KEYNES' FINANCE MOTIVE:

SOME THEORY AND EVIDENCE

An examination of the theoretical role of the finance motive in the theory of liquidity preference; of some of the implications of this role for the interaction between the real and the monetary sectors, with some cross-spectral and regression analysis tests of its empirical significance using Australian data.

by

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SUMMARY

This thesis examines (i) the theoretical role of the finance motive in Keynes' theory of liquidity preference and (ii) the implications of this role for the interaction between the real and monetary sectors. In addition, cross-spectral analysis and regression analysis of Australian data are used to test the significance of this role.

Chapter 1 defines the finance motive, explains the difference between it and the transactions motive, and identifies the critical element of finance demand. Chapter 2 considers the liquidity preference - loanable funds debate which occurred immediately after the publication of the *General Theory* and which formed part of the general review and criticism of that book. It has two objectives: the first is to trace the development of the finance motive and the second is to examine the perspective of the finance motive in the context of this debate.

Chapter 3 is a review of Paul Davidson's 'revival' of the finance motive. In common with others who have considered the finance motive, Davidson does not, at least in his formal statements of Keynes' liquidity preference function, distinguish between transactions demand and finance demand. A specification of the demand function for money which embodies this distinction is introduced in chapter 4. Variants of this function are used in all of the subsequent chapters.

In chapter 4 this function and its advantages are explained; it is compared with the alternative specification of Davidson and of A.G. Hines, and it is incorporated into an IS and LM framework.

The liquidity preference - loanable funds debates can be divided into that which took place immediately following the publication of the *General Theory* and those which took place in the 1950's and 1960's. In the first part of chapter 5, the role of the finance motive in these latter debates is considered, thus extending the examination begun in chapter 2. In the second part, the specification of the demand function for money introduced in chapter 4 is used as the basis for a formal statement of the theory of liquidity preference with which to compare the theory of loanable funds.

In chapter 6 the available evidence, adduced in the main by Milton Friedman, and by Friedman and Anna Schwartz, on the cyclical relationships between monetary and expenditure variables is considered. This evidence is compared with the implications for cyclical relationships that would follow from a Keynesian liquidity preference function which explicitly includes finance demand as an argument.

The results of cross-spectral tests on Australian monetary and expenditure data are reported in chapter 7. These tests are primarily designed to extend the evidence on cyclical *timing* relationships between monetary and expenditure variables and, by including a proxy for finance demand, to present evidence on the perspective of the finance motive in these relationships.

In chapter 8 various models of the demand function for money are modified by including proxies for finance demand. The parameters of these functions are estimated using Australian quarterly data with a view to discovering (i) whether the proxies are significant, (ii) the extent to which their inclusion improves the explanatory power of each model, and (iii) whether the proxies are *robust* in the sense of maintaining significance and explanatory power in a variety of models.

DECLARATION

This thesis contains no material which has been accepted for the award of any other degree in any University, nor material previously published or written by another person, except where due reference is made in the text.

P.R. Smith

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CHAPTER 1

(i) THE FINANCE MOTIVE: THEORETICAL CONTEXT AND DEFINITION

(ii) A PREVIEW OF THE CHAPTERS TO FOLLOW

> "I know of no empirical study of the demand for money that has ever identified variables corresponding to 'the finance motive', let alone found them to have significant influence. An attempt to do so would certainly be an appropriate piece of research".
> [Friedman, 1972, p. 931]

Introduction

> "The fundamental problem of monetary theory is not merely to establish identities or statical equations relating (e.g.) the turnover of monetary instruments to the turnover of things traded for money. The real task of such a theory is to treat the problem dynamically, analysing the different elements involved, in such a manner as to exhibit the causal process by which the price level is determined, and the method of transition from one position of equilibrium to another". [Keynes, 1930, *i*, p. 133]

If this statement were amended, certainly, by adding after 'the price level' *and the level of output and employment*, and, probably, by qualifying the final phrase dealing with the transition from one equilibrium to another, it would not appear out of place in the *General Theory*. It explains why Keynes rejected the quantity theory approach to the analysis of change. This was not because he thought money unimportant or (as Friedman [1970b, p. 13] would have it) that the velocity of circulation of money was a 'will-of-the-wisp', but because velocity is 'merely a name which explains nothing';

which depends 'on many complex and variable factors' and which 'obscures...the real character of the causation, and has led to nothing but confusion' [Keynes, 1936, p. 299].

According to Friedman [1970b] the Keynesian revolution, which established a new orthodoxy, has been successfully countered. It is probably true that 'monetarism' is in the ascendancy, however, its 'central propositions' [1970b, pp. 22-26] do not *appear* to be the radical stuff of which counter-revolutions are made. To illustrate: the propositions (i) that there is 'a consistent though not precise relation between the rate of growth of the quantity of money and the rate of growth of nominal income'; (ii) that there are lags involved which may be irregular; (iii) that an increase in the money supply affects, first, asset prices; second, the output of commodities and, third, the prices of commodities, and (iv) that an increase in the money supply may, through second-round and subsequent-round income effects, raise interest rates, are all propositions which Keynesian economics can accommodate. Similarly, the monetarists policy prescription of a monetary rule is consistent with the purely practical judgement that interference by monetary authorities in the past has been counterproductive and probably will be so in the future.[1]

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[1] Friedman [1953, 1960] reaches this conclusion on pragmatic grounds. Modigliani [1964], on the basis of some empirical tests, reached a slightly ambivalent conclusion but tended to favour modified discretion over a monetary rule.

