MEETING ON MONETARY ISSUES

Reserve Bank of Australia

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* The views expressed herein are solely those of the participants and are not necessarily shared by the Reserve Bank of Australia.

PREFACE

An informal meeting of monetary economists from academic and official spheres was held at the Bank on 8 August 1985. The meeting was designed to discuss technical issues highlighted by the deregulation of the financial system over the past few years. (Participants and papers on which discussion was based are listed in an appendix to the report of the discussion.)

The discussion covered many issues, although several broad themes recurred during the course of the day. These included:

- The instruments and techniques of implementing monetary policy.
- The extent to which deregulation would affect patterns of financing.
- Recent evidence on the stability of the demand for money.
- The appropriate setting of monetary policy during a period of structural change in the financial system.
- The role of the Reserve Bank in informing the community, in general, and financial markets, in particular, about changes in the setting and implementation of policy.

This Research Discussion Paper presents a summary of the meeting and an unpublished paper prepared for the meeting.

P.D. Jonson
November 1985

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I SUMMARY OF DISCUSSION

Instruments and implementation of monetary policy

Discussion of the mechanics of the implementation of policy centred on the role of the money base. The money base (sometimes known as high-powered money) is generally described as the domestic liabilities to the private sector of the Central Bank. In Australia, the base is defined in Table A.1 of the Reserve Bank's Bulletin as "holdings of notes and coin by the private sector plus deposits of banks with the Reserve Bank and Reserve Bank liabilities to the non-bank private sector." SRD deposits account for around 25 per cent of the money base while currency on issue accounts for virtually all the remainder.

One view of the role of the base, described by some as the "text-book" view, was that the Reserve Bank should control the money base and thereby exert control over the monetary aggregates. Participants who held this view saw the money base as an appropriate operating objective of monetary policy. Daily market operations could seek to control the supply of the base and this, in turn, would control the growth of the monetary aggregates through the so-called "money multiplier". This approach assumed a relatively constant, or at least predictably changing "multiplier". Views differed on the empirical issues here, identifying an area for further work. A related issue was the question of a more appropriate definition of the money base.

The alternative view questioned the usefulness of the money base as an operating objective of monetary policy. Participants who held this view recognised that there was a link between movements in the base and monetary aggregates, but this relationship was not causal. Currency, the main component of the base, was demand-determined and not subject to control in anything but the long run. Similarly, SRDs were directly linked to the growth in trading bank deposits but this need not imply a direction of causation. The direction of causality was, in fact, from bank deposits to the base, as SRDs are determined by the average level of deposits in the previous month. On this view, the Central Bank cannot, in the short run, withhold money base; it can only affect the price at which it is made available. Under current institutional arrangements, it was incorrect to view the Bank's operations as working on the money base and through it on the broader monetary aggregates. Rather, the money base was better regarded as simply another monetary aggregate.

To an extent, this debate was academic. It was generally agreed that any strict attempt at controlling the money base - with whatever changes to institutional arrangements might be required to produce that control - would result in marked volatility in interest rates. It was, therefore, appropriate for the authorities to take this into consideration in conducting market operations to secure appropriate outcomes for all the monetary aggregates (including the money base). In this sense, it was generally agreed that the supply of money

base was better regarded in the short-run as demand-determined, but at a price set in the market place (which will be influenced by the setting of monetary policy).

"Reintermediation" and "increased intermediation"

Discussion then turned to the guidance that monetary theory could provide about policy responses during a period of rapid financial deregulation. There was an initial discussion of terminological matters. The word "reintermediation" has been given two meanings. The first is a move from direct to intermediated sources of financing. The second refers to a shift in the pattern of financing between intermediaries - in the present environment, primarily from non-bank financial intermediaries (NBFIs) to banks. On this definition, "increased intermediation" would refer to the process whereby there was a shift in the pattern of financing from direct sources to intermediaries generally. In line with current practice in Australia, the second set of definitions were used in discussion at the meeting.

It was generally agreed by participants that the lifting of controls on banks (and the entry of new banks) would increase the demand for bank deposits and reduce the demand for deposits at non-bank financial intermediaries. This would reflect the fact that banks could offer better terms and provide a wider range of products than they could in the past - factors which may also contribute to money demand instability discussed in the next section. All other things equal, borrowings by NBFIs would, therefore, grow more slowly than they otherwise would have.

In a "text book" world characterised by a stable money multiplier and in which the Central Bank sought strictly to control the quantity of the money base, reintermedition would not be reflected in a corresponding increase in bank deposits and M3. Rather, growth in M3 would be unchanged while growth in broad money would be reduced. By maintaining the same money base objective, the Central Bank would produce an unintended tightening in policy, given that the tendency for M3 to grow more quickly would be due to reintermediation and not to an increase in the overall demand for credit.

It was recognised that the "text book" world was an oversimplification as a description of current circumstances. It was generally agreed that the appropriate policy response to reintermediation would be to accept faster expansion of bank deposits and, therefore, in the money base. Specifically, with demand for M3 boosted by the effects of deregulation, faster than normal growth of M3 and the money base should be allowed. This had, in fact, been the case over 1984/85 with growth in M3 of around 17-1/2 per cent and in the money base of 15 per cent (on a June-to-June basis). It was also recognised, however, that considerable care had to be taken to avoid inadvertently accomodating inflationary credit demands.

One implication of reintermediation is that observed growth in M3 would not be a reliable indicator of underlying monetary conditions. If the effects of reintermediation on M3 were unpredictable or uncertain, it would be important to look at

broader monetary and credit aggregates to guage better the growth of total financing. In these circumstances, broad money would be a superior indicator than M3 because it subsumes the effects of a shift of financing from NBFIs to banks. However, growth in broad money would also be affected if there was a shift of financing from direct sources to intermediaries generally. It was observed that growth in broad money in 1984/85 had been higher than expected on the basis of past relationships.

The Bank had recently introduced an aggregate which included both direct and intermediated sources of financing - Liabilities of the Non-Finance Sector ("L"). This aggregate seeks to capture all inter-sector lending to the private non-finance sector and to governments. However, intra-sector financing and internal financing are not included. It was agreed that further work should be done in this area. In particular, data on direct financing were currently available with a long lag and were not complete.

It was also conjectured that deregulation might even change the relationship between total financing (including direct financing) and nominal GDP. This would be another reason why movements in broad money could be higher than expected on the basis of past relationships.

The demand for money

An important pre-requisite for monetary "targeting", or even the provision of useful "projections", is that the demand for money be stable, or at least predictable, over time. The structural changes occurring in the financial system at present may lead to instability in conventionally estimated money demand functions.

The paper on this subject discussed at the meeting simply updated some previous Australian money demand studies to examine their performance over the past few years. All of the equations considered exhibited some over-prediction in 1983/84 and under-prediction in 1984/85. It was conjectured that over-prediction in 1983/84 was due to the strong surge of economic growth, which the "activity" variable in the equations (typically current period GDP) was not properly capturing. For 1984/85, when the growth rate of M3 was greater than that predicted by the equations, it was argued that the major cause was "reintermediation".

It was pointed out that there were many technical problems with single equation estimates of the demand for money. It was also agreed that the prediction errors evident in 1983/84 and 1984/85 did not generally fail strict statistical criteria - that is, the errors in these years were not significantly larger than previous errors. Indeed, it was surprising how well the equations had stood up over time. However, one participant submitted evidence of further work that suggested statistically significant underprediction of M3 had occurred in the first half of 1985.

