The Quantity of Money
and Monetary Policy

by

David Laidler

Bank of Canada   **Banque du Canada**

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Acknowledgements

Abstract

The relationships among the quantity theory of money, monetarism and policy regimes based on money-growth and inflation targeting are briefly discussed as a prelude to an exposition of alternative views of money's role in the transmission mechanism of monetary policy. The *passive*-money view treats the money supply as an endogenous variable that plays no role in that mechanism. In contrast the *active*-money view, while recognizing money's endogeneity, nevertheless treats it as having causative significance for the behaviour of output and inflation. It is argued that the active view is more plausible, on both theoretical and empirical grounds. It is further suggested that, notwithstanding the effects of institutional change in the Canadian financial system on the stability of relationships involving the quantity of money, the active view implies the desirability of the Bank of Canada's paying more systematic attention than it now does to the behaviour of monetary aggregates, particularly narrow ones, in the design and implementation of monetary policy.

Résumé

Dans cette étude, l'auteur traite brièvement des relations existant entre la théorie quantitative de la monnaie, le monétarisme et les régimes de politique fondés sur la poursuite de cibles en matière d'expansion monétaire et d'inflation, puis il examine différentes hypothèses relatives au rôle de la monnaie dans le mécanisme de transmission de la politique monétaire. Une première école de pensée considère la monnaie comme une variable endogène non causale, c'est-à-dire que l'offre de monnaie ne jouerait qu'un rôle *passif* dans la transmission des effets de la politique monétaire. Selon une deuxième école, même si la monnaie est déterminée de façon endogène, il y aurait une relation significative de cause à effet entre la monnaie d'une part et le comportement de la production et de l'inflation d'autre part, c'est-à-dire que la monnaie jouerait un rôle *actif*. L'auteur soutient que les fondements de cette deuxième école sont solides sur les plans tant théorique qu'empirique. Il fait valoir également que, nonobstant l'incidence des changements d'ordre institutionnel apportés au système financier canadien sur la stabilité des liens relatifs à la quantité de monnaie, le rôle causal que jouerait la monnaie implique que la Banque du Canada devrait suivre de façon plus systématique l'évolution des agrégats monétaires—particulièrement les agrégats au sens étroit—lors de l'élaboration et de la mise en oeuvre de la politique monétaire.

1. Introduction

For nearly eight years, an inflation target, jointly set by the Bank of Canada and the Government of Canada, has anchored Canada's monetary policy. For a period 20 times as long, the quantity theory of money has provided economists with a framework for analyzing the influence of the supply of money on the inflation rate. Even so, the quantity of money plays an ambiguous role in the Bank of Canada's conduct of monetary policy. The Bank has long and consistently made it quite clear that it believes the rate of money supply growth to be crucial for the inflation rate in the long run, and the Bank regularly comments on the behaviour of the narrow M1 and the broader M2 aggregates, not to mention the policy significance of that behaviour, in the *Monetary Policy Report* and in the *Bank of Canada Review*. But the Quarterly Projection Model (QPM), which nowadays provides the analytic background against which Bank policies are designed, includes no variable to represent this crucial aggregate.[1] This paradox is a matter of concern because a strong case can be made that the money supply is not merely the key long-run determinant of inflation in the Canadian economy, but also a strategic variable in the transmission mechanism through which price-level behaviour, and, in the shorter run, income and employment behaviour, are linked to policy actions.

      I shall explore these matters in this paper. I shall begin with a brief account of the quantity theory of money, particularly in its most recent *monetarist* incarnation, and its relationship to the once-popular policy device of gearing monetary policy to the pursuit of money-growth targets. I shall then go on to discuss the fact that a particular view of the role of money in the economy—as a variable that adapts passively to, but has no causative significance for, the behaviour of prices and output—has long been the dominant one in the Bank's thinking. I shall analyze that view at length, arguing that the quantity of money is better regarded as playing an *active* rather than a *passive* role in the transmission mechanism of monetary policy, and that a case for according monetary aggregates a more formal role in the policy framework follows from this position.[2] I shall then discuss some of the practical difficulties of applying these lessons to the actual conduct of policy, and conclude that, even though it would be risky simply to replace the Bank's current policy framework with another in which one or more monetary aggregate plays a key role, there is a strong case to be made for paying more attention to these variables as a complementary source

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1.   For an account of QPM's basic structure, see Poloz, Rose, and Tetlow (1994). For a discussion of the interaction between its structure and the policy formation process, see Duguay and Longworth (1998), part 5.

2.   The terms *active* and *passive* should not be confused with *exogenous* and *endogenous*. Their meaning is discussed in detail in section III. Their use seems to have originated in discussions within the Bank of Canada, but I have not been able to track down their first appearance. See Engert and Selody (1998) for a recent example of their use by Bank of Canada staff.

of insights into the design of policy, and for undertaking research designed to deepen our understanding of their role.

2. The quantity theory of money, monetarism, and money-growth targeting

Traditionally, the quantity theory of money argued that, other things being equal, variations in the quantity of money caused variations in its purchasing power, as measured by some broadly based price index. From the late 19th century onwards, however, it became recognized that monetary economics needed to do more than explain the price level, a theoretical position that received dramatic empirical confirmation from the behaviour of aggregate output and employment in the inter-war years. The traditional quantity theory was, quite simply, silent about what determined those real variables, and that was an important reason for its intellectual eclipse in the 1930s. Even so, from the 1860s onward, the quantity theory was the starting point for a number of explanations of shorter-term real fluctuations; but only a starting point, because all of these explanations departed from the quantity theory's traditional form by recognizing the importance, within the cycle, of reverse causation running from prices and output to the quantity of money.[3]

The monetarism of the 1960s built upon this earlier quantity theory tradition, but supplemented it with a series of novel propositions. First, it was a *sine qua non* of monetarism that the stock-demand-for-real-balances function[4] was simple, in that it relied upon only a few arguments, the most important of which were a scale variable—real national income, real permanent income, or perhaps real non-human wealth—and some representative nominal interest rate (or rates) measuring the opportunity cost of holding money. Second, monetarism had it that the parameters linking the demand for money to these variables could be estimated with a high degree of statistical significance, and did not vary over time. Third, quite contrary to the prevailing wisdom of the 1960s and early 1970s, monetarism also had it that the Phillips curve, which seemed to provide an analytic link between explanations of unemployment and of inflation, was, at most, a transitory phenomenon, and not available for systematic exploitation by policy-makers.[5]

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3. The role of the quantity theory as a starting point for theories of cyclical fluctuations in the literature before World War I is discussed in Laidler (1991).

4. The stock-demand-for-real-balances function evolved by way of Keynes's theory of liquidity preference from the "Cambridge" or "cash-balance" version of the quantity theory.

5. The description of monetarist doctrine given here obviously reflects the work of Milton Friedman (1953, 1956, and 1968) and Friedman and Schwartz (1963a and 1963b), but much of its content is also found in the work of Karl Brunner and Allan Meltzer. See Brunner and Meltzer (1993) for both a retrospective account of their work and extensive references to their original publications.

Monetarism made major inroads on the policy scene in the 1970s. By the middle of that decade, right across the Western world, the inflation–unemployment trade-off that the economy had seemed to present in earlier years did indeed vanish, just as monetarism had predicted. In a number of countries, wage and price controls were being tried as a means of controlling what by then was serious and deeply entrenched inflation, and found wanting. It was time to try something else and money-growth targeting came into vogue, not least in Canada, where its implementation strayed some way from its intellectual origins.

The traditional monetarist case for money-growth targeting begins from a simple supply and demand experiment. In the most elementary case of that experiment, where quantity supplied and demanded depend only on price, a shift of the supply curve leads to an equilibrating change in price along the demand curve. In the more complicated case of money-growth targeting, the demand for nominal money is typically thought of as depending upon, say, real output, a representative nominal rate of interest, and the price level. Output growth is assumed to be determined independently of the nominal money supply, as is the real rate of interest. More specifically, these variables are treated as approximately constant. The nominal rate of interest does depend on the expected inflation rate, but only varies when the inflation rate itself is changing. Given stability in the demand function and constant money growth, therefore, one argument alone of the demand function remains to equilibrate supply and demand: namely, the price level, which rises at a rate given by the percentage rate of money growth minus that of real output (modified by the real output elasticity of demand for money, if that differs from unity).

