THE INFORMATION CONTENT OF MONETARY INDICATORS[1]

A discussion by Eric Hansen of problems in assessing the implications of movements in the money and credit aggregates, interest rates, and exchange rates for the level of nominal expenditure. The views expressed in this article are not necessarily shared by the Reserve Bank of New Zealand.

Abstract

One of the main tasks of economic advisers to government and the private sector is to assess the implications of changes in 'indicators', such as money and credit aggregates, for the likely future level of nominal expenditure. Since information on the variables of ultimate interest become available only with a lag, the adviser is forced to identify and interpret 'indicators' of these variables. Simple macroeconomic models suggest that movements in money and credit aggregates, interest rates, and exchange rates contain valuable information about likely future developments in nominal expenditure, as well as changes in real output and the price level. More complex models reveal, however, that *individually* none of the indicators contain unambiguous information. Looking at the main monetary indicators *collectively*, on the other hand, requires a model specifying clearly the inter-relationships between indicators: without such a model, collective interpretation of the various indicators can also be misleading.

Introduction

The operation of current monetary policy in New Zealand was described recently in 'A Layman's Guide to Monetary Policy in the New Zealand Context' (June 1987 *Bulletin*, pp. 104-111). That article discussed the main instruments used by the Reserve Bank in the conduct of monetary policy, the channels through which monetary policy affects the economy, and the broad considerations taken into account in making policy-related decisions. The present article complements the article in the previous *Bulletin* by providing further background to considerations underlying monetary policy decision-making. In particular it discusses problems in interpreting systematically the movements in the money and credit aggregates, interest rates and exchange rates to assess the likely future level of nominal expenditure and the consequent implications for the rate of output and the price level.

The need to use such 'indicators' to predict movements in variables of ultimate interest arises because observations on such variables are either infrequent or subject to substantial inaccuracies, or simply are unavailable. For example, the constant price national income and expenditure statistics are published initially with a lag of up to six months or so, and are subject to substantial revision during the following year or more. Similarly, the effect of the government's monetary policy on expectations of future inflation is not directly observable.

[1] This article is based on a forthcoming Reserve Bank of New Zealand Discussion Paper by Eric Hansen and Brian Silverstone, 'The Information content of Monetary Indicators'.

While simple macroeconomic models suggest the indicators referred to individually carry valuable information about likely future developments in key variables, more complex models cast serious doubt on this presumption. The problem is compounded by the fact that interpretation of movements in the main monetary indicators will differ with the purpose for which they are being interpreted. One distinction, for example, is between the use of money and credit aggregates, interest rates, and exchange rates as indicators of the intermediate variable, the state of monetary conditions, compared with their use as indicators of nominal income growth. Clearly, the current state of monetary conditions is just one of many factors influencing nominal income growth. Examples of other factors include other government policy measures, changes in tastes, technologies, expectations, trade patterns, and the public's expectations, perceptions or misperceptions about these factors. The role of those who assess the government's monetary policy is to determine the influence of the monetary authorities on nominal income and inflation. To answer this question, the actual state of monetary conditions must first be determined.

Indicator Analysis and How It May Help

In general, any price or quantity measure which has a close empirical association with another measure of ultimate interest, and which is observed prior to that measure, may be used as an indicator of the variable of ultimate interest. As a simple illustration, suppose that current consumption (C) is observed prior to current income (Y) and it is believed that there exists a stable relationship between the two which can be represented in the following way:

$$C_t = \text{constant} + 0.6Y_t.$$

From the equation above we would know that a 10 dollar increase in income is typically consistent with a 6 dollar increase in consumption. Thus, we could use consumption statistics as an indicator of aggregate income despite the fact that consumption is just one of five components of aggregate national expenditure: consumption (C), investment (I), government spending (G), exports (X), and imports (M).

Suppose instead, however, that consumption actually depends on interest rates (r), as well as income (Y), and the consumption relationship is better represented by:

$$C_t = \text{constant} + 0.6Y_t - 5r_t$$

Observed consumption statistics will now be a good indicator of aggregate income only if we also adjust for interest rate movements: i.e.,

$$C_t + 5r_t = \text{constant} + 0.6Y_t$$

In this example, further problems arise when r has to be interpreted as the real interest rate, rather than the nominal interest rate, or if current consumption is a function of 'permanent income' (expected income over the life cycle of the economic agent), rath-

er than current income. Neither real interest rates nor permanent income are directly observable.

