



---

*C.D. Howe Institute*  
*Institut C.D. Howe*

---

**Communiqué**

---

Embargo: For release *Thursday, July 31, 1997*

***Low inflation at risk from  
rapid money growth;  
Bank of Canada should raise rates,  
says C.D. Howe Institute study***

Although recent strength in the Canadian economy is welcome, the Bank of Canada may be giving Canadians too much of a good thing, says a *C.D. Howe Institute Commentary* released today.

In contrast to the tight money that played a role in Canada's slow growth during most of the 1990s, easy money from the Bank of Canada has helped push the economy ahead since last summer, says the study, entitled *More Money Than Is Good for Us: Why the Bank of Canada Should Tighten Monetary Policy*. The authors — Kenneth Boessenkool and William Robson of the C.D. Howe Institute and David Laidler of the University of Western Ontario — warn, however, that recent money growth has been so rapid that it needs reining in. "Unless increases in the stock of money are matched by increases in the economy's capacity to absorb it," they say, "inflation will eventually pick up."

The authors note that growth of M1 — cash and chequing accounts at chartered banks — has outpaced growth in the economy by a wide margin over the past year, a situation that has prefigured rising inflation in the past. Rather than a dramatic tightening of policy, however, the authors urge a measured series of small interest rate hikes, for several reasons:

- Some of M1's recent rapid growth appears to be the result of changes in the banking industry, which have shifted accounts into M1.
- Lower interest rates on alternative investments such as money market securities and the spread of competitive interest rates on chequing accounts have lowered the cost of holding M1.
- The amount of slack remaining in the economy and the Bank of Canada's reputation as an inflation fighter will damp any emerging inflationary pressures.

These factors, say the authors, may give the Bank of Canada some "breathing space" in which to bring M1 growth back to a sustainable pace. "This can be accomplished," they argue,

“through further small rises in short-term interest rates” along the lines of the quarter percentage point hike in the Bank’s range for the overnight rate in late June.

By bringing the cost of funds more into line with recent increases in consumer and business confidence, the authors conclude, “such action would reign in money growth to a sustainable level, and help Canadians enjoy a long-lived, low inflation expansion.”

\* \* \* \* \*

The C.D. Howe Institute is Canada’s leading independent, nonpartisan, nonprofit economic policy research institution. Its individual and corporate members are drawn from business, labor, agriculture, universities, and the professions.

- 30 -

For further information, contact:

Ken Boessenkool; Bill Robson;  
Susan Knapp (media relations),  
C.D. Howe Institute  
phone: (416) 865-1904; fax: (416) 865-1866;  
e-mail: cdhowe@cdhowe.org;  
Internet: [www.cdhowe.org/eng/pr/new.html](http://www.cdhowe.org/eng/pr/new.html)  
David Laidler, phone: (519) 661-3400

*More Money Than Is Good for Us: Why the Bank of Canada Should Tighten Monetary Policy*, C.D. Howe Institute Commentary 95, by Kenneth J. Boessenkool, David Laidler, and William B.P. Robson (C.D. Howe Institute, Toronto, July 1997). 16 pp.; \$6.00 (prepaid, plus postage & handling and GST — please contact the Institute for details). ISBN 0-88806-415-2.

Copies are available from: Renouf Publishing Company Limited, 5369 Canotek Road, Ottawa, Ontario K1J 9J3 (stores: 71<sup>1</sup>/<sub>2</sub> Sparks Street, Ottawa, Ontario, phone 613-238-8985; 12 Adelaide Street West, Toronto, Ontario, phone 416-363-3171); or directly from the C.D. Howe Institute, 125 Adelaide Street East, Toronto, Ontario M5C 1L7.

# More Money Than Is Good for Us:

## Why the Bank of Canada Should Tighten Monetary Policy

by

*Kenneth J. Boessenkool, David Laidler,  
and William B.P. Robson*

In contrast to the tight money policy that played a part in Canada's disappointing economic performance through most of the early 1990s, the Bank of Canada is now supporting economic expansion with very rapid money growth. Over the past year, the growth of M1 (cash and chequing accounts at the chartered banks) has been so rapid as to suggest that, without a dramatic tightening of policy, Canada may be on the verge of another inflationary outbreak, bringing another bout of contraction and slump in its wake.

Examination of a number of factors that may have increased the Canadian economy's demand for M1 somewhat mitigates this concern. Structural changes in the banking industry may have encouraged a shift of deposits into M1, explaining some of its recent growth. A combination of lower interest rates

on alternative investments and higher interest rates on M1 accounts may also be responsible for some of the increase. Considerable slack in the economy and the Bank of Canada's higher credibility as an inflation fighter also suggest that rapid growth in the near term need not trigger an immediate upsurge in prices.

Even after allowing for these factors, however, money growth has been rapid enough to warrant timely action by the Bank. Further small rises in short-term interest rates, along the lines of the quarter percentage point hike in the Bank's range for the overnight rate in late June, would raise the cost of funds in line with rising consumer and business confidence. Such action could put M1 on a sustainable path, and guide the Canadian economy to a durable expansion.

## ***Main Findings of the Commentary***

- Among the factors contributing to Canada's disappointing economic growth during the early 1990s was periodic bouts of tight money. A pronounced easing of monetary policy since last summer — evident in annual percentage growth of M1 (cash and chequing accounts at the chartered banks) in the high teens — appears to be a key factor behind the recent pickup in spending, job growth, and consumer and business confidence.
- While the stronger economy is welcome, such rapid money growth raises concerns. In the past, double-digit M1 growth, if maintained for more than a few quarters, has not proved compatible with low inflation. Unless increases in the stock of money are matched by increases in the economy's capacity to absorb it, inflation eventually will pick up.
- On the face of it, the increase in M1 has outpaced growth in output so much as to suggest that the economy already has more money circulating than is good for it, and that the Bank of Canada must rein in M1 promptly to avoid an inflationary outbreak. There are, however, several reasons to reject a dramatic tightening of monetary policy:
  - Institutional changes in the banking industry may have boosted the economy's demand for M1. Examination of a new money measure, M1X, which includes accounts whose holders may recently have shifted some of their balances into M1, suggests that at least some of M1's recent rapid growth arises from structural changes, and has no implications for economic growth or inflation.
  - The cost of holding transactions-oriented money such as M1 and M1X has declined in recent years. Generally falling interest rates have driven down yields on alternative investments such as money market securities, while competition has driven up the interest paid on some accounts included in M1 and M1X. A lower opportunity cost of holding money balances may also raise demand, alleviating some concern over recent rapid money growth.
  - The economy still has enough slack to allow vigorous growth at least through the balance of this year before inflationary bottlenecks start to emerge. Once they do, the Bank of Canada's higher credibility as an inflation fighter should help to slow the pickup in prices and eventually wages that will follow.
- These mitigating factors do not completely offset M1's principal message that a period of vigorous economic growth is in store and that, unless the Bank moves to a less expansionary stance, inflation eventually will pick up. They do, however, suggest that the Bank has breathing space to act in a measured way.
- What is needed is further small rises in short-term interest rates, along the lines of the quarter percentage point hike in the Bank of Canada's range for the overnight rate in late June, so that the cost of funds in the economy moves up in line with increases in confidence. Such action would rein in money growth to a sustainable rate and help Canadians enjoy a long-lived, low-inflation expansion.