The updated equations suggested that a prediction of growth in M3 in 1984/85 based on historical experience would have been markedly lower than the growth that actually occurred. This also tended to be true (but was less obvious) for preliminary equations for broad money. Participants agreed that further work was desirable for equations for broad money and (as data permitted) even broader measures of financing.

Indicators of the setting of policy in the current environment

In the past, movements in M3 have provided useful information to policy-makers and the community in general about the degree of firmness of policy. However, it was generally agreed that the monetary aggregates have recently been affected by structural change. Hence it was argued that the authorities should rely more heavily on other indicators. In particular, the response has been to examine a wide range of financial and economic indicators - the so-called "check list" - when setting policy. This "check list" of indicators includes, inter alia, all the monetary aggregates; interest rates; the exchange rate; the external accounts; the current performance and outlook for the economy, including movements in asset prices, inflation, the outlook for inflation and market expectations about inflation.

This approach was generally accepted as being appropriate in the present circumstances. Interpretation of the list would obviously require considerable judgement. For example, the indicators would often give mixed signals. It would also be necessary to take account of lags in the operation of policy.

It was also suggested that, although interest rates should not be targeted, short-term interest rates could be used as one important indicator of the stance of policy. This reflected the view that interest rates are an important means through which policy changes are transmitted to monetary aggregates and financial markets more generally. The role of other variables, including the exchange rate, was also canvassed in this context.

Several views were put on the question of whether or not a monetary target or projection should be announced by the authorities during a period of rapid structural change in financial markets. It was generally agreed that both the money base and M3 would be affected to a sizable but uncertain extent by reintermediation and would, therefore, not be appropriate candidates for the purposes of a projection. (It was suggested that the base was also being distorted at the present time by the impact of changes to the payments system, automatic teller machines, the introduction of new coinage and the entry of new banks.)

Broad money might be the aggregate least affected during this period which could be monitored regularly and with only a short lag. One problem would be that broad money is not amenable to close control in the short-term by changes in monetary policy. Even if these problems could be ignored, there would clearly be a trade-off between the benefits of announcing a monetary projection against the costs and uncertainties of setting a range for an aggregate which might prove to be inappropriate as a result of structural change or other unexpected

developments. Participants generally were of the view that an early return to the publishing of monetary projections would not be desirable.

Finally, the view was put that the current "check list" approach was, in effect, a form of nominal GDP targeting and that a formal nominal GDP target could be considered. Particular problems with this approach were that data on GDP were available only with a substantial lag and were often subject to sizable revisions. Nominal GDP could also be influenced by many factors other than monetary policy and its "controllability" would therefore be even less than that of broad money.

Participants also discussed the setting of monetary policy when the transitory effects of deregulation had passed. There were different views about when this might be. It was noted that some structural changes may only be beginning now and that further major distortions to monetary aggregates could occur. If this were the case, current problems with the aggregates may continue in the immediate future.

Information and the market

It was noted that financial markets have become accustomed to a numerical indication of policy over the ensuing year - in the form of a conditional projection of M3 growth. One advantage of this approach was that it provided markets with a relatively simple guide to the stance of policy. It was observed that at the time of the suspension of the M3 projection for 1984/85 there was an increase in market uncertainty about the stance of policy. To overcome this uncertainty, the Bank had increased the flow of information to the market. Despite this, some argued that this additional information had not satisfied all legitimate demands in this area. This suggested that the market sought more information and/or a better explanation of what the Central Bank is doing. An alternative view was that the market would never be satisfied, no matter how much information was provided by the authorities. It was also suggested that uncertainty was greatest at the time of the dropping of the M3 target but that many market participants may now have adjusted to the new regime.

There was also discussion of the form that any additional information about policy could take. The pros and cons of a return to the announcement of conditional projections were again canvassed. It was also suggested by some participants that the Bank could extend the information it provided on expected developments in major financial and economic variables, including GDP, prices and monetary aggregates. This information should not be seen as defining the aims of monetary policy. Rather, it would indicate to the market the Bank's outlook for the economy, given the stated stance of policy. Participants agreed that there should be regular comment on the stance of policy.

MEETING ON MONETARY ISSUES

PARTICIPANTS

Discussion was based on three papers already in the public domain and one working paper prepared specially for the meeting (attached). The meeting was chaired by P.D. Jonson.

Participants at the meeting were:

Professor V.E. Argy (Macquarie University)

Dr A.W. Blundell-Wignall (EPAC)

Dr J. Carmichael (Reserve Bank)

Mr D.W. Challen (EPAC)

Mr K.T. Davis (University of Adelaide)

Mr B.L. Gray (Reserve Bank)

Dr C.I. Higgins (Treasury)

Mr P.D. Jonson (Reserve Bank)

Dr G.C. Lim (University of Melbourne)

Mr I.W. Little (Reserve Bank)

Mr I.J. Macfarlane (Reserve Bank)

Mr A.M. Mohl (Reserve Bank)

Mr A.J. Oster (Treasury)

Dr R.W. Rankin (Reserve Bank)

Mr S.T. Sedgwick (Prime Minister and Cabinet)

Professor I.G. Sharpe (University of Newcastle)

Professor T.J. Valentine (Macquarie University)

Dr J.M. Veale (Reserve Bank)

The papers discussed were:

Davis, K.T., "Australian Monetary Policy: Recent Experience and Some Current Issues", Conference of Economists, Sydney, May 1985

Mohl, A.M., "Changing Patterns of Financing", Reserve Bank of Australia, Bulletin, May 1985

Valentine, T.J., "Recent Australian Monetary Policy", Bulletin of Money Banking and Finance, No. 3, 1983/84

Veale, J.M., Boulton, L.F. and Tease, W. "The Demand for Money in Australia: A Selective Survey and Some Updated Results".

II THE DEMAND FOR MONEY IN AUSTRALIA: A SELECTIVE SURVEY AND SOME UPDATED RESULTS*

i INTRODUCTION

This survey was prepared for a conference on monetary matters held at the Reserve Bank of Australia in August 1985. The purpose of the paper was to shed some light on the hypothesis that reintermediation and increased intermediation had distorted the relationship between money, broadly defined, and its determinants.

The approach of the paper is straightforward. If reintermediation is, in fact, occurring then estimated money demand equations should tend to underpredict the actual growth of the relevant monetary aggregate. The results presented below found that this was indeed the case.

Rather than attempt to specify new demand for money functions, it seemed that it might be useful to examine the hypothesis by updating previously reported money demand studies. More than 20 such studies have been published over the past 15 years. The earlier studies were summarised by Davis and Lewis (1979). The past five or six years have seen a renewed burst of activity in this field with particular attention being paid to the stability of the demand for money in the 1970s. An updated version of the Davis and Lewis summary table is shown in the Attachment.

Almost all previous studies consider the demand for M1 or M3, although some consider particular components of these aggregates and a recent study by Drane et. al. (1985) considers some broader aggregates. Use of a variety of income and interest rate measures further complicates comparison, but some broad conclusions can be drawn from the published research. The long run income elasticity of money demand appears to be about one - few studies show a larger figure. Most studies successfully identify a long run "cross" interest rate elasticity whose value clusters around -0.4. The adjustment process appears to stretch to at least several quarters. There is little agreement on the question of the general stability of the money demand function.

