as to what extent the prime–paper market spread might change should money market rates see a further decline. In other words, the coefficient on the money market rate in the estimated prime rate equations might shift downward from unity.

In the next subsection we use cointegration techniques and ECMs to investigate the dynamics of the relation between the prime rate and money market rates in Canada, and how they might have changed since 1990.

3.4 Equations for the prime rate

Unit root tests show that there has been no tendency for the level of nominal interest rates to converge to a constant mean value over time. However, the tests reported in the table below reject a unit root in the differentials of *RPRIME* against *BA30* and *R90*, indicating that these spreads do tend to revert to a constant mean value over time. Since the prime rate is cointegrated with these money market rates, we may estimate an ECM to study the adjustment of prime rate to a long-run equilibrium value determined by 1- and 3-month money market rates (Table 2).[23]

Table 2
Dickey- Fuller (DF) tests, weekly data 1970–90

	RPRIME-BA30	*RPRIME-R90*	*RPRIME-RBANK*
Augmented DF statistic	4.67	4.45	3.22
Unit root	Rejected	Rejected	Not rejected
Critical ADF = 3.45			

23. The ECM described here is based on the work of Scott Hendry (1992). He investigates a number of variables affecting short-run dynamics that are omitted here for simplicity, such as threshold effects and the cumulative change in the Bank Rate since the last prime rate change.

For *RPRIME-RBANK*, the test does not reject the unit root, suggesting that there has been no stable value for this spread. Thus, from a statistical as well as an economic viewpoint, the Bank Rate does not appear to be a determinant of the level of the prime rate in any fundamental sense.[24]

Entered together into an ECM, the coefficients on the spreads of both the 90-day commercial paper rate and the 30-day banker's acceptance rate were statistically significant, as were first differences of these rates and the Bank Rate. After a search for a good fit, the selected distributed lag structure was as in equation (2):

$$\begin{aligned}\Delta RPRIME_t = {} & 0.15 + 0.12\Delta R90_t + 0.15\Delta R90_{t-1} + 0.15\Delta R90_{t-2} \\ & (6.71)\ (5.20) \qquad (4.45) \qquad (4.28) \\ & + 0.34\Delta RBANK_t - 0.08\Delta BA30_{t-2} - 0.13(RPRIME_{t-1} - BA30_{t-1}) \\ & \qquad (8.12) \qquad (2.24) \qquad (3.66) \\ & + 0.10(RPRIME_{t-2} - BA30_{t-2}) - 0.09(RPRIME_{t-1} - R90_{t-1}) \\ & \qquad (3.78) \qquad (3.67)\end{aligned} \tag{2}$$

$R^2 = 0.70$ SEE = 0.15 Durbin h = – 0.99; critical values at the 0.95 confidence level are ± 1.65.

Data are weekly and range from March 1980 to June 1990.

Chow F = 2.58 for H_0: unchanged coefficients over July 1990 to September 1993; critical F at the 0.95 confidence level is 1.83.

The implied steady-state equation is
$RPRIME = 1.25 + 0.25BA30 + 0.75R90$.

The use of the differentials (in parentheses) as ECM terms constrains the sum of the long-run effects of *R90* and *BA30* on *RPRIME* to unity. Any other value would be difficult to rationalize, and a test does not reject the

24. The unstable value of the spread may also reflect the change from the discretionary setting of the Bank Rate before 1980 to the current method.

constraint.[25] Equation (2) allows the Bank Rate to have a short-run impact, which is estimated to be quite large, but with no permanent effect.