---

**D**uring most of the 1990s, economic growth in Canada has been weak. Fiscal retrenchment, continued structural adjustment, and periodic bouts of tight money have each played a part in this sluggish performance.<sup>1</sup> Recently, however, much easier money, evidenced by exceptionally strong money growth (as measured by the narrow M1 aggregate) since last summer, has given the economy new life.

Recent reports of stronger spending, a long-awaited pickup in employment, and rapidly rising consumer and business confidence now suggest that a vigorous expansion is under way. Indeed, in late June, the Bank of Canada responded to renewed signs of life in the economy by raising its range for the overnight rate — the shortest-term interest rate in the economy and the one most closely linked to central bank activities — by one-quarter of a percentage point.

Will this increase, perhaps followed by others like it, push the economy back into a slump? The answer is almost certainly no. Interest rates are only high or low relative to the state of consumer and business confidence. Earlier in this decade, Canadians saw how falling interest rates failed to spark a flagging economy when they were outpaced by plunging expectations about future incomes and profits. As the economy picks up momentum, interest rate rises that merely keep pace with rising confidence could keep monetary policy in a sustainable accommodative stance.

A more apt concern at this point is that interest rates might not rise with more buoyant expectations, and the expansion might get out of hand. While an M1 percentage growth rate in the high teens over the past year has produced no sign of accelerating prices so far, growth this fast is not compatible with maintaining low inflation if it goes on too long. Since monetary policy works with well-known lags, M1 growth will need to slow at some point, so that a long overdue and continued healthy expansion does not turn into an inflationary blow-off. With the economy looking ever more buoyant, reducing money growth will probably

require the Bank of Canada to push short-term interest rates higher over this summer and into the autumn.

Current M1 growth may be a less-than-perfect measure of the Bank's stimulus to the economy. Some special factors — developments in Canada's banking system that are increasing the demand for M1 and changes in interest rates — require a more nuanced judgment. Even after allowing for these changes, however, monetary policy still seems too expansionary for comfort. In short, the Canadian economy may now be getting more money than is good for it.

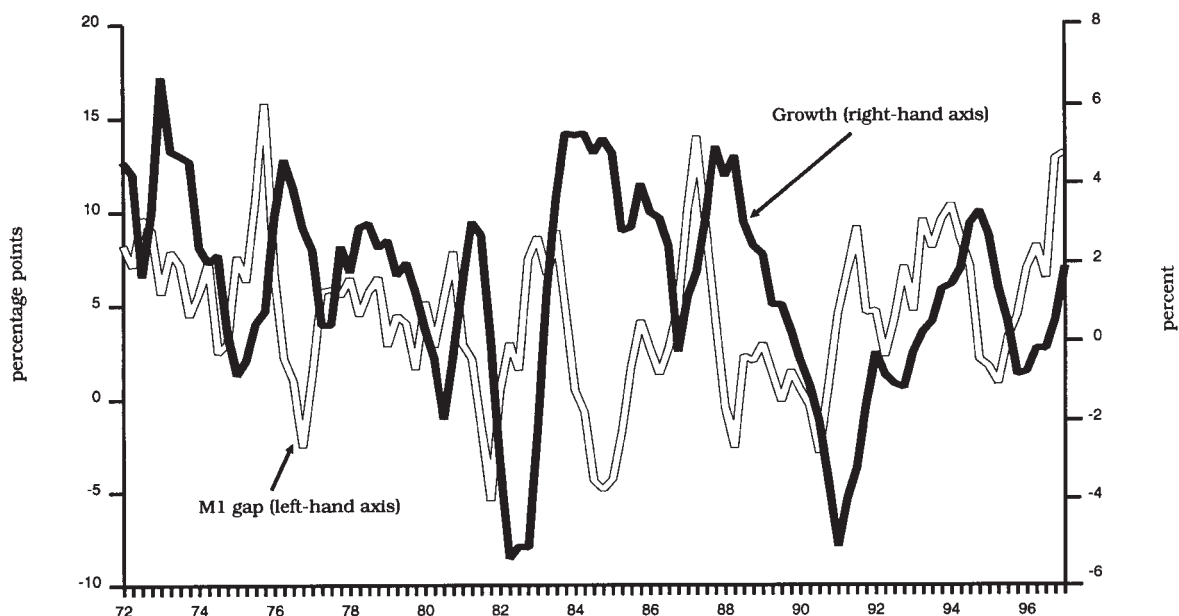
### **How Much Money Does Canada Need?**

Whether a given money growth rate is over-stimulative and inflationary, or contractionary and disinflationary, or just right depends on how fast the economy's demand for money is growing and how fast it is likely to continue growing in the future.

### **Economic Growth and the M1 Gap**

Historically, the most important influence on the demand for real — that is, measured in constant dollars, adjusted for changes in purchasing power over time — balances of transactions-oriented money has been the long-term trend of economic activity. If money growth outpaces the growth in demand for it that one would expect on the basis of rising real gross domestic product (GDP), monetary policy is said to be stimulative, heralding rising growth in the short run and higher inflation in the medium and longer run. If money growth falls short of the changes in demand induced by real GDP growth, the opposite is true.<sup>2</sup> Figure 1 shows the difference between annual growth in real M1 and annual growth in demand for it as proxied by real GDP — an “M1 gap” — and compares it with annual changes in economic activity;<sup>3</sup> Figure 2 compares the same M1 gap with annual changes in inflation.<sup>4</sup>

**Figure 1: The M1 Gap and Growth, 1972–97**



As this survey of the past 25 years' experience makes clear, the M1 gap tends to signal changes in growth two to three quarters before they happen, and to signal changes in inflation with a lead of about a year and a half. And, as a glance at the most recent quarters reveals, the M1 gap is now signaling highly expansionary — and ultimately inflationary — monetary policy.

