

MONETARY TARGETS: SOME NEW ZEALAND EVIDENCE

INTRODUCTION

The resurgence of interest in the role of money in economic policy formation which took place in the late 1960s has led, in recent years, to a number of western governments adopting some form of publicly announced monetary target or guideline. The pursuance of such targets is generally based on two beliefs on the part of the monetary authorities. Firstly, that there is a causal relationship between the monetary target being used and the ultimate targets of economic policy — inflation, employment, growth etc. Secondly, that the monetary aggregates can to a reasonable extent be controlled through changes in the available policy instruments. There is also the hope that the public announcement of monetary targets will of itself facilitate the control of the aggregate or magnify its influence.

It is evident from the wide variety of monetary aggregates which have been adopted overseas as targets that there is no one aggregate which has been found to meet consistently these requirements. Indeed, published research suggests that an aggregate which appears most suitable as a target variable in one country might be inappropriate in another.

In New Zealand the Reserve Bank has for some time published a range of monetary and credit aggregates in the *Bulletin*. Although the public announcement of monetary targets has not been utilised by the authorities, with the exception of a private sector credit guideline in 1978/79, official analysis of monetary conditions is usually conducted within the framework of these data. Movements in such variables as M1, M3 and the credit aggregates are subject to close surveillance and policy is often based on forecasts of these aggregates as well as other facets of economic activity. In addition, the Reserve Bank has encouraged and supported research into the relationship between money and the economy and on the role and appropriate form of monetary policy. Some of this work has been published in previous Bulletins, in Research Papers and in the text *Monetary Policy and the New Zealand Financial System*. This article outlines some results obtained from a recent research study¹ conducted within the Bank. The main objective of the research was to compare the characteristics of a range of money and credit aggregates with a view to identifying the most suitable potential monetary target variable for New Zealand.

Two main criteria were used to enable comparisons to be made between the alternative aggregates. The first criterion was the strength of the relationship from each of the aggregates to the final objectives of economic policy. The second criterion was based on the extent of control that could be exerted by the authorities over the aggregate.

The aggregates which were considered (and the notation adopted) were as follows:

Monetary Aggregates

- M1 = Narrowly defined money supply.
= Currency holdings plus demand deposits at trading banks plus savings bank cheque accounts.
- M2 = M1 plus all other demand deposits at M3² institutions.
- M3 = Total money supply and selected liquid assets in the hands of the public.
= M2 plus all term deposits at M3 institutions.

Credit Aggregates

- LPT = Total trading bank lending to the private sector.
- PSC = Total private sector credit of M3 institutions (excludes claims on local authorities).
- D = Total Domestic Credit.
- DC1 = Total Domestic Credit adjusted to include overseas claims on Government.

Other

- MB = Monetary base or high powered money
= Cash in the hands of the public plus reserve assets held by trading banks.
- M3B = Broadly defined money base.
= MB plus reserve assets held by other 'M3' institutions.

The following section contains some results obtained from analysing the alternative aggregates according to the first criterion, the relationship between the aggregate and the ultimate targets of policy. In the third section, comparisons are made in terms of controllability.

THE RELATIONSHIP TO ULTIMATE TARGETS

Initial results concerning the strength of the monetary target/ultimate target linkage were obtained by graphing the historical relationships between the various monetary aggregates and private sector aggregate demand.

The graphs depicted in figures 1 to 3 show the annual rates of change in the various aggregates plotted against a private sector demand variable.³

2 'M3' institutions are the Reserve Bank, trading banks, trustee savings banks, private savings banks, Post Office Savings Bank, finance companies, stock and station agents and official money market dealers.

3. Measured as annualised quarterly changes in a four quarter rising average of private sector demand.

1 G. H. Spencer *Monetary Targets. A Comparison of Some Alternative Aggregates* Reserve Bank of New Zealand Research Paper No. 30, May 1980

Credit Aggregates

From figure 1 it is clear that both trading bank lending and total private sector credit appear to lag rather than lead private sector sales, by about one quarter, with trading bank lending tending if anything to be slower in reaction (at the turning points) than private sector credit. This pattern may be taken to imply that over the historical period, private sector credit has to a significant extent been demand determined.

In figure 2 the rate of growth in private sector sales is compared to rates of change in M3 and DC1 (adjusted domestic credit). From the visual evidence it would appear that domestic credit expansion follows private sector demand fairly closely on the upturns, but that it lags demand, sometimes considerably, on the downturns. This is particularly true of the 1974/75 downturn where the attempt at anti-cyclical fiscal policy on the part of the Government caused domestic credit expansion to remain at high levels right through to 1976.

Monetary Aggregates

Relative to domestic credit expansion, the fluctuations observed in M3 growth appear to be more in line with cycles in private sector sales. Also the cycles in M3 appear to lead rather than lag demand by one to two quarters at the turning points. As can be observed with most of the monetary aggregates considered, oscillations in M3 growth are more damped than oscillations in sales through the 1960s, but less damped through the 1970s. A further point to note is the limited extent of the 1976/77 downturn in M3 growth relative to the drop off in private sector demand.