Two features of this monetarist case for money-growth targeting are worth stressing.[6] First, because it abstracts from interactions among money growth, output growth, the real interest rate, and expected inflation, the context of the case is *inherently long-run*; the policy regime relies for its effects, not even on year-to-year relationships, but on *the average effect of money growth on inflation over a period at least as long as a business cycle.* Second, because the case calls for the authorities to set a course for *a supply of money determined independently of the demand for it,* it treats money as an *active* variable in the transmission mechanism of monetary policy. These two characteristics have little to do with the manner in which the Bank of Canada's "gradualist" program of money-growth targeting was implemented between 1975 and 1982, or with the criteria by which it was judged and found wanting in subsequent years.

With regard to the first of them, suffice it to note that the program was kept in place for roughly one cycle, and that from its 1974 peak to the next one in 1981, the inflation rate (as

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6.   The *locus classicus* of monetarist discussion of these matters is, of course, Milton Friedman (1960). It is
       worth noting that Friedman's proposals went far beyond giving a target value for the rate of money growth a
       central place in the conduct of monetary policy. They involved making the rate in question constant, and the
       central bank being obliged by law to maintain it so as the sole aim of its operations.

measured by the GDP deflator, surely a more technically appropriate price index than the CPI for testing propositions having to do with the traditional quantity theory) did fall by a small amount. Though the program was formally abandoned in late 1982, there were clear signs during 1981 that it had been given up. At that time, money growth fell suddenly and significantly below its target range, partly as a result of institutional developments in Canadian banking, but in good measure as a result of the Bank's conscious choice to support the exchange rate in the face of a sharp tightening of U.S. policy. Output and, a little later, the inflation rate, also duly fell sharply.[7] In light of this evidence, the widely held view that money-growth targeting was a failure is a little too pat. This is not to deny that genuine problems of interpreting the behaviour of M1, the aggregate on which the experiment focused, arose during the course of money-growth targeting, particularly from late 1979 onwards, or that these problems raised important doubts, still relevant today, about the usefulness of monetary aggregates as policy guides. It is, however, to question the common interpretation of this earlier episode, namely that it demonstrates a degree of inherent unreliability in these variables that should disqualify them from anything but a subordinate position in policy formation. These issues will be discussed further below.

A view of money as a *passive,* or, more precisely, a passively endogenous, variable underlay the gradualist experiment, as the methods by which the Bank tried to control money growth demonstrate. Simplifying somewhat, but without misrepresenting the essence of the case: a money-demand function was estimated using monthly data; values of its real income and price-level arguments over a rather short policy horizon were forecast and plugged in, along with the lagged values dictated by the econometrics of an equation based on monthly data; a target value for the money *supply* became the equation's left-hand-side variable; the resulting expression was solved for the value of the interest rate that would set money *demand* moving towards that target value over some desired time horizon; and the Bank then set its interest rate instrument at that value. In the gradualist experiment, therefore, the quantity of money's growth rate was treated as an indicator of the effect that other variables, including presumably the short-term interest rate,

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7.   The argument for taking the GDP deflator more seriously than the CPI from a technical viewpoint rests on the fact that the quantity theory is, in the first instance, a theory of money income determination. This argument does not detract from the political case for focusing on the CPI when discussing inflation as a policy issue. In terms of annual data, the inflation rate, as measured by the deflator, peaked in 1974 at 14.4 per cent, and again in 1981 at 10. 8 per cent. By 1984, it had fallen to 3.1 per cent. Inflation as measured by the CPI was 10.9 per cent in 1974, 12.5 per cent in 1981, and 4.3 per cent in 1984. The difference in the peak-to-peak pattern of inflation between 1974 and 1981 as measured by these two indices, and in particular the fact that it was the headline rate of inflation that actually rose a little, helped discredit the policies that the Bank of Canada pursued in the intervening years. The above data are taken from *International Financial Statistics Yearbook 1998,* pp. 158–59 (deflator) and 122–23 (CPI).

were having on the course of inflation. However, the short-term interest rate was not thought to have causative significance for inflation in its own right.[8]

There do exist economic models that imply that the quantity of money should be treated in just this way, so it is not appropriate to level a charge of internal inconsistency at the Bank's implementation of money-growth targeting. However, those models have very little to do with monetarism, or the quantity theory of money generally, which gave impetus to money-growth targeting in the first place. It is impossible, therefore, to avoid concluding that the gradualist episode in Canadian monetary policy was, at a deeper level, characterized by a fundamental intellectual dissonance.

This last observation is not just a matter of historical interest. The postulate that the money supply is a passively endogenous variable in the macroeconomy, which underlay the implementation of gradualism two decades ago, is still at the heart of the Bank's policy framework today. But the inflation-targeting regime now in place is at least as much a legacy of the quantity theory tradition as was money-growth targeting. The intellectual dissonance of 20 years ago echoes as loudly as ever, and those echoes deserves further attention.[9]

3.   Passive money, active money, and the transmission mechanism

Like the quantity theory of money, the view of money as a passively endogenous variable has a long history, but its most recent manifestation originates in a simple variation on the once-standard IS–LM macroeconomic model.[10] That model usually treats the quantity of nominal money and, in its fixed-price version, the real quantity too, as an exogenous, and therefore active, variable. On the assumption that the demand for real balances depends on income and the rate of interest, the LM curve defines the relationship that must hold between these two variables to

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8.   The Bank of Canada's control technique was chosen on the basis of careful analysis of the characteristics of alternative procedures, carried out in the context of an explicit IS–LM model; see Freedman (1981). For a contemporary discussion of the Bank's experiment with money-growth targeting, and the difficulties it encountered, see Thiessen (1983). A retrospective account of the episode is given by Duguay and Longworth (1998) Part 2.

9.   The passive view of money is not confined to the Bank of Canada. A recent demonstration by Svensson (1998) of the irrelevance of supplementary money growth targets in the European Central Bank's inflation-targeting regime is developed in terms of a model that treats money in just this way and indeed depends crucially on this characteristic. I am grateful to Pierre St-Amant for drawing my attention to this paper.

10.   The passive-money view is closely related to the analysis of 19th-century British anti-bullionists and exponents of the Banking School position, as readers of Viner (1937) or Mints (1945) will recognize. Inasmuch as it pays careful attention to the role of the interest rate as an instrument of central bank policy, it avoids what Mints termed the "real bills doctrine," which contended that the banking system's role is to meet the "needs of trade" for short-term credit as represented by the supply of "real bills" (short-term commercial paper) offered for discount, but which ignored the role of the interest rate in determining the volume of those "needs."

maintain money demand in equilibrium with a given money supply. When the LM curve is superimposed upon the IS (investment equals saving) curve, which portrays aggregate demand, and therefore income, as an inverse function of the rate of interest, the point of the curves' intersection determines both the equilibrium levels of income and the rate of interest in the economy as a whole. According to the simplest deterministic form of this model, the pursuit of "full employment" and price-level stability requires the monetary authorities to pick exactly the quantity of money that will provide an LM curve that intersects the IS curve at the economy's maximum sustainable level of output.

It seemed to some exponents of IS–LM more "realistic" to treat the rate of interest, rather than the quantity of money, as the monetary policy variable under the control of the authorities. With this change, the LM curve becomes a horizontal line at the rate of interest set by the central bank.[11] Neglecting open-economy complications, the monetary policy problem that now must be solved is the apparently simpler one of choosing the level for the rate of interest at which the IS curve generates a full-employment level of aggregate demand; meanwhile, the supply of money looks after itself by passively adjusting to meet demand.

The problem of hitting an inflation target, in an IS–LM model supplemented by an expectations-augmented Phillips curve, appears to be simply a more elaborate variation on this same theme, and its details need not concern us here. Suffice it to note, first, that the introduction of endogenous inflation expectations into the picture shifts the emphasis to a nominal interest rate that is explicitly understood to incorporate those expectations, and to the *rate of growth* of the nominal money supply, as opposed to its *level*; and second, that, once attention is focused on the inflation rate as a policy target, it becomes clear that open-economy considerations require the authorities to choose a flexible exchange rate regime.