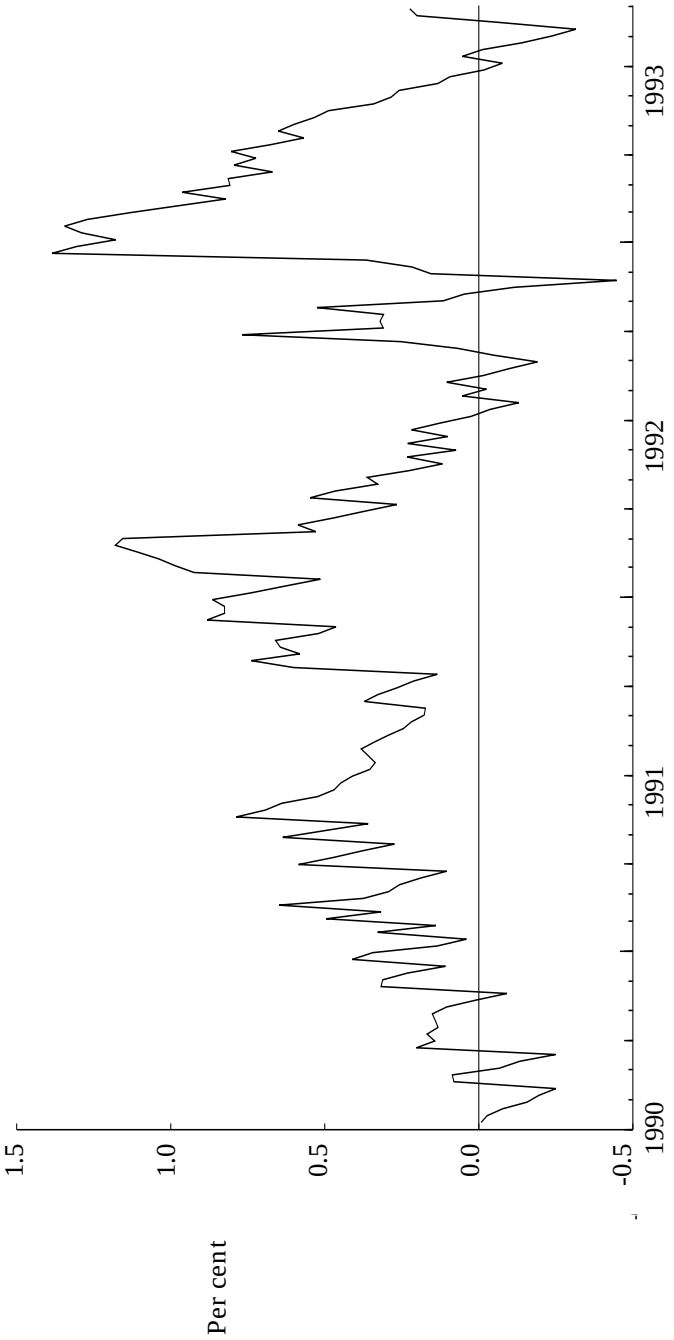
According to the estimates, the most important single variable is *R90*, as it has a long-run coefficient three times as large as that for *BA30*, as well as a strong short-run effect. The estimated equation probably underestimates the speed of adjustment, at least with respect to sharp changes in money market rates, since it embodies continuous adjustments, rather than the discrete steps that the prime rate takes in the real world.[26] For example, rounded to the nearest quarter, the estimates imply that if the market rates and the Bank Rate were to jump by 1 per cent, then it would take seven weeks for the prime rate to change by the same amount, whereas casual observation suggests that such a reaction would come within a few days.

The Chow test rejects the null hypothesis that the coefficients remained stable in the early 1990s at their 1980s values – but the macroeconomic import of this may be minor. Chart 4 shows the prediction errors for the prime rate for the period 1990–93, which is outside the estimation period, from a dynamic simulation. Although the actual value of prime has usually been below the predicted value during the rate declines of the past three years (sometimes well below, during the intervals when rates have flattened out or increased, such as in the summer of 1993), the prediction error has narrowed and even disappeared. This pattern of errors does not look so much like a structural decrease in the intermediation spread as an acceleration of cuts in prime in anticipation of further drops in money market rates.

25. The test involves estimating a more general specification that allows a non-unit negative coefficient on *BA30* and *R90* within the parentheses on the second and third lines of equation (2).

26. Hendry uses a probit analysis to deal with this feature. The probit forecasts showed very high probabilities of a prime rate change every time that prime actually changed, indicating that the technique can successfully capture the critical thresholds.

Chart 4
Prediction error: predicted minus actual prime rate



3.5 Unusually low prime rate spreads, 1991–92

As already noted, after August 1990 the banks began to cut prime rates more quickly than usual. Whereas in the 1980s cuts in prime were usually made in half-percentage-point steps, at a typical trigger spread between the prime rate and the 90-day paper rate of almost 2 percentage points, since August 1990 the cuts have usually been of a quarter point, at a trigger often less than 1 point (Table 3).

Table 3
Mean interest rate spreads on the day before a prime rate decrease

	No. of observations	*RPRIME-R90* before 25 basis point decrease	No. of observations	*RPRIME-R90* before 50 basis point decrease
Jan. 1982 – Dec. 1989	8	140	21	197
Aug. 1990 – Feb. 1991	10	126	6	155
Apr. 1991 – Jan. 1992	14	92	6	130
Apr. 1992 – Nov. 1992	12	116	5	101
Dec. 1992 – June 1993	12	50	1	120
9 July 1993	1	149		
Aug. 1990 – June 1993	48	95	18	136

This strategy was typified by the more aggressive stance of one large bank, which was trying to regain the share in the business loan market that it had lost in the 1980s. By mid-1993, the price-leading bank had succeeded in raising its share of the loan market by a couple of per cent above its 1990 share. Moreover, the publicity it generated by leading the price cutting in the loan business seemed to have had a favourable side

effect on its other lines, as its share in retail markets also rose. For the banking industry as a whole, the keen pricing has attracted a large volume of business out of the paper market. Despite the drop in demand for short-term business credit since 1990, the banks have managed to keep their loan volume fairly steady; the decline in short-term credit of firms is entirely accounted for by the drop in corporate paper and BAs (Chart 1).