The historical movements in M1 and M2 relative to private sector sales are shown in figure 3. These look very similar to those for M3 with 'money' again appearing to lead sales by up to two quarters. On the 1976/77 downturn however, it is clear that M1 and M2 growth drops away to a much greater extent than M3 growth. This difference is accentuated in figure 5 where M1, M2 and M3 growth rates are compared. Given the sharp increase in nominal interest rates since 1976 it is not surprising to observe this implied switch from cash and demand deposits (the interest rates on which are in the main fixed at zero or three percent) into higher yielding term deposits. However it is interesting to observe that changes in private sector sales over this period are more highly correlated with narrow (M1 and M2) rather than broad (M3) money. This could be taken as a point in favour of concentrating on a narrow rather than a broad money aggregate as a target for monetary policy.

Monetary Base Aggregates

These 'base' aggregates consist of currency in the hands of the public plus reserve assets held either by all M3 institutions, giving M3B; or by trading banks alone, giving MB. It should be apparent from these definitions that the link from 'high powered money', as it is sometimes called, to private sector demand must be an indirect one, operating through one or more of the other money and credit aggregates. In theory, changes in the stock of 'high powered money' serve as the basis for a multiplier process of credit and hence monetary expansion. Textbooks often give the impression that the multiplier process is a mechanical one but the multiplier mechanism in practice will tend to be imprecise, shifting from one period to the next in response to both supply

and demand conditions. To obtain some idea of the stability of the multiplier mechanism one can look at the historical relationships between the monetary base and trading bank lending or private sector credit. The two relationships are similar and so only one (the latter) is discussed in further detail.

In figure 5 the close relationship between percentage changes in the broad monetary base (M3B) and private sector credit (PSC) is unmistakable. Turning points in M3B growth consistently lead turning points in PSC growth by three to four quarters with PSC tending to accentuate upwards rather than downwards movements in the M3B growth rates. The exception to this in figure 5 is the pattern of PSC growth relative to M3B movements at the end of the historical period. In early 1978, M3B growth reached a peak of 32 percent whereas in contrast to the historical pattern, the subsequent peak in PSC growth, which occurred in June 1979, fell below this rate at around 29 percent. This uncharacteristic relationship was probably due to the system of compensatory deposit which was introduced in March 1978 to allow the March tax drain from the banks to be extended over a three month period. When the Reserve Bank lodges compensatory deposits (CDs) with the trading banks the money base is affected to the extent of these deposits. However, the banks, knowing that the CDs must be repaid within two months, would not see the increase in reserves (relative to the same quarter in the previous year) as a signal to increase PSC expansion. When the money base data are adjusted to exclude CDs (dotted line in figure 5) the historical pattern of movements in M3B and PSC becomes evident once more although demand pressures — and perhaps official policy moves on reserve asset ratios — do seem to have reduced its strength below its historical norm.