If there has been a 'counter-revolution' it should be possible to identify at least one *fundamental* proposition of Keynesian economics which monetarism explicitly or implicitly disavows. It is suggested here that such a proposition is that a capitalist-free-market economy is intrinsically unstable[2]; that is, is one in which 'new fears and hopes will, without warning, take charge of human conduct' and in which 'the forces of disillusion may suddenly impose a new conventional basis of valuation' [Keynes 1937c, p. 215]. The repudiation of this proposition may or may not be ideologically based. Friedman [1970b, p. 7] contends that monetarism is 'a scientific development' with 'little ideological or political content'. For a contrary point of view see Harcourt [1977b].

Ultimately, the question of stability is one which will be decided by experience rather than by ideology. If the economic system is stable then it may suffice to observe and correlate the surface phenomena - the inputs and the outputs. Keynes' analysis presupposes that it will not suffice. Hence the careful consideration in the *General Theory*, and to an extent in the *Treatise*, of the various motives that lead individuals and enterprise to save, to hoard, and to spend, and with the exception of household saving, of the capricious nature of these propensities.

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[2] See appendix 8.2 for some argument in support of this suggestion.

The finance motive is an extension of the monetary analysis of the *Treatise* and *General Theory*. To exclude it, is to circumscribe the effectiveness of Keynesian monetary theory in explaining current and past monetary experience and in providing a framework for policy prescription. Much of the evidence which seems inconsistent with Keynes' theory of liquidity preference and which, therefore, influences both theorists and policy-makers to embrace monetarism is, in fact, inconsistent with a circumscribed version of the theory of liquidity preference. It remains to be discovered whether this inconsistency remains once the finance motive's role in that theory is correctly specified. The objectives of this thesis are to identify this role; to examine the theoretical implications of it; to compare these implications, where appropriate, with the available evidence, and to conduct tests using Australian data to investigate its empirical significance.

Since these objectives are concerned with the extension of Keynes' monetary analysis, the context of this thesis is the 'post-Keynesian' [see Eichner and Kregel, 1975] developments of, for example, Davidson [1972a], Hines [1971b], Minsky [1975], Kregel [1973], and Roe [1972]. Davidson's and Hines' contributions will be considered in some detail further on. Roe, Minsky, and Kregel extend the usual income and expenditure-cum-IS and LM analyses of the *General Theory* into one in which financial assets play a conspicuous role.

Roe [1972] in arguing the need for detailed financial statistics makes the point that, for the large part, the financial analogue of the multiplier is neglected in Keynesian analysis. It is noted that the translation of desired demand into effective demand is constrained by the ability to pay. Roe lists three factors upon which the ability to pay depends, they are:

> "(a) the level of money income;
>
> (b) the ability and willingness to sell assets to raise money;
>
> (c) the ability and willingness to borrow to raise money".[3]
> [Roe, 1972]

In conventional Keynesian analysis the repercussions of unemployment in one sector is translated to others through the income and expenditure relationship associated with constraint (a). But, in a money economy, the ability to borrow may in the short period be the more important constraint. This is so especially for businesses as distinct from households. Furthermore, the effects of errors in financial decisions will communicate themselves throughout the economic system in a similar fashion to errors in production decisions. For example, an unexpected shortfall in cash receipts may lead to a firm laying off labour but, alternatively, the firm may sell financial

[3] These three constraints taken together are the impediment to the attainment of a Walrasian full equilibrium. They stand alongside the budget constraint, what Tsiang [1966] calls the 'fair exchange restraint'; the only operable constraint when trading at false prices does not occur.

assets or increase its borrowing. Financial markets in general will be affected by this action. In consequence, the ability to borrow of other firms will be affected.

Minsky and Kregel take substantially the same stance as Roe. Minsky presents, as an alternative to the neo-classical synthesis, an interpretation of the *General Theory* in which 'capitalist finance in the context of uncertainty' [p. 131] regulates the cyclical path of the capitalist economy.

Prior to the reappraisals of Clower, Leijonhufvud, Davidson, Hines, Minsky, and others, the Keynesian model was often stripped of its monetary content. The debate between monetarists and fiscalists is, to the extent that fiscalism is considered *the* policy derivative of the Keynesian model, an illustration of this. It will be suggested in this thesis that the reintroduction of money and other financial assets into the Keynesian model is deficient without an explicit account of the finance motive.