Nevertheless, the general idea of indicator analysis is to model economic relationships empirically, based on a theoretical model of the economy. A full business cycle model would be ideal for this purpose, but is too complex for this discussion.[2] The main concern of this paper is to concentrate on the information available from each indicator singularly in order to point out the reservations and uncertainties surrounding each indicator taken alone.

Traps in Interpreting Movements in Individual Indicators

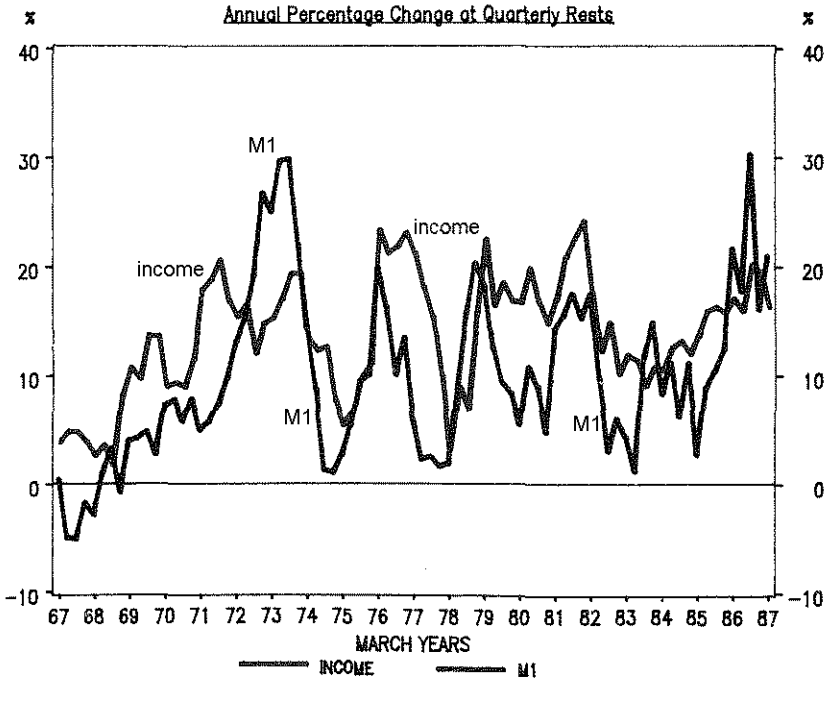
Monetary aggregates are often regarded as the major indicators of monetary conditions, reflecting the 'Quantity Theory' which links the money stock and its velocity to nominal aggregate expenditure.[3] If the velocity of money does not change, then an increase in money is associated with an increase in nominal expenditure. Traditionally *M1* (narrow money stock) has been expected to form a close historical relationship to spending because of its dominant role as a medium of exchange in transactions. But, as figure 1 shows, the relationship between M1 and nominal income has proved rather weak. The loose relationship between M1 and nominal income may be accounted for by a number of factors, including the following:

— changes in the velocity of circulation of M1 balances (the number of times the average dollar of M1 balances are used in transactions during the period of measurement);
— direct use of money balances other than M1 balances, such as autoaccess accounts, to settle transactions;
— changes in the stock of M1 balances between end of month or end of quarter measurement points; for example, it is possible for a term deposit (an M3 balance) to be transferred to a cheque account (an M1 balance), used in a transaction, and transferred back into a term deposit — all within a matter of days;
— use of other media of exchange in transactions, such as certain forms of credit.

The Quantity Theory predicts a stable money-income relationship because of a range of research work which led economists to believe that the velocity of money is relatively stable. Also important, however, is an implicit assumption that a single, well-defined money stock exists as the sole medium of exchange. In practice, however, the information content of movements in M1 balances is constrained severely in the absence of information about the movements in *velocity, M2, M3,* and *broad credit* aggregates.

Moreover identifying the information content of the broader money and credit aggregates in addition to M1 is also hampered by measurement and interpretation difficulties. M3, for example, includes term deposits which are held partly as savings assets rather than as transactions assets. Consequently, an increase in the overall level of real interest rates (which is an 'indicator' also) will tend to shift the composition of M3 from non-interest bearing transactions balances towards savings balances. Typically an increase in real interest rates would lead to a decrease in spending while the level of M3 (as distinct from its composition) might not have changed. Alternatively, an increase in interest rates on term deposits relative to other (non-M3) savings instruments would tend to inflate M3 balances, without a corresponding effect on aggregate spending, unless the overall level of real interest rates also changed.

Figure 1
M1 and Nominal Income
Annual Percentage Change at Quarterly Rests



2 A model of business cycles in a small open economy is currently being developed within the Bank and should eventually prove a useful complement to the indicator analysis already used.