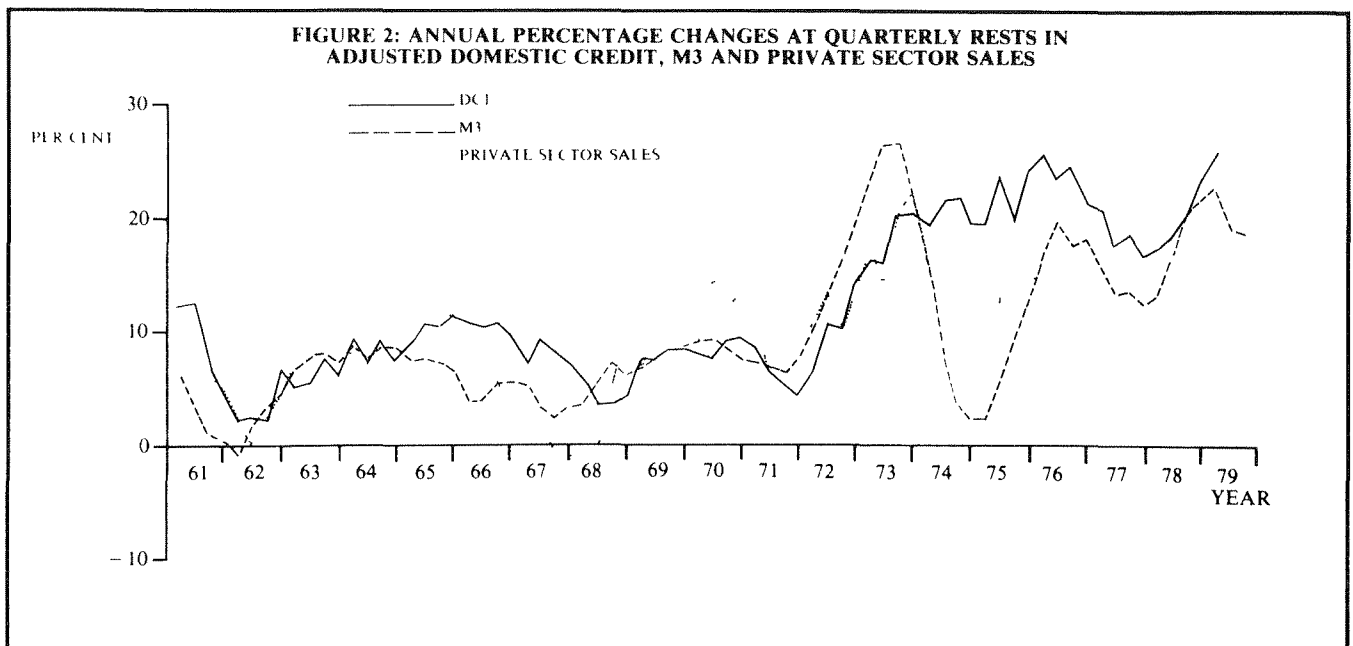
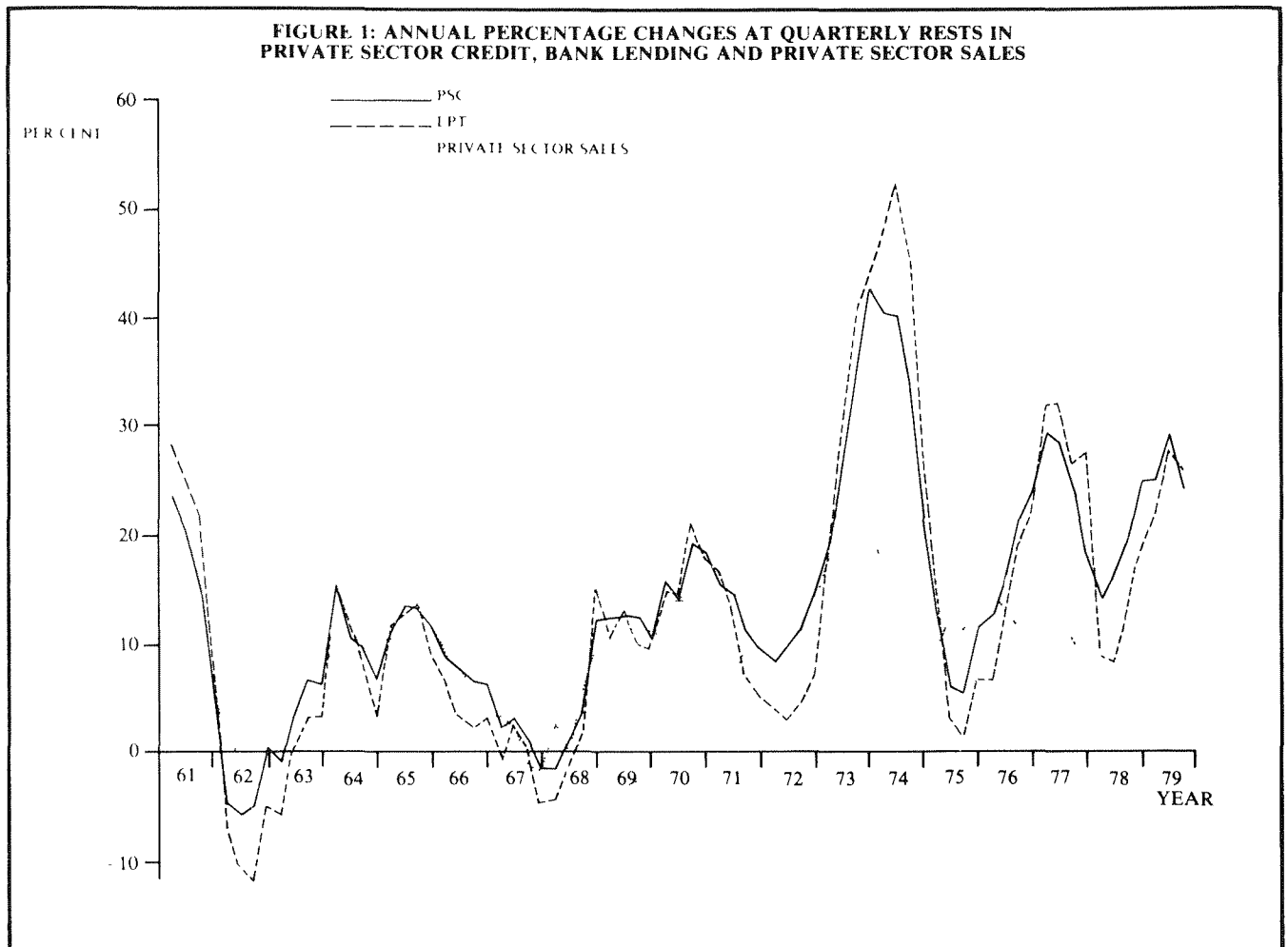
This historically close relationship between PSC expansion and monetary base growth implies that the earlier observation that PSC may be largely demand determined (made when comparing the relationship between PSC and private sector demand) may not be entirely appropriate. Both demand and supply factors are no doubt of importance in practice.