The impact of the three constraints facing a spending unit listed by Roe cannot be properly appraised unless the types of expenditure for which money is required are known. For example, it seems likely that constraints (b) and (c) are especially applicable to expenditure flows associated with new fixed capital investment. If this is so, and further, if this type of expenditure has a larger planning horizon than, for example, expenditure on wages, then it is relevant, as will be made clear further on in this chapter, to consider these constraints within the context of the finance motive. Constraints (b) and (c) may operate throughout the planning period and may effectively prevent the execution of plans. Furthermore, the effect of these constraints will be exhibited in financial markets concurrently with the formulation and financial articulation of expenditure plans, but prior to the real expenditure flows for which the plans are a design. The finance motive, because it expressly involves the link between the real and financial sectors, ought to be an important element in any model which purports to monetarise the 'Bastard Keynesian' construct.

This chapter has two main sections. The first defines the finance motive; explains the difference between it and the transactions motive, and identifies the critical element of finance demand; the second previews the chapters to follow.

1. The Finance Motive

1.1 *Origin and Definition*

There are two classifications of money in the *Treatise*. [Keynes, 1930, chapters 3 and 15] In the first the community's holdings of money balances are divided into business, income, and savings deposits; in the second, which cuts across the first, they are divided into industrial deposits and financial deposits. Neither classification exactly corresponds to the *General Theory's* division of money into transactions, precautionary, and speculative holdings. However, one essential analytical point is the same, and that is that while one part of the money supply may exhibit some *stable* relationship with income, the other is dependent on expectations and on the rate of interest.

Davidson [1972a, p. 161] has pointed out that in the *Treatise* business deposits and income deposits are related to *expected* personal and business expenditure of the forthcoming period, whereas the nearest equivalent to these balances in the *General Theory* - transactions balances - are related to current income. While this is true it seems unlikely that anything of substance is involved. For it is also made clear in the *Treatise* that this category of balances is stably related to current income. Keynes [1930, *i*, p. 46] notes three types of transactions involving business deposits. They are:

> "(i) transactions arising out of the division of productive functions, namely:

(a) payments from entrepreneurs to the income deposits of the factors of production;

(b) transactions between those responsible for the stage of process (of extraction, manufacture, transport or distribution) just completed and those responsible for the next stage or for assembling the different components;

(ii) speculative transactions in capital goods or commodities;

(iii) financial transactions, e.g. the redemption and renewal of treasury bills, or changes of investment".

And, furthermore, he explains that the first of these 'like transactions in respect of income deposits, [deposits held by *individuals* to meet personal expenditure, which together with balances held to undertake (i), more or less, correspond to transactions balances] will be a fairly stable function of the money value of current output'.

In the *Treatise* and in the *General Theory* the demand for money to accommodate transactions involving goods and services (as distinct from transactions involving financial assets) is related, in the main, to the level of money income. The motives underlying this demand are detailed in the *Treatise*. The *General Theory* account is cursory and relies upon the groundwork established in the *Treatise*. This is made explicit in the following passage:

> "In my *Treatise on Money* I studied the total demand for money under the headings of income deposits, business deposits, and savings deposits, and I need not repeat here the analysis which I gave in Chapter 3 of that book".
> [Keynes, 1936, p. 194]

The *Treatise* examines many qualifications to the notion of a stable relationship between transactions balances and money income. In itself this is a promising basis for the development of the finance motive but it would be wrong to assume that this development is foreshadowed in the *Treatise*. This point may be confirmed by comparing the analysis of chapter 3 of the *Treatise* with the analysis of the two articles and the note which delineated the finance motive. It is possible, however, if the monetary detail of the *Treatise* had been combined in the one book with the analysis of expectations and investment plans of the *General Theory*, that the finance motive might have been developed earlier.

The finance motive is variously defined by Keynes [1937a, b, 1938]. The variants are all mutually consistent. The most succinct is that 'finance' is 'the credit required in the interval between planning and execution'. Here Keynes is specifically referring to private investment expenditure. It is, however, made clear that other categories of planned expenditure may give rise to finance demand. (See Keynes [1937b, p. 667].) Keynes viewed the finance motive as being a distinctive and additional motive for demanding money. Others have not taken this view. Both Tsiang [1956, 1966] and Shackle [1961] argue that the finance demand for money is in fact transactions demand in another guise. Furthermore, Davidson [1972a] and Hines [1971b], in arguing that the demand function for transactions balances is mis-specified unless cast in a finance demand form, are, at least in this respect, at one with Tsiang and Shackle. It will not be claimed that this approach *necessarily* leads to wrong conclusions. It is claimed, however, that Keynes perceived a distinction between transactions demand and finance demand, and that while it is open to anyone to frame a definition of transactions demand which encompasses all of the individual demands listed by Keynes under both headings, Keynes did not do so. There is in his account a clear distinction between the finance motive and the transactions motive; this distinction remains notwithstanding the fact that both the finance motive and the transactions motive are *ex ante* motives.

1.2 *The Distinction Between Transactions and Finance Demand*

> 'Of course, the transactions motive is an *ex ante* motive. Whoever said it was not?'
> [Shackle, 1961, p. 239]

It is possible to concur with Shackle and at the same time perceive a clear distinction between the transactions motive and the finance motive. For the distinction between them is that they are related to different categories of planned expenditure.