Section ii presents some graphical evidence on movements in the key variables generally regarded as important in the analysis of money demand. Section iii considers some previously reported equations and updates them with a view to observing their behaviour over the past few years. (In selecting the equations to update, we have generally preferred wide rather than very narrow definitions of money. This reflects the view that since the regulatory changes of the early 1980s, M1 in particular is not a useful variable on which to focus.) Section iv reports some very preliminary work on the demand for broad money. Section v draws some conclusions.

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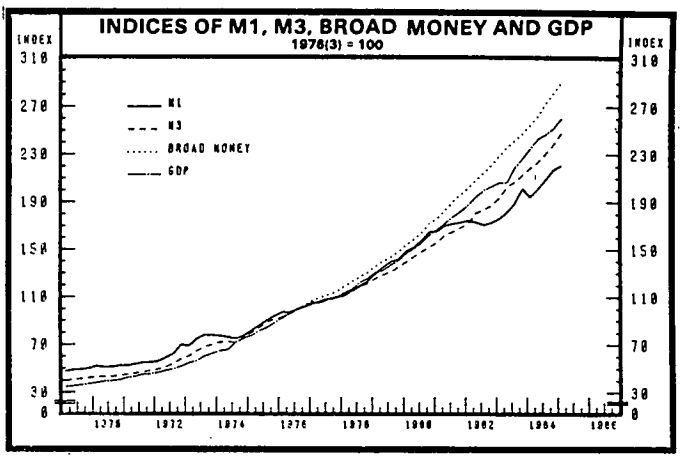
* J.M. Veale, L.F. Boulton and W. Tease.

ii THE STATISTICS

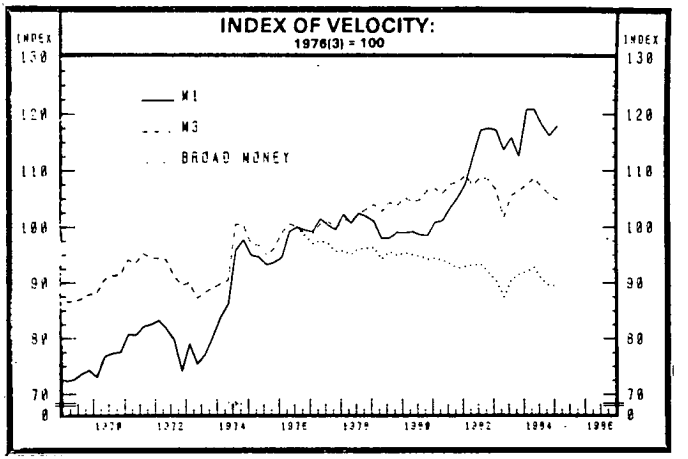
Graph 1 shows some data on M1, M3, and Gross Domestic Product (GDP) from 1969 to early 1985. Data on broad money are added from 1977. Between September 1977 and March 1985 GDP grew by around 160 per cent. Broad money grew more rapidly, by 190 per cent, while M3 grew by 150 per cent. Graph 2 shows the trends in velocity implicit in Graph 1. Over the period shown, M1 velocity has increased sharply, M3 velocity has risen more gradually, while the velocity of circulation of broad money has declined.

Graph 1

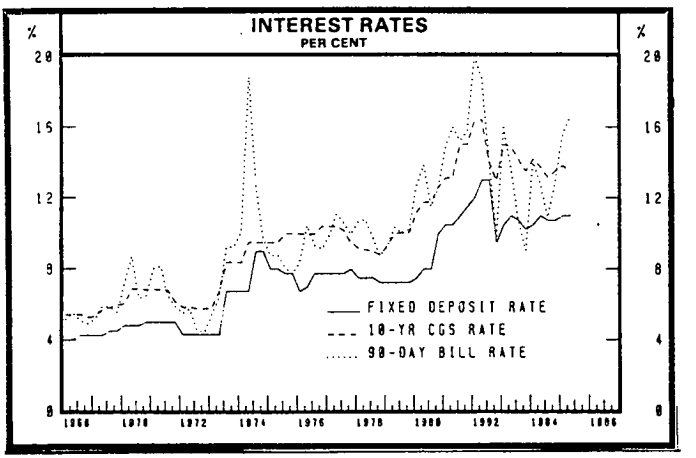


Many interest rates have been used in studies of the demand for money. Most studies use a government bond rate or the 90-day commercial bill rate as a cross rate. A smaller number of studies attempt to identify an own rate on money. Some indicative own and cross rates are shown on Graph 3. Those shown are the interest rate on trading bank fixed deposits, the interest rate on 10 year government bonds and the interest rate on 90 day commercial bills. While there is some general positive correlation between the rates, very significant differentials have opened up at various times. For instance in the June quarter of 1974 there was a 10 per cent differential between the bill rate and the other rates shown on Graph 3. This suggests that the choice of interest rate in money demand equations may be important.

Graph 2



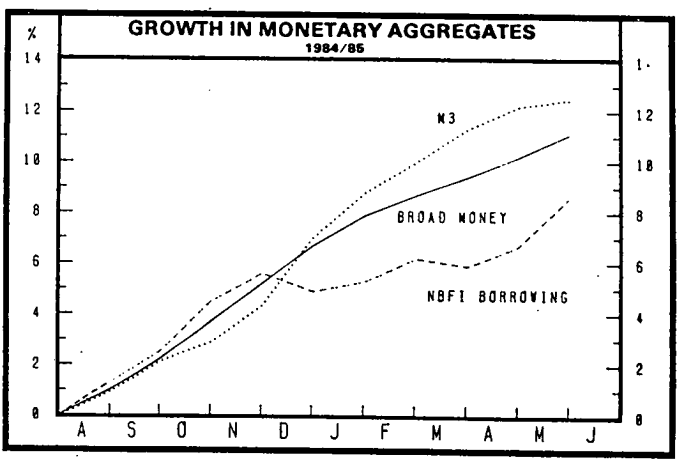
Graph 3



The long-run picture of the monetary aggregates stands in some contrast to developments over the past financial year. The long-run trend is one of more rapid growth in Non-Bank Financial Intermediary (NBFI) borrowings than growth in M3. The most recent year, however, has seen a period in which this

picture has been reversed. Graph 4 shows cumulative percentage changes in M3, non-bank borrowings and broad money since July 1984.[1] The year can be conveniently divided into two (or three) periods. During the first few months of the year, M3 and NBFI borrowings grew more or less in line, although at the time there was some surprise that NBFI borrowings were growing more strongly following the 1 August measures. This may have reflected some jockeying for position by non-bank intermediaries. However, the following four or five months saw the situation change markedly. M3 grew rapidly, while there was little net change in NBFI borrowings between November and March. More recently, NBFI borrowings have again picked up, although cummulative growth of NBFI borrowings has been well below that of M3.

Graph 4



Over the year to June 1985, M3 grew by more than 17 per cent. Nominal GDP was growing by around 10 per cent and interest rates rose. As noted, existing econometric studies suggest an income elasticity of up to one and a negative interest elasticity. This conjunction of facts immediately suggests that conventional money demand functions are not likely to have been capable of explaining M3 growth in 1984/85 at all well.

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1. July 1984 was chosen as a base as this was the first month some transactions between NBFIs could be identified. The data for broad money shown in the graph exclude this identified double-counting.

iii PREVIOUS M3 STUDIES UPDATED

It is convenient to classify the Australian studies of the demand for money into three broad categories:[2]

- equilibrium studies assume that the demand for money adjusts completely within the current quarter (or year if annual data are used for estimation). There is no distinction between the long-run and short-run demand for money.

