Money Substitutes and Interest Rate Determination: the Australian Case

This paper describes a test carried out to assess the significance of money substitutes in interest rate determination in Australia in the years 1953-1962. The test involved a comparison of four simple alternative hypotheses (1); these were:

1. \[ R = A_1 - a \frac{M_1 - kY}{P} \]
2. \[ R = A_2 - b \frac{M_1}{Y} \]
3. \[ R = A_3 - c \frac{M_2 - w_1 M_1 - w_2 M_3}{Y} \]
4. \[ R = A_4 - d \frac{w_1 M_1 + w_2 M_2 + w_3 M_3}{Y} \]

where the four independent variables correspond to four alternative indices of liquidity:

- \( R \) = yield on 2-year government bond
- \( M_1 \) = (notes + coins) = total deposits (public)
- \( P \) = consumer price index
- \( Y \) = Gross National Product
- \( M_2 \) = Constant Price assets (sec text)
- \( M_3 \) = M... range of liquid assets
- \( w_1, w_2, w_3, ... \) = weights determined by the liquidity of the relevant assets.

(1) The hypotheses are of course not comprehensive. They exclude other possibly significant variables e.g., expectations, lagged adjustments, the rate of interest on fixed deposits, the rate of price change. However, since we are concerned merely with isolating the significance of money substitutes the tests proposed would appear to be reasonably adequate. Also the number of observations provides little scope for adding to the explanatory variables.

There is now a considerable literature on the rationale of functions (1) and (2), so these may be dealt with very briefly (3). Function (1), which relates the rate of interest to devalued idle balances, assumes the absence of any money illusion in the holding of idle balances (3); \( k \) was estimated in the familiar manner: the value of \( M_1 \), which was used corresponds closely to the minimum value reached by the ratio public cash + current deposits/GNP in Australia in 1959 (4). Total idle balances were then obtained by subtracting active balances from the money supply, as defined. These total balances were then deflated. The formulation in (2) has the advantage that it does not rely on any distinction between active and idle balances (5). (This ratio \( M_1 / Y \) will henceforth be referred to as the Cambridge ratio.) Table 1 (columns 2-6) sets out annual data for \( R, Y, M_1 \), deflated idle balances and the Cambridge ratio.

It is now proposed to examine the Gurley-Shaw thesis that the two tests suggested so far may be inadequate in that they ignore the possible influence of money substitutes on the demand for bank deposits. These writers (6) take the view that if explicit allowance were made for these money substitutes a closer explanation of the

(2) See for example Lasane (ref. 13), Bell (ref. 3).
(3) Prott (1) it may be seen that doubling both \( M_1 \) and \( P \) would leave the rate of interest unchanged whereas in the crude Keynesian function, which does not deflate idle balances, this change would double the size of idle balances and thus lower rate, see Pollock (ref. 10). See also Broadnentsbrantner and Mayer (ref. 5) for a similar treatment of idle balances. The crude Keynesian function was found unsatisfactory in our study.
(4) Since it is the movement in idle balances that is critical, our test is not sensitive to changes in the assumed value of \( k \). Two other methods of estimating idle balances have been suggested in the literature. Eisner (ref. 8) suggests adding a minimum constant term to idle balances derived in the above manner. Khosu (ref. 12) estimates \( k \) from the equation \( R = A - M(L+bY)/L \), where \( M \) represents total deposits, \( Y \) aggregate income and \( L \) liquid assets. Khosu claims that his results are improved by this method of estimation but this claim is not supported by the data he presents. Khosu compares the result of using this technique and taking the net yield on assets as the dependent variable with the result obtained by the crude technique when the gross yield was used. Clearly the comparison should be between the results obtained when the net yield was used. On this basis the improvement is negligible from 0.8 to 0.82.
(5) Tobin (ref. 20), Khosu (ref. 12) Broadnentbrantner and Mayer (ref. 5) have used variants of our formulation (1). Lasane (ref. 13, 14), Bell (ref. 3), Aris (ref. 2) have used variants of our formulation (2).
(6) This is implied in many of their writings; see for example ref. 11. The most explicit statement of this hypothesis is found in J. Gurley — to —. The Mackayle Report claims very close to expressing rather similar views, see p. 27 para. 390 (ref. 26). See also refs. 2, 9, 12, 14, 20.
A new financial intermediary is characterised by some innovation. Financial innovations may be conveniently divided into two groups: those that involve in the debt offered and those that involve in the credit being provided. The impact of these innovations on the economy is worth summarising: credit innovations tend to shift the aggregate demand schedule upwards (an availability effect); on the other hand, debt innovations, other things being equal, may shift the liquidity preference schedule downwards. The first produces a direct effect on aggregate demand, the second an indirect effect via a change in the rate of interest. In our context it is clear that it is the second type of effect that is of more direct concern to us and accordingly we will tend to concentrate on the liabilities offered in this period by the new financial intermediaries. Three of these intermediaries — unit trusts, new private savings banks (8), the official short term money market — may be classified as pure debt innovators. Three others, on the other hand — factoring, leasing and development companies — may be treated as pure credit innovators and therefore fall largely outside the scope of this study.