### Structural Changes and M1X

Money demand is, however, subject to influences other than real economic growth. As the Bank of Canada has pointed out in response to recent comments about the exceptional speed of recent M1 growth,<sup>5</sup> new banking practices can boost M1 demand for a time, reducing or removing any inflationary threat from a rapid expansion.<sup>6</sup> The Bank's 1992 phasing out of reserve requirements against demand deposits, which are included in M1, blurred the distinctions between these and other types of deposits not included in M1. This change

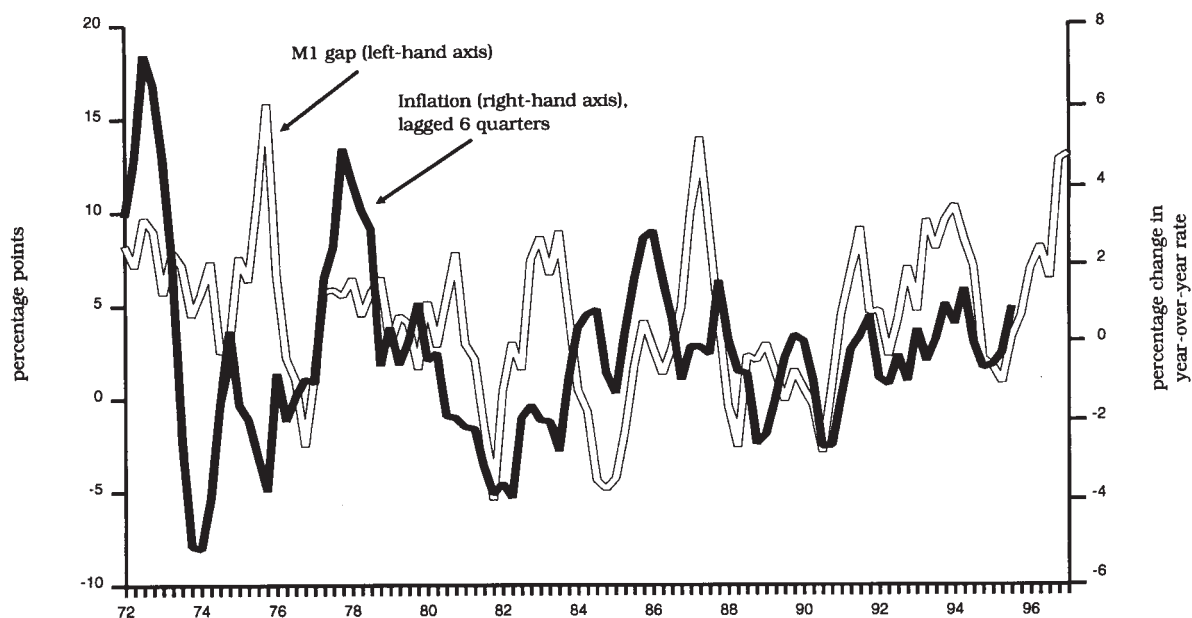
might account for some of the recent rapid growth of M1.

One way of allowing for this possibility is to create a new monetary aggregate — which we call "M1X" — that would be less affected by such shifts. This new measure adds to M1 certain accounts — chequable nonpersonal notice deposits (normally a component of M2) — that have become hard to distinguish from demand deposits.

Two developments suggest this approach. First, chequable nonpersonal notice deposits increased sharply around 1980 and grew much faster than M1 for a number of years afterward, a period when most banks began to use these accounts in the cash management techniques they offered to their commercial clients. Second, the growth of these deposits slowed down at about the time M1 growth picked up in the early 1990s, a period when the abolition of reserve requirements left banks with no incentive to get their business customers to hold chequable notice deposits rather than ordinary demand deposits.

As Figures 3 and 4 show, the relationships between an "M1X gap" — computed in exactly

**Figure 2: The M1 Gap and Inflation, 1972–97**



the same way as the M1 gap displayed in Figure 1 — and future real growth and inflation are broadly similar to those involving the M1 gap, although the leads and lags involved are slightly longer and the message about current policy from this new aggregate is less worrisome. The money gap calculated from M1X, which allows for institutional changes, shows monetary policy to be expansionary — but not much more so than in mid- to late 1993, an episode followed by strong growth in 1994 without significant inflationary pressures later on.

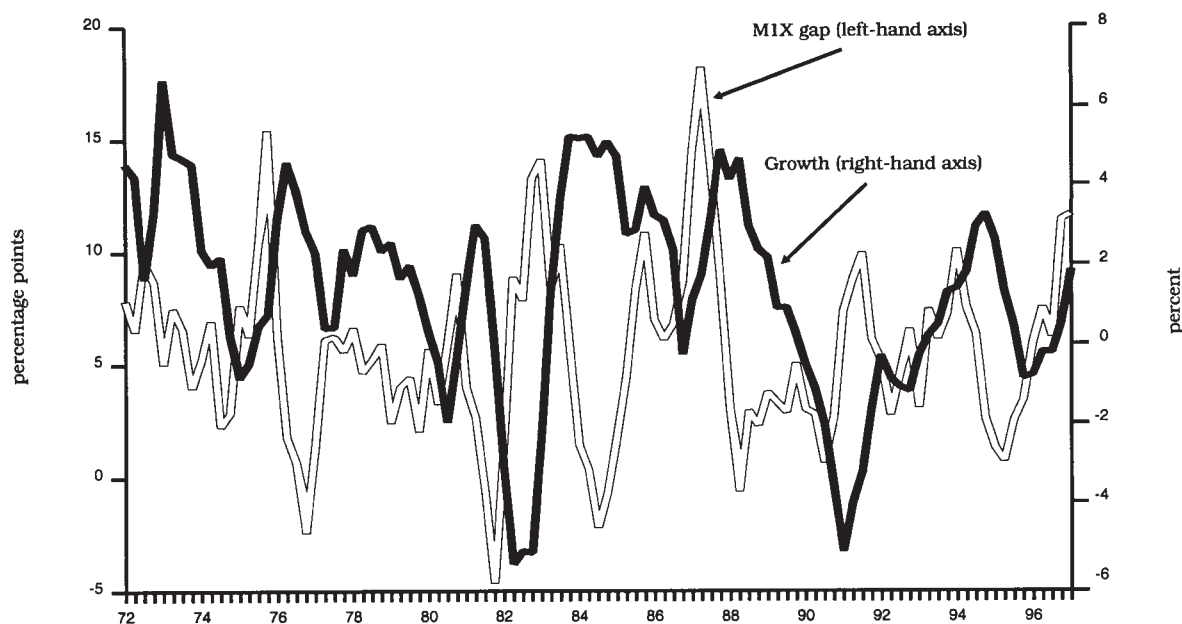
### Changes in Interest Rates and Money Demand

This slight inconsistency in their messages aside, there are other reasons to treat inflationary warnings from the M1 and M1X gaps with caution. First, there remains a good deal of slack in the Canadian economy: an unusually long period of rapid expansion might be feasible before capacity constraints and their accompanying inflationary pressures develop. Second, the Bank of Canada has established

considerable credibility as an inflation fighter, so that even when capacity constraints emerge, workers and businesses ought to think twice before bidding up wages and prices. History, as portrayed in Figures 1–4, may therefore not quite repeat itself this time around.