3 The 'Quantity Theory' focuses on the money-nominal income relationship given by M.V. = P.Y.
where: M is money stock,
V is velocity of money,
P is price level, and
Y is real expenditure.
Velocity, though not a constant, is thought to be relatively stable over time.

Measurement of the appropriate credit aggregates presents difficulties also. To provide a comprehensive set of information useful for understanding financial developments and their relation to economic behaviour, credit aggregates need to include lending which does not have a counterpart in the monetary aggregates and which is left out of the narrower credit measures which are derived as a result of the use of a balance sheet framework for measuring monetary aggregates. For example, retail, credit card, and trade credit extended by organisations not included in the M3 collection would all need to be taken into account. But as there is a vast array of these firms, collecting and collating the relevant statistics would be a time consuming and costly process.

Interest Rates are usually thought to contain information about income growth because of their effect on certain categories of consumption and investment expenditure. At least in economic models which assume an economy at full employment continuously and zero inflation, a fall in nominal interest rates is associated with less saving and increased consumption. For the practical application of indicator analysis, however, this set of conditions is too restrictive. Any analysis of observed nominal interest rates must distinguish between their real and inflation components, as represented in the following relationship (known as the Fisher Equation):

Nominal interest rate (i) =
expected real interest rate (r^e)
+ expected inflation rate (p^e)

Nominal interest rates are determined by supply and demand in credit markets. If inflationary expectations were to remain static in the short term, then movements in nominal interest rates would be a reflection of movements in real interest rates. Even here though interpretation of interest rate movements depend crucially on the source of the new influence on the credit market. The differences can be illustrated diagrammatically. Figures 2 and 3 represent the demand and

Figure 2

The Market for Loanable Funds: Increase in Demand

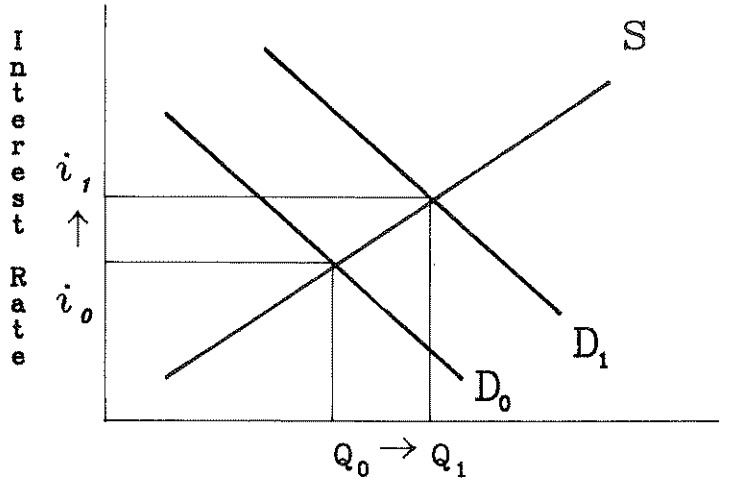
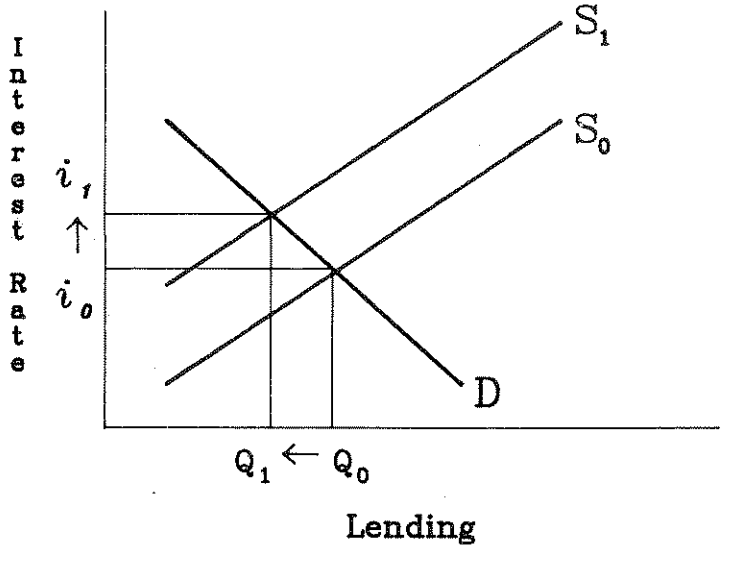


Figure 3

The Market for Loanable Funds: Fall in Supply



supply for loanable funds at various interest rates. The results of an increase in the demand for loanable funds in figure 2 is contrasted with a decrease in the willingness to supply loanable funds in figure 3. In both cases, interest rates would register an increase, which might be suggestive of an unexpected tightening in monetary conditions. However, whereas in the case of a decrease in supply for loanable funds an easing in the liquidity constraint (i.e. an injection of base money) might be consistent with keeping credit growth stable, in the case of an increase in demand for loanable funds a policy-determined injection of money would accommodate a possibly unwanted increase in credit.

