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Money Demand in Canada

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Abstract

The pace of financial market innovation in Canada quickened in the past decade or so with implications for the empirical relationships between the various monetary aggregates and other economic variables. Against this background, this paper, using an error correction formulation, presents new estimates of the demand functions for real M1, M2, and M2+ balances and concludes that while some reasonable well-behaved money demand functions exist, the interpretation of some of the variables, notably the Canadian Savings Bond variable, is open to question. The total interest elasticities of demand (i.e., including the own rate elasticity) are close to zero raising monetary management questions.

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I. Introduction

In November 1975 the Bank of Canada began to set explicit targets for the narrow monetary aggregate, M1. 1/ Toward the end of the 1970s and into the early 1980s, however, the relationship between M1, nominal GDP, and interest rates became increasingly unstable, reflecting a pickup in the pace of financial market innovation in response to high (and rising) rates of inflation and interest. As a result, the Bank of Canada in late 1982 announced that it no longer had a target for M1.

In the wake of these developments, the Bank of Canada examined the possibility of monitoring M1A, an alternative aggregate which, by being defined to include some interest-bearing deposits, accommodated to a degree some of the factors responsible for the unstable behavior of M1. However, although this aggregate was initially well behaved in the sense that its actual growth appeared to be consistent with a stable underlying demand function, subsequent financial innovations resulted in a breakdown in that relationship also. 2/ More recently, attention has focused on monitoring the M2 and M2+ aggregates which are considered to be sufficiently broad to be largely unaffected by the continuing process of financial innovation. However, to this point the intent appears to be to use these broader aggregates as indicative policy guides rather than as a basis for a return to formal monetary targets. 3/

The purpose of this paper is to discuss and evaluate the extent and nature of the changes in the empirical relationships between the various monetary aggregates and other economic variables. The focus will be limited to a consideration of money-demand models. Specifically, illustrative regression equations of the demand for real M1, M2, and M2+ balances, respectively, will be developed to highlight the main issues. The principal conclusion is that, while there is evidence that some reasonably well-behaved money demand functions do exist, both the interpretation of the role of some of the variables in those functions and the appropriate specification of the functions may still be open to

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1/ M1 consists of currency and net demand deposits (i.e. demand deposits net of private sector float); M1A consists of M1 plus nonpersonal notice deposits and daily interest checkable accounts (DICAs); M2 consists of M1 plus personal savings deposits and nonpersonal notice deposits; M2+ consists of M2 plus deposits of trust and mortgage loan companies and deposits and shares at caisses populaires and credit unions.

2/ The IMF staff's earlier work showed that although the simulated values of M1A tracked actual values fairly closely over the four-year period ended in September 1983, the apparent stability of demand for M1A may have been the result of offsetting though unrelated shifts in its major components, specifically in personal and nonpersonal deposits. See Appendix V to the recent economic developments paper to the 1983 Canadian Article IV consultation (SM/84/9).

3/ See Crow (1988).

question. While the existence of stable demand functions is not the only precondition for a possible return to monetary targeting, any uncertainty concerning the behavior of those demand functions would suggest the need for caution in reintroducing formal targets.

II. Background

1. Structural changes affecting the behavior of monetary aggregates

The major structural changes in the Canadian financial sector over the past decade or so that have important implications for the behavior of monetary aggregates can be classified by whether their primary impact has been felt by households or corporations. 1/ Concerning households, the first structural change of note concerned the introduction of daily interest savings accounts in 1979. Prior to the introduction of these accounts, the Canadian chartered banks paid interest on the basis of the minimum balance held in the account over the calendar month. The net effect of the introduction of these new accounts was to provide an increased incentive for households to economize on their M1 holdings.

The daily interest savings accounts could not easily be used for transactions purposes. However, starting in 1981, "all-in-one" accounts emerged, combining elements of both the daily savings accounts and personal checking accounts. The result was the daily interest checking account (DICA) which, because it is officially a "notice" rather than a demand deposit, is not included in M1.

The high interest rate (and inflation rate) environment Canada experienced in the late 1970s and early 1980s provided a major incentive for the development of these financial innovations, as households became increasingly aware of the opportunity cost of holding their assets in noninterest-bearing accounts. At the same time provision of these accounts was facilitated by advances in information technology.

As regards the financial innovations affecting corporations, 2/ the banks started to offer cash management services to large firms during 1976-77, and this was followed in the early 1980s by the spread of such services to smaller firms. These facilities provided profitable overnight use of surplus funds, e.g., through investments in overnight

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1/ This is not to say that important structural changes have been limited to the past decade. For example, the 1967 revision of the Bank Act had removed ceilings on administered rates in Canada, thereby allowing the banking system to respond more flexibly to changing market circumstances. However, the pace of financial innovation in recent years appears to have been particularly rapid. This part of the discussion follows Freedman (1983).

2/ See Boothe and Poloz (1988).

money-market instruments, given standing instructions by the relevant corporations concerning the disposition of those funds.

It may be noted that, in contrast to recent experience in the United States, financial innovations in Canada did not need financial deregulation but instead occurred spontaneously in response to changes in the market environment. 1/ As a result, these financial changes have tended to be continuous rather than discrete, particularly so in the case of innovations in corporate cash-management techniques. This has obvious implications for how the pace of financial change is captured within estimated money demand functions. 2/

2. Recent velocity behavior

To illustrate the impact of the recent financial innovations in Canada on the behavior of the monetary aggregates, and to set the stage for the discussion on money demand equations, Chart 1 presents income-based (GDP) measures of velocity for M1, M2, and M2+, respectively. M1 velocity has followed a rising trend with the trend becoming more pronounced, as expected, in the late 1970s, when the pace of financial innovation quickened in response to rising rates of interest and inflation, encouraging households and corporations to economize on their transactions balances.

If the only structural influence on the monetary aggregates in recent years had been the effect of financial innovation in causing individuals and corporations to shift from transactions balances to interest-bearing deposits then presumably the broader monetary aggregates, which are defined to include such deposits, would have relatively stable velocity measures. This has not been the case. M2 velocity, which showed no discernable trend in the first half of the 1970s, declined significantly between 1977 and 1983, a period of pronounced financial innovation. This decline is consistent with portfolio shifts into the interest-bearing components of M2 from assets outside M2 and suggests that factors other than those associated with the decline in the share of M1 balances may have been at work.

The velocity of M2 subsequently increased sharply in the period 1983-84, a period when the financial holdings by the public included in the broad aggregates declined significantly relative to total spending. This has come to be known as the "consolidation period." While this

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1/ This difference may not be crucial from a monetary policy perspective, since, irrespective of whether deregulation has a role to play in accommodating financial innovation, velocity measures are likely to be affected in a manner which is difficult to predict.

2/ For example, see Boothe and Poloz (1988), op. cit., who use a continuous time trend rather than a discrete dummy variable to capture the impact of the spread of corporate cash management techniques on money demand.

velocity behavior is not fully understood, it appears to have been the result of households reducing their liquid assets generally in order to pay down their debts in the post-recession period. Since 1984, the trend in M2 velocity became negative again. However, there was a subsequent upturn in 1987 which appears to have been at least in part due to a particularly large sales campaign for Canadian Savings Bonds (CSB). 1/

As can be seen by comparison, the velocity of M2+ has behaved in a broadly similar fashion to that of M2.

It is also clear from Chart 1 that all three velocity measures exhibit substantial volatility in the short run. Since the purpose of this paper is to consider the stability of estimated money demand functions, accounting for this short-run volatility is important. Section III below on money demand equations will address this issue.

3. The information content of monetary aggregates

As final background to the discussion of money demand equations, reference should be made to a couple of papers that have been completed recently within the Bank of Canada in which the "information content" of a broad range of monetary and credit aggregates is examined. 2/ In essence, this approach involves searching for empirical regularities on both a contemporaneous and a leading basis between the various aggregates and macroeconomic variables such as nominal spending, output, and prices. 3/ Concerning the monetary aggregates, Hostland et al. test for the information content of 46 measures of the money supply. These measures included both conventional (summation) aggregates and superlative (Divisia-type) aggregates based on the chain Fisher Ideal formula, which weighs each component in a given aggregate in light of the "monetary services" that component yields.

The most important conclusions of these papers may be summarized as follows. The best contemporaneous indicator of the growth of nominal spending is the growth of M2+. As potential leading indicators, M1 has the highest information content with respect to nominal spending and output, M2 with respect to prices. The information content of the superlative indices tended to be less than that of the simple-sum aggregates. 4/ The "best" monetary aggregates were consistently superior to the best credit aggregates, though the credit aggregates sometimes add

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1/ The role of CSB campaigns in money demand is discussed more completely below.

2/ Hostland, Poloz, and Storer (1987), and Milton (1988).