- disequilibrium partial adjustment models are those most commonly employed in Australia and overseas. In these models a desired demand for money, M_t^*, is combined with a lagged adjustment mechanism (usually the simple Koyck lag) to yield a predicted demand for money, M_t. Examples of this approach include Porter's (1979) technical paper for the Campbell Committee, Sharpe and Volker (1977), Freeland (1984) and Drane, Marzouk and Valentine (1985).

- whole system disequilibrium models in which money plays the role of a buffer stock. In models of this type, the parameters in the implicit money demand function are estimated indirectly in the equations in which monetary disequilibrium plays an important role. The Reserve Bank's RBII model is an example of this approach. In that model, monetary disequilibrium plays an important role in many equations including those for prices, consumption and the demand for bonds.

Identifying emerging shifts in econometric relationships is always difficult. Formal tests such as the Chow test or the QSUM test are unlikely to show statistically significant results if the shift is just beginning to occur. Most such tests require a reasonable run of data on both sides of a break in series before any rigorous conclusions can be drawn. However there are two informal, but suggestive, tests of the stability of the relationship being modelled. The first is to compare values of the estimated parameters when the relationship is estimated over differing sample periods. Any apparently sizeable difference in the estimates between the sample periods may be indicative of an alteration in the relationship between the dependent and independent variables. The second test is to compare the actual growth in the relevant

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2. The studies reported in this paper, excluding that for RBII, are standard partial adjustment models. There are no examples of demand for M3 studies which have an equilibrium specification. However, the paper by Porter and Adams (1976) reports estimates of such a model for M1. It would have been desirable to consider other classes of model such as the Hendry error correction specifications. However, such a specification has not, as yet, been applied in demand for M3 studies, although Pagan and Volker (1981) use such a specification in estimating the demand for M1.

monetary aggregate with that predicted by the equation. This may be the only way in which to identify the possibility of a very recent breakdown in a relationship. Setting standards by which to judge the significance of divergences in actual and predicted growth rates is of course subjective.

The following paragraphs examine the recent performance and predictive ability of previously estimated models, from each of these classes. In each case, the model is updated to the period for which a full data set is available. In the case of quarterly models, this is 1985(1) and, for the one annual model considered, 1983/84. Reflecting the balance of the Australian literature, the bulk of models reported are disequilibrium partial adjustment models.

Partial Adjustment Disequilibrium Models

This section analyses four previous studies.

. Sharpe and Volker (1977);

. Porter (1979);

. Freeland (1984);

. Drane, Marzouk and Valentine (1985).

Sharpe and Volker

Taking up some earlier work by Juttner and Tuckwell (1974), Sharpe and Volker estimated several specifications of money demand functions using quarterly data for the period 1952(2) to 1972(3). For each specification two equations were estimated, one including the rate on two year government bonds and the other containing a long-term interest rate, the rate on ten year government bonds. The specification updated here is the conventional demand for money specification with real M3 balances depending on nominal gross national expenditure (deflated by the CPI) and interest rates. A simple Koyck lag structure was used. Table 2 compares the characteristics of the original Sharpe and Volker equation with the updated equation estimated using data for the period 1952(2) to 1985(1).[3]

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3. Data revisions made it impossible to reproduce the results of the original Sharpe and Volker specification exactly. This should be kept in mind when comparing estimates for this and other studies. Revisions to national accounts data, in particular, have been considerable. Both sets of equations have been corrected for first order autocorrelation.

Table 1
The Sharpe and Volker Equations
(Dependent Variable: Real M3)

Variable	S1 (Short Rates) Original 1952(2)-1972(3)	S1 (Short Rates) Updated 1952(2)-1985(1)	L1 (Long Rates) Original 1952(2)-1972(3)	L1 (Long Rates) Updated 1952(2)-1985(1)
Constant	.427	.364	.400	.343
	(2.60)	(3.56)	(2.52)	(3.70)
GNE	.225	.193	.192	.155
	(5.13)	(5.06)	(4.73)	(4.07)
CGS	-.056	-.041	-.095	-.026
	(3.12)	(2.80)	(3.29)	(1.68)
$(M3/P)_{-1}$	.756	.774	.797	.807
	(13.95)	(15.50)	(15.27)	(16.62)
R^2	.99	.98	.99	.99
Implied Long Run Elasticity:				
GNE	.922	.854	.946	.803
CGS	-.230	-.181	-.468	-.135

Where CGS = interest rate on two year Commonwealth Government securities.

Comparing the estimated parameters of the original and updated equations suggests little structural change. Graph 5 plots the results from the first of these equations for growth in M3, and $\hat{M}$ over the sample period.[4] The graph includes estimates for the June quarter of 1985[5] which suggest that $\hat{M}$ grew more rapidly in 1983/84 and much more slowly over the past year than M3.

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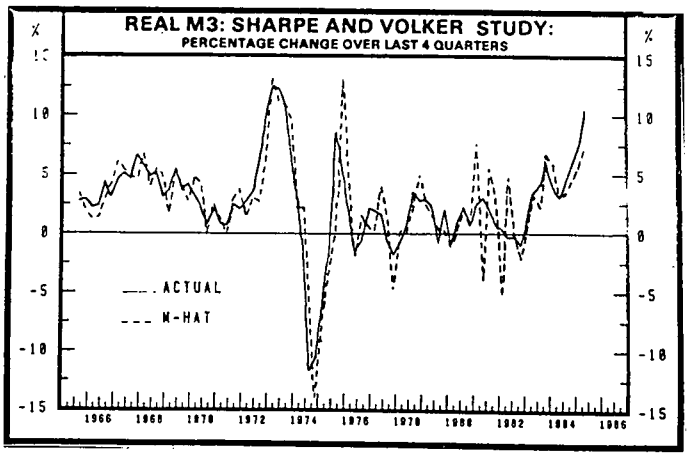
4. In Graph 5 (and subsequent graphs), results are presented showing four quarter ended growth rates for two series, actual M3 and the predicted series, $\hat{M}$.;

5. When this paper was prepared for the August conference June quarter 1985 national accounts data were not available. Accordingly, June quarter growth in real GDP was assumed to be 1 per cent. Results shown in Graphs 5 to 10 are based on this assumption. In the event, June quarter GDP growth was 2.8 per cent and GNE growth 2.2 per cent. Growth in earlier periods was revised downwards.

Graph 5



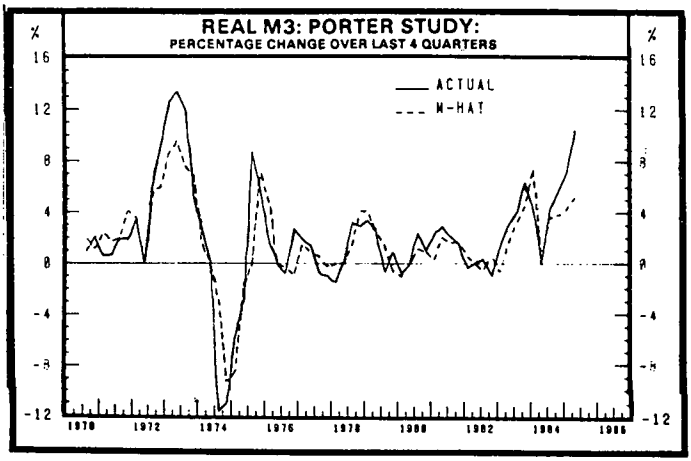
Porter

Porter reported conventional equations for M3, with slight variations in the estimation period. In general, these variations yield only slight differences to the estimated parameters. The equation chosen for comparison is that estimated over the period 1966(3) to 1979(2). The new estimates are shown below in Table 3.