Transactions balances, like finance balances, bridge the interval between the receipt of funds and the expenditures for which these funds are earmarked. However, there are certain expenditure flows which can be assumed to be stably related to current income. The resulting transactions demand for money is referred to by Keynes [1938, p. 319] as that part of the active demand for cash 'due to the time lags between the receipt and the disposal of income by the public and also between the receipt by entrepreneurs of their sale-proceeds and the payment by them of wages, etc.'. It is contrasted with the other part of the active demand for cash, that is, finance demand, which is 'due to the time-lag between the inception and execution of the entrepreneur's decisions'. It is unlikely that this other part is stably related to current income. It depends on that category of planned expenditure which forms a central concern of the *General Theory*. And it is this association between finance demand and the investment plans of entrepreneurs which probably led Keynes [1937b, p. 667] to refer to the finance motive as 'the coping-stone of the liquidity theory of the rate of interest'.

It has been mentioned that the spending plans to which finance demand is related are not restricted to private investment. Private investment expenditure is emphasised by Keynes because 'it is subject to special fluctuations of its own' [Keynes, 1937a, p. 247]. The essence of the type of expenditure associated with finance demand is that it is *non-routine*; that is, it is the type of expenditure which does not follow as a matter of course after the receipt of income. It may comprise consumer-durable expenditure by households and fixed capital expenditure by business and by government. It can be assumed that the average gestation period between decision and execution is longer for this type of expenditure than for *routine* types of expenditure.[4]

The notion that the transactions demand of the *Treatise* and *General Theory* includes finance demand, and that nothing new is added by its articulation, is wrong precisely because it is at odds with a major affirmation of the *General Theory*, namely, that expectations may be volatile. The only way to make sense out of the association between transactions balances and current income in the *General Theory* is to accept Keynes' own appraisal, that his 1937 articles analysed a part of the demand for money which had been 'previously overlooked' [Keynes, 1937b, p. 665]. (See also Keynes [1939, p. 573].)

1.3 *The Finance Demand Function*

It has so far been concluded that finance demand is the demand for money to accommodate planned non-routine expenditure flows. This expenditure is not restricted to private investment expenditure but, as well, includes both consumption expenditure and government expenditure. (See Keynes [1937a, p. 247 and 1939, p. 573] and also chapter 3.) The rationale is that planned, anticipated or expected expenditure, by business, individuals or government, creates a commensurate demand for money *prior* to the execution of this expenditure. Obversely, the execution of planned expenditure may be deferred

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[4] The terms 'non-routine' and 'routine' are broadly similar in meaning to the terms 'non-available' and 'available' - see Keynes [1930, *i*, chapter 9], and to the terms 'discretionary' and 'non-discretionary' - see Eichner and Kregel [1975, p. 1300].

or prevented unless the commensurate demand for money is accommodated at an acceptable cost *or* the act of planning itself may be deferred or prevented unless there is an *expectation* that finance will be available.

Let Y* stand for the total of planned expenditure for the forthcoming period. This is the sum of planned routine and planned non-routine expenditure flows. Designating these as R* and N* respectively, the transactions demand for money, L_t, and the finance demand for money, L_f, can be written as:

$$L_t = \ell_t (R^*) \qquad \ldots\ldots\ (1.1)$$

and

$$L_f = \ell_f (N^*) \qquad \ldots\ldots\ (1.2)$$

However, because routine expenditure flows are so closely related to current income, little is lost by replacing (1.1) with the function:

$$L_t = \ell_t (Y) \qquad \ldots\ldots\ (1.3)$$

where Y is current income. The transactions *plus* finance demand for money, L, can, therefore, be written as:

$$L = L_t + L_f = \ell_t (Y) + \ell_f (N^*) \qquad \ldots\ldots\ (1.4)$$

In chapter 4 a slightly different specification of the transactions *plus* finance demand function will be introduced with the object of facilitating the exploration of the finance motive's theoretical and empirical importance; at this stage, when the object is one of explanation and clarification, the more literal translation of equation (1.4) is preferred.

It is reasonable to suppose that planned non-routine expenditure per period will have a secular growth rate commensurate with the growth rate of income. If this were its only period-to-period variability, the finance demand to which it gives rise would still be an important monetary phenomenon. For 'if decisions to invest are (e.g.) increasing, the extra finance involved will constitute an additional demand for money ... and unless the banking system is prepared to augment the supply of money, lack of finance may prove an important obstacle to more than a certain amount of investment decisions being on the tapis at the same time' [Keynes, 1937a, p. 247]. If, in addition, planned expenditure has special fluctuations of its own, which may be larger in amplitude than, and in some cases perverse to, those of current income, then finance demand assumes an even greater significance.

As well as variability in the demand for finance resulting from the variability in aggregate planned expenditure, account has to be taken of the influence of differing compositions of planned expenditure. There is no *a priori* reason for assuming that any given amounts of planned consumption, investment, and government expenditure need have the same finance requirements.