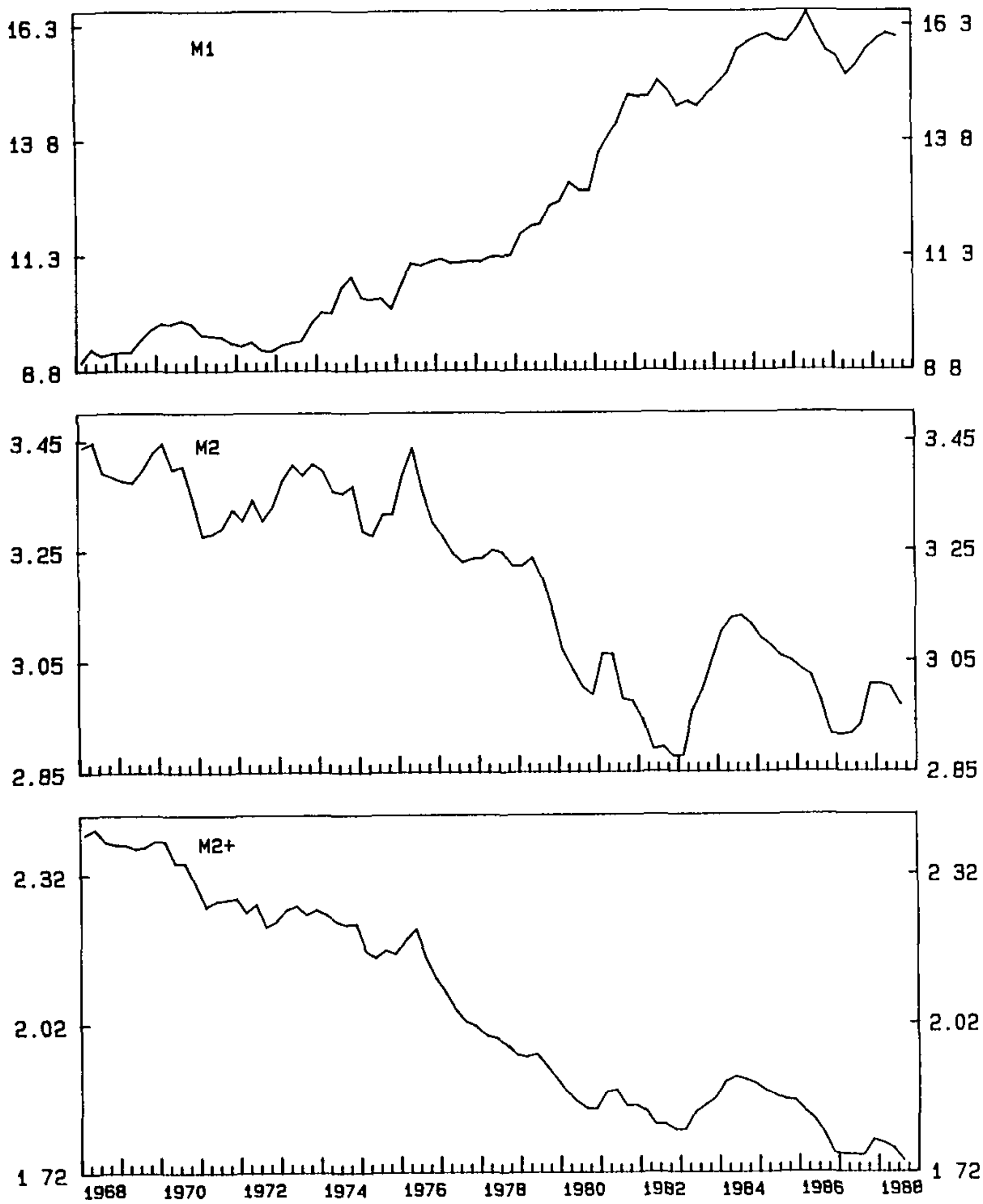
3/ Although the interpretation differs, the mechanics of some of the tests used in these papers are identical to those used when testing for Granger-causality.

4/ The estimates of the superlative indices in these papers were based on the earlier work of Cockerline and Murray, who also reported mixed success. See Cockerline and Murray (1981).

CHART 1

CANADA

VELOCITY OF MONEY[1]



[1]The ratio of the nominal GDP to the relevant monetary aggregate

"information" to equations already containing monetary aggregates. Finally, the authors did not experience much success with monetary aggregates augmented to include the stock of CSBs.

III. Money Demand Equations

This section presents regression equations of the demand for a number of monetary aggregates. The regressions are intended to highlight some of the issues which have already been noted. The underlying money demand functions can be expressed in general form as:

$$M_i = f(P, \frac{Y}{P}, R_i, D_i) \tag{1}$$

where P is a measure of the price level, Y is a scale variable (e.g., national income), R_i refers to a vector of relevant rates of return, and D_i refers to selected dummy variables (discussed below). Assuming that nominal money demand is homogeneous of degree one in prices, equation (1) can be re-expressed in terms of real money demand as:

$$\frac{M_i}{P} = f(\frac{Y}{P}, R_i, D_i) \tag{2}$$

A conventional way of estimating this equation would be to run a regression in the logarithms of these variables, including a lagged value of the dependent variable. This type of formulation--commonly referred to as the Goldfeld specification--has often been motivated by a (generally vague) appeal to portfolio adjustment costs. 1/ A difficulty with that motivation arises from the fact that the estimated coefficient on the lagged value of real money balances typically implies an extremely long adjustment period for which there is no theoretical justification. Alternatively, Goodfriend demonstrates that the Goldfeld specification can be retained if it is interpreted as being derived from a model where true money demand adjusts completely within a period but where the regressors are measured with error. 2/

Rather than being restricted to the relatively simplistic lag structure implied by the Goldfeld specification, this paper will start from a more general class of autoregressive distributed-lag equations, in principle allowing for multiple lagged values of both the dependent

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1/ E.g., Goldfeld (1973). Goldfeld refers to both pecuniary and nonpecuniary costs as preventing the full immediate adjustment of actual money holdings to desired levels. However, the nature of these costs is not specified further.

2/ Goodfriend (1985). See also Ebrill (1988).

and independent variables. 1/ Specifically, a general autoregressive distributed lag model (ADL) is used that yields a static long-run equilibrium solution consistent with the economic theory implied by equation (2) above. The resultant equation is sequentially simplified ("tested down") by dropping insignificant higher-order lags. While not an inevitable outcome of this process, one of the objectives of this testing down procedure in the context of this paper is to see if Canadian data are consistent with an error correction formulation of money demand. (Error-correction models (ECM) are elaborated upon briefly in Annex 1 to the paper. 2/)

The regressions are run in the logarithms of real money balances and the scale variable. This restricts the elasticity of real money demand to changes in the scale variable to be constant, a restriction common to much of the literature. However, this restriction might not be appropriate for the rate of return variables. In particular, in light of the possibility that the interest elasticity of money demand, which appears to have risen in the United States, may also have increased in Canada, a semi-logarithmic specification is assumed for the rate of return variable. 3/

In contrast with the practice at the Bank of Canada, the regressions are run on quarterly rather than monthly data. This choice was made in part with a view to keeping the lag structure manageable.

Turning to the specification of the variables selected, money demand equations are estimated for M1, M2, and M2+, respectively. 4/ This choice of monetary aggregates was suggested by the empirical literature and the current policy discussion. While the earlier literature concluded that narrow aggregates such as M1 were associated with the more stable money demand functions, the more recent experience of the Bank of Canada, as mentioned earlier, has tended to favor the broader

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1/ The approach adopted here is based on the work of Hendry (see, for example, Hendry, Pagan, and Sargan (1984), Hendry and Richard (1982), and Hendry and Starr (1987)).

2/ See also Culbertson (1985).

3/ See Ebrill (1988) op. cit. Freedman (1983) op. cit notes that the high interest rate environment and the observed shifts in M1 demand occurred simultaneously making it difficult to discriminate empirically between the semi-logarithm and double-logarithm specifications. While not bearing directly on the work at hand because their work was based on data through 1979, it may be worth noting that Gregory and McAleer concluded in favor of a double logarithm specification over both the pure linear and the constant elasticity, additive errors (Cobb-Douglas) specifications. See Gregory and McAleer (1983).

4/ Data sources for both dependent and independent variables are cited in Appendix II.

aggregates. 1/ The implicit GDP deflator is used to deflate relevant series.

The choice and specification of the independent variables was also dictated by the experience of others, particularly that of the Bank of Canada. The specific independent variables were selected as follows.

1. Scale variable

While a range of scale variables have been used in the empirical literature, in this paper a current income measure, 2/ specifically, real gross domestic product (designated Y) was selected. Concerning the relative magnitudes of the coefficients that might be expected on this variable in the different regressions, note that, as already observed, M2 and M2+ have both often tended to grow more rapidly than nominal GDP, and M1 less rapidly. Accordingly, it is expected that the estimate of the scale elasticity will increase the broader the aggregate under consideration. 3/

2. Opportunity cost variables

A number of issues have to be considered in selecting opportunity cost variables. First, on the issue of which maturity to use, a short-term interest rate is viewed in this paper as the most appropriate gauge of the opportunity cost of holding money. For this purpose, the 90-day corporate paper rate is used. The variable is designated by RC.

The existing empirical work suggests that the negative interest elasticities are highest in the demand for M1. 4/ One potential explanation for this lies in the fact that, the broader the aggregate under consideration, the greater the proportion of deposits contained in that aggregate which has a positive own rate of interest. The opportunity cost of holding these deposits is the interest rate differential between that own return and money market rates. In Canada, where there traditionally has been no regulatory ceiling set for deposit rates, a rise in money market rates has usually been followed, though with lags, by an increase in deposit rates, with the result that there is only a limited short-run impact on the differential.

1/ Examples of the earlier literature include Clinton (1973) and Foot (1977). Not all of the earlier work favored M1 over broader aggregates. See, for example, Rausser and Laumas (1976).

2/ An alternative would be to use a permanent income measure. However, Clark found that the choice of whether to use a permanent or a current income measure was sensitive to the method selected for calculating permanent income. This suggests that, in the context of the present limited exercise, attempting to use a permanent income variable would raise unnecessarily complex issues. See Clark (1973).

3/ This result has been noted among others by White (1979).

4/ Dufour and Racette (1986).

This suggests that it would be worthwhile to make some attempt to accommodate own rates of return in the money demand equations. Because the bulk of the broader aggregates consist of interest-bearing deposits, it is possible to proxy the rates of return on these aggregates by the interest yields on these deposits. 1/ Specifically, the 90-day time deposit rate at banks, designated RB, is included in both the M2 and M2+ equations. Further, since there is evidence that relative interest rates have a measurable influence on the public's allocation of funds between bank deposits and trust and mortgage loan sector deposits 2/, RT, the 90-day time deposit rate at trust companies, is also introduced into the M2 equation. This variable is not included in the M2+ equation since M2+ includes both assets. 3/

There are indications that changes in the growth of the stock of Canadian savings bonds can affect the demand for various monetary aggregates. Canadian savings bonds are highly liquid assets which, subject to a short holding period at the time of issue, are redeemable at face value with accumulated interest and hence are substitutable for monetary assets. The Bank of Canada emphasizes the impact of this variable on the demand for M2 and M2+ but not for M1. 4/ Based on a general equilibrium point of view, however, in this paper the variable gauging the return to CSBs will be tested in all asset-demand functions.

The discrete nature of the campaigns to sell these assets raises the issue of how to accommodate this variable in estimated money-demand functions. The practice has been to include the real stock of Canadian savings bonds as the relevant argument in money demand functions. That practice is followed here. 5/ The variable is designated by CSB.

Some earlier empirical work on money demand tested for the significance of currency substitution possibilities between domestic and foreign currencies. Typically, a variable such as the forward exchange rate (Bordo and Choudhri) or the forward premium (Daniel and Fried) is included to gauge the return to holding foreign money. 6/ The results of this work are mixed. Bordo and Choudhri find no evidence for significant currency substitution effects, while Daniel and Fried argue that some effects can be discerned when proper account is taken of the impact of Canadian postal strikes on money markets, though even in this case

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1/ Calculating the own rate of return on currency and noninterest-bearing demand deposits raises a number of difficulties and accordingly will not be attempted here. See Ebrill (1988) for a further discussion of this issue in the context of the United States.