The two remaining ones — hire purchase, credit unions — are hybrids in that some contribution was made by them to both debt and credit innovation. Credit unions will, however, be excluded from the study because of the unavailability of data and also the fact that even in 1962 their assets could hardly have exceeded £6m.

One way of representing the possible impact of debt innovation is by way of a shift leftward in a hypothetical schedule relating the Cambridge ratio to the rate of interest. This is shown in Figure 1. Suppose the ratio \( M_1/Y \) was as shown at \( x \) and suppose a new financial intermediary whose liability was a partial substitute for money entered the system. If the money supply remains unchanged then only a fall in the rate of interest to \( r_0 \) will be consistent with the ratio at \( x \) obtaining (9). Alternatively, we could say that in order to maintain the same rate of interest the ratio \( M_1/Y \) would need to fall from \( x \) to \( y \). F. Paish (10) in his submission to the Radcliffe

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(8) To some extent the inclusion of savings deposits by the newer savings banks in the group of debt innovations seems dubious. This may be justified, however, by the fact that they were differentiated by advertising and also by the fact that the many new branches opened up added to the convenience of the small saver.

(9) It is also suggested that the elasticity of the schedule at \( C \) will be greater than at \( B 

Committee has described the effects of near money as follows: "I would say that whereas they could get a given rate of interest with a 40% ratio of bank deposits to National income if there was not very much near-money in the system, they might need 35% to get the same rate if there was a lot of near-money in the system. They would have to offset the increased liquidity due to large holdings of near-money by having less real money, in order to get the same effect on total liquidity". H. Arudt (11), commenting on the downward trend in the ratio of money to income in the post-war years in Australia suggests that: "there is little doubt that this reflects chiefly the new developments in the capital market, especially the availability of short term notes and other liquid assets. In effect, these developments have brought about a significant increase in the velocity of circulation of money". We should add "at given interest rates" (12).

(11) See ref 1, p. 35
(12) This liquidity effect of the entry of new intermediaries has been given some prominence in the more recent literature. Other things being equal, this effect tends to become progressively weaker as financial markets become more sophisticated. This follows from the fact that a greater variety of financial assets will now be available and therefore more competition would be offered to any new claims being made available by intermediaries.
of Gurley’s paper is to explain the movement in interest rates in the U.S. (corporate bonds, government bonds and prime commercial rates) in terms of the ratio of weighted liquid assets in the hands of the non-finance private sector to GNP. It seems that he experimented with alternative weights and found that attributing a weight of 1/2 that of money to other liquid assets provided a good fit (13). The relationship, a hyperbolic one, is very close indeed for the period covered 1945-58. Two comments on Gurley’s work are worth making. First, Gurley’s selection of non-monetary liquid assets is a narrow one: they include time saving deposits, savings and loan shares, credit union shares, savings bonds and policy reserves of the life offices (the latter could hardly be regarded as possessing the same liquidity as the others in the list). Second, and this is very significant, Gurley himself in the appendix to his work presents evidence to show that, taking the period under consideration, the ratio of money/GNP would have produced equally good results, and certainly the relationship between money/GNP and the rate of interest appears equally close (14). This is so according to him because “both the money/GNP ratio and weighted liquidity/GNP were reduced almost hand in hand throughout the period”, and again “the use of money instead of weighted liquidity assumes that non-monetary liquid assets move in some stable way with the money supply, an assumption that is roughly true for post-war annual data”. The inference is that Gurley considers it analytically more legitimate to take account of money substitutes even though, as it happens, in the period examined it does not improve the results.

Latane (ref 13), derived a close relationship for the years 1949-1958 between income velocity and the rate of interest. He finds no evidence of a shift in the schedule as a result of the increasing importance of financial intermediaries (15). He concludes that

(13) This is the inference from page 8. “The best that one can do is to test various hypotheses about these degrees of substitutability with interest rate data”, and in a footnote “other weights... provide equally good explanations of interest rate behaviour... it is not the very best weight out of an infinite number of possibilities”.

(14) No figures are given of the “elasticities of fit” in either case.