The concept of 'non-routine expenditure' is a vague one. It essentially refers to expenditure 'which has to be planned ahead' [Keynes, 1937b, p. 667]. For operational purposes a proximate delineation of this expenditure may include fixed capital expenditure by business and by government, and consumer durable expenditure. In this case equation (1.2) above may be written as:

$$L_f = \ell_{f_1} (I) + \ell_{f_2} (G) + \ell_{f_3} (C) \quad \ldots\ldots \quad (1.5)$$

where I, G, and C stand for planned private fixed investment expenditure, planned government fixed investment expenditure, and planned consumer durable expenditure respectively, with ℓ_{f_1}, ℓ_{f_2}, ℓ_{f_3}, indicating the different linkages between each of these categories of planned expenditure and the demand for finance balances.

Finance balances are 'active' in the sense that they are held in order to purchase commodities. However, their velocity of circulation may be less than transactions balances. Keynes considered that this was likely and, in fact, noted that, of planned activity and actual activity, the former 'may sometimes be the more important of the two, because the cash which it requires may be turned over so much more slowly' [1937b, p. 667]. Finance balances are similar to transactions balances in that as each completed transaction affords the opportunity for some business and household units to increase their individual holdings, so each executed investment plan allows the creation and execution of other plans by freeing money balances. That the average turnover period per dollar may be more for finance than for transaction balances, is as

Keynes pointed out, an added reason for ascribing importance to finance demand because of the implication that more money is required to support a given level of planned activity than for the same level of actual economic activity. It must be noted, however, that relating the demand for money to planned activity presupposes some definite time horizon. The relationship represented above by equation (1.5), will be conditioned by both the usual planning horizon for which a spending unit formulates a finance need and the quantitative linkage between expected expenditure within that horizon and the required finance.

1.4 *The 'Revolving Fund' of Finance*

It may be possible for an individual business to supply its required finance from its past accumulations. In fact the empirical evidence suggests that this is so for a major portion of expenditure.[5] Generally, the finance available to a firm depends on its current period receipts from sales, which vary with its sales and the trade credit which it allows; on its past accumulations; on its permanent capital raising; on its fixed term borrowing and on its bank overdraft facilities. A business, therefore, has a range of alternatives if its past accumulations are insufficient to fund a particular project. The alternatives are not mutually exclusive. For

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5 For example, see Bosworth [1971] where it is noted that since 1965 in the U.S.A., 75% of the expenditure of corporations has been internally financed.

example, recourse to the new issue market may entail as an initial consequence the acquisition of bridging finance from a trading bank. Whether a business obtains an increased overdraft limit from a trading bank or whether it relies solely on a new debenture or share issue, there will be ramifications for the complex of market rates of interest and for the demand for money.

A pertinent question is: can the finance motive be analysed in the context of a micro-economic construct? Baumol [1952] and Tobin [1956] endeavoured on a theoretical level to examine an individual firm's demand for transactions balances. Their theoretical results have been tested using cross-sectional data.[6] Something undoubtedly can be discovered about finance demand at the level of the individual firm. But, it will be argued here that the demand for finance is essentially a macroeconomic concept, and that its importance and significance is derived mainly from its macroeonomic implications. To appreciate this, consider Keynes' likening of finance balances to a 'revolving fund'.

When aggregate expenditure plans are constant from period to period, finance balances constitute a constant revolving fund. Within this macroeconomic equilibrium it is possible for individual business firms and other spending units

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6 For example, see papers by Meltzer [1963] and Whalen [1965].

to have plans which vary from period to period.

> "If investment is proceeding at a steady rate, the finance (or the commitments to finance) required can be supplied from a revolving fund of a more or less constant amount, one entrepreneur having his finance replenished for the purpose of a projected investment as another exhausts his paying for his completed investment". [Keynes, 1937a, p. 247]

Strictly, the concept of a revolving fund of constant amount depends (i) on the requirements of finance for each unit of planned expenditure being constant regardless of who is doing the planning, and (ii) on the financial system being sufficiently flexible to channel funds smoothly to where they are required. It is unlikely that these conditions will be met in practice. To an extent aberrations can be taken into account with limited disaggregation. Equation (1.5) illustrates this. Nevertheless, it is an approximation to say that the aggregate demand for finance balances is constant while planned expenditure is constant. But making the approximation is useful, because it provides an equilibrium setting against which may be juxtaposed the essentially disequilibrium setting within which finance demand becomes *critical*. For it is in a growing and/or volatile economy, where aggregate planned expenditure varies from period to period, that a constant revolving fund of finance is inadequate. Varying levels of planned expenditure imply the need for varying amounts of finance:

> "A given stock of cash provides a revolving fund for a steady flow of activity; but an increased rate of flow needs an increased stock

> to keep the channels filled. When decisions are made which will lead to an increase in activity, the effect is first felt in the demand for more cash for "finance"". [Keynes, 1938, p. 319]

While it is true that the varying expenditure plans of individual spending units imply a varying claim by these units for the stock of the more liquid assets in the economy, it is only when claims in aggregate are unequal to the available stock that a significant finance motive effect is evident. It follows that this effect can be appraised only within a macro-economic construct.