2/ Clinton (1974).

3/ The data for RB and RT were provided by the Bank of Canada.

4/ For example, Bank of Canada Review, February 1988, pp. 27 et. seq.

5/ Given the dimensions of the dependent variables, the logarithm of the real stock of these bonds (seasonally adjusted by the X-11 procedure in AREMOS version 1.11) is used in the regressions below.

6/ Bordo and Choudhri (1982) and see also Miles (1978).

the effects appear rather small. Again following the practice at the Bank of Canada, the regressions in this paper do not include variables for currency substitution effects.

Recent work on money demand in the United States has found that proxies for expected inflation can have significant explanatory power. 1/ Expected inflation can affect portfolio allocation across financial assets if nominal interest rates are somewhat rigid in the short run. Further, the tax systems in place in most industrial countries commonly define components of the tax base in nominal terms with the result that changes in inflation can result in reallocations between financial and real assets. 2/ Various measures of expected inflation were tested in the money demand functions, including the actual rate of inflation led one period. The concurrent rate of inflation, measured as the difference of the logarithms of the index of the implicit GDP deflator, was selected. The variable is designated by P^e.

3. Dummy variables

Earlier empirical work found that postal strikes affect money demand by disrupting payment and clearing mechanisms. Accordingly, a series of dummies are included in the regressions to capture this effect. In general, they turned out not to be significant which may be in part due to the fact that the regressions are run on quarterly data. 3/ Where appropriate, the variable is designated as D_i where i refers to the relevant year.

A shift dummy, denoted as DCON, is included in the M2 and M2+ equations to capture the "consolidation period" referred to earlier that occurred in 1983 and 1984. A variable, designated TIME, was entered into the M1 demand equation to capture the trend of innovation in financial markets in the 1980s--this variable was set at zero until 1981Q1, when DICAs became available, and then commences counting upwards one unit per quarter. (TIME was not included in the equations for M2 and M2+ because the changes the variable is intended to gauge are presumably sontained within the broader aggregates.)

A final observation before proceeding to the regressions; while simultaneous equation bias is always a concern when using single-equation OLS, there is some evidence that the bias may not be very severe in the case at hand. 4/

1/ For example, Baba, Hendry, and Starr (1988) op. cit.
2/ On the potential tax wedge between real and financial assets, see Boadway, Bruce, and Mintz (1984); and Boadway and Clark (1986).
3/ It may also be due to the fact that the lag structure associated with a given postal strike may not have been appropriately captured by simple dummies. See Gregory and Mackinnon (1980).
4/ See Poloz (1980).

The following error-correction model of real M1 demand was estimated using quarterly data 1/ The sample period is 1970:III to 1988:II which has been set to exclude the period when exchange rates were fixed since there is evidence to suggest that the exchange rate regime can affect the demand for money. 2/

$$\Delta \ln(M1/P) = \underset{(5.658)}{0.483} - \underset{(-3.372)}{0.364}\, \Delta \ln(M1/P)_{-1} - \underset{(-6.217)}{0.132}\, [\ln(M1/P) - \ln(Y/P)]_{-2} \quad (3)$$

$$- \underset{(-2.871)}{0.003}\Delta RC - \underset{(-9.256)}{0.010}\, RC_{-1} - \underset{(-5.076)}{0.075}\, \ln(CSB/P) + \underset{(3.219)}{0.042}D75$$

$R^2 = 0.664$ $F(6,65) = 21.42$ $\sigma = 0.0127$

$\eta_1(1,64) = 0.87$ 3/ $\eta_2(1,64) = 4.81$ $\eta_3(4,61) = 2.22$

ARCH 4/: $F(4,60) = 1.56$ $F(4,60)$ Critical Value = 2.53

Heteroskedasticity 5/: $F(11,53) = 1.80$

$F(11,53)$ Critical Value = 1.98

1/ All computations used version 5.0 of the PC-GIVE econometrics package of D.F. Hendry and the Oxford Institute of Economics and Statistics.

2/ Sarlo (1979).

3/ η_1 (1,T-k-1) denotes a Lagrange multiplier test for residual serial autocorrelation of order 1 with k regressors, η_2 is for simple fourth-order autocorrelation, and η_3 is for orders 1 through 4. The test is distributed as χ^2 in large samples under the null hypothesis that there is no autocorrelation. However, for finite samples, the F-form reported here, with its critical value at the 0.5 percent level, is preferable as a diagnostic test (Harvey (1981). Note that this test is valid for models with lagged dependent variables.

4/ Engle's "ARCH" test (Auto Regressive Conditional Heteroskedasticity) see Engle (1982).

5/ Due to White (1980).

The t-ratios are in parentheses. This equation satisfies a range of diagnostic tests (at the 5 percent significance level). 1/ To interpret this equation, consider the long-run equilibrium solution:

$$\ln(M1/P) = 3.65 + 1.0 \ln(Y/P) - 0.074RC - 0.566\ln(CSB/P)$$

The income elasticity of real M1 demand is unity, a value suggested by the testing-down procedure. This value is somewhat high, given the possibility of economies of scale in M1 holdings, a transactions medium. 2/ The (competing yield) interest semi-elasticity of M1 demand is

$$E_{M1/P,R} = -0.074R$$

implying an elasticity of 0.74 at an interest rate of 10 percent per annum. This is very high. 3/

The coefficient on the stock of Canadian savings bonds is negative and statistically significant suggesting that those assets may be viewed by wealth holders as substitutes for M1. 4/ Taking the absolute magnitudes of the stocks of M1 and CSB prevailing in the second quarter of 1988, the coefficient value implies that for a $1 increase in the stock of savings bonds, the stock of M1 would decline by $0.40. In light of the Bank of Canada's experience that CSB sales have little impact on M1 demand, this would appear to be a very high value. 5/

Chart 2 tracks the recursive least squares coefficient for the CSB variable to illustrate the behavior of the coefficient over time. According to that chart, until about 1980 this coefficient did not differ significantly from zero but since that time it has become increasingly negative and significant. In fact, one interpretation of Chart 2 is that the coefficient may not be stable over the sample period. 6/

1/ The exception is the value for η_2 which suggests that there may be some fourth-order autocorrelation. (The critical value for η_2 is 3.99.)

2/ However, in this connection it may be worth noting that Gregory and McAleer (1983) recorded long-run income elasticities as high as 0.9.

3/ See, for example, White (1976).

4/ Note that this statement could be consistent with the Bank of Canada's statement that the greatest volume of activity is between CSB and M2 and M2+ rather than M1 given the relative magnitudes of these various assets. For example, at the end of 1987 the stock of M1 was about 75 percent that of the stock of CSB's whereas for M2 and M2+ the ratios were about 380 percent and 640 percent, respectively.

5/ In this connection, it is worth noting that the Bank of Canada, using a different estimating equation, reports a positive and barely significant coefficient for this variable.

6/ Similar analysis of the other coefficients provided no evidence of instability.

Alternatively it could be argued that the recent significantly negative values of the coefficient merely reflect the fact that the estimating equation finally had sufficient information on this variable to permit a more accurate estimate of the true value of the coefficient. At a minimum there is a potential problem for policy makers in that the coefficient value will clearly depend on the sample period selected.

Given the concern with the ability of monetary aggregates to track macroeconomic variables, an important question is whether the equation throws some light on the instability in M1 demand experienced in the late 1970s and early 1980s. In Chart 3, the one-step residuals ($Y_t - X_t'\hat{\beta}_t = \bar{u}_t$ where $\hat{\beta}_t$ is the estimated β using data up to and including t) are graphed together with their current standard errors ($\pm 2\sigma_t$). The chart provides no evidence of a significant deterioration in the goodness of fit of the equation in the early 1980s despite the fact that the variable to capture the effects of continuing financial innovation, TIME, has not been included in this regression (due to its lack of significance). 1/

Chart 3 also shows that in more recent times the residuals have on occasions exceeded the 2σ bounds. However, as can be seen in Chart 4 which presents the performance of one step ahead forecasts for real M1 demand for the period 1986:3 to 1988:2, 2/ the forecasting bounds are never exceeded. Furthermore, a χ^2 test comparing within and post-sample residual variances for parameter constancy cannot reject at the 5 percent confidence level the hypothesis of parameter constancy.

The forecasts presented in Chart 4 are static, however, and it may be argued that dynamic forecasts would provide a more useful indication of the impact of cumulative errors. A dynamic out-of-sample simulation over the period 1986:3 to 1988:2 revealed that while actual nominal M1 stock increased by 20 percent over the period as a whole, forecast nominal M1 stock increased by 25 percent, a significant discrepancy. 3/ (This result could have been inferred from Chart 4 since the equation consistently overpredicted real M1 demand in the most recent three quarters.)

1/ This evidence is supported by a Chow test based on a break in the sample period at 1980:1. The test failed to reject at the 5 percent confidence level the hypothesis of parameter constancy. Note that tests such as the goodness of fit tests used here are not intended to form the basis for policy--95 percent confidence bands are wider than those which would be typically employed in a monetary targeting exercise.