Table 3
The Porter Partial Adjustment Equation
(Dependent Variable - Real M3)

Variable	Original 1966(3)-1979(2)	Revised 1966(3)-1979(2)	Updated 1969(3)-1985(1)
Constant	1.46	.636	.016
	(2.17)	(1.30)	(.03)
GDP	.204	.218	.249
	(3.70)	(3.95)	(4.71)
CGS	-.073	-.060	-.056
	(4.40)	(3.60)	(4.11)
$(M3/P)_{t-1}$	.818	.747	.774
	(10.38)	(9.11)	(10.34)
R^{-2}	.976	.959	.950
Durbin's h	.324	.012	.221
Implied Long Run Elasticity:			
GDP	1.12	0.862	1.102
CGS	-.401	-.237	-.247

Graph 6



Graph 6 shows the results from the updated Porter model. The results are similar to those obtained by updating the Sharpe and Volker model. Once again, there is evidence that the equation tended to overpredict M3 growth in 1983/84 and underpredicted growth in the second half of 1984/85.

Freeland

Freeland (1984) estimated a standard money demand function over the period 1967(3) - 1983(2). The statistical properties of the equation and the estimated coefficients were virtually unchanged when the equation was re-estimated with revised data over the original sample period and over the period 1967(3) to 1985(1). The results from the original equation and those from the longer sample period are reported in Table 4.

Table 4
The Freeland Equation
(Dependent Variable - Real M3)

Variable	Original 1967(3) - 1983(2)	Updated 1967(3) - 1985(1)
Constant	1.031	.984
	(2.85)	(2.95)
GDP	.229	.226
	(4.94)	(5.11)
CGS_{-1}	-.110	-.113
	(6.08)	(6.32)
$RSSA_{-1}$	.024	.028
	(2.91)	(3.45)
RFD_{-1}	.065	.063
	(2.91)	(2.86)
$(M3/P)_{-1}$	.693	.703
	(11.44)	(12.32)
$\bar{R}^2$	0.98	0.98
Durbin's h	.37	.18
Implied Long Run Elasticity:		
GDP	0.746	0.761
CGS_{-1}	-.358	-.380
$RSSA_{-1}$	.078	.094
RFD_{-1}	.212	.212

Where:

RFD = Interest rate on trading bank fixed deposits. Comprises the rate on 18 to 24 month deposits to 1971(4), the rate on deposits of 24 months maturity from 1972(1) - 1974(2), and the mid-point of the range of 24 to 48 month deposits thereafter.

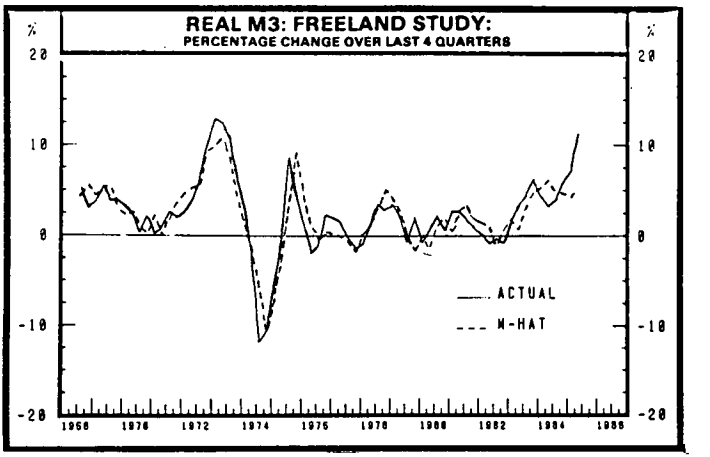
RSSA = Interest rate on savings bank statement accounts. This comprises the minimum of the range on ordinary savings accounts under $4,000 up to December 1979, and the mid-point of the range on statement savings accounts thereafter.

In general, the estimated parameters of both equations are plausible. The interest rate on two year government securities played the conventional role of the rate on competing assets in the money demand function; it has the expected sign and is highly significant. The interest rates on balances included in M2 and M3 were included as own rates of interest and, as expected, their signs were positive in both sets of results. The adjustment speeds for each equation were also similar; 2.25 and 2.37 for the original and updated version respectively. The long run income elasticity for each was approximately 0.75 - perhaps a little low compared with previous studies.

Graph 7 shows the results from the updated Freeland equation. On average, the equation appears to perform quite well. However, in the recent March and June quarters the equation clearly underpredicts, giving a pattern of errors seemingly out of character with the earlier results. This equation also suggests the relationship between M3 and the explanatory

variables has shifted - M3 has been growing faster over the past year than can be explained by movements in the variables that have previously explained its demand.

Graph 7



Drane, Marzouk and Valentine

Using annual data from 1958/59 to 1982/83 Drane, Marzouk and Valentine estimated a series of equations for M1, M3 and two broader aggregates - one similar to broad money and a wider credit aggregate. The broader aggregates, MM and DCMM, are those previously developed by Marzouk and Drane (1983).

In contrast to the quarterly studies, Drane et. al. do not find a significant role for GDP in determining demand for M3. As an alternative, they use company gross operating surplus as a measure of transactions demand for money. However, it is shown below that when the time trend is omitted, GDP becomes significant so we have concentrated on the conventional specifications labelled (B.4) by Drane et. al. The results of re-estimation with the latest data and updating to 1983/84 are shown in Columns 2 and 3 of Table 5.

The above problems with the original equation remain when it is updated. In particular, the co-efficient on GDP remains insignificant. It seemed likely that there was co-linearity between the time trend and GDP which could explain the small coefficients and the large standard errors. This was confirmed when the equation was re-estimated omitting the time trend. These results are shown in Column 4 of Table 5. This seems a superior form on all counts.[6]

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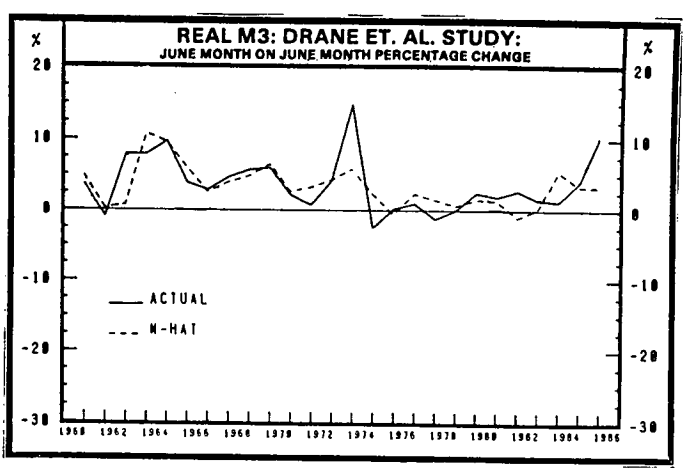
6. Note that the long-run income and interest rate elasticities now conform more closely to "standard" results.