2. Preview of the Chapters to Follow.

The content of the chapters to follow may be broadly divided into (1) theory and (2) evidence. (1) may be further divided into (1a) concerned with the theoretical position of the finance motive within Keynes' theory of liquidity preference, and (1b) concerned with the theoretical implications of the finance motive for the cyclical relationships between monetary and expenditure variables. Additionally, (2) may be divided into (2a) concerned with the testing of some of the propositions deduced in (1b) using cross-spectral analysis, and (2b) concerned with testing of the significance of some proxies for finance demand using regression analysis. The approximate correspondence between these divisions and chapters is as follows: chapters 2, 3, 4, and 5 correspond to (1a); chapter 6 and appendix 8.1 to (1b); chapter 7 to (2a), and chapter 8 and appendices 8.2 and 8.3 to (2b).

The finance motive was devised by Keynes in the context of the original liquidity preference-loanable funds debate. The word 'original' is used to differentiate this debate, which occurred immediately after the publication of the *General Theory*, and which formed part of the general review and criticism of that book, from the intermittent debate which occurred throughout the 1950's and 1960's. Chapter 2 considers this original debate, and has two objectives. The first is to trace the development of the finance motive, and the second is to examine the perspective of the finance motive in the context of this debate. That is, to examine what difference it makes to the relationship between the theories of liquidity preference and loanable funds (using the ground-rules of the original debate) when the finance motive is included in Keynes' theoretical structure. This examination leads to an appraisal of the method of analysis used by Keynes in the *General Theory*.

Chapter 3 is a review of Davidson's 'revival' of the finance motive. Its subject matter breaks with that of chapter 2. However, it is chronologically appropriate to consider Davidson's contribution immediately following the original debate, and, furthermore, this contribution lays important groundwork for chapter 4 upon which, to a certain extent, the subsequent chapters rely.

Davidson, and others (see chapter 5), while recognising the importance of the finance motive, do not, at least in their formal statements of Keynes' liquidity preference function, distinguish between transactions demand and finance demand. This chapter has already made this distinction; chapter 4 introduces a specification of the demand function for money which embodies this distinction in a workable form. Variants of this function are used in all of the subsequent chapters. In chapter 4 this function and its advantage are explained; it is compared with the alternative specificiation of Davidson and of Hines, and it is incorporated into an IS and LM framework.

It has been noted that the liquidity preference-loanable funds debates can be chronologically divided into that which took place immediately following the publication of the *General Theory* and those which took place in the 1950's and 1960's. However, this division is, at least, roughly consistent with a division based upon another criterion. That criterion is the treatment of time within each debate. In the original debate the analyses were of a comparative static form whereas in the later debates they were of a dynamic form.

In the first part of chapter 5 the role of the finance motive in these later debates is considered, thus extending the examination begun in chapter 2. In the second part, the specification of the demand function for money introduced in chapter 4 is used as the basis for a formal statement of the theory of liquidity preference with which to compare the theory of loanable funds.

The object of the first section of this chapter and of chapter 2 to 5 inclusive is to put the finance motive into perspective; to see where and how it fits into Keynes' monetary analysis, and to formalise it so that it may be tested and its implications discovered. In chapter 6 some of these implications are derived, and compared with the available evidence.

One factor more than anything else underpins the monetarist position, and that is the observed timing relationship between the money supply and nominal income. Kaldor and Cramp (see appendix 8.1) and Tobin (see chapter 6) have made the point that evidence on timing can be a misleading indication of causality. However, the burden of explanation presumably falls more heavily on those who contend that the direction of causation runs counter to the timing evidence than those who do not. Another factor which Friedman regards as being inconsistent with Keynes' monetary analysis is the cyclical behaviour of velocity. Friedman has observed that velocity moves procyclically. That is, that velocity reinforces the effect on income due to an increase in the money supply. Chapter 6 looks at this and other evidence on the cyclical relationship between monetary and expenditure variables, with the object of comparing it with the implications for these relationships that follow from a Keynesian demand function which explicitly includes finance demand as an argument.

The available evidence on cyclical timing relationships is not very extensive. Furthermore, there has been no empirical study which has attempted to discover the relationship between monetary variables and variables which stand for the finance motive. Chapter 7 makes some progress towards remedying these deficiencies by reporting the results of cross-spectral tests on Australian monetary and expenditure data, and by including a proxy for finance demand in some of those tests. The results are compared with the overseas evidence cited in chapter 6, and with the kind of results that would be expected if the finance motive had a significant influence on the course of events.

In the quotation which begins this chapter, Friedman objects (i) that there is no empirical evidence to support the finance motive and (ii) that no study has identified variables corresponding to the finance motive. The first section of this chapter, and chapters 4, 6 and 7 go some way towards meeting these objections. Chapter 8 makes further progress.