Of course, *expectations of future inflation* are not static, even in the short run. Such expectations are relevant for two reasons. First, in order to understand what is happening to unobservable real interest rates, one needs to adjust the observable nominal interest rates for inflation expectations. Secondly, expectations of future inflation rates can also convey information about the inflation component of future nominal income growth. While expectations can to some extent be self-fulfilling, expectations as an indicator of future inflation depend on the degree of economic understanding of those people forming expectations, and their ability to forecast the future direction of policy, acts of nature, and events external to the economy. In general, the longer the forecast period the less certain these forecasts become. In addition, knowledge of significant upcoming events, such as an election, may add further noise to expectations (and other indicators) for various reasons, including increased speculation or uncertainty about the future path of policy.

Inflationary expectations have the potential to convey information about the state of monetary conditions, since the firmness of monetary conditions is a factor influencing future inflation and, hence, expectations about inflation. In practice, however, inflationary expectations are also influenced by numerous other factors, including announced and expected future fiscal, trade and financial market policy initiatives, prospective wage negotiations, and also external events which affect the domestic economy. In essence, anything which has the potential to affect the actual inflation rate in either the short term or medium term will also affect inflationary expectations. The problem for the monetary policy adviser in using inflation expectations as an indicator of monetary conditions is to adjust for these other (sometimes unobservable) influences.

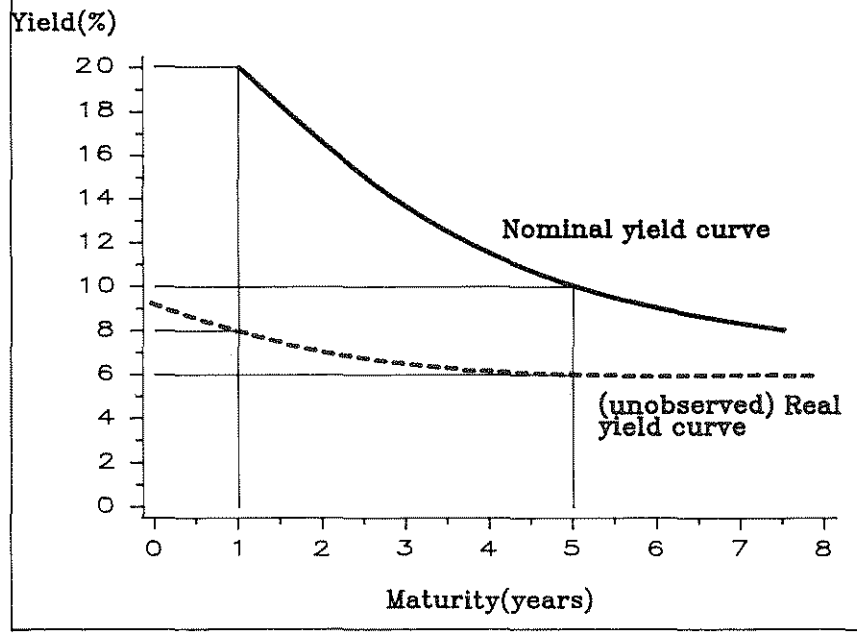
The major difficulty in interpreting inflationary expectations is obviously the difficulty of observing them. One technique commonly used is to look at the slope of the nominal yield curve.[4] For example, in figure 4 the nominal yield curve is negatively sloped (inverted), falling from a 20 per cent yield for one year bonds to 10 per cent for five year bonds. But this does not imply that inflation is expected to fall from 20 per cent to 10 per cent by the end of year 5. To estimate inflationary expectations we must first adjust nominal interest rates for their (unobserved) real interest rate component, as is implied by the Fisher equation.

If real interest rates are such that the yield curve for real rates is as shown in figure 4, the correct interpretation of the nominal yield curve is that the expected annual rate of inflation in the coming year is 12 per cent - the difference between the nominal and real yield for one year bonds. The 4 per cent difference between the nominal and real yields for five year bonds is (approximately) the average expected inflation rate during the coming five years; it is not the expected inflation rate during year five.