Table 5
Drane, Marzouk and Valentine: Equation (B4)
(Dependent Variable: Real M3)

Variable	(1) Original (1958/59-1982/83)	(2) Revised (1958/59-(1982/83)	(3) Updated (1958/59-(1983/84)	(4) Updated (1958/59-1983/84) (excl. time)
Constant	.23	.352	.337	-.125
	(0.64)	(0.79)	(.83)	(1.53)
GDP	.205	.173	.177	.405
	(1.17)	(0.72)	(0.78)	(3.47)
Interest Rate	-.132	-.151	-.150	-.129
	(3.82)	(4.34)	(4.57)	(4.72)
Time	.005	.007	.007	-
	(1.11)	(1.08)	(1.16)	
$(M3/P)_{t-1}$	.736	.747	.747	.627
	(5.22)	(4.38)	(4.49)	(4.77)
$\bar{R}^2$	.993	.9912	.9918	.9917
Durbin's h	.23	1.439	1.32	1.26
Implied Long Run Elasticity				
GDP	.777	.684	.700	1.086
Interest Rate	-.500	-.597	-.593	-.346

The growth rates for $\hat{M}$ implied by the updated equation (including the time trend) are shown in Graph 8. As with the quarterly equations examined above, this shows underprediction of M3 growth in 1984/85. Once the role of GDP is more accurately pinned down as in the equation shown in Column 4 of Table 5, the underprediction in 1984/85 is a little more marked than that shown in Graph 8.

Graph 8



Buffer Stock Disequilibrium Models

RBII

The quantity of money is not directly determined by demand in RBII. Rather, the demand for money is implicit and estimated indirectly by using monetary disequilibrium (M* - M) as an argument in several equations of the form:

$$Y = f(\quad) + \alpha(M^* - M) \qquad (2)$$

M* is determined by income and a vector of interest rates. Thus equations including monetary disequilibrium are estimated in the form:

$$Y = f(\quad) + \alpha({}_1Y - {}_2r_1 + {}_3r_2 + \ldots - M) \qquad (3)$$

The values in the various equations in which money demand appears are constrained to be equal across equations. The model was estimated in continuous time using full information simultaneous estimation techniques. The most recent full model estimation was over the period 1959(3) to 1980(4).

That version of the model can be seen as reflecting the structure of the financial system before deregulation and the floating of the exchange rate. A decision was taken some time ago that, since many fundamental relationships in the financial sector had altered as a result of institutional and regulatory changes in the 1980s, re-estimation of the model with data that did not reflect these developments was not likely to be very fruitful. However, Fahrer and Rankin (1984) have reported some work in which they made some modifications to the estimated money demand equation to reflect the likely effects of deregulation. In particular, various parameters were imposed at values which reflect the fact that the demand for money may become less sensitive to all interest rates and that money demand was homogenous of degree zero in all interest rates (the own rate, and bond and bill rates taken together). Their resulting equation was:

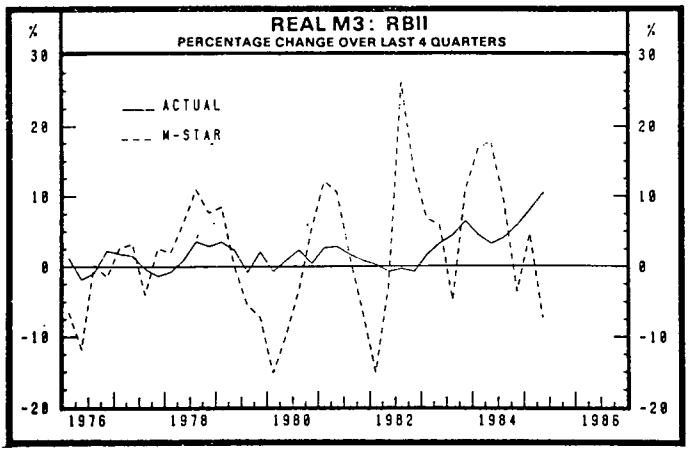
$$M^* = m_o y e^{(7.321\, r_m - 4.086\, r_b - 3.235\, r_{bl})} \qquad (1)$$

Where:

M^* = desired real M3 balances
m_o = a constant
y = real GDP
r_m = interest rate on trading bank fixed deposits
r_b = interest rate on ten year government bonds
r_{bl} = interest rate on 90 day commercial bills.

Graph 9 shows growth in RBII's implied M* using this equation. Growth in M* is quite volatile, partly reflecting the imposed unitary income elasticity of money demand and the quarter to quarter volatility of movements in GDP but more importantly, quite significant shifts in interest rate differentials. Once again, it seems clear that money growth over recent years has been moving in directions different to those suggested by movements in the assumed money demand function.

Graph 9



The results of this section suggests that M3 grew more slowly over 1983/84 and more rapidly over 1984/85 than can be explained by the updated versions of several money demand functions. It is interesting to note that when originally estimated parameters were used to generate predictions for growth over 1984/85, they tended to show even more marked underprediction. If recent strong growth in M3 simply reflects shifts in market share within the financial sector, equations for broader aggregates should suffer less from these problems. The following section turns briefly to this issue.

iv THE DEMAND FOR BROAD MONEY

The recent paper by Drane et. al. considered the demand for the aggregate MM previously developed by Marzouk and Drane. Rather than attempt to update MM, which was originally developed before the publication of the broad money aggregate, we have preferred to concentrate on broad money.[7]

As a first step, broad money was substituted for MM in the equation reported by Drane et. al. The results reported by Drane et. al. are shown as equation 6.1 in Table 6 and the results for broad money (using the same independent variable data set and deflation procedures as used by Drane et. al.) are shown as equation 6.2.[8] The results are broadly similar. The previous section showed the M3 equation to be better specified when time was dropped as an independent variable.

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7. The aggregate MM differs from broad money in that it also incorporates estimates of borrowings of some institutions not reporting under the Financial Corporations Act. However, its correlation with broad money is quite high.

8. Drane et.al. used end June observations for MM and year average data for GDP, giving a single observation for each financial year.

Table 6

Equations for Broader Aggregates

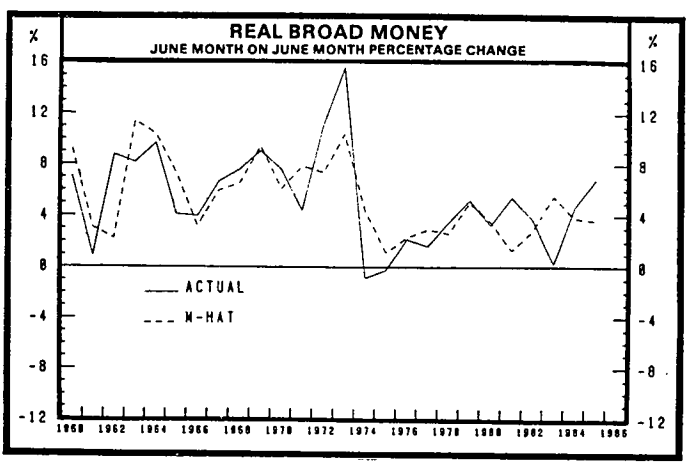
Equation	Estimation Period to	Const.	GDP	Interest Rate	Time	Lagged Dependent	$\bar{R}^2$	h
6.1 MM Drane et.al Original data	1982/83	.19 (.57)	.337 (2.04)	-.122 (3.49)	.012 (2.56)	.580 (3.99)	.997	2.14
6.2 Broad money, Drane et.al data	1982/83	-.238 (.74)	.444 (2.79)	-.106 (3.12)	.007 (1.82)	.591 (4.31)	.997	1.83
6.3 Broad money Drane et.al, data, Excl. time	1982/83	-.643 (2.67)	.496 (3.01)	-.082 (3.01)	-	.670 (4.89)	.997	1.78
6.4 Broad money Revised data	1982/83	-.228 (.54)	.445 (1.94)	-.118 (3.16)	.007 (1.33)	.611 (3.46)	.997	1.72
6.5 Broad money Revised data Excl. time	1982/83	-.647 (2.27)	.556 (2.56)	-.094 (2.82)	-	.621 (3.45)	.997	1.70
6.6 Broad money Revised data	1983/84	-.268 (0.67)	.451 (2.02)	-.115 (3.21)	.006 (1.34)	.617 (3.58)	.997	1.67
6.7 Broad money Revised data Excl. time	1983/84	-.659 (2.39)	.563 (2.66)	-.093 (2.87)	-	.616 (3.52)	.997	1.69

The effect of dropping time from equation 6.2 is shown as equation 6.3 in Table 6. The explanatory power of the equation is not reduced and all co-efficients become significant.