The increased competitive activity stemmed mainly from the desire to be first to announce prime rate cuts and to move aggressively when market rates were expected to move down. As soon as the banks had reason to think rates had stabilized or might rise, they allowed the industry spread to return to its normal historical range. This would explain the errors in the simulation of the equation, which widened during the periods when rates were falling and then narrowed virtually to zero whenever rates stabilized or rose for a while.

4 SAVINGS DEPOSIT RATES

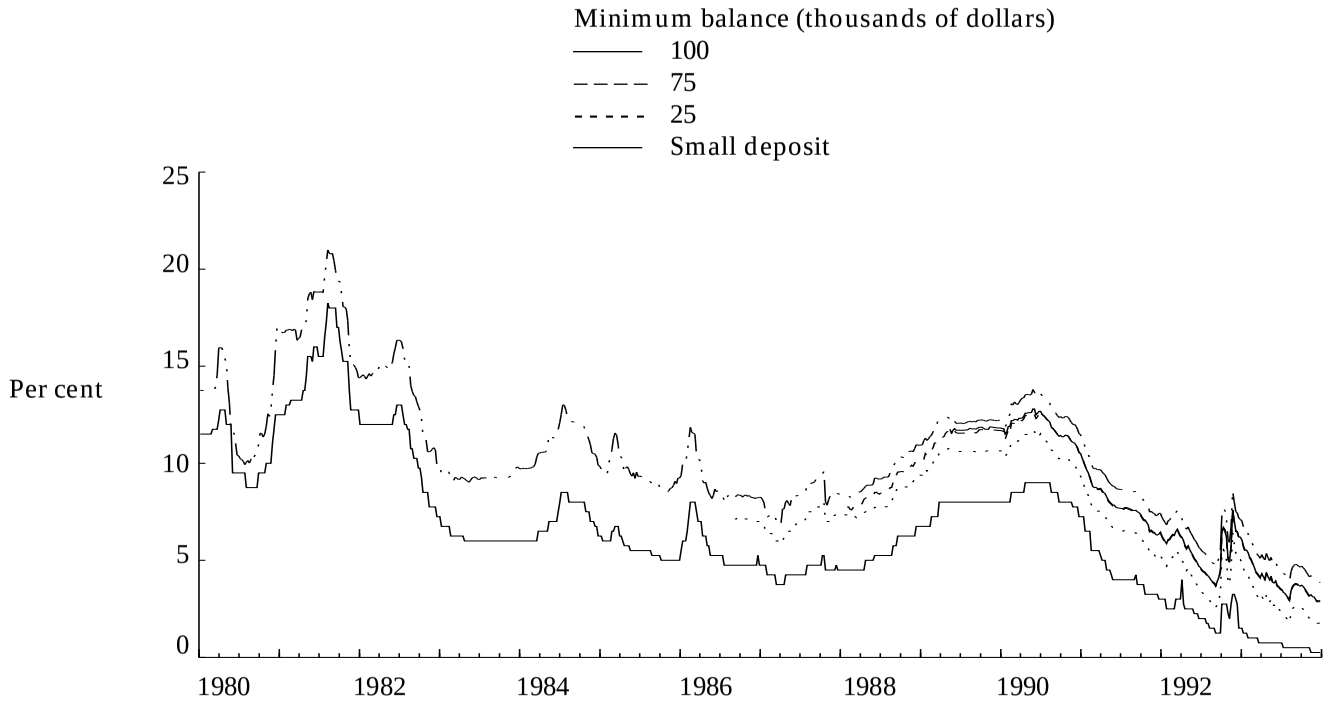
Canadian deposit-taking institutions have offered interest on chequable deposits as well as on non-chequable savings accounts for many years. Since 1980 they have brought numerous innovations to these products. Some changes have made it easier for depositors to manage their accounts, such as automatic teller networks, automated payments, telephone banking and longer hours of business in the branches. Others have allowed more competitive pricing for more interest-sensitive depositors, especially the introduction of daily interest accounting in 1980 and of premium rates on high balance deposits in 1986.

At the same time, the banks have been more assiduous in charging for services. The most common way to charge for retail transaction services has been a fixed monthly fee for standardized packages covering, for example, regular cheques, bill payments, travellers' cheques, and automatic transfers.

Interest rates on savings deposits are shown in Chart 5. For setting the return on the largest-value balances, the banks have adopted the simple strategy of shadowing the rate on 3-month treasury bills, which are themselves readily available to large retail investors. The initial minimum boundary for the best yields offered was set at $25,000 in 1986, then raised in 1987 to $75,000 and again in 1989 to $100,000. Since 1990 the banks have generally reset the rate on the high-balance accounts weekly, at 1 per cent below the auction rate on the bill. (The initial rates on the $100,000 balances had been set at less than a half-point below the bill rate to launch the product.)