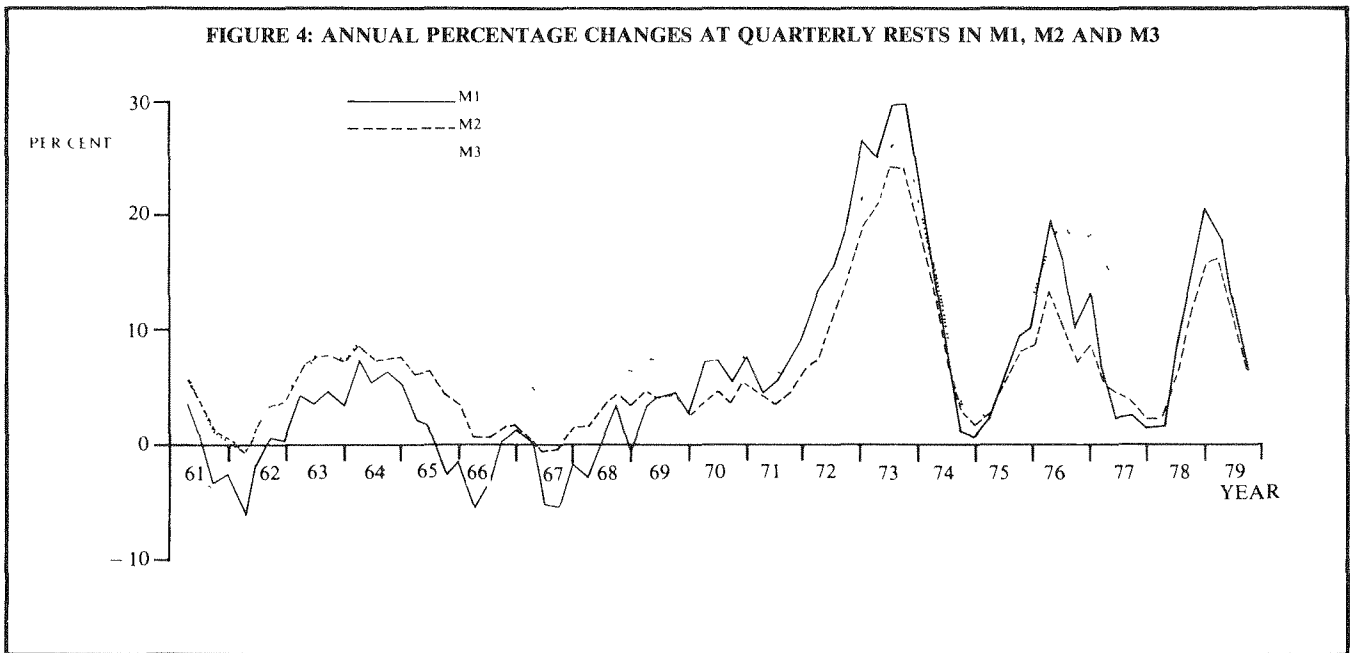
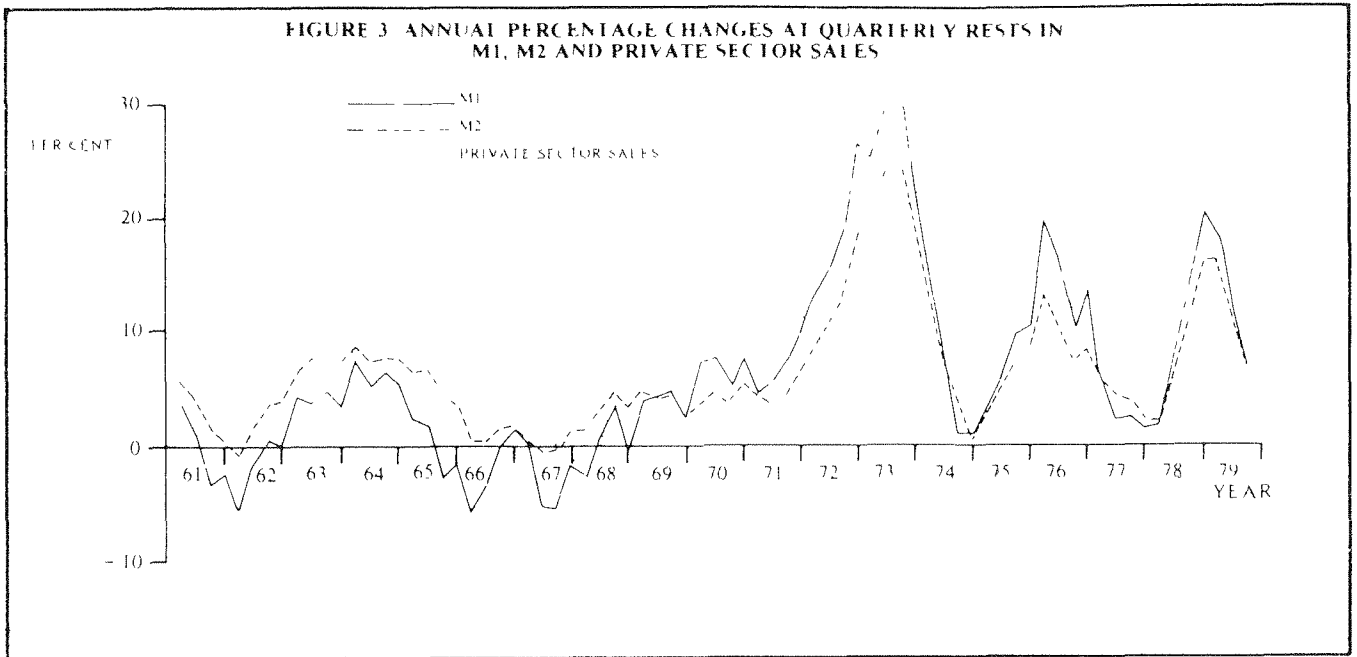
Econometric Analysis