A key additional reason for caution is the possible influence of a third factor on money demand: the level of interest rates.<sup>7</sup> M1 and M1X balances pay relatively low, and sometimes no, interest. If alternatives such as money market securities offer high yields, the sizable opportunity cost associated with holding the types of money measured in M1 and M1X will depress the demand for them. When, as at present, money market securities offer much lower returns, the cost of holding M1 and M1X falls and demand for them rises. Recently, moreover, increased competition in the financial sector appears to be forcing up the interest rates offered on some components of M1 and M1X, further narrowing the opportunity cost of holding them. Simple measures of M1 and M1X gaps that take no account of these effects may overstate the recent expansiveness of monetary policy.

**Figure 3: The M1X Gap and Growth, 1972–97**



## The Current Money Supply and Demand Balance

Econometric estimation of demand functions for M1 and M1X is the best way to come to grips simultaneously with the effects of changes in the opportunity cost of holding these monetary aggregates, changes in real GDP, and the influence of institutional developments. (Our efforts along these lines are described in the appendix.) Such an exercise allows an informed guess about what the Canadian economy's demand for money would be if it were operating at a level of capacity use consistent with stable inflation, both now and in the future.<sup>8</sup>

Turning first to the present, how far below its capacity level would current output have to be — in other words, how big would the output gap have to be — for the quantity of money now in circulation to promise simply a return to full employment, with no renewal of inflationary pressures? If the answer to this question suggests that the stock of money is as yet insufficient to push Canada through full employment into inflationary pressure, a question about

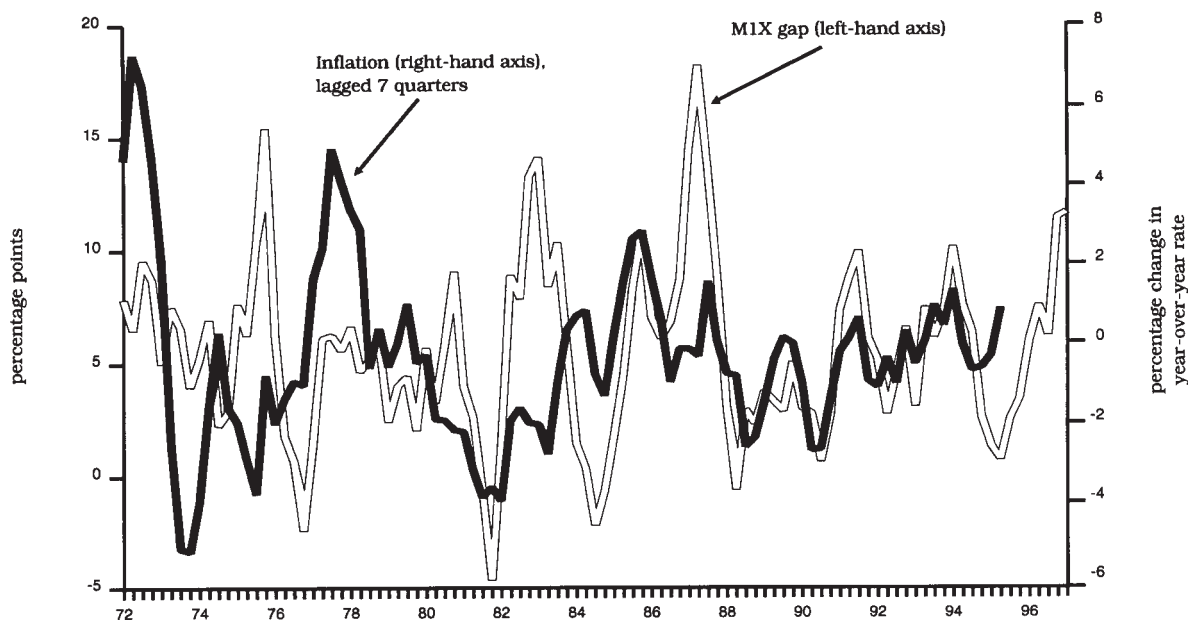
the future arises: How long can current money growth rates continue before Canada gets more money than is good for it? The answer to this second question provides a rough-and-ready estimate of how much breathing space remains for the Bank of Canada to reduce money growth to a sustainable rate.

## The Message from M1

The answer M1 gives to the first question is disturbing. Even on the rather conservative assumption that the current low level of the opportunity cost of holding money (and hence high money demand) would persist at full employment and 2 percent inflation, our results suggest that, in the first quarter of 1997, output would have had to be 11 percent below capacity for the stock of M1 already in circulation not to be inflationary. Repeating the calculation on the assumption that M1's equilibrium opportunity cost is one percentage point higher than its level in the first quarter pushes this figure for the output gap to an astonishing 17 percent.



**Figure 4: The M1X Gap and Inflation, 1972–97**



We estimate that the Bank of Canada's model registered a 2.3 percent output gap in the first quarter of 1997.<sup>9</sup> Many other estimates of the output gap exceed this number. We are, however, aware of no estimate of the difference between output and its stable-inflation level in the 11 percent range. If our estimate of the economy's demand for M1 is accurate, therefore, there is already too much of it in circulation. There is no need to proceed to the second question: Canada already has more M1 around than it needs and, with M1 continuing to grow at double-digit annual rates, the problem is worsening.

### The Message from M1X

Repeating this exercise using econometric estimates of the determinants of demand for M1X yields more reassuring results. On the assumption that the early 1997 opportunity cost of holding M1X is sustainable, the supply of M1X in the first quarter of 1997 was more or less equal to M1X demand at the then-current level of output. If, on the other hand, the equilibrium opportunity cost of holding

M1X is one percentage point higher than the actual figure recorded in the first quarter of 1997, the output gap would have had to be 4 percent at that point for M1X not to be ultimately inflationary. While 4 percent is higher than the 2.3 percent output gap estimate suggested by Bank of Canada figures, it is not badly out of line with other estimates.

If M1X is a reliable guide, then, the stock of money in the first quarter of 1997 was about right. Further money growth since then, moreover, is entirely appropriate, to keep the economy on track toward full employment.

Unfortunately, there are grounds for doubting that M1X is a reliable guide. As discussed further in the appendix, the responsiveness of M1X to income growth — which our econometric work suggests is very high — is central to this result, since it means that closing even a small output gap would raise the economy's demand for M1X by a large amount. If, in fact, M1X demand responds less to income growth than our estimates suggest, then the economy's capacity to absorb the amount of M1X already in circulation as it returns to full em-

---

**Box 1: *Calculating Money Targets***

Constructing estimates of full-employment demand for M1 and M1X requires estimates of how responsive demand for real money balances is to changes in real activity, to changes in the opportunity cost of holding them, and to institutional changes (both theory and evidence suggest that nominal money demand varies in direct proportion to the price level). Here, we give the key econometric results relevant to the calculations presented in the text; a full description of the econometric exercise is provided in the appendix.