It can be seen in the chart that each time the boundary was raised, the highest value deposit rate was temporarily moved a notch closer to the bill rate, and the lower-value accounts were made somewhat less attractive. This more comprehensive tiering of rates has allowed the banks to meet growing competition from treasury bills and money market mutual funds and at the same time to pay lower interest rates on less price-sensitive deposits. Rates posted on small deposits have been 3 to 4 per cent

Chart 5
Savings deposit rates



less than the highest tier, and can hardly go much below their early 1994 value (1/2 per cent or less), even if there is a further decline in money market rates.

5 MORTGAGE AND LONG-TERM DEPOSIT RATES

In this section we develop a simultaneous equations model of mortgage rates and spreads, starting with some institutional background.

5.1 Market structure and developments

The market for residential mortgage loans in Canada has long been very competitive and innovative, with numerous lenders and a variety of borrowing choices. The largest lenders are the banks, but they do not dominate the market, since the trust and mortgage loan companies, credit unions and caisses populaires, and insurance companies are also very large.

Financing of mortgage loans comes primarily from *retail* term deposits, known as guaranteed investment certificates or GICs, with between 1- and 5-year maturities. The domestic market in *wholesale* funds is not very active at these longer terms. GICs have several features that affect their rates:

- They are usually not cashable before the maturity date.
- They are covered up to $60,000, maximum term 5 years, by the Canada Deposit Insurance Corporation (CDIC).
- They have not been taxed by reserve requirements – banks book GICs in mortgage loan subsidiaries that are not subject to such requirements.
- They compete with the federal government's Canada Savings Bond (CSB), a cashable, small-denomination savings instrument sold in an annual campaign in the fall of each year. During the campaign there is a lot of competitive jockeying with respect to rates and options on retail term deposits – for example, the institutions often offer cashable GICs to match the CSB.
- For large retail investors, they can be substitutes for regular government bonds and one-year bills, which have a deep market.

Since 1987, the development of mortgage-backed securities (MBS) and an acceleration of growth in mortgage mutual funds has opened further sources of funds to the market. However, the MBS vehicle occupies only a small part of the market. This is essentially because over the years the institutions have been successful in matching the terms of their mortgages and deposits, and by and large have not had a strong incentive to move mortgages off balance sheets. Also, the relatively short interest contracts and frequent prepayment opportunities attached to most Canadian mortgages are not well-suited for securitization.

The federal government's Canada Mortgage and Housing Corporation (CMHC) offers guarantees on certain types of mortgage lending for which it charges the borrower a fee. The guarantee is most frequently used against high-ratio loans to individuals and loans for social housing. Because of a rapid expansion of this kind of lending over the past three years, the proportion of guaranteed loans to total lending has gone from one-quarter to almost one-half of all new mortgages. However, this official participation in the market does not have any direct effect on mortgage interest rates. Rates on CMHC-guaranteed mortgages have invariably been the same as those on ordinary mortgages (so that the all-in cost of a guaranteed mortgage is the fee plus the interest rate), as the benefit of the guarantee to the lender is roughly offset by administrative costs. CMHC has actively encouraged the development of mortgage-backed securities, which are based on CMHC-guaranteed loans.

The most common mortgage instrument has a fixed interest rate for a term of from 1 to 5 years; floating rate arrangements have also been available.[27] Since the early 1980s, the 1-year term has fairly consistently seen a large volume of activity, whereas the level of activity at the 5-year term, which was the most common in the 1970s, has varied, and often 2- and 3-year contracts, as well as the 1-year, have been more popular than

27. Some mortgages are made with 7- and 10-year rate contracts, but mortgage terms longer than 5 years are uncommon – in part because of limits on prepayment penalties under the Canada Interest Act.

the 5-year.[28] Since 1990, with the decline in inflation and interest rates, there has been some movement back towards longer-term contracts. In addition, total mortgage credit has continued to expand quite strongly, as households have switched from consumer loans – especially for buying durable goods at the time of house purchase, and for consolidating debts at the time of a mortgage renewal – opting to lock in the lower interest rate on a mortgage.

To minimize interest rate risk, institutions match mortgages as closely as possible against liabilities of the same term to maturity. Nowadays they also use derivatives extensively to remove any undesired interest rate exposure of this type. Nevertheless, there are two further sources of interest rate risk, which are somewhat more difficult to hedge. The first stems from the practice of fixing the interest rate at the time a loan is approved, which is usually one to three months before the loan is disbursed, without committing the borrower to take the loan. The second is that, beyond a certain point, a drop in interest rates will be large enough that borrowers save money by prepaying existing loans and refinancing with a competing institution, despite the prepayment penalties specified in most loan contracts. In both instances, borrowers are presented with options that will be costly to lenders in the event of a decline in rates, given the fixed interest obligations of the lenders. Moreover, lenders have increasingly advertised easier prepayment features to attract business.