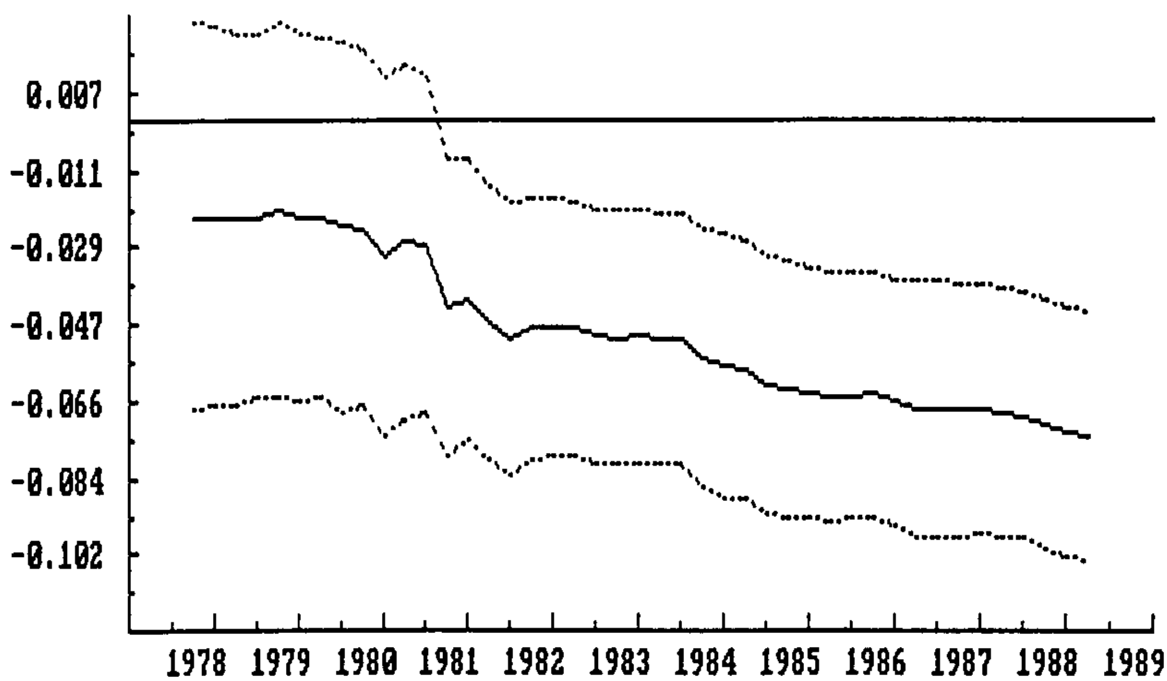
2/ The bounds around the forecast path is set for the 5 percent confidence level. Again, this is a statistical criterion rather than a basis for policy.

3/ The dynamic simulations in this paper were estimated using AREMOS version 1.11. They are expressed in terms of nominal rather than real stocks given the interest being expressed recently in re-examining the role of nominal monetary targets.

Chart 2

CANADA

Real M1 Equation: Bounded Recursive Least Squares Coefficient for ln CSB 1/

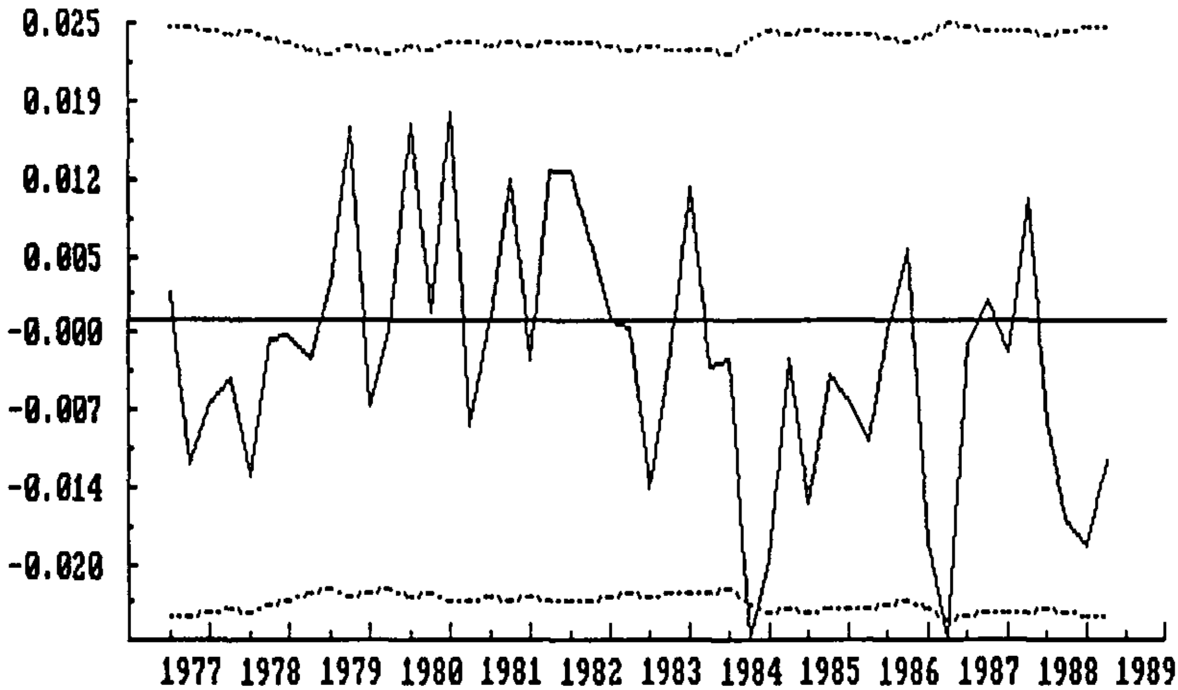


1/ The estimated value of the coefficient of the variable calculated by recursive least squares and bounded by plus or minus two standard errors of that estimated value.

Chart 3

CANADA

Real M1 Equation--Residuals 1/

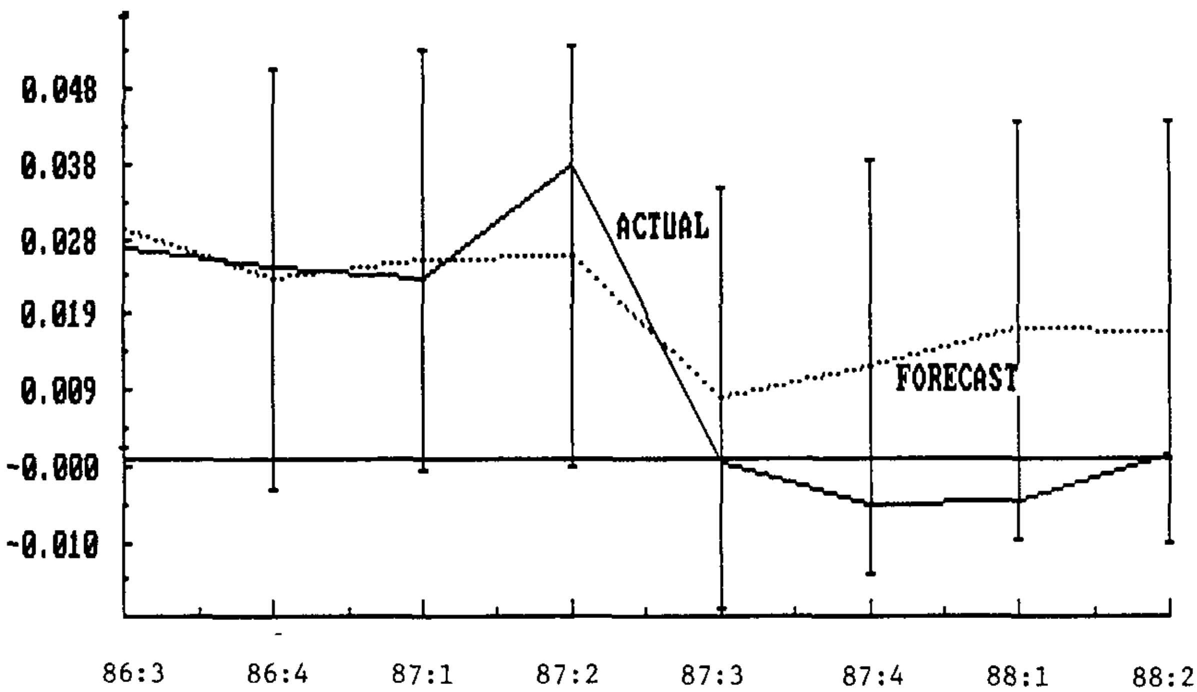


1/ One step residuals ($Y_t - X'\hat{\beta}_t = \bar{u}_t$ where $\hat{\beta}_t$ is the estimated β using data up to and including t) bounded by the current standard errors ($\pm\ 2\ \hat{\sigma}_t$).

Chart 4

CANADA

Real M1 Equation: Forecast Peformance 1/



1/ The error bars show plus or minus two standard errors of the estimated value for the dependent variable, yielding an approximately 95 percent confidence interval for the one-step forecast.

Officials of the Bank of Canada view the role of the CSB variable in equation (3) as coming from a spurious correlation between that variable and the process of financial innovation. Specifically, in their interpretation, the CSB variable might be picking up the impact of the introduction of DICAs. The alternative approach suggested is to introduce into the equation a dummy variable (valued at unity starting in 1983:3) when the growth in popularity of DICAs started surging. Equation (3A) below presents the estimation results of that approach.

$$\underset{}{\Delta \ln(M1/P)} = \underset{(7.804)}{0.396} - \underset{(-3.980)}{0.398}\Delta \ln(M1/P)_{-1} - \underset{(-7.028)}{0.172}[\ln(M1/P) - 0.66\ln(Y/P)]_{-2} \quad (3A)$$

$$- \underset{(-10.258)}{0.008}RC_{-1} + \underset{(2.849)}{0.036}D75 - \underset{(-5.242)}{0.034}D83$$

$R^2 = 0.665$ $F(5,68) = 26.96$ $\sigma = 0.0124$

$\eta_1(1,64) = 0.78$ $\eta_2(1,64) = 10.88$ $\eta_3(4,64) = 3.28$

ARCH: $F(4,60) = 0.13$ $F(4,60)$ Critical Value = 2.53

Heteroskedasticity: $F(5,59) = 0.218$ $F(8,59)$ Critical Value = 2.10

where D83 refers to the suggested dummy variable. There is evidence of autocorrelation, due perhaps to seasonality, since the critical values for η_2 and η_3 are 3.98 and 2.52, respectively. Otherwise the equation is satisfactory on the basis of the diagnostic tests presented.

Considering the long-run behavior implied by this alternative equation, the long-run income elasticity is now about 0.7 and the long-run interest elasticity is now 0.5 at 10 percent interest rate levels. In light of the results reported elsewhere, these values seem more reasonable than those in equation (3). A further statistical mark in favor of the model in equation (3A) is that it encompasses the model in equation (3) by a variety of non-nested encompassing tests. 1/

1/ For example, Ericsson (1983). The encompassing tests were conducted in PC-Give version 5.0.

In other respects, equation (3a) parallels equation (3). Specifically, there is no evidence of a break in the late 1970s 1/ and, concerning its forecasting ability, there is again evidence of a cumulative overprediction of M1 demand in recent quarters. On balance, and in light of the Bank of Canada's practical experience in this area, equation (3A) might be prepared to equation (3).