The exponents of passive money have a well-worked-out story to tell about the sequence of events that lies between a change in the interest rate and its ultimate effect on output and employment— about, that is to say, the *transmission mechanism* of monetary policy. According to this story, when, the monetary authorities lower (raise) the rate of interest, the quantity of money demanded increases (decreases) and the money supply begins to rise (fall). In an open economy, the currency is also likely to depreciate (appreciate) relative to whatever path it was initially following. Only subsequently do output and then prices begin to respond. These generate further

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11. Hicks (1937) discussed just this variation on the model in the article in which the IS–LM diagram first appeared. To call the horizontal line that represents equilibrium between the supply and demand for money in the exogenous interest rate case an LM curve does, of course, mean abandoning the precept that the curve is drawn for a given supply of money. Note that when we leave a deterministic world, the "optimal" LM curve will usually embody a policy rule in which the monetary authority behaves according to a reaction function along which it trades off money supply and interest rate variations at a rate that depends on the relative frequency and magnitude of shocks hitting the money-demand function and the IS curve. Poole (1970) is the classic source for this analysis. Boyer (1978) extends it to an open economy.

changes in the demand for, and therefore the supply of, money. It was precisely this view of the transmission mechanism that underlay the execution of the Bank's gradualist policy in the late 1970s. Indeed, one reason that the narrow M1 aggregate was given a strategic role in the gradualist policy was that its demand seemed to be linked to an interest rate variable by a coefficient sufficiently large and well-determined to facilitate control of money growth with an interest rate instrument.

However, the account of the transmission mechanism that goes with the passive-money view is incomplete. This may be seen most clearly by abstracting from open-economy complications, which do not in any case change the fundamentals of the story, and by considering the theoretically limiting case in which the interest sensitivity of the demand for money disappears. In this case, it has sometimes been argued that, since control of the money supply works through that interest sensitivity, it is impossible for the authorities to increase the quantity of money in circulation by lowering the interest rate, and hence impossible for them to set the transmission mechanism in motion.[12]

This conclusion, however, is not quite right. It rests on the implausible assumption that when the rate of interest is lowered the sole motive for members of the non-bank public to borrow from the banking system is to increase their money holdings. When the interest rate is cut, the willingness of households to borrow to buy, say, durable goods grows, as does that of firms to finance, say, an increase in inventories. These effects do not depend upon the interest sensitivity of their *demand for money*, but upon the interest sensitivity of their *supply of indebtedness* to the banking system. When this supply is met by an increase in the quantity of *loans that banks make available*, however, the *supply of bank liabilities* also increases as a matter of accounting necessity, and in a simple model in which all bank liabilities are money, so does the supply of money.

IS–LM, then, ignores the market for bank credit.[13] This omission is irrelevant so long as attention is confined to the model's equilibrium, or steady-state, behaviour. However, its significance for understanding the transmission mechanism of monetary policy, which involves the out-of-steady-state behaviour of the system, extends far beyond the theoretical special case of an interest-insensitive money-demand function. Specifically, it draws our attention to the fact that, in the immediate wake of an interest rate cut, which induces new borrowing by the non-bank public, extra money is put into circulation, money which that public does not want to hold. This

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12. This argument is not merely a straw man, having appeared in the writings of some prominent economists. It seems to originate in Keynes's (1936) *General Theory*, 197. In the post-war literature it has been advanced by, among others, Gramley and Chase (1965), Hahn (1971), and Hicks (1982, 262–4).

13. As Brunner and Meltzer argued from the 1960s onwards—see Brunner and Meltzer (1993) for a retrospective account of the case they made, and for references to the sources in which they first made it.

happens no matter how interest-sensitive or -insensitive the money-demand function might be. Even though the borrowers' transactions with the banking system are voluntary, they accept newly created money from the banks, not in order to add it to their money holdings, but in order to use it to purchase goods, services or other assets.

The idea of any agent, let alone the public as a whole, being "off" its money-demand function is not an easy one for economists to swallow, particularly those for whom "equilibrium modelling" is *de rigueur.* If, however, money is, in Friedman's phrase, "a temporary abode of purchasing power," the quantity of it that any agent "demands" should be considered not as a fixed sum to be kept on hand at each and every moment but rather as the target value of an inventory, or a *buffer stock* as it is sometimes termed. This buffer stock's actual value will fluctuate around that target as the agent's streams of income and expenditure are subjected to various shocks, both within and beyond that agent's control, both foreseen and unforeseen.[14] There is nothing odd at all about any individual agent being off his or her money-demand function at any particular moment as a consequence of engaging in voluntary exchange. Indeed, widely taught inventory-theoretic models of the demand for money, in the spirit of Baumol (1952) and Tobin (1956) explicitly embody just such effects.[15]

As for individual agents, the aggregate consequences of many idiosyncratic shocks to their portfolios cancel each other out. Nevertheless, any economy-wide shock that affects all agents subjected to it in the same direction will have observable consequences at the level of the economy as a whole. An increase (or decrease) in the aggregate money supply, not initially matched by a change in agents' target money holdings, is just such a shock. Money put into (or taken out of) circulation has to go (or come from) somewhere, whether or not agents want to hold it (or relinquish it). Such an increase (or decrease) will in the first instance show up as an increase (or decrease) in the sum of individual agents' money holdings above (or below) their desired levels. When there is a shock to the money supply, fluctuations in agents' buffer stocks of money will be observed at the level of the economy as a whole.

Even so, the crucial question is not whether the economy can be "off" its money-demand function at a particular moment, but whether that has any interesting and persistent consequences; whether, as a consequence of being held as a buffer stock, money in fact *actively* influences aggregate demand, and hence the price level. The first thing to be said here is that the effects of

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14.　To the best of my knowledge, the first use of the term *buffer stock* in this sense was by Friedman and Schwartz in their (1963b) article on money and business cycles.

15.　In his very first (1871) account of the Cambridge version of the quantity theory, Alfred Marshall explicitly defined the demand for money as the desired average value of a fluctuating stock. It should also be noted that in S-s inventory-theoretic models in the spirit of Miller and Orr (1963), the demand for money emerges as a range between upper and lower limits, rather than as a specific amount.

any shock to the money supply that pushes the economy off its money-demand function will depend on how long that shock persists and is expected to persist. To use conventional vocabulary, a "transitory" shock is unlikely to have any significant consequences, because it will be, and is expected to be, quickly reversed.

A "permanent" shock is a different matter, however.[16] Agents affected by it will, once they perceive its permanence, face the prospect of holding stocks of real money balances whose implicit service yield is lower than that available on other assets. They will therefore try to reduce the size of those stocks. What then transpires for the economy as a whole will depend, among other things, on the nature of the monetary system.

To see why this might be, it is helpful to consider as (only) a first step the theoretically limiting special case where the nominal money supply is an exogenous variable that enters the system not through bank lending but as if dropped from a passing helicopter, a simile made popular by Milton Friedman.[17] Here, in the wake of a permanent increase in the nominal money supply, it is obvious that individual agents wishing to reduce money holdings back towards a target level, at which their implicit rate of return would once more be at an equilibrium value, can do so only by transacting with other agents. It is equally obvious that such transactions in and of themselves do nothing to eliminate excess money holdings at the level of the economy as a whole. Hence, each agent will continue to transact with others until interest rates, including the implicit own rates of return on consumer and producer durables, have been bid down, and/or output and/or the price level have been bid up, to whatever extent is necessary to bring the quantity of money demanded by the economy into equilibrium with the new, larger, money supply.[18] In short, exogenous money plays an active role in the transmission mechanism.

Effects need not be so different in an economy whose financial system consists of a central bank and commercial banks, all of whose liabilities to the public circulate as money. This would

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16. Brunner and Meltzer argued from the 1970s onwards that the distinction between permanent and transitory shocks, and the inability of agents immediately and accurately to differentiate between them in particular instances, was far more important than that between economy-wide and localized shocks to understanding why monetary disturbances have real effects. See Brunner and Meltzer (1993) for an account of their case and references to their earlier expositions of this point.