The empirical demand-for-money literature is dominated by the search for *the* appropriate specification of the demand function for money. Chapter 8 briefly reviews some of the major problems associated with this search with the object of putting into perspective the approach undertaken to test the significance of the finance motive. This approach consists of modifying various models of the demand function for money by including proxies for finance demand. The parameters of these functions are then estimated using Australian quarterly data with a view to discovering (i) whether the proxies are significant and (ii) the extent to which their inclusion improves the explanatory power of each model. The overall objective is to discover whether the proxies are *robust* in the sense of maintaining significance and explanatory power in a variety of models. The major problem of this procedure, that of designing proxies for finance demand, is considered in some detail.

There are three appendices to chapter 8. Appendix 8.1 looks (i) at the issue of whether the money supply is predominantly exogenously or endogenously determined; (ii) at the relationship of the finance motive to this issue; (iii) at the relevance to this issue of the Australian institutional and monetary policy changes during the 1950's and 1960's, and (iv) at the bearing these changes may have on the appropriate specificiation of the demand function for money. The purpose of appendix 8.2 is to see whether results obtained by Meyer and Neri [1975], in their attempt to distinguish a transactions/finance approach from an asset approach to the demand for money, using United States data, are paralleled using Australian data. Meyer and Neri's results were, of course, published after Friedman's statement concerning the absence of evidence on the finance motive. Their method of approach is totally different from that taken in chapter 8. Appendix 8.3 is a technical appendix.

Chapter 9, the final chapter, contains a summary of the major theoretical and empirical findings of chapters 1 to 8.

CHAPTER 2

LIQUIDY PREFERENCE *VERSUS* LOANABLE FUNDS: THE ORIGINAL DEBATE

Introduction

Keynes, it seems, after his own 'long struggle *of* escape', could not, during the controversy which followed the publication of the *General Theory*, divest himself of the persuasion that others were still wedded to classical theory. His prior expectation that classically-minded critics would waver between the belief that he was either wrong or saying nothing new was confirmed, and never more completely so, by the loanable funds versus liquidity preference debate. A small section of that debate will be considered here. It is that which occurred in the *Economic Journal* of 1937 and 1938; the principals were Keynes [1937a, b, 1938], Bertil Ohlin [1937a, b, c], D.H. Robertson [1937, 1938a, b], and R.G. Hawtry [1937].

The obvious reason for concentrating on this particular part of the debate is that it was here that the demand for money in anticipation of expenditure, was invoked by Ohlin in criticising the liquidity preference theory, and given form and substance by Keynes in accepting the validity of this criticism.[1] A less obvious, but equally compelling reason, is

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[1] It should be noted that there is probably some justification in Robertson's belief that Keynes in formulating the finance motive had 'misapprehended Professor Ohlin's position'. [1938a, p. 314] In the larger context of Ohlin's argument

that it is at this early stage of the debate that the essential distinction between the two approaches to interest rate determination can be clearly discerned. This is of some importance when it is realised that the ensuing controversy has produced no definitive synthesis. Whether the interest rate is the 'price' of credit or the 'price' of money still remains in dispute, notwithstanding Robertson's view that in admitting the finance motive into his liquidity preference theory, 'Mr. Keynes seems ... to have put his foot through his whole verbal apparatus'. [Robertson, 1937, p. 432]

The liquidity preference - loanable funds debate can be conveniently decomposed. In the early stages (to which this chapter applies) effort was expended to show that the two approaches are equivalent. In the later stages (to which chapter 5 applies) effort, in the main, was expended to show that the two approaches are not equivalent. There is no inconsistency, providing the terms of reference are understood. In the early stages of the debate the two theories were compared in terms of comparative statics whereas in the later stages they were compared in terms of dynamic analysis. In this chapter it is argued that in terms of comparative statics the two approaches are equivalent only in a trivial

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there remained differences. But, the extraction of *ex ante* investment and its influence on the rate of interest, from Ohlin's article, seems a valid procedure, even if its incorporation into the theory of liquidity preference might not have met with Ohlin's complete concurrence.

sense; that for understanding the process of economic change it is necessary to employ the liquidity preference approach.

This chapter has two main sections. The first considers the 1937/38 debate and, in particular, the bearing that differences in methods of analysis between Keynes and his critics had on it. The second considers the perspective of the finance motive in this debate.

1. Liquidity Preference *versus* Loanable Funds

1.1 *Hick's Reconciliation*

It is instructive, before examining Ohlin's attempt to reconcile the loanable funds and liquidity preference approach, to digress slightly and consider J.R. Hicks' [1946] reconciliation. It will be found that this in crystalline form delineates the loanable funds theorists' position and aids in illustrating why Keynes was unable to accept the equivalence of the two approaches.

Hicks' analysis is based on a Walrasian system of simultaneously determined equations applied to an *n* commodity system with one type of loan transaction. There are therefore *n* prices and one rate of interest to be determined. Given that money is the *n*th commodity and the standard in which the prices of the other *n-1* commodities are expressed, this leaves *n-1* prices and the rate of interest to be determined by *n-1* supply and demand equations for the *n-1* commodities, one supply and one demand equation for money and one supply and one demand equation for loans. In all there are *n+1* equations to determine *n-1* prices and one rate of interest. The system is rescued from being overdetermined by the fact that any one equation is dependent on the rest and is therefore redundant. As far as the loanable funds *versus* liquidity preference controversy is concerned, it does not seem to matter whether the supply and demand for loans equation or the supply and demand for money equation is made redundant; in either case the rate of interest is uniquely determined.