As regards the demand for the other aggregates, the approach followed in this paper is to estimate the regressions in a form equivalent to that employed in the regression for real M1 demand. A representative equation for the demand for real M2 balances is: 2/

$$\underset{}{\Delta \ln(M2/P)} = \underset{(9.275)}{0.035} - \underset{(-3.99)}{0.100}\,[\ln(M2/P) - 1.18\ln(Y/P)]_{-2} - \underset{(-1.511)}{0.002RC_{-1}} \tag{4}$$

$$+ \underset{(4.093)}{0.010RB_{-1}} - \underset{(-2.511)}{0.008RT_{-1}} - \underset{(-7.061)}{0.009\Delta\dot{P}^{e}} - \underset{(-4.281)}{0.005\,\dot{P}^{e}_{-1}} - \underset{(-4.385)}{0.068\Delta\ln(CSB/P)}$$

$R^2 = 0.622$ $F(7,66) = 15.48$ $\sigma = 0.006$ 1970:1 - 1988:2

$\eta_1(1,65) = 1.24$ $\eta_2(1,65) = 2.45$ $\eta_3(4,62) = 1.29$

ARCH: $F(4,58) = 1.00$ $F(4,58)$ Critical Value = 2.53

Heteroskedasticity: $F(14,51) = 0.74$ $F(14,51)$ Critical Value = 1.89

1/ To gain further insight into the problems experienced by the Bank of Canada with the M1 aggregate at that time, equation (3) was re-estimated for an earlier period (1967 up to 1979) to see if the resulting equation could forecast accurately over the period when the instability occurred. The resulting one-step ahead (static) forecasts did indeed on occasion differ significantly (at the 5 percent confidence level) from the actual outcomes. Furthermore, a dynamic simulation over the period 1980 to 1982 indicated the existence of an increasingly serious cumulative forecast error. It should also be remembered that all these equations are run on quarterly rather than monthly data and that there have been numerous data revisions.

2/ It may be noted that the dummy created to capture the impact of the "consolidation period" on real M2 demand did not perform well. This may be due to the relatively crude manner in which the dummy variable was specified.

The corresponding long-run equilibrium is characterized by:

$$\ln(M2/P) = 0.348 + 1.18\ln Y/P - 0.018RC + 0.101RB - 0.082RT - 0.048\dot{P}^e$$

Equation 4 satisfies standard diagnostic tests based on the summary statistics presented. Concerning the equilibrium solution, the equation implies an income elasticity of real M2 demand of about 1.2, which is consistent with the contrasting behavior mentioned above of M1 and M2 velocities (Chart 1). Because the time period of this regression includes a period of financial innovation, however, it cannot be ruled out that the high recorded income elasticity may only reflect a potentially high degree of correlation between changes in income and the process of financial innovation which has not been adequately captured in this equation. One possible way of capturing the influence of financial innovation within the error-correction model framework used here would be by including a trend term in the equation. This resulted in an income elasticity of 0.6 and a trend unexplained growth rate of 2.3 percent per annum.

The coefficients of the rate of return variables all have the expected signs. The magnitudes of the implied elasticities, however, are large. Perhaps more interesting is the fact that the total interest elasticity (i.e., the net effect on real M2 demand of a simultaneous change of the same magnitude in RC, RB, and RT) is effectively zero. This result seems relatively robust; in the alternative regression with the trend variable included, although the individual elasticities were reduced in absolute value, the total effect remained effectively zero.

The CSB variable affects the dynamics of equation (4) but not its long-run value. This has the plausible interpretation that in the short run the discrete CSB sales campaigns affect real M2 demand--a phenomenon often cited by the Bank of Canada--but over the longer term there are further portfolio reallocations which reverse this affect. On the other hand, this result is not consistent with the fact that CSBs have a long-run impact in the M1 demand equation, suggesting one or other result is in error.

Turning to the behavior over time of the opportunity cost variables, Charts 5, 6, and 7 present the bounded recursive least squares coefficients for RC_{-1}, RB_{-1}, and RT_{-1}, respectively. There are a couple of notable features. First, the own-rate of return coefficient, RB, always significant, shows evidence of instability in the late 1970s, precisely when the wave of financial innovation commenced. This result may reflect progressive changes in the pattern of reactions of the own rate to fluctuations in competing market yields that were precipitated by the wave of financial innovation. Second, the coefficient of the trust and loan deposit variable, RT, became significantly negative during the 1980s perhaps also reflecting the impact of financial innovation. 1/

Though not presented here, the coefficient for the proxy for expected inflation is stable throughout the period suggesting that this variable may well be a valuable indicator of the opportunity cost of holding assets in the form of a broadly defined aggregate such as M2.

The one-step residuals presented in Chart 8 indicate that this equation is--with the exception of one observation in early 1983--by that standard, well-behaved. The one step-ahead forecasts are also well-behaved (Chart 9). 2/ However, the errors, though small, are cumulative. This is confirmed by a dynamic simulation over the period 1986:3 to 1988:2; actual nominal M2 stock increased by 18 percent over tht period whereas the corresponding forecast stock increased only by 14 percent.

Turning now to the demand for real M2+ balances, the following is a representative equation:

$$\Delta\ln(M2+/P) = \underset{(-3.629)}{-0.102} + \underset{(2.770)}{0.174}\Delta\ln(M2+/P) - \underset{(-5.913)}{0.101}[\ln(M2+/P) - 1.68\ln(Y/P)]_{-2} \quad (5)$$

$$+ \underset{(5.230)}{0.004}RB_{-1} - \underset{(-7.565)}{0.005}RC_{-1} - \underset{(-8.969)}{0.008}\Delta\dot{P}^e - \underset{(-5.850)}{0.005}\dot{P}^e_{-1}$$

$$- \underset{(-6.474)}{0.069}\,\Delta\ln(CSB/P) - \underset{(-4.502)}{0.020}\,\ln(CSB/P)$$

$R^2 = 0.774$ $F(8,64) = 27.51$ $\sigma = 0.0044$ 1970:2 - 1988:2

$\eta_1(1,63) = 0.00$ $\eta_2(1,63) = 1.63$ $\eta_3(4,60) = 2.84$

ARCH: $F(4,56) = 0.35$ $F(4,56)$ Critical Value = 2.54

Heteroskedasticity: $F(16,47) = 0.537$

$F(16,47)$ Critical Value = 1.87

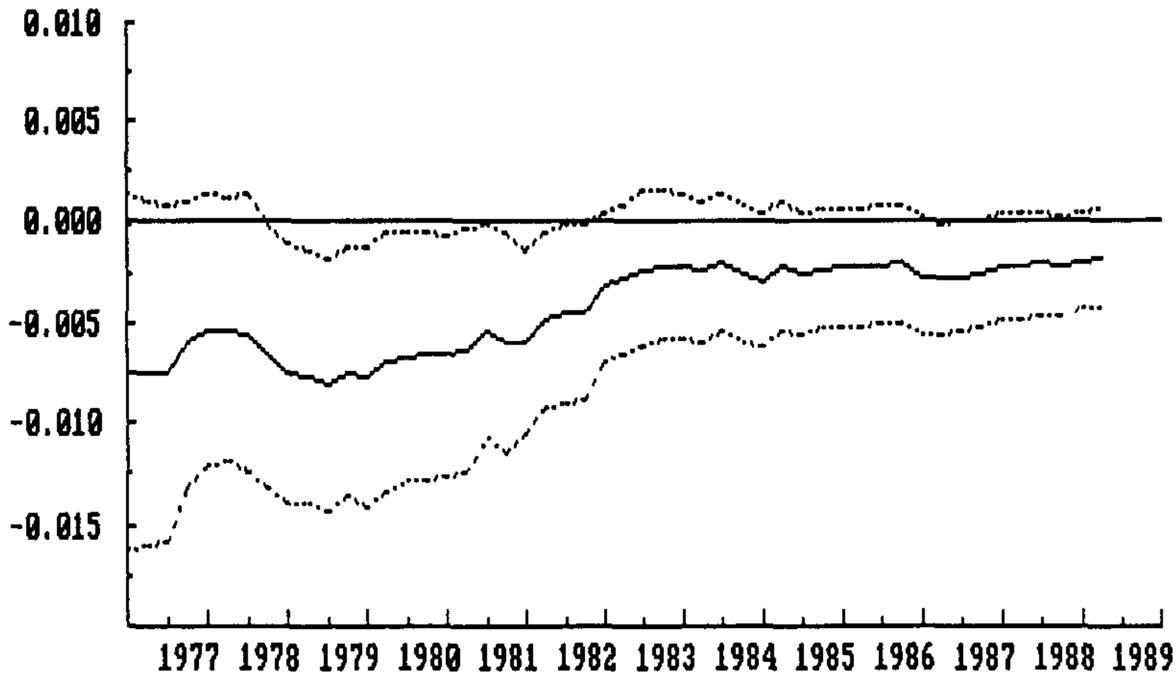
1/ As was the case with Chart 2 above, the significance of this result is open to different interpretations.

2/ Again, the χ^2 test comparing within- and post-sample residual variances cannot reject at the 5 percent confidence level the hypothesis of parameter constancy.

Chart 5

CANADA

Real M2 Equation: Bounded Recursive Least Squares Coefficient for RC_{-1} 1/

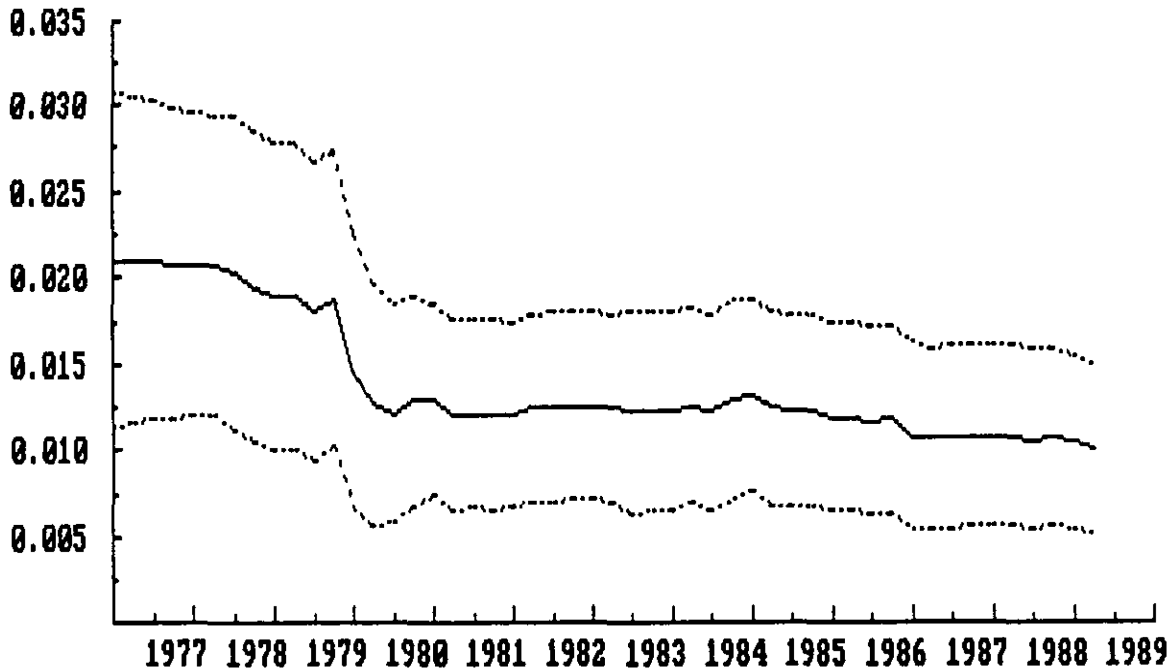


1/ The estimated value of the coefficient of the variable calculated by recursive least squares and bounded by plus or minus two standard errors of that estimated value.