The industry spread should implicitly factor in the cost of these options – that is, it should be large enough to cover the expected loss of revenue that will occur when the options are exercised. It will then widen when rates are high and volatile, since the risk of a large rate drop is then higher.

In Table 4, rows 1 and 3 show differentials between rates on mortgages (*RM*) and GICs (*RGIC*) posted by the mortgage loan subsidiaries of the banks, at the 1- and 5-year terms. Rows 2 and 4 show, respectively,

28. In the 1960s, 25-year mortgages were common, but these had all but disappeared by the early 1970s.

differentials between 1-year GICs and 12-month treasury bills (*RTB12*), and between 5-year GICs and 3- to 5-year Government of Canada bonds (*RGOV5*). Chart 6 also shows industry spreads.

Table 4
Mortgage–GIC and GIC–government differentials
Mean (standard deviation) in basis points, weekly data

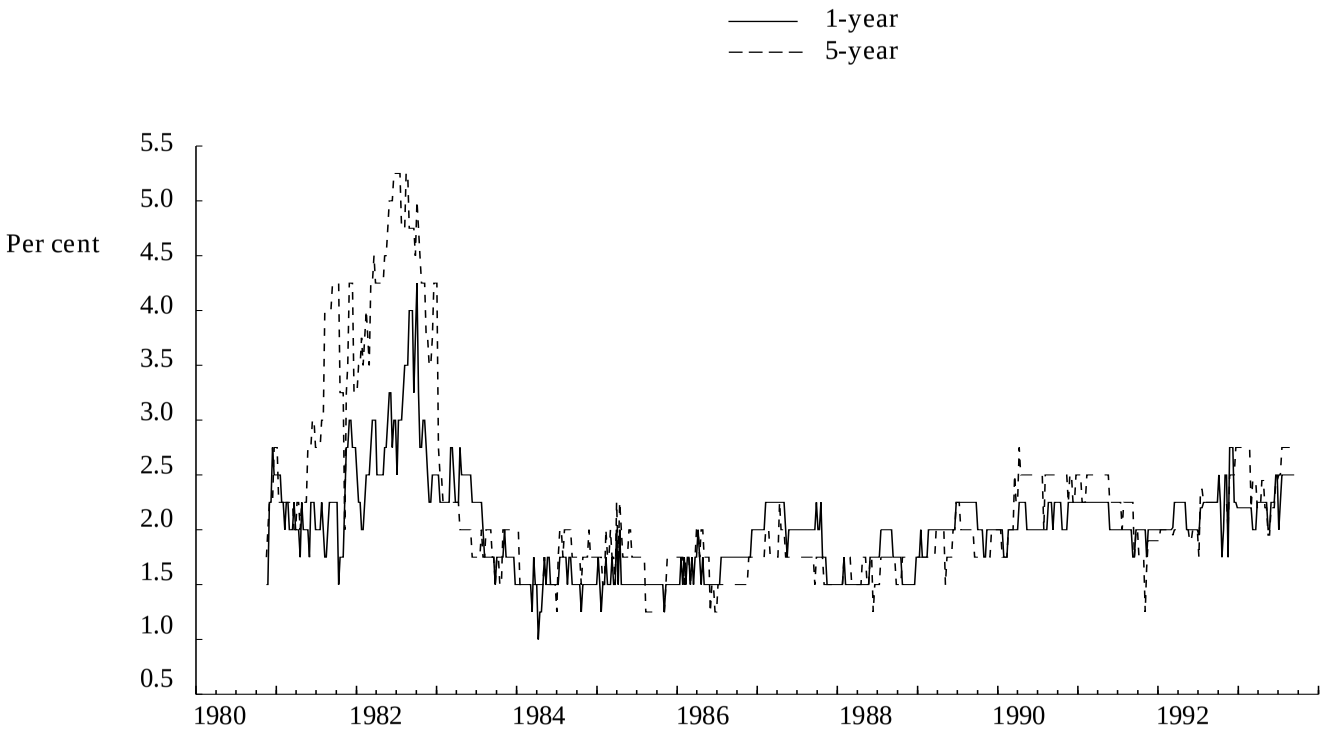
		Sample period		
		Jan. 1981 – Dec. 1982	Feb. 1983 – June 1990	July 1990 – Aug. 1993
1-year	*RM-RGIC*	252 (56)	179 (31)	215 (18)
	RGIC-RTB12	-53 (92)	-101 (52)	-86 (44)
5-year	*RM-RGIC*	368 (98)	178 (30)	229 (28)
	RGIC-RGOV5	-25 (66)	13 (44)	-13 (41)

An interesting feature here, which is also apparent in econometric results presented later, is that the *RM-RGIC* spread has on average been the same at the 1- and the 5-year terms over the past 10 years. It would appear that the greater cost of the options embedded in a longer-term mortgage has just about offset the lower transaction costs associated with less frequent turnover.