When the relationships between the monetary aggregates and private sector demand, as illustrated in the graphs, were analysed using econometric techniques, similar results were obtained. As with the graphical analysis it was found that the aggregates could be more easily ranked using observations from the 1970-79 period as the growth rates of the aggregates were significantly more volatile during this period than in the previous decade. Again the narrower monetary aggregates were found to be most closely related to private sector demand with M1 showing the most satisfactory results overall. The broad money supply aggregate (M3) and the various credit aggregates did not perform as well.

In order to investigate more fully the strength of the linkages from the monetary aggregates to economic activity two further avenues of research were explored. The approaches were based on two reasonably simple models.

The first of these models was the so-called St Louis reduced form model. This model was developed at the Federal Reserve Bank of St Louis in the United States. Essentially the model is a single equation which expresses changes in economic activity (usually Gross Domestic





Product — GDP) as a function of changes (not necessarily instantaneous) in the money supply and in the fiscal deficit. It is referred to as a 'reduced form' model because it postulates that changes in either (or both) the money supply and the fiscal deficit will have a causal effect on GDP but does not provide any information as to how this effect is transmitted. When this model was estimated using each of the alternative money and credit aggregates the pattern of results was roughly similar to those obtained before. The most satisfactory results were obtained from using M1 with M2 also giving reasonably good statistical estimates.

The second approach employed the simple 'quantity theory' model which is based on the following identity:

$$\begin{array}{l} \text{M.V.} = \text{P.Y.} \\ \text{where } \text{M} = \text{Money Supply} \\ \text{V} = \text{Income Velocity of Circulation} \\ \text{P} = \text{Price Level} \\ \text{Y} = \text{Real Income} \end{array}$$

From this identity it is clear that if the velocity of circulation (V) is relatively stable then nominal income (P.Y.) will be directly related to the money supply (M).

Thus the model suggests that if the money supply is assumed to be determined (not necessarily instantaneously) as a stable demand function of real income, interest rates and the price level it must necessarily follow that, provided the velocity is insensitive to interest rate changes, there will exist a stable relationship from interest rates to nominal income via the money supply.

In order to compare the money supply aggregates within the framework of this model it was necessary first to establish the strength of the relationship between the relevant interest rate variable and each of the money supply variables and, secondly, to confirm that the velocity of circulation of each measure of the money supply was insensitive to the interest rate.

When the money demand equations were estimated for each measure of the money supply it was found that both M1 and M2 were sensitive to interest rate changes, a not surprising result, but that the demand for M3 balances was insensitive to interest rates. This suggested that while it might be possible to control M1 and M2 to some degree through interest rate changes, M3 is less susceptible to control through interest rates as a large part of M3 consists of interest-bearing deposits the rates on which can vary in response to policy.

However, when the relationship between the interest rate and the velocities of circulation for M1 and M2 were examined it was found that the velocities of circulation were not insensitive to interest rate changes. This indicated that the linkage from interest rates to nominal income was indirect or weak. Nevertheless, of the two aggregates M2 performed somewhat better than M1 in this framework. Certainly from a visual inspection of the M1 and M2 velocities shown in figure 6, it would appear that the M2 velocity has been the more stable of the two over the past two decades.

CONTROLLABILITY

This section discusses the second major attribute which it was considered a useful monetary target variable should possess, namely an effective control linkage with the instruments of monetary policy. The controllability of monetary and credit aggregates was

considered within the context of the two broad policy instruments: interest rate or public debt policy and reserve ratio requirements.

Public Debt Policy

Although reserve ratio and government security interest rate policies cannot be completely divorced from each other, an attempt was made to consider the relative effects on the various money and credit aggregates which may be caused by policy initiatives which have a direct impact on interest rates.