Our calculations of the output gaps that would have had to exist in the first quarter of 1997 for then-existing stocks of M1 and M1X not to be inflationary were based on a real income elasticity 0.74 for M1 and 1.72 for M1X. (As we note in the text and discuss further in the appendix, the income elasticity for M1X is suspiciously high.) The elasticities with respect to the opportunity cost were - 0.10 for M1 and - 0.14 for M1X.

The target corridor for M1X starts with the estimate of the level of M1X that would have been

noninflationary in the first quarter of 1997, calculated on the basis of a 2.3 percent output gap (consistent with Bank of Canada estimates) multiplied by an income elasticity of 1.72 percent. A  $\pm 2$  percent margin around that initial estimate reflects the uncertainties in these figures. Going forward, the corridor uses the same 1.72 elasticity with respect to real income, adding two standard deviations (of 0.05) in calculating the upper bound and subtracting two standard deviations for the lower bound.

The M1X target corridor is calculated on the assumption that the opportunity cost of holding M1X prevailing in early 1997 was sustainable into the future. If steady economic growth of 2.5 percent at 2 percent inflation and full employment were compatible with a higher opportunity cost, the possibility mentioned in the static calculation, then the target corridor overstates the amount of M1X that the economy can absorb without inflationary pressure.

ployment is probably smaller and the current level of the M1X stock might be inflationary.

Those reservations noted, it is possible to proceed to the second question: How long could M1X continue to grow at recent rates before becoming inflationary? One way of answering this question is to produce an estimate of a growth path — or a growth corridor that allows for various uncertainties about the state of the economy and the responsiveness of M1X demand to changes in real income — for M1X demand, and see for how long recent growth rates would leave M1X inside that safe zone.

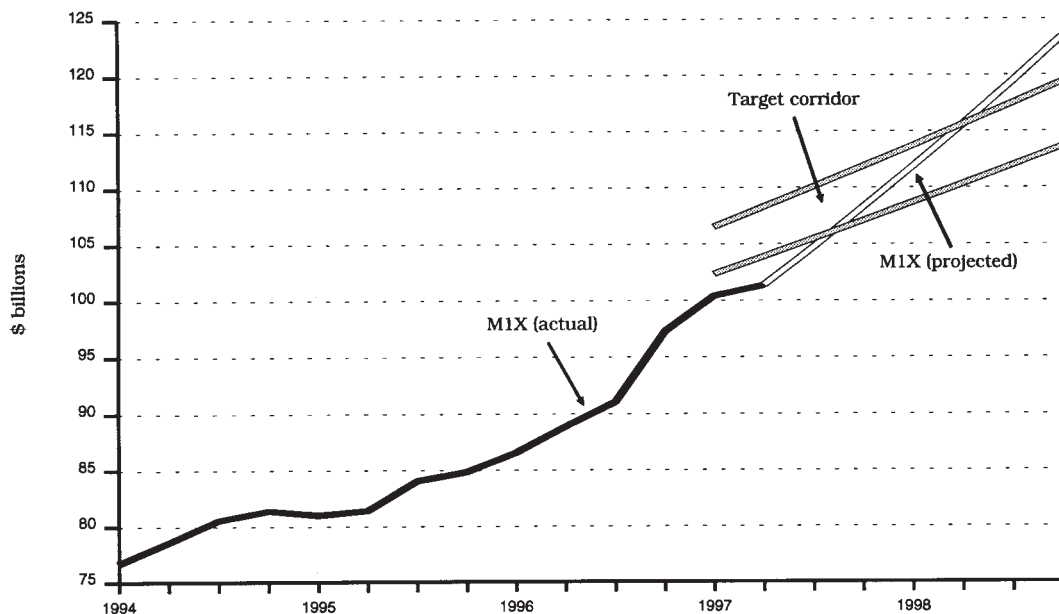
This exercise first requires a starting date — a benchmark period. Ideally, such a period would be one when the demand for and the supply of money were in equilibrium and the economy was already operating at full employment with a stable inflation rate. Money growth within a properly defined corridor starting at such a time would be compatible with maintaining stable inflation at full employment.

There is no such period in recent experience, however, so we started our corridor in the first quarter of 1997, using an estimate of

what the demand for M1X would have been had the price level and the opportunity cost of M1X been at their actual levels, and if real GDP had been at its capacity level in that quarter. (We used an output gap estimate of 2.3 percent in the calculation.) We set the boundaries of the corridor at that date at an arbitrary margin of error of  $\pm 2$  percent of M1X around that estimate. Thereafter, we derived the upper bound of the corridor by assuming that the opportunity cost of M1X remains constant, inflation is steady at 2 percent, capacity output grows at 2.5 percent, and the income elasticity of demand for M1X is 1.83. The lower bound is derived on the same assumptions, except that the income elasticity is 1.61. (See Box 1 for a fuller explanation.)

Figure 5 plots the resulting target corridor for M1X demand from early 1997 through to the end of 1998. Superimposed is a line showing actual M1X to date, along with an extrapolation of its growth rate over the past year (the solid white line). The recent performance of M1X suggests that the Bank of Canada can continue to maintain its recent stance for a

**Figure 5: Target Band for M1X**



short period of time. At current annual growth rates, however, M1X will break through the upper bound of the projected corridor in early 1998. Even disregarding our suspicions of the high estimate of M1X demand's sensitivity to GDP growth, this analysis still implies that the Bank has only about a half-year's breathing space before it should tighten its policy.

### Drawing Conclusions

Using monetary aggregates to assess the stance of monetary policy is always difficult in times of institutional change in the financial sector, and the current juncture is just such a time. Yet, while the results presented in this Commentary do not give a decisive answer to every question of interest, only one important aspect of the situation — that of timing — has been left open to doubt.

### The Promise of Rapid Growth

Our analysis of simple measures of money gaps, which bears on the likely effects of monetary policy given current levels of economic

activity, suggests that Canada is in for a vigorous expansion, regardless of whether M1 or M1X is the focus of attention. Our variations on target growth range analysis, which bear on the stance of monetary policy relative to an informed guess about a capacity level of income and employment, in no way challenge the view that output is now significantly below capacity and that there is considerable room for real growth before inflation becomes a serious threat.

### The Threat of Eventual Inflation

At the same time, however, there is no doubt that recent double-digit rates of monetary expansion, whether measured by M1 or M1X, cannot be sustained indefinitely without sparking renewed inflation. What remains in doubt is how long it will take to reach the danger zone. M1 suggests that inflationary pressures have already been built into the economy, that their effects will be felt next year, and that measures to mitigate these effects should already be in place. M1X, on the other hand, suggests that these pressures will

---

not become a threat before the end of the year, and that the Bank of Canada still has a breathing space within which to act.

If forced to choose, we are inclined to pay more attention to the devil we know: M1. M1X is in principle a cleaner money stock measure than M1, since its interpretation requires fewer ad hoc adjustments for changes in financial institutions; further work on it should yield new insights about the workings of Canadian monetary policy. Before such work is done, however, it would be rash to base policy advice on one set of preliminary results.