17. Friedman's fable of an increase in the nominal supply of money delivered to an economy by helicopter was intended to characterize an economy in which money was clearly exogenous. He first set it out in his essay "The Optimum Quantity of Money" (Friedman 1969).

18. A distinction is sometimes drawn between one monetary policy transmission mechanism, associated with the passive-money view, that works through interest rates and another, associated with the active-money view, that relies on direct effects of excess money holdings on expenditure. As the above discussion ought to make clear, this distinction has no theoretical basis. The most that might be claimed is that the passive-money view pays particularly close attention to observable market rates of return, while the active-money view insists on the crucial relevance of unobservable implicit real rates of return on such items as money balances and consumer and producer durable goods.

be true even if the central bank were to use the interest rate as its policy instrument. In that case, to take a specific example, a cut in the interest rate that initially led to a permanent increase in the public's demand for nominal bank credit would also produce a permanent change in the banking system's supply of nominal monetary liabilities, of which the public as a whole would be unable to rid itself. So long as the demand for nominal credit remained unchanged and was satisfied, the banking system's balance sheet identity would ensure that this new money remained in circulation. As in the helicopter-money case, some argument or arguments in the economy's money-demand function would therefore have to adjust to restore equilibrium between the supply and demand for money, and monetary policy's transmission mechanism would involve not just the first-round direct effects of a lower interest rate on aggregate demand, but also the subsequent effects of an accompanying excess money supply on expenditure flows. In this case, the quantity of money is an endogenous variable in the economic system, but it clearly plays an active role in the transmission mechanism.

Now it should be noted that a cut in the central bank's interest rate is not the only action that can set in motion a series of events such as those just described. Fiscal expansion financed by money creation can do so, as can an autonomous change in the willingness of commercial banks to make loans, or a disturbance on the demand side of the market for bank credit. A positive shock to productivity, for example, or to consumer or business confidence, by increasing private agents' proclivity to borrow from the banks, can obviously set in motion a process of monetary expansion. In the presence of a banking system, a change in money growth will occur in response to anything— not just a monetary policy action by the central bank—that disturbs the margin between the public's supply of indebtedness to the banking system and its demand for stocks of durable goods and other assets.

Matters become more complicated and controversial when the banking system's liabilities include a significant non-monetary component. However, this is precisely the case that is directly relevant to the conduct of monetary policy in the Canadian, or any advanced, economy. Here, it becomes important to distinguish between narrow and broad money and to note that, in addition to the option of transacting with some other non-bank agent, a firm or household with excess money holdings can now purchase some non-monetary bank liability from the banking system. This type of transaction would reduce not only that individual agent's money holdings, but also the quantity of money in circulation, without need for a simultaneous adjustment in the size of the banking system's balance sheet. Thus, a policy-induced cut in the interest rate that leads to a permanent increase in bank credit need produce nothing more than a transitory increase in the

quantity of money. The passive-money view would describe approximately but well the economy's behaviour in such circumstances. So long as the money-demand function was empirically stable, money growth would provide a useful indicator of the impact on the economy of monetary policy. However, the variable itself would have no causative significance.[19]

The foregoing argument is couched in terms of what *could* happen, not in terms of what *must* happen. The actual outcome would depend, in the first instance, on the behaviour of those particular agents who receive newly created money from the borrowers, who have spent it for whatever purpose has caused them to increase their indebtedness to the banks in the first place. It would depend on what the inflow of cash, and the corresponding outflow of whatever was exchanged for it, do to the actual composition of those agents' portfolios relative to their desired makeup; it seems impossible to generalize about this.

Thus, if we consider a firm selling, say, consumer durables, and assume that the firm's inventories and degree of bank indebtedness are both initially too high for comfort; then an inflow of cash from the sale of some item out of inventory would presumably be devoted to reducing indebtedness. Newly created money would, in this case, quickly disappear from circulation. We can conceive of a second case, where the firm initially has equilibrium levels of inventories and indebtedness. The cash inflow might be spent on replacing the item sold, and remain in circulation for a little longer, depending on the actions of those further along the transactions chain. Or, if the firm is willing to tolerate a lower inventory for a while, but feels comfortable with its level of bank debt, its newly acquired cash might be parked in some form of notice deposit, pending a later decision, thus reducing some narrow measures of the economy's money supply, though perhaps not broader ones. And so on: there seems virtually no limit to the possibilities, a sure sign of some deficiency in our theoretical understanding of the matters under discussion.[20]

19.　Indeed, to the extent that money demand varied with factors other than the inflation rate, its usefulness as an indicator of the stance of policy, let alone as an intermediate target, would also be vitiated. This is the basic reason why Svensson's (1998) passive-money model, referred to above, yields its negative verdict on using money growth as a supplementary target in an inflation-targeting regime.

20.　This is one of the deficiencies that monetary general equilibrium (MGE) models, characterized by "limited participation" in financial markets and by portfolio adjustment costs, might help us to repair. Such models are well adapted to dealing explicitly with a sequence of events in which money is given to firms by way of bank loans and then is paid out to households, who in turn take portfolio-allocation and expenditure decisions influenced by their cash receipts, which in due course impinge again on banks and firms. See Hendry and Zhang (1998) for an example of work in this genre.

4. Some empirical regularities—the demand for money and money as a leading indicator

We must turn to empirical evidence for some hints about how these effects play out in practice. To do so is not unlike allowing data to determine the values of "free" parameters in an incompletely specified model; this, it should go without saying, is no substitute for attempts to advance theoretical understanding. It may nevertheless be a useful complement to such efforts, providing some stylized facts to discipline theoretical conjectures. In any event, pending the outcome of further theoretical work, it seems to be the only step available other than abandoning the enquiry altogether.

It is convenient to begin here by referring to our empirical knowledge of the money-demand function. Although Friedman's (1956) conjecture that money demand is an empirically stable function of a few arguments may have been too optimistic, there is overwhelming evidence consistent with the view that velocity indeed is the outcome of individual agents' systematic portfolio choices, even if the constraints imposed on those agents by the structure of the financial system have, from time to time, been subject to variations that have in turn caused the money-demand function to shift.[21]

The fact that a structural money-demand function does indeed seem to exist is nevertheless neutral between passive and active views of the role of money in the economy. At first sight, the form of equation best adapted to pinning down the relationship appears more easily reconciled with the passive-money view. The quantity of money demanded by the economy is not an empirically observable variable, and economists estimating the relationship in question by single-equation techniques therefore use the quantity of money actually in circulation as their dependent variable. Crucially, except when using data that is highly aggregated over time—e.g., cycle-phase or even cycle-average measures—the performance of empirical money-demand functions is almost always improved by allowing for significant time lags in the response of their dependent variable to those variables thought to determine the demand for money. The simplest way to make such allowance is to add a lagged value of that dependent variable to their right-hand side, a common practice over the years.

Relationships of this type have usually been referred to as *short-run* money-demand functions and are obviously compatible with the behaviour of agents who start out with a certain level of money holdings and adjust them slowly towards a new equilibrium by way of transactions

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21. The most thorough body of empirical work on the influence of institutional change on velocity is by Michael Bordo and Lars Jonung. See, for example, Bordo and Jonung (1990), where references to their earlier publications on the topic are also found.

with the banking system when factors affecting their demand for money vary.[22] Not least is this so when one of those factors is an interest rate under the control of the monetary authorities and when the others, real income and the price level, say, vary in response to that interest rate by way of mechanisms embedded in other parts of the economic system. However, although such a passive-money system would be sufficient to generate the stylized facts captured by the typical empirical short-run money-demand function, it is not necessary. It can, and has, been shown that the stylized facts in question can just as easily be generated in an environment characterized by a completely exogenous "helicopter" nominal money supply. The stylized facts are also compatible with a world in which money is largely made up of the liability side of the banking system's balance sheet, but in which, once created, the money stays in circulation for a while and affects expenditure.[23]

What differ among these cases are the sources of the time lags that make it empirically necessary to invoke the distinction between short-run and long-run responses in the first place. In a passive-money world, these would be solely portfolio-adjustment costs paid by individual agents. In a helicopter-money world they would include the factors making for money wage and price stickiness in the economy, while in the awkward intermediate case, parameters would have to be added that were associated with the likelihood of excess money falling into the hands of agents who would prefer to transact with the banking system, rather than some other agent, as its initial holders attempt to get rid of it.[24] Data on empirical money-demand functions are equally compatible with purely passive, purely active, and bi-directional interpretations of the interaction between money and the economy. However, only in the first of the above cases should the estimated relationship be referred to as a short-run money-demand function. In the others it is best thought of as an equation that supplements a long-run demand function with some unspecified quasi-reduced form of the transmission mechanism of monetary policy.