Chart 6

CANADA

Real M2 Equation: Bounded Recursive Least Squares Coefficient for RB_{-1} 1/

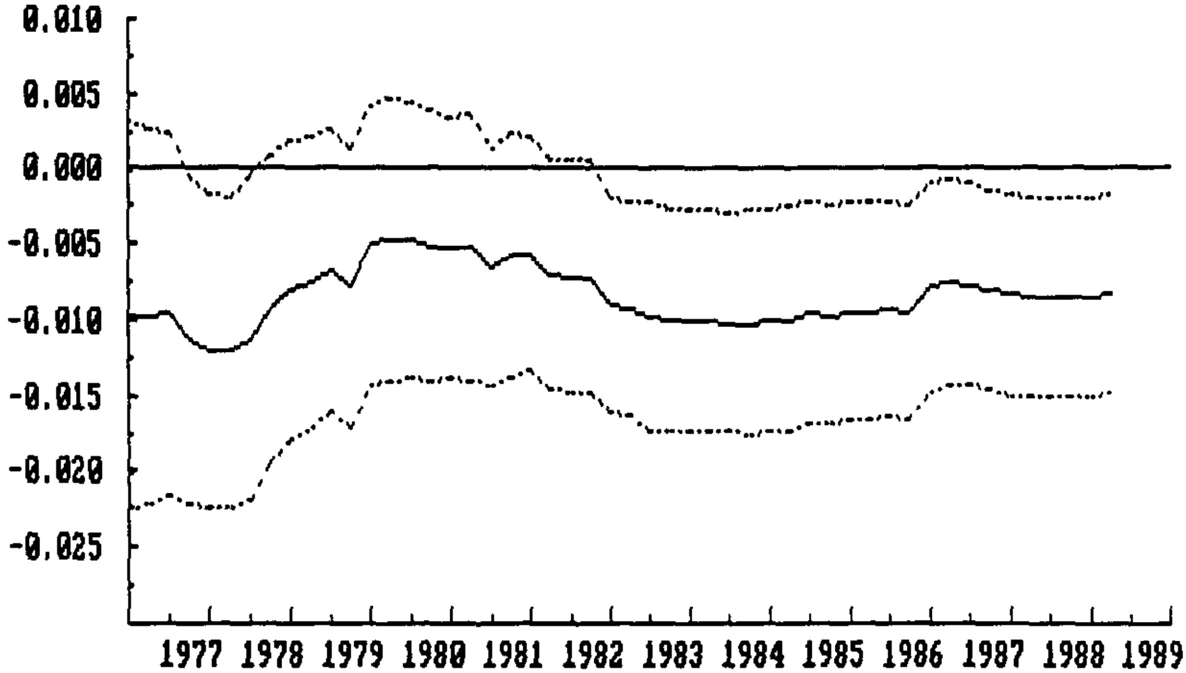


1/ The estimated value of the coefficient of the variable calculated by recursive least squares and bounded by plus or minus two standard errors of that estimated value.

Chart 7

CANADA

Real M2 Equation: Bounded Recursive Least Squares Coefficient for RT_{-1} 1/

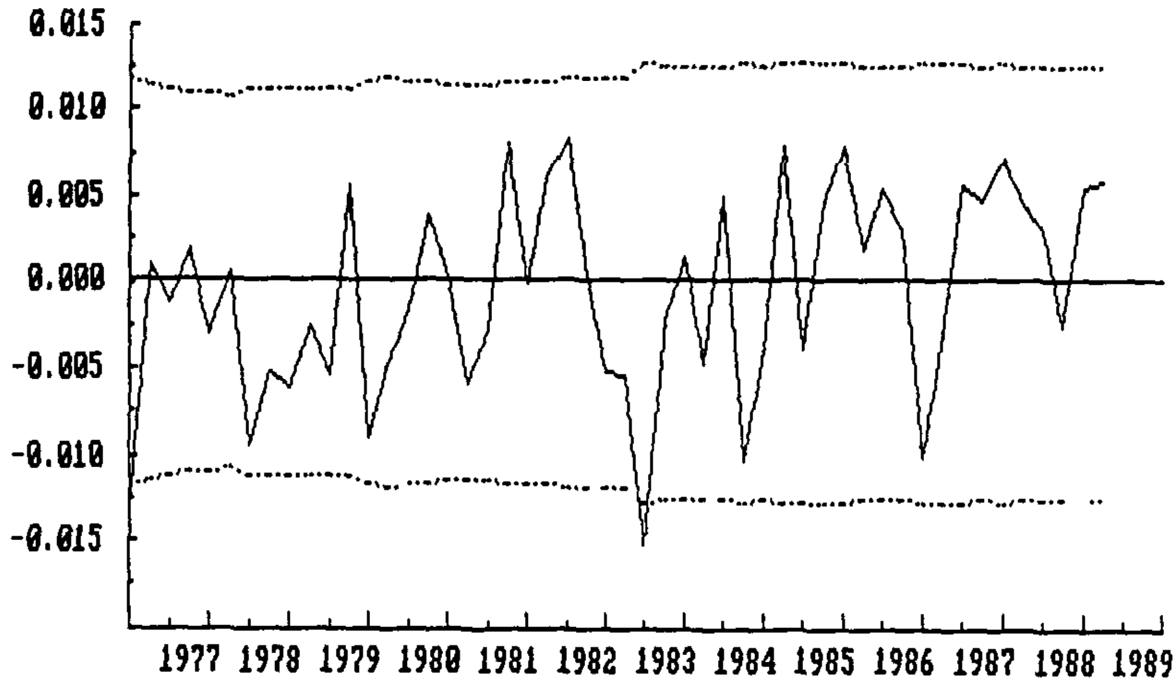


1/ The estimated value of the coefficient of the variable calculated by recursive least squares and bounded by plus or minus two standard errors of that estimated value.

Chart 8

CANADA

Real M2 Equation--Residuals 1/

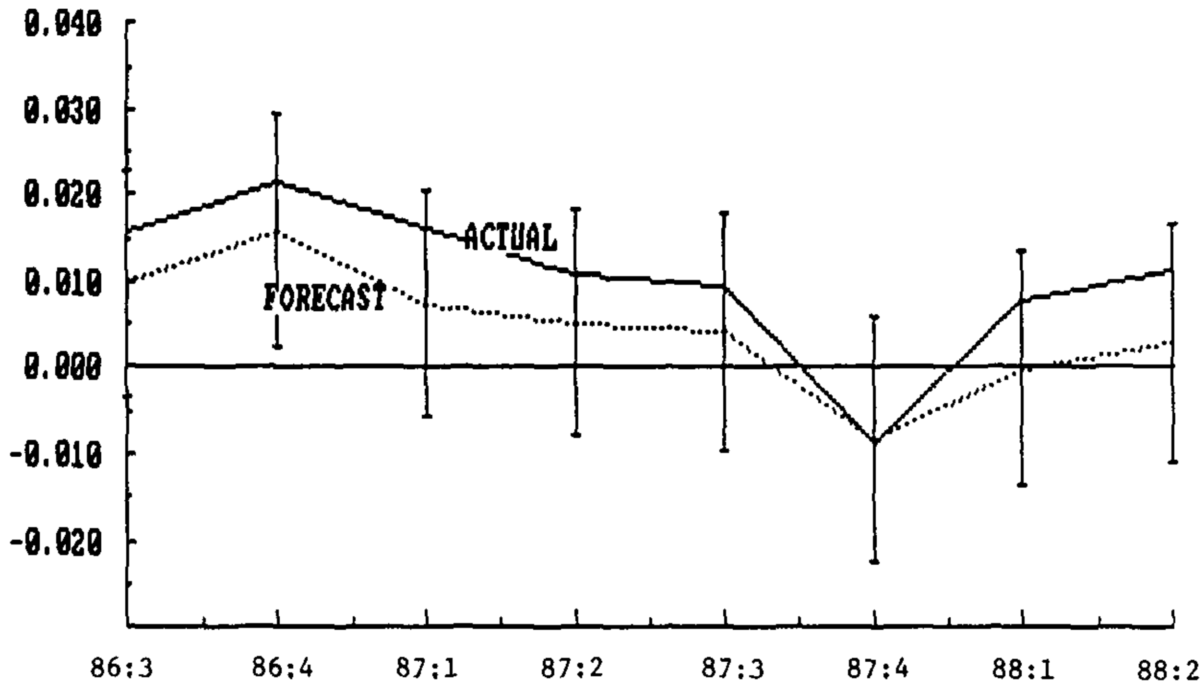


1/ One-step residuals ($Y_t - X_t'\hat{\beta}_t = \bar{u}_t$ where $\hat{\beta}_t$ is the estimated β using data up to and including t) bounded by the current standard errors ($\pm 2\,\hat{\sigma}_t$).

Chart 9

CANADA

Real M2 Equation: Forecast Performance 1/



1/ The error bars show plus or minus two standard errors of the estimated value for the dependent variable, yielding an approximately 95 percent confidence interval for the one-step forecast.