In particular, our estimate of the responsiveness of M1X demand to real GDP, which plays a major role in our results, is suspiciously high. Only further investigation will reveal whether this estimate is robust. If it is too high, we are underestimating how much money growth the economy can absorb before it becomes inflationary. This consideration, along with others of somewhat less importance noted in Box 1, suggests that the comforting message yielded by M1X may be a statistical artifact.

## The Need for a Measured Response

None of our results would justify a severe immediate tightening of monetary policy. There is still considerable slack in the economy and the Bank of Canada's anti-inflation credentials are now widely respected. The economy can therefore withstand more short-term monetary expansion than it could have done a decade ago without inflation's taking off again. Although the speed with which M1 and M1X suggest this slack will disappear may produce bottlenecks and temporary wage and price pressures in particular sectors, reining in narrow money growth over the balance of this year should ensure that any such effects are temporary. The only significant difference in the message coming from M1 and that from M1X is that the former suggests that a temporary

C.D. Howe Institute Commentary<sup>®</sup> is a periodic analysis of, and commentary on, current public policy issues.

Kenneth J. Boessenkool is a Policy Analyst at the C.D. Howe Institute; David Laidler is Professor of Economics at the University of Western Ontario and an Adjunct Scholar of the Institute; and William B.P. Robson is a Senior Policy Analyst at the Institute. The text was copy edited and prepared for publication by Barry A. Norris.

As with all Institute publications, the views expressed here are those of the authors, and do not necessarily reflect the opinions of the Institute's members or Board of Directors.

To order this publication, please contact: Renouf Publishing Co. Ltd, 5369 Canotek Road, Unit 1, Ottawa, Ontario K1J 9J3 (tel.: 613-745-2665; fax: 613-745-7660), Renouf's stores at 71<sup>1</sup>/<sub>2</sub> Sparks Street, Ottawa (tel.: 613-238-8985) and 12 Adelaide Street West, Toronto (tel.: 416-363-3171), or the C.D. Howe Institute, 125 Adelaide Street East, Toronto, Ontario M5C 1L7 (tel.: 416-865-1904; fax: 416-865-1866; e-mail: cdhowe@cdhowe.org).

We also invite you to visit the Institute's Internet web site at:

[www.cdhowe.org](http://www.cdhowe.org)

Quotation with proper credit is permissible.

\$6.00; ISBN 0-88806-415-2

bout of higher inflation is very likely, while the latter suggests that it might not even arise.

What is required now, at most, is action to reduce money growth to a rate compatible with long-term healthy expansion with low inflation — say, about 5 percent annually for M1 or about 7 percent for M1X. There is no case for a sudden choking off that could trigger another slump. But the case for inaction also looks weak. With consumer and business confidence now buoyant, the Canadian economy can withstand more increases in the overnight rate along the lines of the quarter-point hike seen at the end of June. If further such hikes are needed to keep the Canadian economy from suffering the effects of too much money, they will be a worthwhile investment in a durable and noninflationary economic expansion.

---

## Appendix

Much econometric work has been done over the years on estimating demand functions for money. Changes in the banking system that affect the continuity of particular monetary aggregates, and the ways that individuals and businesses hold and use their components, complicate these efforts. There are two ways to approach such problems.

One way is to construct monetary series that internalize the consequences of changes in financial structure or money holding, and hence have a greater degree of continuity than traditional aggregates; M1X represents an attempt to do this.

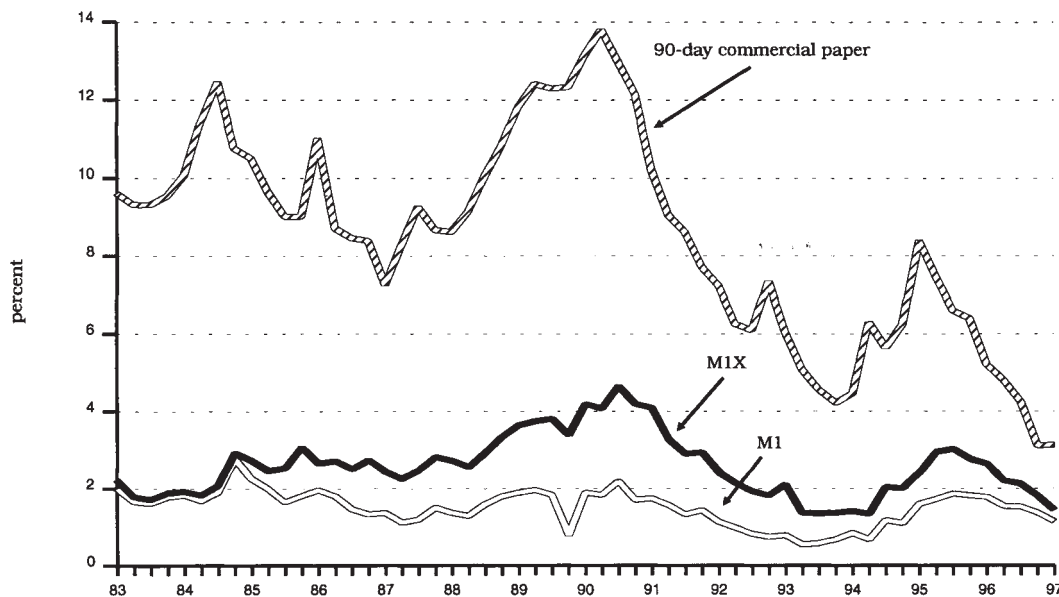
The other way is to add variables to the equation being used to estimate the money demand function in order to capture the changes in question. Analysts often try to deal with such problems by introducing dummy variables, which simply shift the equation at a particular date or over a period of time.<sup>10</sup> Dummies are problematic, however, since they may pick up effects extraneous to the shift the

researcher is looking at, yielding misleading results.<sup>11</sup> It is better, if possible, to use variables that have a more straightforward structural interpretation.