There is obviously a circularity problem here. Nominal interest rates cannot be adjusted for the real interest rate component unless that is known. Real interest rates can only be themselves derived from nominal interest rates adjusted for inflation expectations (unless it is reasonable to assume that the real interest rate element built into forward-looking nominal interest rates can be taken to be the same as historical nominal interest rates adjus-

Figure 4

Yield Curves



4 A yield curve shows how yields (similar to interest rates) on a particular type of financial bond (government stock, for example) vary as the length to maturity of the bond increases.

ted for historical inflation). The desire to obtain an independent indicator of expected future annual inflation rates is one reason behind the Reserve Bank's decision to establish a quarterly Survey of Expectations. (Results of the second quarterly Survey of Expectations are described elsewhere in this *Bulletin*.)

Exchange Rates are also widely accepted as useful monetary indicators. Again, however, identifying the information content of exchange rates is in practice very difficult. One simple view of *nominal* exchange rate determination assumes that (exchange rate adjusted) prices of goods and assets in any two countries will be equal. If prices are not equal traders import or export goods until prices are bought back into equality. In this view, most movements in the nominal exchange rate reflect expected movements in domestic inflation rates relative to foreign inflation rates, since the real component of the exchange rate does not vary frequently or quickly.

In practice, however, real exchange rates can vary widely. Given this, identifying the information content of a nominal exchange rate movement requires a separation of the inflation expectations-related and real components of the exchange rate change. In this sense the problems with interpreting exchange rate movements are similar to those with interest rates.

Movements in the *real exchange rate* contain information about nominal expenditure because the real exchange rate affects the real demand for consumption and investment. As with real interest rates, however, the information carried by real exchange rates needs to be interpreted very carefully. For example, if there is an increase in the demand for credit, this will raise domestic real interest rates above world rates. Among other things, one effect will be an increase in demand for the domestic currency, relative to foreign currency, causing an appreciation of the real exchange rate. If either or both the higher exchange rate and higher interest rate is interpreted as an unintended tightening of monetary conditions then the monetary policy reaction may potentially be procyclical, with an easing in liquidity accommodating the possibly unwanted increase in credit.

The 'Looking at Everything' Approach

The inadequacies described of 'single variable' indicator analysis described above have led monetary authorities in many countries to 'look at everything' when assessing the likely future growth of nominal expenditure. This approach typically involves interpretation of movements in all three main monetary indicators (money and credit aggregates, interest rates and exchange rates) together with broader economic developments. These include real economic activity, the financial state of major economic sectors, expectations and confidence factors, developments in foreign capital markets, other overseas developments and structural changes taking place in the financial sector.

The previous section described the importance of inter-relationships between the main monetary indicators, the source of shocks to the economy, the behavioural characteristics of the country, etc. This analysis, though, was conducted in the absence of an economy-wide model, and must therefore be regarded as tentative only. The linkages and outcomes described can be thought of as short-run 'resting' positions for the economy, rather than the complete adjustment path. Economies are bombarded continually by shocks of all different types. Indicator analysis is therefore invariably conducted in an economy subject to a great deal of 'noise' and uncertainty and which has adjusted only partially to previous shocks. Indeed, some analysis of adjustment paths of the economy between 'resting' positions suggest it is possible for the indicators to move in directions which are counter-intuitive to the casual theorising in this article. In particular, the direction of movement of interest rates and exchange rates can be dependent on the strength of the institutional and behaviour characteristics of the economy.

The only model which can replicate accurately the adjustment paths of the whole economy is a complete model of the economy. The problem, of course, is that in practice there is no one model which truly represents the economy and the way it adjusts in all circumstances. The sheer complexity of the economy has kept the economics profession worldwide busy trying to find the true model, or at least partial models which are adequate for particular forms of analysis.

Conclusion

Inferring the likely future path of nominal expenditure from movements in any one indicator can be misleading. Movements in the money and credit aggregates, interest rates, or exchange rates are not capable on their own of predicting the likely future path of nominal expenditure. A 'looking at everything' approach — looking at the three main monetary indicators and other information — is required, but can also be misleading without a clear unifying framework and model. Analysing the degree to which changes in one indicator affect the interpretation of movements in the other indicators is simply too difficult without an explicit theoretical framework. By way of illustration, consumption statistics may be a reliable indicator of aggregate income if consumption depends on income only, but will not be a reliable indicator if consumption depends also on interest rates.

Models incorporating the relationships between indicators and variables of ultimate interest, and between indicators themselves, are of necessity complex. But the complexity of indicator analysis is simply a reflection of the complexity of relationships within the economy. It is the role of economic advisers to government and the private sector to take these complexities into account in the process of providing sound economic analysis and advice.