The corresponding long-run equilibrium is:

$$\ln(M2+/P) = -0.965 + 1.681\ln(Y/P) - 0.049RC + 0.041RB - 0.049\dot{P}^e$$
$$- 0.185 \ln(CSB/P)$$

Since its characteristics are quite similar to those of equation (4) above for real M2 demand, the discussion of the details of this equation can be brief. In particular, with the exception of some evidence of autocorrelation given by the portmanteau test η_3 (the critical value is 2.53), the equation satisfies all the selected test statistics. The income elasticity of demand is 1.7 which appears high. This implies that again the scale variable may be picking up an unexplained trend effect. 1/ Finally, focusing on the coefficient values for RC and RB, the total rate of return elasticity is negative, but barely so.

The behavior of the recursive least squares coefficients is broadly similar to that observed immediately above in the case of the real M2 demand equation. The one additional variable to consider is the CSB variable which, in the case of this equation, affects long-run equilibrium demand. The long-run elasticity implies, given the 1988:2 levels of M2+ and CSBs, that for a $1 increase in the stock of savings bonds the stock of M2+ would decline by $1.18. This is an implausible value. Further, as can be seen in Chart 10, the coefficient of this variable is unstable and becomes significantly negative in 1982. This behavior again raises some of the issues already mentioned when the CSB variable was discussed in connection with the real M1 demand equation.

Finally, Charts 11 and 12 present the one-step residuals and one-step ahead forecasts, respectively. 2/ Both are satisfactory. The corresponding out-of-sample dynamic simulation over the period 1986:3 to 1988:2 forecast a 19 percent increase in the stock of M2+ in comparison to the actual increase over that same period of 21 percent, indicating that the equation performs well by that criterion.

To this point the regression equations for individual aggregates have been discussed in isolation. When viewed together, a number of observations can be made.

To begin with a technical but nonetheless an important general point in assessing the econometric results presented above, there is the question of whether the error-correction model (ECM) is a useful

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1/ Interestingly, however, when the regression was re-estimated with a trend term, the trend term was not significant, in contrast with the case of M2 discussed above.

2/ Concerning the latter, the χ^2 test for parameter constancy is again satisfied.

representation of the behavior of money demand. To address this issue, it may be recalled that whether the error correction representation is valid or not depends on whether the speed of adjustment parameter--the coefficient on the error-correction term in the regressions above--is significantly non-zero. In the regressions presented above, the speed of adjustment factors, generally at around 0.1, are low, a result which has also frequently been reported in the partial-adjustment models of money demand. Although the t-ratios indicate that these coefficients differ significantly from zero, that test is biased since, under the null hypothesis of zero values, the model is nonstationary. Further tests are therefore needed.

As discussed in Appendix I below, testing whether the ECM framework is valid is equivalent to testing whether the variables in the relevant regressions are cointegrated. 1/ Accordingly, Augmented Dickey-Fuller tests were run on the residuals of the regressions to test whether the variables are cointegrated. 2/ These tests failed to reject the hypothesis of noncointegration but the results were close to rejection, particularly for M2. Of course, since the power of these tests in small samples is yet to be fully understood, these results should not be viewed as decisive. In this connection it is interesting to note that when the time trend variable was included in the ECM for M2, the speed of adjustment coefficient increased in value from 0.1 to 0.16, a significant improvement.

Other more specific comments on the regressions include the following.

First, a number of the features of the results reported above have also been observed in other studies. For example, the tendency for the (total) interest-rate elasticity to decline as one moves from M1 to the broader aggregates has been noted elsewhere.

Second, this paper took the view that if Canadian savings bonds influence the demand for M2 and M2+, it is reasonable to test whether that influence extends to the demand for M1. The empirical results indicated that the variable to gauge this influence, the stock of CSBs, was significant in some form of equation for all three aggregates. However, on further consideration, the role the variable plays is generally troubling. The long-run elasticity values in both the M1 and M2+ equations are implausibly large. Further, the recursive least squares coefficients are generally unstable in both equations, notably in the early 1980s. While these results may be due to the specific econometric strategy being pursued in this paper, they suggest that care needs to be

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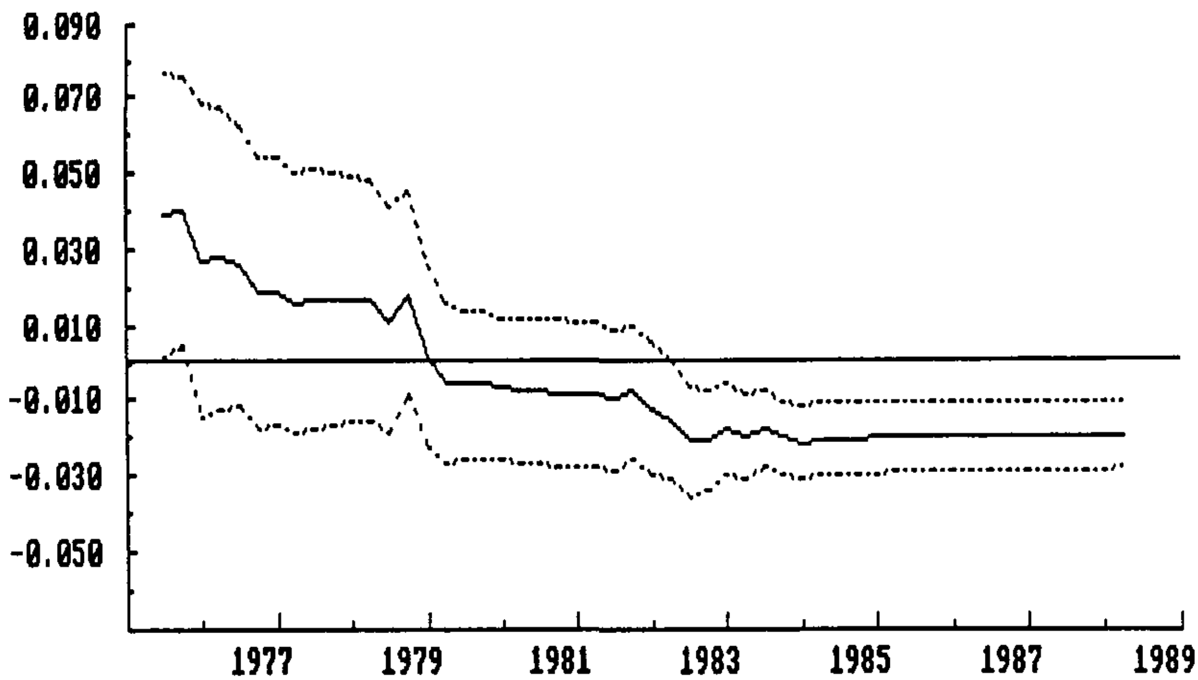
1/ See Engle and Granger (1987). Loosely, the relevant variables are cointegrated when they do not deviate too much from each other over time.

2/ Granger (1986) and Dickey and Fuller (1981).

Chart 10

CANADA

Real M2+ Equation: Bounded Recursive Least Squares Coefficient for ln CSB 1/

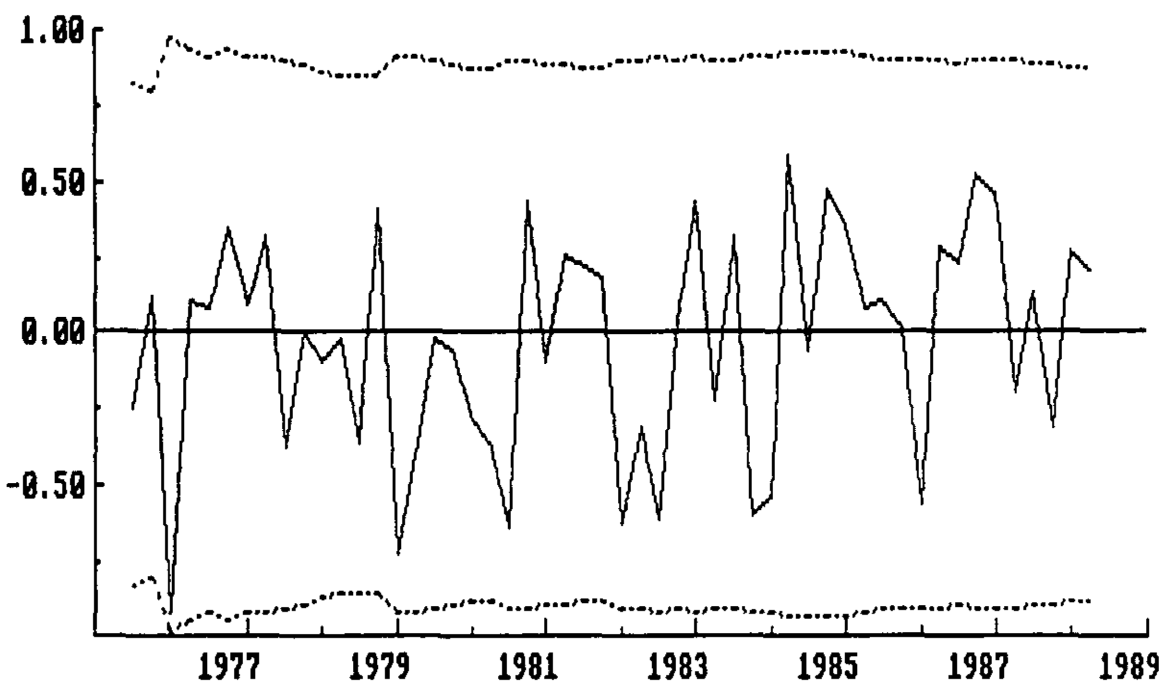


1/ The estimated value of the coefficient of the variable calculated by recursive least squares and bounded by plus or minus two standard errors of that estimated value.