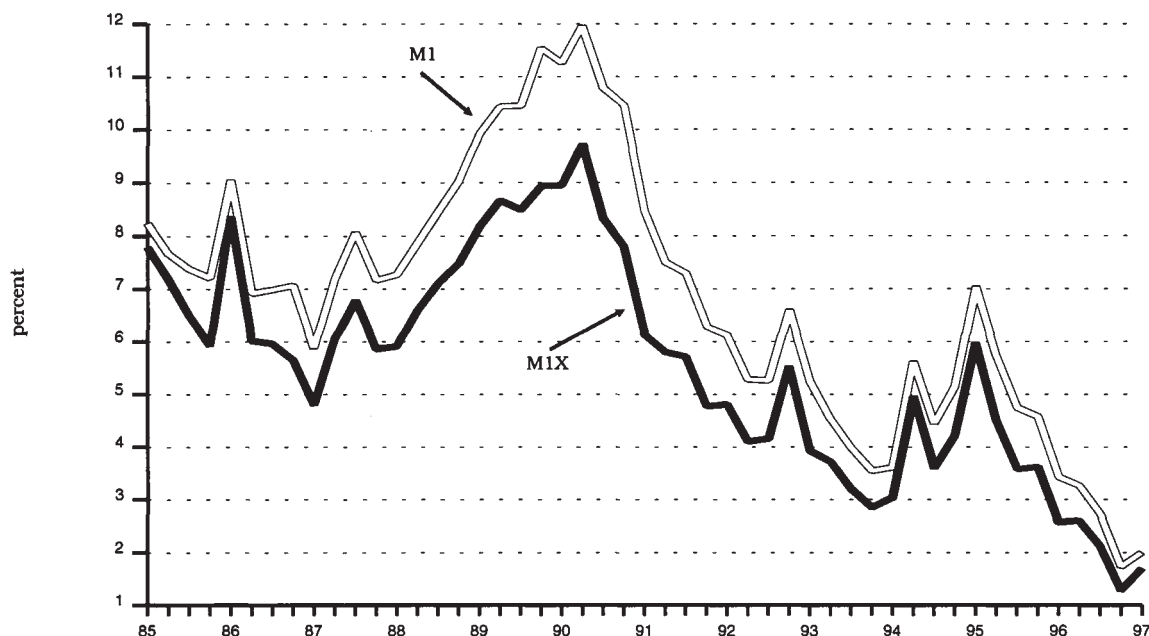
Our development of opportunity cost variables for M1 and M1X represents an attempt to allow for the growth of interest on components of these accounts, especially since the elimination of reserve requirements in 1992 (see Figure A-1). The opportunity cost variables are the difference between the yield on 90-day commercial paper and the average return (total interest paid divided by total amounts outstanding) on the aggregate (Figure A-2). Unfortunately, data on interest paid on demand deposits do not extend back beyond 1983, limiting the estimation period for regressions using this variable.<sup>12</sup>

The removal of reserve requirements also prompted some movement of money back into demand accounts from notice accounts that previously had been subject to differential reserve requirements (and were outside M1).

**Figure A-1: Commercial Paper Rate and Implicit Interest Rates on M1 and M1X, 1983–97**



**Figure A-2: The Opportunity Cost of M1 and M1X, 1985–97**



**Table A-1: Ordinary Least Squares Results for Money Demand Equations**

| Dependent Variable | Constant             | Real GDP             | Opportunity Cost       | Dummy                 | R <sup>2</sup> | Durbin-Watson Test | Augmented Dickey-Fuller Test |
|--------------------|----------------------|----------------------|------------------------|-----------------------|----------------|--------------------|------------------------------|
| Real M1            | -3.737<br>(0.7547)** | 0.7425<br>(0.0573)** | -0.09636<br>(0.0161)** | 0.1354<br>(0.01781)** | 0.960782       | 0.551              | -1.6849                      |
| Real M1X           | -16.29<br>(0.7373)** | 1.722<br>(0.05486)** | -0.139<br>(0.012)**    |                       | 0.979651       | 0.874              | -4.0934**                    |

Notes: Standard errors are in parentheses; \* exceeds the 5 percent and \*\* the 1 percent critical levels; data are from 1993Q1 to 1997Q1; all variables are in natural logarithms; the augmented Dickey-Fuller test is computed on the residuals to three lags.

These changes in reserve requirements roughly overlapped with a period of consolidation in the financial services sector that also shifted some money formerly outside M1 into it. M1X captures these shifts because it includes these other accounts. Assessing the effect of these shifts on M1 requires a dummy variable — zero up to the first quarter of 1992, after which it rises linearly to 1 by the fourth quarter of that year.

We estimated a number of simple ordinary least squares demand equations for M1 and M1X. The results, with some standard tests, are shown in Table A-1. Three features of these results deserve comment.

First, although the Durbin-Watson statistics show evidence of serious autocorrelation, the augmented Dickey-Fuller test on the residuals suggests that the residuals are stationary — a judgment confirmed by the similar

---

long-run coefficients we obtained from regressions using a one-period lagged dependent variable and using first differences.

Second, both M1 and M1X measure transactions-oriented money. Both theory and evidence suggest that the income elasticity of demand for transactions balances should be less than one — in some models, around one-half. Our estimate of 1.72 for the income elasticity of M1X demand therefore seems implausibly high. Arithmetically speaking, it is probably a result of the rapid growth of non-personal business chequing accounts in the 1980s, which our equation seems to have attributed in part to real income growth. We may have omitted from our equation some other factor responsible for this rapid growth, biasing upward our estimate of real M1X's income elasticity. This matter needs more investigation. As we explain in the text, this point is important when it comes to assessing M1X's message about the current thrust of monetary

policy. Pending further work on the issue, it should give rise to a degree of skepticism about what M1X seems to be saying at present.

Third, after experimenting with equations involving both natural and logarithmic values for the variables measuring the opportunity costs of holding M1 and M1X, we found that the log form yielded more satisfactory results. This constant elasticity specification implies much greater responsiveness of money demand to changes in opportunity cost when the opportunity cost is, as now, already low. It is noteworthy that, in basing our conclusions about the current stance of monetary policy on a demand equation of this logarithmic form, we have made an assumption that is particularly generous in allowing for the effects of recent declines in interest rates on the demand for money. Equations using natural values for the opportunity cost variables would yield estimates with more alarming implications for the inflationary impact of recent money growth.