The exceptionally high spreads in 1981–82 coincided with the terminal phase of a prolonged period of inflation, and with record levels of interest rates – mortgage rates were around 20 per cent – and interest rate volatility. Severe interest rate uncertainty caused sharp widening in spreads as well as the virtual disappearance of mortgages with terms longer than one or two years.[29]

29. This episode is described in more detail in "Patterns of Borrowing and Lending During 1982," *Bank of Canada Review (*April 1983): 3-17.

Chart 6
Mortgage–GIC rate differentials



For most of the rest of the 1980s the mortgage–GIC spreads at the banks were in the 1 1/2 – 2 per cent range, but in the early 1990s they shifted up to 2 – 2 1/2 per cent. This renewed widening may be attributed to several factors:

- a renewed increase in the cost of the implied options offered on mortgage rates, as interest rates reached a peak in 1990 and then declined markedly.
- better-than-posted rates for customers with other valuable business. An increased number of borrowers have been able to get a quarter- or a half-point less than the posted mortgage rate, while depositors have been able to get a quarter-point more than the posted term deposit rate. The overall intermediation spread is thus somewhat overstated in the published data.
- losses in commercial real estate lending, which caused severe difficulties for some trust companies, resulting in less competition for the banks.[30]
- relatively strong demand for mortgages, as households have switched from consumer credit to get longer terms and lower costs.

Monetary conditions influence mortgage interest rates through a channel leading from short-term rates through medium-term bond rates. The influence will be stronger, the closer the linkages are, first between the money market and the short-term bond markets, which were discussed in Section 2, and then between the market for short-term bonds on the one hand and GICs and mortgages on the other.

5.2 Links between market yields and mortgage and GIC rates

In some instances the return on a GIC is less than on the corresponding government security, despite the superior liquidity of the latter (the

30. Although losses on residential lending increased in the aftermath of the recession, they remained within a normal range.

negative entries in Table 4, rows 2 and 4).[31] This illustrates that smaller retail clients are deterred by transactions and information costs from buying bills and bonds – especially at the 1-year term, where the negative differential with respect to the treasury bill has averaged almost a full percentage point.[32] At the 5-year term the spread is tighter – perhaps reflecting that transaction costs in the securities markets would be less, in relation to total interest receipts, over a longer holding period.

5.3 Equations for mortgage and long-term deposit rates

Because of the high variance in the early 1980s, the unit root hypothesis can be accepted for the mortgage-GIC rate differentials over the decade (Chart 6 gives a clear illustration of the lack of stability).[33] Augmented Dickey-Fuller tests over a shorter period, starting in 1983, can reject the unit root. The econometric estimates presented in this subsection for the mortgage and GIC rate equations are therefore based just on the period 1983–90.

The equations were specified in ECM format. For estimation, it is important to use a technique that copes with (1) the presence of simultaneously endogenous variables on the right-hand side of each equation; and (2) the high contemporaneous covariance of the errors in equations for the mortgage rate and the GIC rate. The three-stage least squares method (3SLS) has appropriate properties of consistency and efficiency in this context.

31. A comparison of GIC rates with Canada Savings Bond rates is not given, because CSBs are offered for only a short period each year. Moreover, rate-setting tactics during this period need not be representative of behaviour more generally.

32. For small depositors, GICs have almost the same credit standing as federal government securities, since their deposits are insured by the CDIC.

33. This subsection uses a format for the ECM similar to that of Caron (1992). However, Caron's model incorporates various features that are excluded here, for example, an estimate of the wholesale cost of 1- and 5-year deposits, and a measure of interest rate variance. More importantly, his estimates are from monthly data for 1981–89, which yield lower speeds of adjustment than the weekly data starting in 1983 that we use.

To test stability, post-1990 predictions from these equations were compared with actual interest rates.