(15) These results may not be easy to reconcile with the short run analysis offered by Irwin/Gerron and Mayer as to the relationship between the Cambridge ratio and the interest rate. Several shifts are postulated in this study but there is no suggestion that this is consistent with a stable long run function for the period covered, 1914 to 1957.

“there is no significant evidence that financial intermediaries have increased the efficiency of cash balances”. A. Meltzer — ref 16 — in an elaborate study obtains a stable long run demand function for money which spans over half a century (1900-1958). He concludes that “the stability of the long run demand function for money denies the necessity for incorporating the liabilities issued by financial intermediaries as a part of the definition of money or as arguments in the long run demand function”. Ball’s study (16) of the determination of the yield on consols in the U.K. effectively reaches an identical conclusion in respect of the role of money substitutes (17). We may sum up our review of the overseas evidence by saying that the more rigorous of the studies — those by Latane, Meltzer and Ball — suggest that money substitutes have not been significant in the determination of the interest rates.

Two lines of approach are possible for Australian data. One would call for a preliminary dating of the shift or shifts in the schedule; on this basis a best-fit line covering data prior to that date/ies may be extended and an examination then made of observations in the later period to see if a majority fell below the extended line. Even if we attempted to date the shift, assuming it occurred, there would be some difficulties involved in isolating a single unambiguous line to be extended. Moreover, shifts due to other possible considerations, e.g. the level of activity, expectations, become confounded in the analysis. It seems preferable on the whole then to follow the second line of approach: that indicated by Gurley, with certain appropriate modifications. First, the range of non-monetary liquid assets included in the analysis will be considerably extended. Second, a more complex weighting pattern will be adopted than the one actually used by Gurley (18). The lack of data unfortunately compels us to confine the analysis to annual observations for the period 1953 to 1962. Holdings of all liquid assets by the private...
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4. Deposits with short term money market: Total deposits less holdings by the Reserve Bank of Savings Bank Deposits from Reserve Bank Statistical Bulletin.

5. Deposits + shares mostly Bld, Soc, + deposits with Life Offices: Derived from the Flow of Funds.

6. Clients' credit balances with Pastoral Finance Co.: From Flow of Funds.


5. Life Assurance Surrender Values: 70% of reserves of Life Offices less policy loans. Figures from Flow of Funds. The 70% figure was suggested by the Assurance of a large Life Office, in the context of a micro-analysis it is probably an understatement.


7. Debentures, notes, and deposits: Figures for 1955 estimated from Sydney Stock Exchange Companies. Certain very rough deductions were made for holdings by Financial Institutions. Although the figures are widely inaccurate, the changes in the holdings over the period (obtained by noting equities changes in Flow of Funds) are worth of some attention.

8. Flow of Funds, 1955-64: Figures were kindly made available to use by an officer of the Reserve Bank.
non-finance sector for this period are shown in Table 2 (19). The percentages of the different assets to G.N.P. for two-year periods are shown in brackets. Certain interesting features of this table are worth noting: one is the decline in importance of equity holdings (from about 23% to 16%) possibly due to the availability of substitutes, e.g. unit trusts. Another is the sharp fall from 1955 in the holdings of Commonwealth Government debt by the personal sector (the ratio to G.N.P. falls from 20% in 1953-54 to 10% in 1961-62); this coincides with the increasing availability of substitute assets such as debentures/notes and deposits.

On what bases will the financial assets be weighted in terms of their liquidity? Without attempting a precise definition we can accept D. Rowan’s suggestions (ref 22) that the liquidity of any asset depends on three considerations: (a) the speed with which it can be converted into money, (b) the degree of price certainty attaching to the conversion, (c) the capital certainty attaching to the conversion. We may now proceed briefly to examine our liquid assets in terms of these three criteria. Abstracting from considerations of default risk it is possible to isolate in one group those assets which are characterised by price and capital certainty attaching to their conversion. In this group we may include assets numbered 1 (including current and fixed deposits) 2, 3, 4, 5. The ratio of these assets to G.N.P. was computed and the results are shown in column 5 Table 1. The assets in this group will differ only in respect of consideration (4) above. Is consideration (4) measurable in any way? One hint of the “delays”, “inconveniences” involved in conversion may be obtained by indices of relative turnovers of these assets (20). Table 3 sets out some rough calculations of the turnovers in this group (1, 4, 7, 8). The only mild surprise in this result is the relative ranking of interest

(19) The lack of data makes it necessary to omit unsecured overdrafts. Figures for these are only available from 1956. Unsecured overdrafts are certainly relevant to the overall liquidity position of the private sector. Their absolute size is very large; they increased to something like £100m in June 1956. More important, the ratio of these overdrafts to total overdraft limits tends to fluctuate between the peaks of boom and recession conditions, falling in the former and rising in the latter. This would be a factor adding to the liquidity of the private sector when economic activity is slack.