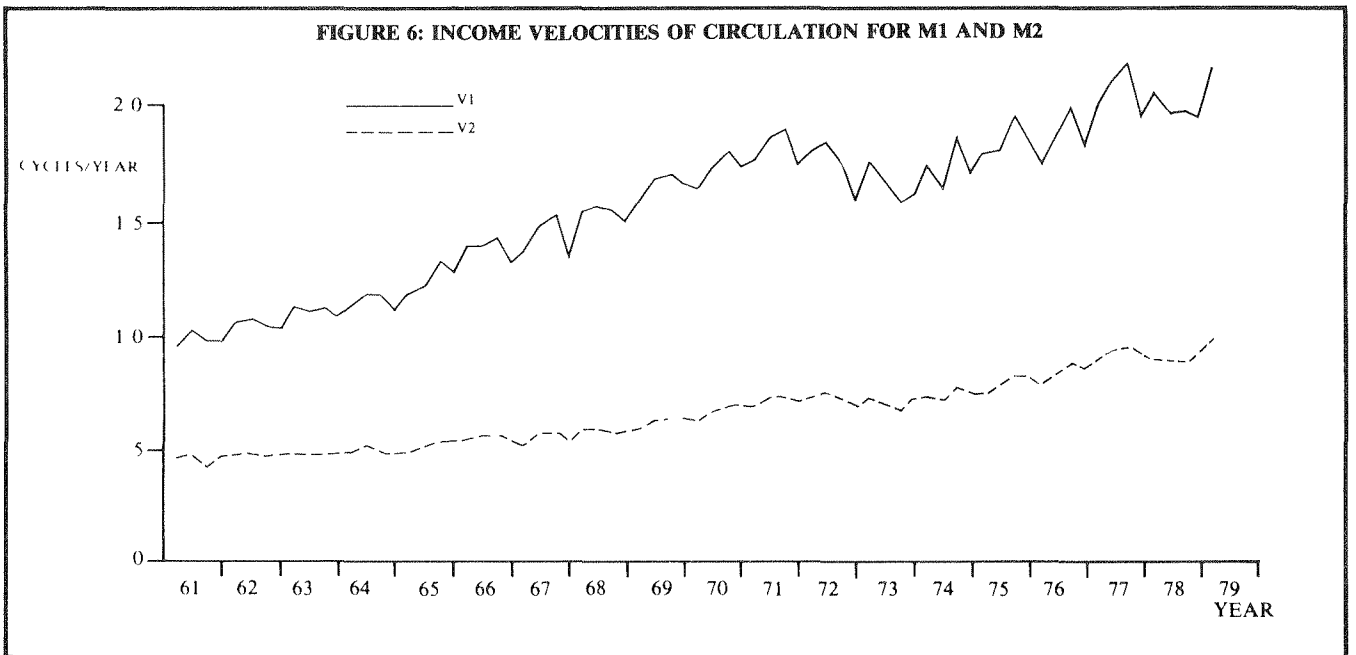
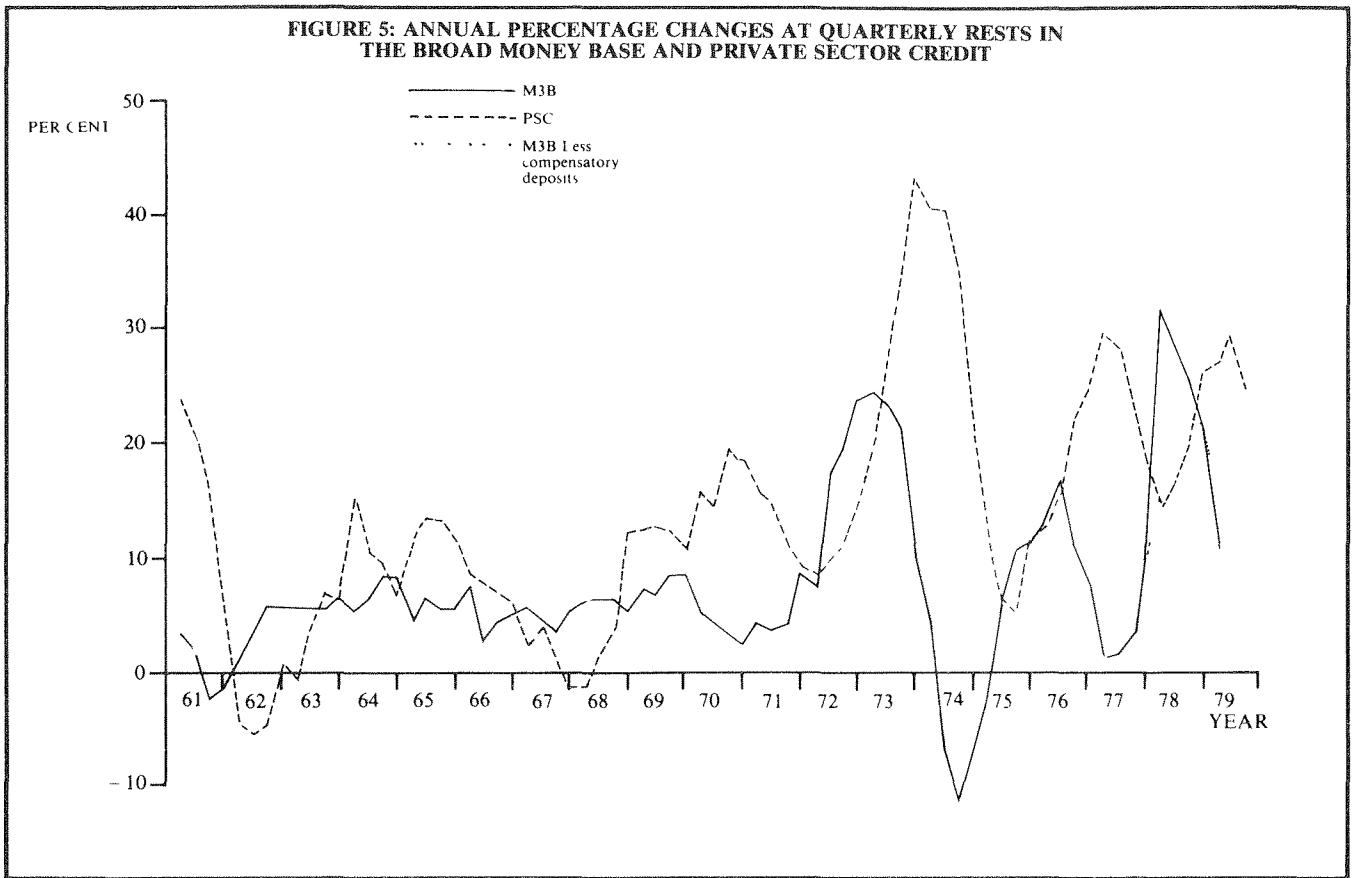
In order to identify the effects of interest rate changes on the various aggregates it was considered useful to follow through the chain of events following an hypothetical increase in government security interest rates. The chain looks at the impact on and reactions of trading banks but other financial institutions would be affected similarly. The higher interest rates should encourage some persons or firms to switch out of money (including fixed deposits) and into government securities. As this occurs, banks and other financial institutions will experience a loss of reserves. This implies an initial reduction in the money base. Assuming that 'free reserves' cannot withstand the reserves drain then in order to meet reserve asset requirements (i.e. avoid borrowing from the Reserve Bank), the banks may either reduce their lending and/or buy up government securities (i.e. reserve assets) on the secondary market, using newly created interest bearing deposits to pay for them. Whatever the eventual outcome, the adjustment process will probably involve increases in both lending and fixed deposit interest rates as the banks react to the policy change. The extent to which lending eventually eases will depend on how strong the demand for credit remains at higher interest rates. If the demand for credit falls off at the higher interest rates, it is unlikely that either bank reserves or total deposits (M3) will reach their pre-policy-change levels. Whatever movement (if any) occurs in total deposits, one implication is reasonably assured and that is a reduction in demand deposits (M1) which is likely to accompany the higher interest rates because of a general shift into interest bearing assets.