After a brief search for the best fit, the format chosen for the mortgage rate was

$$\Delta RM_t = \alpha_0 + \alpha_1(L)\Delta RGIC_t + \alpha_2(L)\Delta RPRIME_t + \alpha_3(L)(RM_{t-1} - RGIC_{t-1}) \quad (3)$$

and for the GIC rate plus:

$$\Delta RGIC_t = \beta_0 + \beta_1\Delta RM_t + \beta_2\Delta RGOV_t + \beta_3(L)(RM_{t-1} - RGIC_{t-1}) + \beta_4(L)(RGOV_{t-1} - RGIC_{t-1}) \quad (4)$$

RM	1- or 5-year mortgage rate
RGIC	1- or 5-year GIC rate
RGOV	12-month treasury bill or 3- to 5-year bond rate
$a_i(L)$, $\beta_i(L)$	distributed lag operators

Equations (3) and (4) taken together form a simultaneous model, which can be solved jointly for the two administered rates. Here, the model is applied separately to the 1-year and 5-year interest rates. The ECM for the mortgage rate (equation 3) assumes that the long-run industry spread is constant. The simultaneous model, incorporating the pair of equations, allows both rates to adjust to eliminate any disequilibrium. The specified adjustment path is affected by the change in the prime rate, since for some borrowers a prime-based loan is a feasible short-run substitute for a mortgage, and since changes in administered rates in general tend to be synchronous. Equation (4) constrains the *sum* of the long-run coefficients on the mortgage rate and on the government security rate to unity – in the event of an exogenous change in just one of these yields, the GIC rate would adjust by a fraction of the change. It is sufficient for dynamic stability of the model that the sum of lag coefficients for $\alpha_3(L)$ lies between -1

and 0, and for $\beta_3(L)+\beta_4(L)$ between 0 and 1. Estimates are presented in Table 5.

Table 5
3SLS estimates of ECMs for mortgage and GIC rates
Weekly data, February 1983 – June 1990
Coefficient (t-ratio)

	1-year		5-year	
	ΔRM_t	$\Delta RGIC_t$	ΔRM_t	$\Delta RGIC_t$
Constant	0.07 (1.85)	-0.14 (3.34)	0.11 (2.36)	-0.04 (0.98)
$\Delta RGIC_t$	0.66 (8.64)		0.83 (8.98)	
ΔRM_t		0.35 (5.26)		0.79 (10.26)
$\Delta RGOV_t$		0.11 (4.44)		
$\Delta RPRIME_t$	0.26 (6.87)		0.17 (4.29)	
$RM_{t-1} - RGIC_{t-1}$	-0.22 (4.46)	0.12 (2.50)	-0.16 (3.27)	0.15 (3.42)
$RM_{t-2} - RGIC_{t-2}$	0.18 (3.69)	-0.10 (1.98)	0.09 (1.97)	-0.12 (2.75)
$RGOV_{t-1} - RGIC_{t-1}$		0.10 (7.17)		0.07 (4.44)
R^2 / Durbin h	0.42 / -0.70	0.36 / -1.62	0.34 / 0.08	0.35 / 0.27
Chow F (for H_o[a])	2.33	2.17	1.37	1.60
Implied steady-state differential *RM-RGIC*	1.85		1.77	
Implied steady-state reduced-form equations	*RM* = 0.91 + *RGOV* *RGIC* = -0.94 + *RGOV*		*RM* = 1.91 + *RGOV* *RGIC* = 0.14 + *RGOV*	

a. H_o: unchanged coefficients over July 1990 – September 1993; critical F value at the 0.95 confidence level is approximately 2.00.

These estimates are reasonable economically. Some features of the dynamics are worth pointing out:

- The error-correction coefficient vectors (α_3, β_3 and β_4) satisfy the stability conditions.

- The coefficients on the industry spread imply that, following a shock to the spread, the mortgage rates move quite rapidly (faster than the respective GIC rates) to restore the equilibrium spread.

- The 5-year rates adjust more rapidly than 1-year rates to changes in market yields – not too plausibly, according to the estimates.[34]

We used dynamic simulations of the models to trace the impact of a percentage point increase in the prime rate and the government security rate (the only exogenous rates in the set-up). With the 1-year model, the simulated administered rates, rounded to the nearest 1/8, take some 20 weeks to rise 1 percentage point. This implausibly slow result suggests that the 1-year model is missing something in the link from market rates. With the 5-year model, full adjustment takes only about 10 weeks. There is no significant movement in the industry spread at either term in these experiments, as the deposit and lending rates move closely in step.

The Chow tests reject the null hypothesis that the coefficients of the 1-year term equations remained unchanged in the 1990s, but accept the null for the 5-year term. As the F-statistics are not far from the critical values in either case, the evidence on stability of these relationships is not conclusive. Out-of-sample forecasts since July 1990 show that GIC rates have been lower than would have been expected, and mortgage rates generally higher. However, from an economic point of view, the errors are not enormous.

Table 6 gives the mean forecast errors from a dynamic simulation of the two 2-equation models. Over the 12 months ending June 1993, the simulated 1-year intermediation spread *RM-RGIC* is around 29 basis points lower than the realized value, and the simulated 5-year spread, 58 basis points lower. Some of this error may be attributed to measurement, in view of the increased prevalence of discounts on mortgage rates and bonuses on

34. The last two properties were inferred from simulation experiments.

GIC rates, but some of it would also be due to the fact that, in the equations, the cost of the implicit interest rate options granted to borrowers is ignored.