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22.   The coexistence of this evidence on the money-demand with equally strong evidence that money is a leading indicator of output and prices, to be discussed below, has sometimes caused perplexity. A 1990 Bank of Canada conference was devoted to this question. Papers by Allan Crawford (1992) and Allan Gregory, Gregor Smith, and Tony Wirjanto (1992), as well as comments by Douglas Purvis (1992), Pierre Duguay (1992), and Peter Howitt (1992), directly addressed the issues. As the reader will note, this paper carries on the discussion, largely along lines explored by Howitt.

23.   Among papers dealing with this issue are Carr and Darby (1981) and Lane (1990). I have discussed this and related questions in Laidler (1990, chs. 2 and 5) where an extensive set of references to related contributions is to be found. See also Laidler and Robson (1995). The multiple possible interpretations of empirical money-demand functions are, of course, but a special example of a general phenomenon—namely, the impossibility of validly deriving uniquely true theoretical propositions from empirical evidence. One can find that the data are inconsistent with a theory, and therefore disprove it, but consistency, though perhaps comforting, can never provide incontrovertible proof of any theory.

24.   See Davidson and Ireland (1990) for an interesting analysis of these mechanisms.

Vector error-correction (VECM) modelling helps us a little further along with these matters. It permits estimation of the parameters of what its exponents usually interpret as the long-run money-demand function while explicitly maintaining a theoretically agnostic position on the short-run adjustment processes, known as *error correction mechanisms,* that cause actual observations to fluctuate around the function, and whose empirical characteristics may then be studied.[25] An appropriate dependent variable for a long-run money-demand function is *real* money balances, the quantity of nominal money in circulation deflated by the price level. VECM modelling permits the out-of-steady-state behaviour of real balances to be decomposed into changes in these two components. If *nominal* money is completely *exogenous* to the rest of the economy, then the out-of-equilibrium dynamics of *real balances,* as they move back towards their steady state after a disturbance, must be dominated by fluctuations in the *price level;* if *nominal* money is *passively endogenous,* those same dynamics will be dominated by fluctuations in *nominal balances,* while in an intermediate case, the process of adjustment will be shared between both variables.[26]

In the case of Canada, this last possibility seems best to explain the data. The implications of this result, taken at face value, are: first, that a fraction of non-bank agents large enough to matter attempts to eliminate discrepancies between desired and actual holdings of money by transacting with other non-bank agents; second, that these efforts affect the overall pressure of demand in the economy, and eventually the price level; and third, that observed changes in the quantity of real money in circulation are the result of money playing an active role in the transmission mechanism; but finally, that there is a non-trivial passive element to money's role in that mechanism.

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25. Söderlind and Vredin (1996) caution against interpreting co-integrating vectors among money, output, and interest rates as structural money-demand functions and construct a particular case in which this interpretation, though apparently plausible, is incorrect. Their result is, of course, a special case of the general proposition mentioned two footnotes above about the impossibility of validly inferring true theoretical statements from empirical evidence. I am grateful to Pierre St-Amant for drawing my attention to this paper.

26. The approach summarized here was applied to Canadian data by Hendry (1995). There is more than a passing resemblance between Hendry's VECM approach and that pioneered 20 years ago at the Reserve Bank of Australia by Jonson, Moses, and Wymer (1976) using FIML techniques. Both emphasize the influence of discrepancies between the supply of money and its long-run demand on other variables. The earlier work, however, obtained its results by estimating a fully specified model of the economy rather than relying on one structural equation, and was particularly well adapted to investigating the role of output fluctuations in the transmission of the effects of monetary shocks to the price level. Its results suggested that models that stress the role of an output gap in the transmission mechanism are, as a practical matter, complementary to those that rely on buffer-stock effects, rather than being drawn from some alternative paradigm. Engert and Selody (1998) have suggested that to put an "either-or" choice here is counterproductive. Their arguments also imply, correctly, that models of inflation that rely on an output gap to drive inflation, without also explaining what deeper disturbances are creating that gap in the first place, are seriously deficient. I am grateful to Seamus Hogan for extremely helpful discussion of these issues.

This interpretation of the results of VECM studies is consistent with the outcome of a broader body of work on money's indicator properties in the Canadian economy. This literature has systematically mined time-series data on various measures of money and such key macro variables as output and inflation in a search for reliable lead-lag relationships among them, and finds that fluctuations in the money supply *lead* those in output and prices. Furthermore, these leading indicator properties remain even when account is taken of the influence of interest rate changes on output and prices.[27] These results are hard to square with the proposition that the quantity of money is passively determined by changes in the demand for it. Were money purely passive, one would expect it either to lag behind output and the price level, or, if it led those variables as a result of agents responding to anticipated variations in them, one would expect money to contain no information about monetary policy's influence that was not already fully signalled by the behaviour of interest rates.

5. Some empirical irregularities—measuring the money supply and institutional change

In textbooks, money is said to be a means of exchange, a unit of account, and a store of value. However, finding an appropriate empirical counterpart to this theoretical concept is a difficult problem, to which, for the sake of expositional clarity, the preceding discussion of empirical evidence deliberately made scarcely a reference. It is now time to make good this deficiency, and we shall see that, of money's three roles, the first two are fundamental, while the third is the source of many, perhaps most, of the difficulties in linking monetary theory to the monetary economy as it exists in the real world.

We often characterize the economy we inhabit as a *market* system, but when we do, we apply the qualifier in a way that differs from its conventional usage in economic theory. The theorist's market is a purely hypothetical institutional framework, within which prices that create and then maintain equality between the supply and demand for all goods and services are costlessly set and maintained, and in which trade takes place by continuous and frictionless multilateral barter.

This abstraction is indispensable for many purposes, but *dealing with monetary questions is not one of them.* In the real world, trade is indirect; agents typically sell the goods and services

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27. Here I refer to results generated by Kasumovich (1996), who built on Hendry's (1995) work. Note that Fung and Kasumovich (1998) show that the active-money interpretation of the evidence implicit in this result also seems to apply to data drawn from other G-6 countries. This finding, that money has leading-indicator properties even when the effects of interest rates are allowed for, provides the most compelling evidence for the active-money view because it is conceivable that, in response to interest rate changes, agents could passively adjust their money holdings in anticipation of future price and output changes. On these matters, see Freedman (1992), especially pp. 548–9.

they supply at times and places different from those at which they buy what they demand. They usually bridge the gap between the two sets of transactions by accepting, holding, and in due course, paying out some commonly acceptable intermediate item. That item is money, in its means-of-exchange role. Since virtually everything that is bought or sold is exchanged for money, it is convenient to have the prices of all other goods and services stated in terms of it; so, money usually serves as the economy's unit of account too.[28] An item must be at least minimally durable if it is to be used as a means of exchange, so anything that can serve that purpose can also be used to store wealth. But an enormous variety of items that are not means of exchange can also be used for that purpose. Hence, though anything that functions as money will have properties that enable it to be employed as a store of value, this third function, unlike the first two, is not a uniquely defining characteristic of money.