Summarising the above, and assuming all other things to be equal, under the present system where government securities qualify as reserve assets for the purposes of official reserve requirements, one can expect an increase in government security interest rates to cause a decrease in the growth rates of M1 and M2 and possibly, depending on demand conditions in credit markets, smaller declines in trading bank lending, private sector credit, and M3.

This implies that under present conditions only M1 and M2 present themselves as being consistently controllable through public debt policy. However, it was concluded that the other aggregates could not be described as being generally uncontrollable without a closer examination of current reserve ratio requirements and their potential as instruments of monetary control.

Reserve Ratio Requirements

In the research study, attention was concentrated on the 'Reserve Asset Ratio' (henceforth RAR) system, for trading banks, rather than the government security ratios applied to non-bank M3 institutions. In a situation where reserve ratio requirements are increased to a



level above the actual reserve holdings of the total banking system, in order to avoid borrowing from the Reserve Bank, the banks must eventually either reduce their lending (by setting higher lending rates or rationing) or purchase government securities on the secondary market so as to increase their reserve asset holdings. Banks pay effectively for these securities with new interest bearing deposit liabilities. The only difference between this chain of events and that described earlier for public debt policy is that new issue rates on government securities will not have increased. This should make it easier for the banks to attract the public out of government stock and into fixed deposits. As before, the degree to which lending falls back as a result of the initial reserves shortage will depend mainly on the reaction of demand to higher lending rates. If the demand for credit remains buoyant in the face of rising interest rates, the overall effect of the increased reserve ratios will be to reduce M1 and M2, while leaving the credit aggregates and M3 at or near their original levels.

SUMMARY

It is apparent from the continuing debate in the economic literature and the different policy approaches adopted by various monetary authorities that the precise nature and the relative importance of the transmission channels from monetary policy instruments to the ultimate goals of policy are unclear. This is disconcerting for policy makers, who are faced with a range of viewpoints on the likely effects of monetary variations on the ultimate targets of policy. But it also reduces confidence in the results obtained from economic models constructed to analyse the linkages between alternative monetary targets and ultimate targets.

Bearing these caveats in mind, it was considered useful to look at the eligibility of a number of monetary and credit aggregates for the role of a possible 'monetary target' within the New Zealand system. Two main criteria were chosen to judge this eligibility: the strength of relationships from the monetary aggregates to the ultimate targets of policy (as represented by 'activity'), and the strength of relationships between the monetary aggregates and the instruments of monetary policy.