(20) This is by no means an unambiguous test: the rate of use need not correspond closely to the effect on the demand for money. It is conceivable that a low rate of use accompanies a high subjective sense of liquidity.
Once we move away from this group and examine the other assets in our list, estimation of liquidity becomes more difficult. In addition to (a) considerations (b) and (c) will now assume some importance. The difference between (b) and (c) is basically one of the perfection or otherwise of the market facing the holder of the asset. If an individual holder may sell any number of the asset at a fixed price, other things being equal, we say that he is confronted with a perfect market. In respect of attribute (b) then price certainty would attach to the conversion. If, on the other hand, increasing sales by the holder progressively lower the price of the asset in question then the market is imperfect. Following Rowan, we may also say that attribute (c) will depend on the stability of the prices in the market.

How do our remaining assets stand up to these considerations? Unit trusts are subject to little delay in conversion because the institutions concerned will generally re-purchase the units at quoted prices. In respect of attribute (b) it will also follow that the individual will tend to be in a perfect market. Since, however, the portfolio of these trusts is subject to substantial price variability (equities being prominently featured), the holdings will possess little liquidity in respect of attribute (c). Some of these points at least would be reflected in the turnover figure for these units; this figure is shown in Table 3. It is clear that it stands well below the turnover figures of the assets comprising the first group above. Turning now to Commonwealth Govt. securities, the bulk of these are listed in stock exchanges and this facilitates shifting. The degree of perfection in the market depends on the value of transactions on the exchange of the maturities concerned. The degree of imperfection would tend overall to be slightly. Attribute (c) depends on the maturities of the holdings, the longer maturity, other things being equal, suffering the largest price changes. No information could be collected on the term structure of debt holdings. Operations by public authorities in varying maturities tend to bolster the liquidity of these holdings. Local and semi-government securities are less liquid on the whole. A smaller proportion of these securities is listed and the market is thinner than in the case of Commonwealth Securities. The liquidity of life policies is a matter of some difficulty. Until a policy acquires a surrender value — 2-3 years after its issue — it has virtually no liquidity. When the policy possesses a surrender value, conversion into money is possible in two major ways: by surrender (part or whole) or by borrowing against the policy (generally a maximum of about 90% of the full surrender value) (23). Loss of rights to the policy by surrender is certainly a deterrent to this form of liquidation; on the other hand, a loan on policy, on which interest is paid, involves no loss of rights and represents a quick and effective means of raising cash (generally 3-4 days from application). Nevertheless, it appears to be true that the bulk of policy holders either by intent or ignorance continue to regard their policy holdings as relatively illiquid assets (24). To some extent this appears to be confirmed by the turnover figure given in Table 3 for life policies (25).

The group labelled debentures, notes and deposits (26) contains a range of assets differing widely in the attribute of liquidity. Aggregation of liquidity for this group would call for complete information on private non-finance holdings in respect of the following: the term structure, the proportion of assets listed in stock exchanges, the default risk attaching to the individual components (proportion of assets secured, the financial solidity of the companies concerned), the negotiability or otherwise of the assets, the value of transactions in given periods for individual components. Some data bearing on these points for total holdings (including those by financial institutions) was obtained as at June 1961. Roughly 32% of issues by finance companies and 36% by non-finance companies were listed on the Sydney Stock Exchange. About 39% of listed issues were unsecured. As to the term structure

(23) Non-payment of annuities (allowing the policy to be placed under non-forfeiture provision) is a form of borrowing against the policy.
(24) See, for example, the monograph prepared for the Commission on Money and Credit in the U.S. by the Life Insurance Association of America, published by Prentice Hall, 1962, Chapter 9.
(25) This figure is deficient in that loans (in particular by banks) secured by these policies are not taken into account. No information could be obtained on the proportion of loans to the personal sector by the banks secured in this way. However, some rough calculations suggest that the turnover figure for life policies would be most unlikely to be raised above 15%.
(26) The contribution by finance companies to the total issues of debentures, notes and deposits was roughly about 50% in 1957 and 1958. Since no information could be obtained of holdings by large financial institutions it is not known what the relative holdings of the personal sector are.
(27) It is safe to say that purchases by financial institutions (life offices, pension funds) would be of the longer term variety (5 years or over). However, with the passage of time their portfolios would contain many short term holdings.
of these listed issues (38) the following differences were noted as between finance and non-finance companies:

<table>
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<tr>
<th>Maturity within two years</th>
<th>Finance % of issues</th>
<th>Non-Finance % of issues</th>
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<tr>
<td></td>
<td>24%</td>
<td>14%</td>
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<tr>
<td>Maturity within three years</td>
<td>4%</td>
<td>24%</td>
</tr>
<tr>
<td>Maturity within five years</td>
<td>80%</td>
<td>53%</td>
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There appears on this basis to be a substantial difference in the liquidity of finance and non-finance issues. The degree of imperfection of the market will also vary considerably within the group, some having high transactions, others low. The final asset on the list is equities: again there is great diversity within this group. The degree of price dispersion (29), however, is sufficient in this case to place the group below all others on the list (39).

Our crude data and a priori reasoning so far have suggested the following rankings in terms of liquidity (31):

1. bank deposits, savings deposits, deposits with the short term money market;

2. clients’ credit balances, shares with building societies;
3. Commonwealth Government securities, debentures/notes, unit trusts, local and semi-government securities;
4. Life policies;
5. equities.

If we treat these group rankings as rigid, the only element of flexibility (experimentation) left to us is in the possible orderings within a group, e.g. rate unit trusts above Commonwealth Securities and debentures below the latter, always maintaining this group of three above the next group under four. Some experimentation was carried out along these lines, but there was little difference in the results yielded by minor changes in orderings. Equities were excluded from the final results because the method of deriving this category was unreliable. The following weights were finally used:

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<th>Asset No.</th>
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<td>1, 2</td>
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<td>3</td>
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<td>4, 5</td>
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<td>8</td>
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<td>9</td>
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The ratio of weighted assets to G.N.P. is shown in column 8 in Table 1.

Correlations between the rate of interest and the four alternative indices of liquidity, for both original values and first differences, are given in Table 4. All correlation coefficients for original values are high but the four hypotheses perform equally well. First differences were taken to eliminate the trends in both series — the correlation coefficients remained fairly high and significant. Although coefficients for the two ratios incorporating money substitutes were higher than the coefficient for the Cambridge ratio the differences were not significant. It is worth noting too that deflated idle balances performed as well as the weighted assets ratio. It would seem to be a reasonable inference from these results that making an explicit allowance for money substitutes does not contribute to
the explanation of the behaviour of the rate of interest. This conclusion parallels the results obtained from the other studies reviewed earlier.

<table>
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<tr>
<th>CORRELATION COEFFICIENTS</th>
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<th>ΔR</th>
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<tr>
<td>Deflated M1</td>
<td>0.87</td>
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<tr>
<td>Δ Deflated M1</td>
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<td>0.85</td>
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<tr>
<td>Cambridge ratio</td>
<td>0.93</td>
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<tr>
<td>Δ Cambridge ratio</td>
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<td>0.76</td>
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<tr>
<td>Constant Price assets ratio</td>
<td>0.93</td>
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<tr>
<td>Δ Constant Price assets ratio</td>
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<td>0.76</td>
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<tr>
<td>Weighted assets ratio</td>
<td>0.92</td>
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<tr>
<td>Δ Weighted assets ratio</td>
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<td>0.83</td>
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(1) Significant at the 5% level.

To complete the discussion certain limitations attaching to the analysis should be mentioned. First, no account has been taken of the liquidity of financial institutions. The study was confined to the private non-financial sector. Second, the role of debt in the total liquidity position was ignored. Since debt also produces its effects on the demand for money (22), the analysis is correspondingly weakened by this omission. Third, certain possible changes in preferences as between non-monetary liquid assets could upset some of the conclusions of the analysis; for example, a shift in preference under certain conditions towards savings deposits and away from riskier assets would produce a "spurious" rise in liquidity. Fourth, certain changes in the structure of rates offered on non-monetary liquid assets could yield misleading results in terms of our liquidity index. For example, if rates on savings or fixed deposits rise relative to, say, rates on offer by finance companies, any switch towards more liquid assets could result in a spurious rise in liquidity. Fifth, each asset has been imputed with a certain "fixed" liquidity weight for the whole period under analysis. It may reasonably be objected that the liquidity of an asset may change over time.

for a variety of reasons (33): the term structure of holdings, e.g., debt, government securities, may change with the passage of time, the expected range of price variability or the conditions of conversion (e.g., a wider market) in particular assets may also change in time. All these limitations at least should be borne in mind; nevertheless, it is doubtful if they are serious enough to throw complete doubt on our findings.

Sydney

BIBLIOGRAPHY


(1) See R. McKean - op. cit. - for a discussion of this point.