When equation 6.2 was re-estimated using data incorporating the most recent revisions, the co-efficients obtained were similar to those reported by Drane et. al. but both time and GDP became insignificant. This result is shown as equation 6.4. When time was dropped from the equation (shown as equation 6.5) the co-efficient on GDP again became significant. Similar results were obtained when the equations were updated to 1983/84 (equations 6.6 and 6.7).

Graph 10 shows predictions based on equation 6.6 in Table 6. There was overprediction of $\hat{M}$ in 1983/84 and in 1984/85. (Similar patterns of errors were found for equations 6.2, 6.3, 6.4, 6.5 and 6.7.)

Graph 10



Unfortunately, the results of these equations are ambiguous. While the finance company debenture rate (the rate used in equations 6.1 to 6.7) should have a negative coefficient for M1 or M3, in equations for MM or broad money, the sign of the debenture rate coefficient is a priori indeterminate. This is because the debenture rate is a cross rate for narrower components of the broad aggregate and an own rate for the broader components of the same aggregate. The sign of the coefficient will thus be a weighted average of these effects.

Some attempts have been made to overcome this problem, but at this stage, the results are not encouraging. An equation has been estimated with own and cross rates which have the appropriate signs, but the co-efficients on both interest rates are insignificant. Not surprisingly, the predictions of the

equations are dominated by movements in GDP. They also show overprediction of broad money growth in 1983/84 and underprediction in 1984/85.

v CONCLUSION

The studies considered above suggest that with these specifications, estimated money balances tended to grow more rapidly than money supply over 1983/84 and grew significantly more slowly than money supply over the course of 1984/85. This largely reflects the fact that real GDP grew extremely rapidly over the course of 1983/84, but less rapidly in 1984/85. Nominal GDP grew by around 16 per cent over 1983/84 while M3 grew by around 11 per cent. In 1984/85 GDP grew at a more moderate pace, while monetary growth increased. Movements in interest rates, which were generally upward in 1984/85, provide no explanation within the conventional framework.

In both 1983/84 and 1984/85, it seems that additional factors must have been at work. One possible explanation for overprediction in 1983/84 is the use of actual rather than permanent income in estimating money demand functions. Strong predicted growth in M3 over 1983/84 appears to reflect the extraordinary bounce-back in economic activity following the drought and the recession. However in 1984/85, the major reason for underprediction appears to be that, especially since November 1984, banks appear to have been winning an increased share of intermediated business.

If the underprediction of equations for M3 in 1984/85 was solely due to reintermediation, it could be expected that broad money might have grown more in line with its traditional determinants over the past year than has M3. However, although equations for broad money remain poorly defined, it seems that broad money has also grown more rapidly than suggested by its previous determinants. This suggests the possibility of an increase in intermediation in 1984/85.

REFERENCES

ADAMS, C. and M.G. PORTER (1976), "The Stability of the Demand for Money" in Reserve Bank of Australia, Conference in Applied Economic Research: Papers and Proceedings, Sept 1976.

DAVIS, K.T. and M.K. LEWIS (1980), Monetary Policy in Australia, Longmans: Melbourne.

_____ (1981), Australian Monetary Economics (edited readings), Longmans: Melbourne.

DIXON, R. and G. LIM. (1984), "The Demand for Transaction Balances: A New Approach", Institute of Applied Economic and Social Research Working Paper RD-84-02, University of Melbourne.

DRANE, N.T., G.A. MARZOUK, and T.J. VALENTINE (1985), "The Stability of the Demand for Money Function in Australia: A Longer Term Perspective", Centre for Studies in Money, Banking and Finance, Macquarie University No. 8503-A.

FAHRER, J.G. and R.W. RANKIN (1984), "Modelling Recent Developments in Australian Asset Markets", Reserve Bank of Australia, Research Discussion Paper 8403.

FAHRER, J.G., R.W. RANKIN, and J.C. TAYLOR (1984), "The Equations of the RBA82 Model of the Australian Economy", Reserve Bank of Australia, Research Discussion Paper 8401.

FREELAND, B. (1984), "The Demand for Money and its Role in the Re-designed NIF Model", Australian Treasury Seminar Paper.

JONSON, P.D. and J.C. TAYLOR (1978), "Modelling Monetary Disequilibrium", in M.G. Porter and M.E. Burns (eds), The Australian Monetary System in the 1970s, Proceedings of a Conference held at the Residential College, State Bank of Victoria, 14-16 October, 1977.

JONSON, P.D., E.R. MOSES, and C.R. WYMER (1976), "A Minimal Model of the Australian Economy", Reserve Bank of Australia, Research Discussion Paper 7601.

JUTTNER, D.J.P. and R.H. TUCKWELL (1974), "Partial Adjustment, Multiple Expectations and the Demand for Money in Australia", Credit and Capital, March 1974.

LEWIS, M.K. (1978), "Interest Rates and Monetary Velocity in Australia and the United States", Economic Record, Vol 54, p111-126.

LEWIS, M.K. and R.H. WALLACE (1974), "The Savings Banks" in R. HIRST and R.H. WALLACE (eds) The Australian Capital Market, Longman Cheshire: Melbourne.

MARZOUK, G.A. and N.T. DRANE (1983), "Stability and Invariance of the Income Velocity of Money, Widely Defined", Centre for Studies in Money Banking and Finance, Macquarie University

NORMAN, P.M. and D.D. PURVIS (1975), "The Behaviour of Monetary Aggregates in Australia: Some New Evidence", Fifth Conference of Economists, Brisbane, August 1975.

NORTON, W.E., A.M. COHEN, and K.M. SWEENY (1970), "A Model of the Monetary Sector", Reserve Bank of Australia, Occasional Paper No. 3D.

PAGAN, A.R. and P.A. VOLKER (1981), "The Short Run Demand for Transactions Balances in Australia", Economica, Vol. 48, p381-395.

PORTER, M.G. (1979), "Monetary Targeting", Committee of Inquiry into the Australian Financial System, Commissioned Studies and Selected Papers Part 1,. Australian Government Publishing Service, Canberra, 1982.

SCHEDVIN, C.B. (1971), "Monetary Stability and the Demand for Money in Australia Between the Wars", Australian Economic History Review, September 1971.

SHARPE, I.G. and P.A. VOLKER (1977), "The Impact of Institutional Changes on the Australian Short-Run Money Demand Function", Sixth Conference of Economists, Hobart 1977.

THURLOE, J. and T.J. VALENTINE (1984), "Financial Innovations and Monetary Policy", Conference on Innovation in the Australian Finance System, February, 1984.

VALENTINE, T.J. (1973), "The Demand For Very Liquid Assets in Australia", Australian Economic Papers, December 1973.

VALENTINE, T.J. (1977), "The Demand for Money and Price Expectations in Australia", Journal of Finance, June, 1977.