In order to investigate the relative strengths of linkages from monetary aggregates to 'activity', two sorts of simple statistical relationships were estimated over samples drawn from the years 1960 to 1979. These included aggregate private sector demand equations with private sector final sales related to the monetary aggregates and reduced form equations with nominal GDP related to the monetary aggregates and the fiscal deficit. The most satisfactory overall results were given by M1. The other narrow aggregate, M2 and the money base variables MB and M3B also did reasonably well within the demand function framework but M2 was the only aggregate besides M1 to give reasonable reduced form equation estimates. Whilst none of the equations incorporating the various credit aggregates stood out at any stage, M3 gave some results comparable with the narrower aggregates when sample observations from the late 1970s were excluded from the estimation period.

A further approach to the money-activity relationship was considered where comparisons between M1, M2 and M3 were made on the basis of estimated money demand and income velocity equations. The demand equations for M1 and M2 were found to have significant interest rate terms, but the estimated interest elasticities

for the circulation velocities of both M1 and M2 did not support any significant linkage from interest rates to nominal income. Nevertheless, of the two aggregates, M2 performed somewhat better than M1 within this framework. The demand for M3 real balances appeared to be insensitive to interest rates.

In discussing the controllability of the alternative monetary aggregates both interest rate (public debt policy) and reserve ratio policies were considered. It was concluded that with government securities specified as reserve assets for official requirement purposes, neither interest rate initiatives nor reserve asset ratio (RAR) policies would necessarily achieve effective control over any of the monetary aggregates except for M1 and M2. The main reason for this conclusion lay with the ability of banks to avoid pressure on the total supply of reserves through the purchase of government securities from the non-bank private sector.

Given the existing policy framework then, the evidence from the study points towards M1 and M2 as the most appropriate intermediate monetary target variables for policy to concentrate on.

While it appears that either M1 or M2 targets would be suitable focal points for the implementation of monetary policy, the interdependencies between all of the monetary aggregates considered need to be re-emphasised. Because of this inter-dependence, the monetary authorities would probably always need to maintain surveillance over a range of monetary aggregates in addition to any particular target variables which may be utilised.

The study also observed a close relationship between private sector credit expansion and lagged changes in the money base. Monetary base fluctuations do appear to foreshadow movements in the major monetary aggregates.

OTHER ISSUES

There are some important questions relating to the implementation of a system of monetary targeting that were outside the issues considered in this study. Firstly, what ultimate economic target should monetary policy be aimed at given that it cannot simultaneously operate favourably on all targets — growth, inflation, unemployment and the balance of payments? This question involves a number of contentious theoretical and empirical issues. Different theories lead to different conclusions as to the appropriate target of objective for monetary policy. For example, the 'Monetary Approach to the Balance of Payments' theory suggests that under a fixed exchange rate in a small open economy, the balance of payments will be a major channel by which the money supply is brought into line with demand. Any attempt at an independent monetary policy will cause offsetting deficits/surpluses in the balance of payments. The appropriate ultimate target for monetary policy within this framework may therefore be the balance of payments. An alternative 'monetarist' viewpoint which assumes monetary aggregates to be controllable suggests the rate of inflation as the appropriate ultimate target for monetary policy.

A recent quantitative analysis⁴ making use of the Reserve Bank's core model suggested the interest rate

4. G. H. Spencer and A. Grimes, On the Stability of Alternative Policy Rules within a Model of the New Zealand Economy, in G. H. Spencer (ed.), *Experiments Within a Model of the New Zealand Economy*, RBNZ Research Paper No. 29, Wellington, March 1980.

instrument had a comparative advantage with respect to the output objective relative to the government expenditure and exchange rate instruments. Even if the model used was a perfect representation of the New Zealand economy, this result would not imply that monetary policy should be aimed exclusively at output. But it does throw doubt on the desirability of following any strict monetarist prescription in New Zealand.

Secondly, there remain questions relating to the flexibility of a monetary target. How often should the target be adjusted and to what extent should it be adjusted? Is smoothness particularly important or should fine tuning be encouraged? Any version of the 'monetarist' analysis will emphasise the potential destabilising hazards of trying to fine-tune monetary growth. In the New Zealand context, the lack of stability which has been found often in aggregate demand and reduced form equations, coupled with the general lack of knowledge about the precise nature of monetary-real sector linkages, imply that greater stability of monetary growth could assist general economic stability.

CONCLUSION

Although there is much scope for debate about the relationship between the various money supply and credit aggregates and the level of economic activity, the available research does suggest that the narrower definitions of the money supply (M1 and perhaps M2) may be the most suitable focal points for the implementation of monetary policy. Nevertheless, uncertainties about the nature of these inter-relationships, changes in them over time, and the inter-dependence of the various aggregates, suggest the need to monitor all of the major monetary variables. In practice, this is what the Reserve Bank endeavours to do. The Bank's attitude to the role of both monetary and fiscal policies has been set out in some detail in its *Annual Reports* over recent years, and in previous issues of the *Bulletin*⁵.

5. See also R S Deane and P. W. E Nicholl (editors), *Monetary Policy and the New Zealand Financial System* Wellington, Reserve Bank of New Zealand, 1979