---

## Notes

- 1 See K.J. Boessenkool, D.E.W. Laidler, and W.B.P. Robson, *Devils in the Details: Improving the Tactics of Recent Canadian Monetary Policy*, C.D. Howe Commentary 79 (Toronto: C.D. Howe Institute, April 1996).
- 2 The impact of changes in real GDP on the demand for real money balances need not be proportional, as is explained later; this is one reason that the analysis in this section is only a first step.
- 3 Growth is the year-over-year change in real GDP per person of labor force age.
- 4 For previous investigations along these lines, see D.E.W. Laidler and W.B.P. Robson, *Money Talks — Let's Listen!*, C.D. Howe Institute Commentary 26 (Toronto: C.D. Howe Institute, January 1991); *idem*, *Don't Break the Bank! The Role of Monetary Policy in Deficit Reduction*, C.D. Howe Institute Commentary 66 (Toronto: C.D. Howe Institute, February 1995), especially box 1; and Boessenkool, Laidler, and Robson, *Devils in the Details*.
- 5 See D.E.W. Laidler and W.B.P. Robson, "The Bank of Canada and the Economy: Has the Referee Put Away the Whistle?" *Background* (C.D. Howe Institute), February 13, 1997.
- 6 Gordon Thiessen, "Monetary Policy and the Prospects for a Stronger Canadian Economy" (notes for remarks by the Governor of the Bank of Canada, Ottawa, March 21, 1997), p. 5.
- 7 *Ibid.*
- 8 See D.E.W. Laidler and W.B.P. Robson, *A Rough Re-entry: A Comment On Recent Bank of Canada Policy*, C.D. Howe Institute Commentary 34 (Toronto: C.D. Howe Institute, November 1991); and *idem*, *Re-entry in Progress: Canada's Transition to Noninflationary Growth*, C.D. Howe Institute Commentary 51 (Toronto: C.D. Howe Institute, August 1993).
- 9 In the fourth quarter of 1996, the Bank's model registered a 2.6 percent output gap. Actual growth in the first quarter of 1997 was 0.85 percent, while the Bank's model shows potential output growing at 0.58 percent per quarter. These figures suggest an output gap of 2.3 percent in the first quarter of 1997.
- 10 Following C. Freedman ("Financial Innovation in Canada: Causes and Consequences," *American Economic Review* 58 [3-4]: 101-106), most work at the Bank of Canada uses a dummy to proxy these changes in M1 demand equations. See, for example, F. Caramazza and C. Slawner, "The Relationship between Money, Output and Prices," Bank of Canada Working Paper 91-4 (Ottawa: Bank of Canada, 1991); and S. Hendry, "Long-Run Demand for M1," Bank of Canada Working Paper 95-11 (Ottawa: Bank of Canada, 1995).
- 11 The common practice of introducing a step dummy beginning in the final quarter of 1980 to proxy for the banking changes, for example, juxtaposes the dummy with a peak in interest rates. If the dummy picks up some of the effects of the subsequent interest rate decline, estimates of the effects of both the structural change and interest rate movements will be biased.
- 12 Other deposit rates can be used as proxies. Co-integration analysis using these data suggests that M1X responds less than does M1 to changes in interest rates. Interestingly, these M1X demand equations are more stable than their M1 counterparts, requiring no dummy variable for the early 1980s. Given that the 1979-83 period was characterized by large interest rate movements and important institutional changes, however, conclusions based on constructed data must be cautious ones.



---

---

---

## **Recent C.D. Howe Institute Publications**

- Stein, Janice Gross, David R. Cameron, and Richard Simeon. *Citizen Engagement in Conflict Resolution: Lessons for Canada from International Experience*. C.D. Howe Institute Commentary 94 (June 1997). 36 pp.; \$6.00. With Alan Alexandroff; also available in French.
- Pesando, James E. *From Tax Grab to Retirement Saving: Privatizing the CPP Premium Hike*. C.D. Howe Institute Commentary 93 (June 1997). 20 pp.; \$6.00.
- Scarth, William. *A Job-Creation Strategy for Governments with No Money*. C.D. Howe Institute Commentary 92 (April 1997). 20 pp.; \$6.00.
- Schwanen, Daniel. *A Matter of Choice: Toward a More Creative Canadian Policy on Culture*. C.D. Howe Institute Commentary 91 (April 1997). 36 pp.; \$6.00.
- Boessenkool, Kenneth J. *Back to Work: Learning from the Alberta Welfare Experiment*. C.D. Howe Institute Commentary 90 (April 1997). 32 pp.; \$6.00.
- Schwanen, Daniel. *Trading Up: The Impact of Increased Continental Integration on Trade, Investment, and Jobs in Canada*. C.D. Howe Institute Commentary 89 (March 1997). 32 pp.; \$6.00.
- Laidler, David, ed. *Where We Go from Here: Inflation Targets in Canada's Monetary Policy Regime*. Policy Study 29 (March 1997). 300 pp.; \$19.95.
- Robson, William B.P. "Ottawa's Incredible Disappearing Act: Canadians Pay Billions More in Tax than the Budget Shows, and the Gap Is Growing." Background (C.D. Howe Institute), March 13, 1997. Free of charge.
- Gibbins, Roger. *Time Out: Assessing Incremental Strategies for Enhancing the Canadian Political Union*. C.D. Howe Institute Commentary 88 (February 1997). 28 pp.; \$6.00. With Katherine Harmsworth.
- Laidler, David E.W., and William B.P. Robson. "The Bank of Canada and the Economy: Has the Referee Put Away the Whistle?" Background (C.D. Howe Institute), February 13, 1997. Free of charge.
- Slater, David W. *The Pension Squeeze: The Impact of the March 1996 Federal Budget*. C.D. Howe Institute Commentary 87 (February 1997). 32 pp.; \$6.00.
- Boessenkool, Kenneth J., and William B.P. Robson. *Ending the Training Tangle: The Case against Federal-Provincial Programs under EI*. C.D. Howe Institute Commentary 86 (February 1997). 16 pp.; \$6.00.
- Lipsey, Richard G. *Economic Growth, Technological Change, and Canadian Economic Policy*. *Bene-factors Lecture, 1996* (November 6, 1996). 87 pp.; free of charge.
- Nakamura, Alice. *Employment Insurance: A Framework for Real Reform*. C.D. Howe Institute Commentary 85 (October 1996). 12 pp.; \$6.00.
- Richards, John. *Language Matters: Ensuring That the Sugar Not Dissolve in the Coffee*. C.D. Howe Institute Commentary 84 (October 1996). 44 pp.; \$6.00.
- Sauvé, Pierre, and Daniel Schwanen, eds. *Investment Rules for the Global Economy: Enhancing Access to Markets*. Policy Study 28 (September 1996). 332 pp.; \$19.95.
- Mintz, Jack M., and James E. Pesando, eds. *Putting Consumers First: Reforming the Canadian Financial Services Industry*. Policy Study 27 (September 1996). 104 pp.; \$14.95.
- Iacobucci, Edward. *Value for Money: Executive Compensation in the 1990s*. Observation 41 (September 1996). 178 pp.; \$14.95. With Michael J. Trebilcock.
- Monahan, Patrick J., and Michael C. Bryant. *Coming to Terms with Plan B: Ten Principles Governing Secession*. C.D. Howe Institute Commentary 83 (June 1996). 56 pp.; \$9.00. With Nancy C. Coté.
- Schwanen, Daniel. *Drawing on Our Inner Strength: Canada's Economic Citizenship in an Era of Evolving Federalism*. C.D. Howe Institute Commentary 82 (June 1996). 20 pp.; \$6.00.
- Howse, Robert. *Securing the Canadian Economic Union: Legal and Constitutional Options for the Federal Government*. C.D. Howe Institute Commentary 81 (June 1996). 20 pp.; \$6.00.
- Boessenkool, Kenneth J. *The Illusion of Equality: Provincial Distribution of the Canada Health and Social Transfer*. C.D. Howe Institute Commentary 80 (June 1996). 24 pp.; \$6.00.
- Horstmann, Ignatius J., C. Frank Mathewson, and Neil C. Quigley. *Ensuring Competition: Bank Distribution of Insurance Products*. Observation 40 (May 1996). 110 pp.; \$12.95.