VALENTINE, T.J. (1978), "The Determination of the Volume of Money", in M.G. Porter and M.E. Burns (eds), The Australian Monetary System in the 1970s, Proceedings of a Conference held at the Residential College, State Bank of Victoria, 14-16 October 1977.

ZERBY, J.A. (1969), "An Econometric Model of Monetary Interaction in Australia", Australian Economic Papers, December, 1969.

ATTACHMENT

SUMMARY OF EMPIRICAL STUDIES OF THE DEMAND FOR MONEY FUNCTION IN AUSTRALIA[1]

Study	Data	Monetary Variable	Income Measure	Interest Rate	Elasticity of money with respect to; Income	Interest Rate	Lags (Adjustment within initial year)	Evidence of Stability
Zerby (1969)	1948-49-1964-65 annual	M3	Personal disposable income	2-year government bond yield	0.82	-0.70	45%	Not reported
Norton, Cohen and Sweeny (1970)	1959(1)-1968(4)	(a) Currency	GDP	12-month bank fixed deposit rate	0.66	-0.26	43%	Not reported
		(b) Current deposits	GDP	12-month bank fixed deposit rate	0.73	-0.44	58%	
		(c) Fixed deposits	GDP	12-month bank fixed deposit rate	1.60	0.33	68%	
Schedvin (1971)	1919-20-1937-38 annual	(a) M1	Net domestic product	10-years or more government bond yields	0.60	-0.03	Full adjustment	Stable
		(b) M2	Net domestic product		0.47	-0.28	Full adjustment	
		(c) M3	Net domestic product		0.40	-0.36	Full adjustment	
Valentine (1973b)	1962(4)-1969(4)	(a) Liquid assets (currency, current and savings deposits, loans to money market)	GDP	12-month bank fixed deposit rate	0.53	-0.18	Adjustment complete within year	Not reported
		(b) Fixed deposits	Farm and non-farm GDP	12-month bank fixed deposit rate	0.95	0.38	83%	Not reported
Juttner and Tuckwell (1974)	1952(1)-1972(3)	M3, deflated	Real GDP	(a) 2-year govt bond yield	0.89	-0.17	69%	Stable
				(b) 10-year govt bond yield	0.96	-0.50	65%	
Lewis and Wallace (1974)	1954-1971 annual	(a) Real savings deposits per capita	Real personal disposable income per capita	10-year bond yield less savings deposit rate	1.58	-0.21	Full adjustment	Evidence of instability
	1953-1971 annual	(b) Ratio of M1 to liquid assets	Real personal disposable income per capita	Weighted rate on fixed deposits, savings deposits, and building societies	n.a.	-0.49	Full adjustment	
Norman and Purvis (1975)	1965(2)-1974(4)	(a) M1, deflated	Real GDP	90-day bank endorsed commercial bill rate	1.01	-0.36	77%	Post sample forecasts exhibit large prediction errors
		(b) M3,	Real GDP	90-day bank endorsed commercial bill rate	1.22	-0.40	54%	
Jonson, Moses and Wymer (1976)	1959(3)-1974(4)	M3 deflated	Real GDP	Australian 10-year govt bonds; U.S. long-term bonds	1.00*	-0.40	Adjustment in other markets	Not reported

Study	Data	Monetary Variable	Income Measure	Interest Rate	Elasticity of money with respect to Income	Elasticity of money with respect to Interest Rate	Lags (Adjustment within initial year)	Evidence of Stability
Adams and Porter (1976)	1965(3)-1975(4)	M1 deflated	Real GDP	(a) 90-day commercial bill rate	0.54	-0.11	Full adjustment by quarter assumed	Post sample forecasts exhibit large prediction errors
				(b) 2-year govt bond yield	0.57	-0.17	Full adjustment by quarter assumed	
Valentine (1977)	1962(2)-1974(4)	M1 deflated	Real GDP	Call rate on loans to money market	0.96	-0.22	80%	Not reported
Sharpe and Volker (1977)	1952(1)-1972(3)	M3 deflated	Real GDP	(a) 2-year govt bond yield	0.92	-0.23	67%	Post sample forecasts exhibit large prediction errors
				(b) 10-year govt bond yield	0.95	-0.47	59%	
Lewis (1978)	(a) 1902(1)-1968(4)	Current (and total) deposits	Bank clearings	10-year govt bond yield	1.00*	0.44#	Adjustment completed	No formal test. Results, however, are consistent with the view that interest rates are "more endogenous" than money supply
	(b) 1946-1971 monthly	Current (and total) deposits	Bank debits	10-year govt bond yield	1.00*	0.22#	Adjustment completed	
	(c) 1901-1971 yearly	M1	GDP	10-year govt bond yield	1.00*	0.34#	Adjustment completed	
Valentine (1978)	1966(4)-1976(3)	M3 deflated	Real Gross Operating Surplus	(a) Fixed deposit rate	0.21	0.29	Adjustment completed	Not reported
				(b) Rate on call deposits with authorised dealers in STMM		-0.34		
Porter (1979)	1966(3)-1979(2)	M1 deflated	Real GDP	2-year Govt. bond yield	0.91	-0.49	88%	No formal test
		M3 deflated			1.00	-0.33	94%	
Pagan and Volker (1981)	1967(4)-1978(2)	M1 deflated	Real GDP	90-day commercial bill rate	0.73	-0.46	73%	No statistical evidence of instability
Dixon and Lim (1984)	1975(2)-1983(3)	M1 deflated	Real GDP	90-day commercial bill rate	-	-0.97	Adjustment completed	Not reported
Freeland (1984)	1967(3)-1983(2)	M3 deflated	Real GDP	(a) 2-year govt bond yield	0.75	(a) -0.36	Adjustment completed	No statistical evidence of instability
				(b) rate on Savings Banks savings accounts		(b) 0.08		
				(c) Fixed deposit		(c) 0.21		

Study	Data	Monetary Variable	Income Measure	Interest Rate	Elasticity of money with respect to Income	Elasticity of money with respect to Interest Rate	Lags (Adjustment within initial year)	Evidence of Stability
Fahrer, Rankin and Taylor (1984)	1959(3)-1980(4)	M3 deflated	Real GDP	(a) 10 year govt bond yield (b) Fixed deposit rate (c) 90-day commercial bill rate rate	1.00*	(a) -0.39 (b) 0.46 (c) -0.23	Adjustment in other markets	Not reported
Thurloe and Valentine (1984)	1969(3)-1983(3)	M1	GDP	Weighted average rate on deposits with STMM	2.50	-0.88	51%	No statistical evidence of instability arising from financial innovations
Drane, Marzouk and Valentine (1985)	1958/59-1982/83 annual	(a) M1 deflated	Real GDP	1 year finance company debenture rate	12.80	-2.22	10%	Stable
		(b) M3 deflated	Real GDP	1 year finance company debenture rate	0.78	-0.50	36%	
		(c) MM deflated	Real GDP	1 year finance company debenture rate	0.80	-0.29	72%	
		(d) DCMM deflated	Real GDP	2 year govt. bond rate	1.42	-0.12	43%	

*Coefficient constrained
#As the dependent variable is the velocity of money, the coefficient is positive.
Note: 'Full adjustment' means that equilibrium is assumed to be present with annual data; when lags are allowed for, but are a year or less, the phrase 'adjustment completed' is used.

1. Compiled in part from Davis, K. and Lewis, M. (1978), "Monetary Policy", in F.H. Gruen (ed), "Surveys of Australian Economics", George, Allen and Unwin.