Table 6
Mean prediction errors for mortgage and GIC rates
Basis points, actual *minus* forecast

		12 months ending June		
		1991	1992	1993
1-year	*RM*	-8	-1	5
	RGIC	-27	-7	-24
	RM-RGIC	19	6	29
5-year	*RM*	13	1	16
	RGIC	-38	-23	-42
	RM-RGIC	51	24	58

Even if the widening of the mortgage intermediation spread since 1990 is taken at face value, it would not have had much negative impact on construction and on sales of housing. If our model has the right order of magnitude, the widening would amount to only a quarter or a half of a point on the level of mortgage rates. In the context of the large decline in the cost of a mortgage over the past three years – 700 basis points at the 1-year maturity – the negative impact on outlays would hardly be visible.

6 CONCLUSIONS

The key linkages between policy instruments and money market rates, and between market rates and administered rates, have been fairly stable.

On occasion, however, the Bank has had difficulty in keeping very short-term rates in its preferred range of interest rates during periods of exceptional market volatility. One reason for this has been the continued existence, for some banks, of a requirement to hold sizable deposits at the Bank of Canada. This will disappear on completion of the transition to zero reserve requirements in mid-1994.

The prime lending rate of the banks has reacted quickly to the declines in money market rates of the past three years, and the intermediation spread for business credit – that is, the lending rate minus the cost of short-term wholesale funds – has at times been unusually low. This contrasts with the situation in the United States.

Bond yields have come down more slowly than short rates, and the long-short differential has been in excess of 3 per cent for some time. While this is typical in this stage of the interest rate cycle, and also in line with the appreciable term differential in the United States, it may indicate that the credibility of the objective of price stability is taking time to build up in spite of the low rates of inflation already achieved, and promised for the future, under the inflation-reduction program. Because there has been such a long history of inflation rates close to, or a little above, those in the United States, bond holders may still habitually demand a premium in the nominal return on Canadian bonds over and above the nominal yield on U.S. bonds. Heavy budget deficits and political uncertainties in Canada have clearly also contributed to the relatively high level of long-term interest rates.

In recent years, spreads on mortgage rates versus long-term deposit rates at the lending institutions have increased from the 1983 to mid-1990 average. This seems to be largely because of increased interest rate volatility, which exposes the lenders to increased risks. When interest rate volatility was at its peak in 1981–82 the spreads were much greater than they are

currently. Also, the institutions have increasingly offered their customers rates that are more favourable than those posted, as well as more generous prepayment options that are costly to the lenders when interest rates decline.

REFERENCES

Bank of Canada. 1987. "Implementation of Monetary Policy in the Absence of Reserve Requirements." Discussion Paper No. 1. Ottawa.

Bank of Canada. 1989. "The Implementation of Monetary Policy in a System with Zero Reserve Requirements." Discussion Paper No. 2. Ottawa.

Bank of Canada. 1991. "Implementation of Monetary Policy in a System with Zero Reserve Requirements." Discussion Paper No. 3. Revised. Earlier version in *Bank of Canada Review* (May 1991): 23-34.

Boothe, Paul, Kevin Clinton, Agathe Côté and David Longworth. 1985. *International Asset Substitutability: Theory and Evidence for Canada.* A study for the Royal Commission on the Economic Union and Development Prospects for Canada. Ottawa: Bank of Canada.

Caron, Jean-Paul. 1992. "Les taux à terme administrés des banques." Working Paper 92-4. Bank of Canada, Ottawa.

Clinton, Kevin and Kevin Fettig. 1989. "Buy-Back Techniques in the Conduct of Monetary Policy." *Bank of Canada Review* (July): 3-17.

Dingle, James F. 1986. "Technical Note: Introduction of Retroactive Settlement for the Daily Clearing of Cheques and Other Payments Items." *Bank of Canada Review (*August): 3-7.

Freedman, Charles. 1993. "Formal Targets for Inflation Reduction: The Canadian Experience." Bank of Canada paper presented at the conference "A Framework for Monetary Stability" at the Nederlandsche Bank, October 1993.

Hendry, Scott. 1992. "Determinants of the Prime Rate: 1975-1989." Working Paper 92-2. Bank of Canada, Ottawa.

Howard, Donna. 1992. “The Evolution of Routine Bank of Canada Advances to Direct Clearers.” *Bank of Canada Review* (October): 3-22.

Longworth, David. 1989. “Optimal Behaviour of Direct Clearers in a World with Zero Reserve Requirements.” Bank of Canada paper presented to the Canadian Economics Association, Ottawa, June 1989.

Malkiel, Burton G. 1966. *The Term Structure of Interest Rates: Expectations and Behavior Patterns.* Princeton, NJ: Princeton University Press.