These considerations suggest that when we construct an empirical measure of money the means-of-exchange role should dominate our choice of what to include and exclude. We have also seen that this role is essential in getting agents voluntarily to exchange debt for money in their credit-market dealing with banks; thus, any analysis of monetary policy's transmission mechanism that relies on an active view of money must also pay careful attention to it. However, the very fact that some monetary economists use the phrase *transactions money* to specify the real-world aggregate to which they attach primary importance suggests that this guideline is not straightforward to apply in practice, and indeed it is not.[29]

In Canada, for example, currency is generally acceptable, and to pay for an item using it renders the transaction final. Funds in a chequable demand deposit held at a chartered bank are immediately available to their holder and are also generally acceptable, so they too are money. But in the case of chequable notice deposits, their holders' contracts with the banks whose liability these deposits are gives the latter the right, admittedly never exercised in practice, to require notice of withdrawal—so perhaps they are not quite immediately available. And, though a passbook savings account is not directly chequable, funds held in one can be used as an automatic backstop to a chequable account should it be overdrawn (often, however, a fee is charged that makes their use for such a purpose costly). On the other hand, some agents treat passbook

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28. An interesting account of modern approaches to this line of analysis, based on search theory, and their relationship to older, largely Austrian ideas, is given by Gravelle (1996). Such analysis is sometimes interpreted as showing how monetary exchange can evolve from an initial state of barter, but, as Hicks (1994) has argued, monetary exchange seems to have developed out of a transactions system based on credit as the boundaries of exchange widened.

29. Like the "active–passive" terminology, the phrase "transactions money" also seems to have its origins in Bank of Canada discussions. It is clearly related to the commonly used expression "transactions balances" but it is not the same. Rather than referring to a quantity of money demanded by agents for use in transactions, it denotes a quantity of money supplied by the authorities that is usable in such a way.

accounts as savings vehicles pure and simple. And how should we deal with, for example, accounts held with trust companies, credit unions, investment dealers, or unused lines of credit with credit card companies?

Suppose, moreover, that the question of where to draw the line between "money" and other assets has somehow been settled: how should the items classified as money be aggregated? Should we simply add up their dollar value, or should we try to weight them by some measure of their degree of "moneyness" so that, for example, one dollar held as currency counts for more than one dollar on deposit in a chequable notice account? Again, the complications are virtually endless and economic theory offers no simple "one size fits all" way of dealing with them.[30]

Empirical applications of models related to the quantity theory of money always involve an arbitrary element in the definition of their most basic variable, namely money. That is why it has become routine to talk not of a unique quantity of money but of a number of "monetary aggregates," some more broadly defined than others, and to let the data play a role in deciding which aggregate is best suited for which purpose. For Canada, the following generalizations seem to hold. First, there do seem to exist stable demand functions for a variety of monetary aggregates, both narrow and broad, while one narrowly defined aggregate, M1, has proved usable in further studies using VECM techniques. Second, more than one aggregate seems to have good leading-indicator properties: indicators based on M1 do particularly well with respect to subsequent fluctuations in real variables and, at a longer horizon, provide useful information about inflation too. Broader aggregates seem to be useful indicators of future inflation; some of them are more accurate than M1, albeit with a shorter lead time.[31] Third, and crucially, all of these relationships, including those involving M1, have from time to time shifted or broken down altogether for significant periods.

There is no mystery about the sources of these shifts and breakdowns. Like any other, the Canadian financial system evolves over time. The nature of the assets it offers to the public also changes, as do as the terms on which they are offered. For example, beginning in 1979, newly developed computer technology enabled the chartered banks to calculate and pay daily interest on balances held in chequable notice accounts, while continuing inflation ensured that the rate at which such interest was paid made those accounts extremely attractive relative to traditional non-interest-bearing demand deposits. Demand deposits were included in M1, but chequable notice

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30. The fullest account of the case for ultimately letting the data choose the empirical definition of money is still that of Friedman and Schwartz (1970). Note, however, that this approach is open to the danger of circular reasoning, whereby the aggregate with the most stable demand function is chosen and then used to demonstrate the stability of the money-demand function; see Mason (1976). For an account of questions about how best to aggregate over various assets, see Barnett (1990).

31. For a succinct summary of recent results on the leading-indicator aspects of various monetary aggregates, see Atta-Mensah (1995), particularly section 3.

deposits were not, and so, inevitably, the demand function for M1 shifted as agents moved funds from the former to the latter. All this is easy to explain in hindsight, but at the time it was difficult to predict; and it took three or four years for the financial system to adapt to these changed circumstances. Small wonder that M1 growth targeting was given up, although it is now clear that the M1 demand function did stabilize again in the mid-1980s.[32]

Now, in the late 1990s, the demand for M1 seems to be undergoing another disturbance rooted in institutional change, this time related to the recent phasing-out of reserve requirements against the liabilities of chartered banks. Before that change, reserve requirements against demand deposits, included in M1, were higher than those on other classes of deposits, giving the banks incentive to work with their customers to minimize holdings of demand deposits, and to take considerable care in classifying the data on deposit liabilities that they reported to the Bank of Canada. With the general disappearance of reserve requirements, banks have begun to pay interest on demand deposits that were once non-interest-bearing accounts, and business customers seem to be shifting an increasing fraction of their liquid assets into them. Recent double-digit growth of M1 is, to a probably significant but now-unmeasurable degree, the result of these developments, rather than of a loosening of monetary policy.[33]

Broad aggregates are relatively less prone to such demand shifts, because asset reallocations across the margins between transactions money and certain other liquid assets in response to institutional changes are hidden within them. But these aggregates have difficulties of their own. Consider: whatever guaranteed investment certificates (GICs) or Canada Savings Bonds (CSBs) might be, they are not means of exchange, nor are they immediately and cheaply convertible into one. Passbook savings accounts are readily convertible, but they are also used as savings instruments by a significant fraction of holders; they are, therefore, close substitutes for chequable notice deposits on one margin, and for GICs and CSBs on another. Thus, an aggregate that includes chequable notice deposits but excludes passbook savings accounts draws an arbitrary line in one place, while one that includes the latter but excludes GICs and CSBs draws an equally arbitrary line in another. Similar considerations arise with a variety of other assets, and

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32. The earliest and still standard reference dealing with institutional developments in the late 1970s and early 1980s is Freedman (1983). It has subsequently become apparent that the addition of a shift dummy variable for the years 1980 to 1982 seems to be enough to render the Canadian demand for M1 function stable, by conventional standards, from the mid-1950s until the early 1990s. See Hendry (1995) for a recent investigation of the demand for M1 over the 1956–1993 period.

33. Boessenkool et al. (1997) seems to have been the first published study to draw attention to and attempt to make allowances for this recent shift in the demand for M1. The foregoing discussion owes a great deal to conversations with Loretta Nott.

as the array of products that the financial services industry offers the public changes over time, so too will new problems of this sort continue to arise.[34]

The uncomfortably wide gap between simple economic models and the world we actually inhabit, where a sophisticated financial system provides a broad and changing array of assets, some of which more obviously play a means-of-exchange role than do others, cannot be permanently bridged by more research. The best that can be done is to monitor the effects of institutional change on the relationship between monetary theory and the monetary system to which that theory is being applied, and to adjust the application to whatever new information this monitoring provides.

6.   The monetary policy framework

I have already noted that the analytic framework in terms of which the Bank of Canada's policy is designed and conducted has no well-defined place for any monetary aggregate beyond an indicator role. This is not surprising, because policy-makers usually look to economic models to define the roles of variables for them, and the explicit model, QPM, which informs the Bank's framework, excludes monetary aggregates altogether. To be sure, analysis derived from QPM is not the only factor in the Bank's policy decisions, nor does that model mimic precisely what the Bank actually does. Thus, the Bank's policy instrument is the overnight rate, and its preferred short-term indicator of the stance of policy is the monetary conditions index (MCI), a weighted average of the yield on 3-month commercial paper and the exchange rate of the Canadian dollar against the basket of other G-10 currencies. In contrast, within QPM itself the key monetary policy variable is the spread between the commercial paper rate and the 10-year government bond rate. Even so, the bond rate and the exchange rate are endogenous variables in QPM, so recognizable informal links do exist between the model and the Bank's operating framework.