Chart 11

CANADA

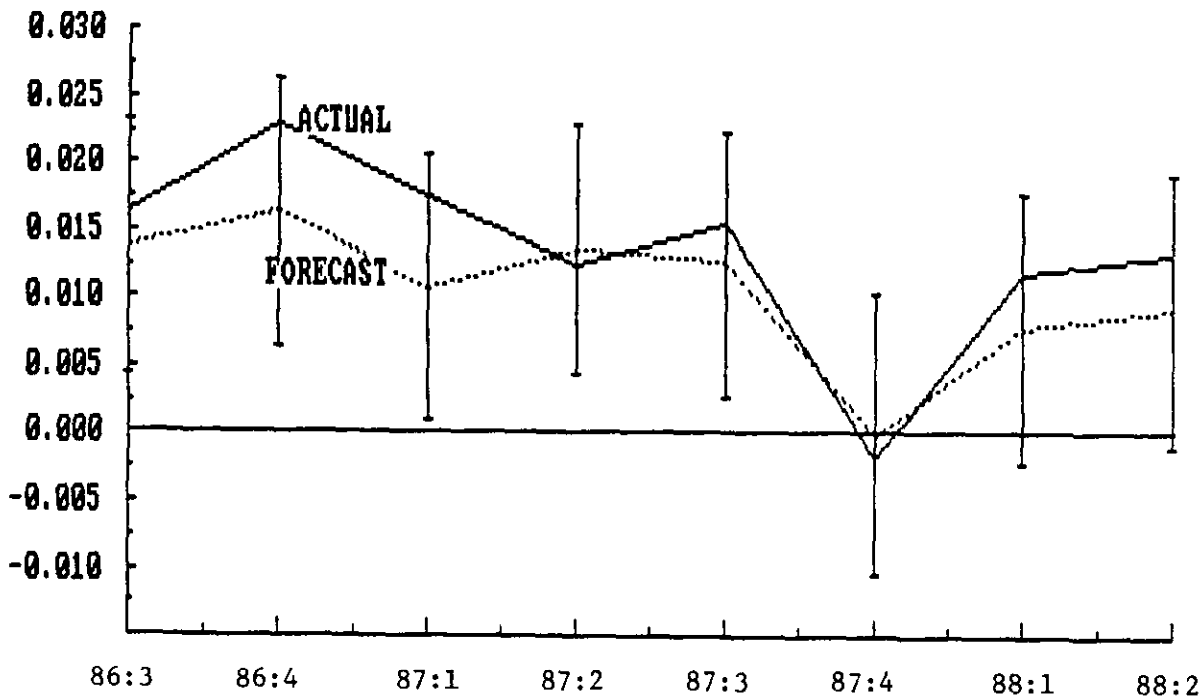
Real M2+ Equation--Residuals 1/



1/ One-step residuals ($Y_t - X_t'\hat{\beta}_t = \bar{u}_t$ where $\hat{\beta}_t$ is the estimated β using data up to and including t) bounded by the current standard errors ($\pm 2\ \hat{\sigma}_t$).

Chart 12

Real M2+ Equation: Forecast Performance 1/



1/ The error bars show plus or minus two standard errors of the estimated value for the dependent variable, yielding an approximately 95 percent confidence interval for the one-step forecast.

taken in interpreting the influence of this variable in all money demand equations, rather than in just the M1 equation.

Third, the ranking and the magnitude of the measured income elasticities are not implausible in light of the velocity behavior displayed in Chart 1. However, as pointed out above, the time period of these regressions includes a period of rapid financial innovation and thus the possibility of high correlation between changes in income and the process of innovation cannot be ruled out. 1/ The potential difficulty this raises is that if the pace of financial innovation were to change then the coefficient on the scale variable might result in inaccurate forecasts. 2/

Fourth, expected inflation, though admittedly crudely calculated, appears to have an important role to play--particularly in the broader aggregates. It may be worth noting that the coefficient of this variable was unaffected by the "consolidation period." In studies for other industrial countries this variable is often rationalized as being a proxy for the relative rates of return on financial and real assets.

Fifth, as already mentioned in the case of the CSB variable, on a number of occasions there is evidence of coefficient instability. Whether this is due to structural shifts or due to the ability of the estimating equations more accurately to estimate a coefficient value as the sample period lengthens is not certain. In either case, however, coefficient variability poses a serious problem for policy makers since the estimated value of relevant coefficients will then depend on the sample period selected.

Sixth, the use of a semi-logarithmic form for the rate of return variables is generally supported by the results. In particular, abstracting from the structural shifts in the values of the coefficients of these variables, the coefficients are otherwise stable over time.

Seventh, when comparing across equations, the broader the aggregate, the smaller is the standard error of the regression. This becomes even more significant when it is recognized that the dependent variable for broader aggregates is larger in absolute value. 3/

1/ It may be noted in this connection that with the exception of the DICA dummy in the M1 equation, the variables introduced to capture that continuing process of change failed the significance tests.

2/ Note that this problem occurs irrespective of whether the process of financial innovation is captured by a trend term or by a scale variable--either way, the prospects for financial innovation are uncertain.

3/ See Dufour and Racette (1986), page 224.

IV. Conclusion

This paper had the limited objective of seeing whether the underlying money demand functions fit well and are stable. The results of that limited exercise suggest that, on balance, the equations seem to have become reasonably stable, with the equations for the broader aggregates fitting somewhat better than that for M1. However, the stability of some coefficients remains in doubt raising questions concerning the predictive value of the equations. In addition, difficulties in interpreting some of the individual regressors raise questions concerning the appropriate specification of the equations.

It must be emphasized that a stable money demand function is a prerequisite for a successful return to monetary targeting but does not of itself indicate that such a return is either desirable or feasible. For example, the magnitudes of the estimated coefficient values is also important. The empirical work above suggested that the total interest elasticities of demand for the broader aggregates are close to zero. This could raise serious problems for the Bank of Canada if interest rates were selected as the control instrument since the Bank would then have to control the spread between own and competing rates of return. That in turn raises the question of the appropriate choice of control instrument or control procedure to implement a targeting policy, a question that raises issues beyond the scope of this paper. 1/

As a final observation, it should also be recognized that, should targets be re-established, there remains the issue of how broad or narrow the target bands should be; in the case of the M2+ equation estimated above, if the target period is one year, the standard error of the regression would suggest bands of about ± 3 1/2 percent. Narrower bands would increase the risk of exceeding the bands for purely random reasons. However, even if the bands are established in light of the available empirical information, there will always be the possibility that the monetary aggregate moves outside its band when all other indicators suggest that there is no need for a policy change or, which is perhaps more serious for the credibility of the targeting exercise, it remains within its band even as all other indicators suggest the need for a change in the stance of policy. These considerations reinforce the need to exercise caution before reintroducing monetry targets.

1/ See, for example Dufour and Racette (1986), Courchene (1979), and White (1979).

Appendix I

Error-Correction Models and Cointegration

As an example of the methodology being employed in this paper, consider a first-order version of an autoregressive distributed-lag equation. 1/

$$Y_t = \beta_0 + \beta_1 X_t + \beta_2 X_{t-1} + \beta_3 Y_{t-1} + \varepsilon_t \qquad (1A)$$

The Goldfeld partial adjustment specification is tantamount to setting $\beta_2 = 0$ to yield

$$Y_t = \beta_0 + \beta_1 X_t + \beta_3 Y_{t-1} + \varepsilon_t \qquad (2A)$$

This may be an unwarranted _a priori_ restriction and, in particular, is not imposed within the error-correction framework. Specifically, the error-correction model (ECM) relaxes this restriction, while continuing to assume the existence of a long-run stable demand function for real money balances, deviations from which encourage adjustments to re-establish equilibrium. Transforming equation (1A) yields:

$$\Delta Y_t = \beta_0 + \beta_1 \Delta X_t + (\beta_2 + \beta_1) X_{t-1} + (\beta_3 - 1) Y_{t-1} + \varepsilon_t \qquad (3A)$$

where Δ indicates a first-difference. This equation can be expressed in an ECM form as follows:

$$\begin{aligned} \Delta Y_t &= \beta_0 + \beta_1 \Delta X_t + (\beta_3 - 1)\left[Y - \frac{(\beta_2 + \beta_1)}{(1 - \beta_3)} X\right]_{t-1} + \varepsilon_t \\ &= \beta_0 + \beta_1 \Delta X_t + (\beta_3 - 1)\left[Y - A\,X\right]_{t-1} + \varepsilon_t, \; A > 0 \end{aligned} \qquad (4A)$$

The term in $(X\text{-}AY)_{t-1}$ is the error-correction term--it measures the "error" in the previous period and agents "correct" their decision about Y_t in light of this disequilibrium. The coefficient on the term, $(\beta_3\text{-}1)$, measures the speed of adjustment. This equation form offers two advantages. By first-differencing, the possibility of running a

1/ For further elaboration, see Gordon (1984).

spurious regression is reduced. Second, since it is not a pure first-difference equation ($\beta_3 \neq 1$), there is a determinate long-run equilibrium solution.

The following describes how ECMs and cointegration are linked, as suggested in the text. 1/

Denote a stationary series as I(0) (integrated of order zero), then another series Z_t, for example, is I(k) (integrated of order k) if $\Delta^k Z_t$ is I(0). (In fact, stationarity is not necessary for a series to be I(0) but stationarity, as found for example when a random walk is first differenced, captures the notion of an integrated series.)

Consider two series X_t, Y_t, both I(1) and having no drift or mean trend. If there exists a constant A, such that

$$Z_t = X_t - AY_t$$

is I(0), then X_t and Y_t are said to be cointegrated. The relationship $X_t = AY_t$ might then be interpreted as the long-run equilibrium with Z_t measuring the extent to which the system is out of equilibrium. This is analogous to the error-correction term above. In that connection, testing to see if the coefficient on the error correction term (the speed of adjustment parameter) is significantly different from zero is equivalent to testing whether the variables are cointegrated--a significantly positive speed of adjustment implies that the system will tend to its long-run equilibrium in response to random shocks, implying that the variables do not deviate much from each other. If, however, the coefficient is not significantly different from zero, then the model does not converge and levels can be permanently affected by the error terms--the variables are not cointegrated.

1/ The following is based on Hendry (1986) and Granger (1986).

Appendix II

Data Sources

The data in the regressions are quarterly and, where appropriate, seasonally adjusted. In those cases where the original series are monthly, quarterly data are derived from three-monthly averages. The following are the source data series where the B- and D- numbers refer to the CANSIM data bank.

M1: Currency and Demand Deposits. Monthly data. B1627

M2: Currency, all checkable notice, and personal term deposits. Monthly data. B1630

M2+: M2 plus deposits at trust and mortgage loan companies, caisses populaires, and credit unions. Monthly data. B1633

RC: 90-day prime corporate paper rate. Monthly data. B14017

CSB: Stock of Canadian savings bonds. Monthly data. B2406

NGDP: Gross Domestic Product at Market Prices. Quarterly data. D20011

GDP: Gross Domestic Product at 1981 prices. Quarterly data. D20031

RB: 90-day time deposit rate at banks. Data supplied by the Bank of Canada.

RT: 90-day time deposit rate and trust and mortgage loan companies. Data supplied by the Bank of Canada.

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