As to the quantity of money, the authors of QPM suggest that its "seemingly curious" absence from their model is "more apparent than real." They make this claim because, within the model, "it is straightforward … to close the circle with respect to money growth … by specifying a link between inflation and money growth and between the price level and the money stock using a money-demand function … but nothing would be added except an endogenous determination of monetary magnitudes. At this level of discussion, money is there; staff simply do not pay any explicit attention to it" when they use QPM in policy exercises. The money, whose absence from QPM is "more apparent than real," that is to say, is passively endogenous and has no active role to play in monetary policy's transmission mechanism. The Bank's use of monetary aggregates as

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informal and supplementary indicator variables for policy-making purposes is compatible with this view.[35]

It is simply a fact that the interest rate spread used in QPM is an extremely good substitute for leading indicators based on M1, particularly with respect to real economic activity, and so it might be argued that no great harm comes from its ignoring active money. The problem with QPM, however, and indeed with the Bank's operating framework, is not just that they have no role for active money, but that they also leave an uncomfortably wide gap, whether measured in terms of steps along a causative chain or simply by the passage of time, between changes in the policy variables they emphasize and the response of the Bank's inflation-rate target. Today's actions vis-à-vis interest rates must be geared to a forecast of the inflation rate six to eight quarters in the future, and, as time passes, policy must be adapted to changes in that forecast. In effect, if the Bank is to avoid short-term distractions, then it must take the risks inherent in allowing a forecast of inflation to replace the actual inflation rate as the main focus of monetary policy. The intellectual discomfort that these risks must generate could be eased by monitoring and responding to some observable *intermediate target* variable, which is affected by policy actions earlier than inflation, but to which inflation's own subsequent behaviour seems to respond systematically.

The obvious candidate offered by QPM for this role is the "output gap"—the difference between the current level of real GDP and an estimate of the maximum sustainable value of that variable. This gap responds to monetary policy earlier than does inflation and it is critical in transmitting the effects of monetary policy to that ultimate target, both within QPM but also apparently within the Canadian economy. These properties of the variable suit it well to the "intermediate target" role.

However, there are objections to using it in this way. To begin with, were one to try to measure it directly, one would need an estimate of the economy's "natural" unemployment rate, one of the hardest variables to pin down in the whole of applied macroeconomics, not to mention data on available productive capital, as well as factor productivity. As it is, the Bank relies on direct estimates of the output gap, based on a measure of potential output derived by applying a sophisticated time-series filter to data on actual output, a procedure that carries with it problems of its own. The recent appearance of confidence bands around estimates of the gap in *Monetary Policy Report* charts suggests that the Bank itself is well aware of these measurement problems.[36] It is also worth recalling that, in the 1970s in particular, estimation difficulties of this sort

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35. The quotations in this paragraph are from Coletti, Hunt, Rose, and Tetlow (1996, 123).

36. For a constructive technical critique of the Bank's approach to measuring the output gap, see St-Amant and Van Norden (1997).

interacted with over-optimism about the efficiency of the labour market to produce what turned out to be significantly over-expansionary macroeconomic policy. To enhance the role of the output gap in the current policy framework is to increase the risk that such errors might be repeated in future.

7.   A role for monetary aggregates

On the other hand, and notwithstanding the experience with M1 in the late 1970s discussed earlier, the use by the Bank of an intermediate policy target, based on the behaviour of one or more monetary aggregates, seems a more attractive option. In the "active-money" analysis deployed earlier in this essay, money has causative significance in monetary policy's transmission mechanism and its behaviour is subject to systematic influence by the central bank. Also, crucially, the analysis in question seems to match some key features of the Canadian economy. From a purely technical point of view, the difference between the quantity in circulation of some narrow transactions-oriented aggregate and its steady-state demand has a significance to monetary policy's transmission mechanism not unlike that of the difference between current and capacity output. A transactions money gap does not have the same capacity to generate political controversy as do measures of output and employment, however, because the level of the nominal money supply has no direct significance in its own right for economic welfare, as do the levels of real income and employment. The extra degree of insulation from political pressures that this implies for monetary policy gives a monetary aggregate an advantage over output or employment variables as an intermediate policy target.

Two more purely technical considerations also weigh in favour of using a monetary aggregate in this way. The first stems from the quantity of money lying closer than does output to what the Bank actually does along that causative chain known as the transmission mechanism of monetary policy. The chain has many links, and by the time the output gap can reveal that policy has been inappropriate, it is often too late to avoid damage. Transactions money, however, helps transmit monetary policy impulses to the output gap; as a practical matter, much more important, it also helps transmit the effects of other impulses originating on the real side of the economy when monetary policy is not changed to offset them as they occur. Even though, in Canada, it is observed on only a monthly basis, and with a lag of three weeks or so, and even though these monthly observations are extremely "noisy" such that only their trend over one or two quarters

can be expected to reveal information about the appropriateness of the recent policy stance, that is still probably early enough to prompt useful action if policy appears to have strayed off track.[37]

An enhanced role for a transactions money aggregate would also strengthen the Bank's ability to communicate its intentions about the future stance of policy. Even assuming a high degree of credibility for inflation targets, the fact that what the Bank does today only affects inflation six to eight quarters later inevitably leaves private agents, particularly in financial markets, eager for further insight into what might happen to interest rates and the exchange rate in the interim. Experience has shown that for the Bank to speculate publicly about the likely evolution of, say, the MCI, even when the risks to which such speculations are subject are explicitly noted, invites misinterpretation. Regular statements from the Bank about what would constitute desirable behaviour on the part of one or more monetary aggregates over the next year, say, could be a useful input into private sector agents' attempts to forecast interest rates and the exchange rate. Such statements would be at less risk of inadvertently giving the impression that the Bank was tipping its hand about its future intentions for the interest rates under its direct control than any concern with "monetary conditions."[38]

Certain obvious objections to such use of a transactions money aggregate must, nevertheless, be taken seriously. Thus, it is true that even year-on-year variations in M1, which is a widely monitored measure of transactions money in Canada, do not betray any simple stable correlation with year-on-year fluctuations in the price level.[39] It is important to distinguish between two factors here that are often confused with one another. The first is the proclivity of measures of M1 *growth* to have given misleading information when used as leading indicators of output and inflation, and the second is the occurrence of shifts in the *demand function* for this aggregate.

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37. Racette and Raynaud (1991), who are also uneasy about the Bank of Canada's current operating framework, and argue for paying more attention to a monetary aggregate, nevertheless favour a broader one. Given that broader aggregates are better than narrow ones as leading indicators of inflation, the Bank's ultimate target variable, there is something to be said for this position. However, the extra information that broad aggregates yield is only available significantly later than that contained in narrower measures of money, and this reduces their usefulness as early warning devices. This, and the fact that the role of a transactions aggregate is better grounded in the theoretical framework described earlier in this paper, seem to weigh in favour of the latter. However, it is important not to exaggerate differences of opinion here. It is hard to believe that policy-makers who treated one aggregate as an intermediate target variable would, in practice, ignore all others.

38. Independently of whether or not the Bank should begin to use monetary aggregates in this way, there is something to be said for making an easily accessible version of QPM available to private agents who wish to use it, not to try to reproduce the Bank's own policy projections, but rather to draw their own inferences about the Bank's likely responses to whatever shocks those agents think are likely to affect the economy over their decision-making horizon.

39. Mishkin and Estrella (1998), discussing U.S. and German data, argue that the lack of simple stable correlations of this sort disqualifies monetary aggregates as useful intermediate target variables. As will be apparent from the discussion that follows, I believe that this conclusion is seriously overstated.

Quite apart from the problems that arose in the late 1970s, M1 growth was well into double digits in the years 1983–84, but this was followed neither by an over-exuberant real expansion, nor by a resurgence of inflation. The period after 1992 saw a qualitatively similar pattern of events.[40] These apparent anomalies stemmed from the fact that this particular indicator, by its very nature, makes no allowance for the pronounced increase in the demand for M1 that occurs at times when nominal interest rates fall significantly. There should have been nothing surprising about them, and they provide no evidence against the appropriateness of using monetary aggregates in the policy process. Their implication is rather that, if a monetary aggregate with a large interest elasticity of demand is to be used as a target variable, then this elasticity had better be taken carefully into account when goals are set for its behaviour, and the outcome monitored for any surprises stemming from this quarter.[41]

The propensity of the demand function for M1 to shift in response to institutional change raises different issues. The last 30 years have seen two episodes of such instability: 1980–83, and one that began in 1994 or 1995 and may still be in progress. The institutional changes that create such problems are not usually predictable, nor is the length of time over which they are likely to distort the data. However, they are readily observable while they are occurring, provided that one is on the lookout for them. Even so, the fact that they do occur, and might well occur again, suggests that it would be unwise for the Bank to rely on a single policy framework, based on a particular monetary aggregate, to the exclusion of all else. There will be times when it becomes, and will be known to have become, unreliable. But that is no argument against paying more careful attention to such a framework than is now done.

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40. The most widely used M1 growth indicator is *real* M1 growth; this may be thought of as a very crude, and therefore sometimes inadequate, indicator of impulses imparted by the gap between the supply and demand for money. Specifically it measures the rate of change of this gap in the case where the effect of real income and interest rates on the demand for money can be ignored, presumably because variations in the demand for nominal M1 are dominated by variations in the price level, which in turn are largely the consequence of past monetary policy. In circumstances where other determinants of the demand for money, notably interest rates, are exerting an important influence, this indicator becomes unreliable for reasons discussed in the text.

41. The effects at work here have long been understood to explain why, in periods of rapid inflation, prices rise faster than does the money supply. See Bresciani-Turroni (1931, tr. 1937) for a classic application to the Weimar Republic hyperinflation. In conditions of falling inflation, the phenomenon is sometimes referred to as the "re-entry problem." That its relevance to recent Canadian experience was understood before the event by advocates of an active-money approach is illustrated by the title of Laidler and Robson's (1991) commentary on what they then believed to be a pressing monetary policy problem—*A Rough Re-entry*. Advocates of passive money, not least those at the Bank of Canada, have been aware of this problem since the early 1980s, as Charles Freedman has pointed out to me.

For a monetary aggregate to be a useful intermediate target, it is not enough for it systematically to affect aggregate demand; it also must be controllable, in the sense that specific policy actions can be expected to have a well-defined effect on its behaviour.[42] The problem of controllability, as a practical matter, has two dimensions: first, there must exist a stable linkage between policy instrument and target; and second, that linkage must be adequately understood. Here again, it is important not to be misled by an at-first-sight unpromising history. M1 growth did indeed prove hard to control in the late 1970s, but the control mechanism used at that time was derived from analysis that embedded a short-run demand function in a passive-money view of the world. It was, if the arguments presented in this paper are valid, flawed because it ignored the role of credit markets in the money supply process.[43] That said, our understanding of the mechanisms involved here is seriously deficient at the moment. There is a surprising dearth of work exploring the credit-market processes linking the evolution of the supply of money to variations in the interest rate variable actually under the Bank's direct control, and that could be used for implementing a regime that treated that variable as the basis of an intermediate target.

As noted above, the interest rate spread on which QPM concentrates is highly correlated with M1 growth, so it might seem that repairing this gap would be straightforward. There are, however, at least three complementary reasons why these variables might be related to one another. First, if money growth affects inflation expectations, and does so more systematically at horizons beyond, say, 18 months than in the nearer term, it will influence the yield spread by that route. Second, if, when excess money is put into circulation, some of it spills over into securities markets, this "liquidity effect" might influence the demand for short-term assets more than that for long-term assets, and thereby affect the yield spread. Finally, according to an active-money view of the transmission mechanism, it is borrowing from the banking system that drives money growth in the first place, and its attractiveness varies with the spread between the returns that agents expect to earn on the new assets they acquire with the proceeds of their borrowing and the costs of that borrowing. To the extent that a longer rate of interest is influenced more by market forces and less by policy actions than a short rate, the spread between them will be related to money growth.[44]

The last of these effects has to do with the *causes* of money growth, while the first two are related to its *consequences*. If we are to understand the relationships among the overnight interest

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42. Charleen Adam has provided helpful discussion of the role of controllability as a factor affecting the potential of a monetary aggregate to serve as an intermediate target variable.

43. For a contemporary critique of the role of the passive-money view in the money-growth-targeting regime along these lines, see Howitt and Laidler (1979).

44. For discussions of the relationship between interest-rate spreads and money growth, see in particular Macklem's (1995) comments on Laidler and Robson (1995).

rate that the Bank of Canada actually controls, the yield spread between 3-month and 10-year securities, bank lending, and money growth, and use that understanding in devising reliable methods of controlling the money supply, we must first understand the complicated interactions that lie behind them.[45] Until this is accomplished, it will be difficult to a make a complete case for treating any monetary aggregate as the basis for a full-fledged controllable intermediate policy target. The case remains, though, for treating such a variable less formally, as a systematic and useful leading indicator of what the effects of past policy actions are likely to be, and how therefore the stance of policy ought to be modified.

8.   Concluding comments

The first basic message of this essay is this: When the Bank of Canada formally gave up money-growth targeting in 1982, and demoted M1 (along with other monetary aggregates) to the status of an indicator variable with no formal place in its operating framework, it went too far. To have made nominal M1 growth not just *a* but *the sole* target of monetary policy, as was done in the 1970s, was to put far more weight on that aggregate than it could bear. However, if the active-money view advanced in this paper is correct, not all of the difficulties that were then encountered originated with the aggregate itself. Some of them arose from the flawed mechanism deployed to control its growth, and, if we probe deeper, from the view of money as a passive variable in the economy that underlay it.

A second, empirical, proposition has also been advanced that serious money-demand instability does not seem to be a continuous phenomenon.[46] In the case of M1, Canada has experienced two episodes of serious instability over the past 40 years: one in the early 1980s, and one in the last three years. Furthermore, once its potential for shifting the money-demand function has been recognized, institutional change is better thought of as reducing rather than obliterating the information contained in money growth.

This paper's third, and more general, message may be put as follows: The existence of instability in the money-demand function, whether resulting from institutional change or from any other source, does not alter the importance of the interaction of that demand function with an independent money-supply function for the determination of aggregate demand; it simply makes

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45.   Here again, MGE analysis, of which Hendry and Zhang (1998) provide a recent example, looks like a promising tool for coming to grips with these problems. Models of this type explicitly specify the nature of the credit-market relationships between banks and the private sector and the nature of money-holding and expenditure decisions. These models also pay careful attention to the sequencing of the transactions that follow from these decisions. They are ideally adapted to modelling the processes at work here, and to investigating which features of the financial system are and are not important in generating their salient empirical characteristics.

46.   I am aware that in making this observation I am tempting fate!

it more difficult to apply our understanding of this mechanism to the design of monetary policy. It is important to be able to recognize such shifts when they occur, and to make allowances for their effects when interpreting the significance of the observed behaviour of money. That behaviour, however, remains important precisely because the interaction of the supply and demand for money is crucial not only to the impact of monetary policy but also to the way other shocks impinge upon the economy.

These messages together provide the basis for this essay's fourth and final theme: When it comes to monetary policy, it would be appropriate and helpful to move towards using the rate of growth of one or more transactions-money aggregates or some variable related to that rate of growth. These growth-related aggregates or variables should be used not, as in the late 1970s, as the only target of monetary policy, but rather as a supplementary intermediate target variable in a regime whose principal anchor is an inflation goal. Note, however, the phrase "move towards using:" in the current state of knowledge, we do not know enough about the controllability of any monetary aggregate to justify its immediate promotion to the status of a formal intermediate target. Note also the reference to "one or more transactions-money aggregates," rather than to a specific measure such as M1. There have been, and presumably will again be, times when the behaviour of any monetary aggregate will be difficult or impossible to read, just as there have been and will be similar times for such variables as the output gap, the yield spread, or the MCI. It would be foolish not to maintain a capacity to use information available from elsewhere at such times, even as work proceeds to enhance and maintain the usefulness of whatever monetary aggregates are initially chosen to play a role in policy formation. What is being proposed here is the promotion of monetary aggregates, particularly those appertaining to transactions money, in the hierarchy of policy variables, not the displacement of other variables by them.

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