Although there can be no dispute with this analysis as such, one point which is often given insufficient emphasis, is that omitting the supply and demand for money equation does not imply that the rate of interest is determined solely by the supply and demand for loans equation, just as the omittance of this latter equation does not imply that the rate of interest is determined solely by the supply and demand for money equation. There are also *n-1* commodity equations to be satisfied. In a Walrasian system all prices are simultaneously determined in satisfying a general equilibrium solution. It will become apparent when Ohlin's and Robertson's arguments are examined, that it is their adherence to a general equilibrium framework of thought which is at the heart of their dispute with Keynes, as it is the latter's rejection of this frame of reference for analysing change, which leads him to resist their arguments.

1.2 *Ohlin and Robertson*

Using Myrdal's distinction between *ex ante* and *ex post* Ohlin makes it clear that while he does not regard the investment-saving relationship in either form as determining the rate of interest, he considers that Keynes' theory pays insufficient attention to the interdependence between 'production, income and savings ... and the ability to make financial investments' [Ohlin, 1937b, p. 226]. The rate of interest is regarded as the 'price of credit' and as such is determined by the 'supply of and demand for credit' [Ohlin, 1937b, p. 221]. The supply of new credit per period is equal to the amount of claims [interest bearing securities] and other assets desired by some in excess of their existing holdings, minus the amount of existing holdings regarded by others as in excess of their desired holdings. The demand for new credit is equal to the supply of new claims *minus* the reduction in the volume of existing claims. [Ohlin, 1937b, p. 224] Keynes [1937a, p. 245] points out that since the supply of credit so defined is equal to saving and since the demand for credit so defined is equal to net investment, Ohlin was asserting what in another guise he had denied, that is, that planned saving and planned investment determined the rate of interest.[2]

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[2] Ohlin's supply of and demand for credit is expressed in *ex ante* terms. Keynes' repudiation of Ohlin's position is a little unclear because he seems to be attributing to Ohlin the contention that realised magnitudes determine the rate of interest. The repudiation remains valid, however, if in Keynes [1937a] reply, for saving and investment the terms planned saving and planned investment are substituted.

In analysing the spending process, Ohlin made planned or *ex ante* consumption and investment dependent on expectations and on the availability of cash and credit, the latter being operative as a constraint when expectations were such that planned expenditure exceeded the available finance. It is here that the rate of interest is important, a lower rate allowing expenditure that might otherwise be prevented. To the extent that *ex ante* consumption is increased because of a lower rate of interest, it follows according to Ohlin that planned saving is decreased. Keynes' objection to allowing saving an active role in the process of change was that saving in neither the *ex ante* nor the *ex post* sense determined the availability of finance. While it is certainly true that in this there was a measure of agreement between Ohlin and Keynes, Ohlin perceived a connection, through the income process, between the financing of investment and of consumption, and the levels of investment and saving:

> "there is a connection between the rate of interest, which is the price of credit, and the process of economic activity, of which the flow of saving is a part". [Ohlin, 1937b, p. 224]

In other words, in describing a process of change, Ohlin compared one general equilibrium with another; that is, he allowed for the income change and its repercussions following a change in the rate of interest:

> "Thus, if we regard the rate of interest as determined by the supply and demand curves for claims, both the quantity of cash and of assets are influencing factors. The situation every day must fulfil the condition that at existing prices

> of claims and assets, people prefer to hold the existing quantities of cash, claims and assets rather than exchange part of some of them for a little more of the others". [Ohlin, 1937c, p. 427].

While it may be necessary to read into Ohlin's account of interest rate determination to realise that he allows for the full consummation of any change, D.H.Robertson [1973, p. 435] makes his position clear by complaining that 'Mr. Keynes appears once more to stop short' of 'a decline in income'. This is further illustrated in an exchange over the influence of saving. Some sort of agreement is reached by substituting the term thriftiness for thrift, which presumably had been substituted for saving. Robertson then proceeds to argue that thriftiness, by reducing income, increases the availability of inactive funds, and thus lowers the rate of interest, and that therefore a mechanism exists by which 'an increased desire to save could lower the rate of interest, or - therefore - promote investment' [Robertson, 1938b, p. 556].

The real issue between Keynes and his critics lay in their respective methods of analysing change. The loanable funds theorists compared equilibrium with equilibrium and in so doing created a conundrum; if loanable funds were the wherewithal to finance investment then they were equal to investment, and to savings. This is not to say that within its terms of reference the loanable funds approach is wrong, merely that in a comparative static framework it is uninteresting and inauspicious for analysing change.

1.3 *Methods of Analysing Change*

Whether the liquidity preference theory of interest determination is a disequilibrium approach is debatable; after all, the rate is determined where the supply of and demand for money are equal. But, in Robertson's words, Keynes does stop short. That is, the level of income is kept constant while the determination of the rate of interest is analysed. In that the loanable funds theorists were at one with Keynes [1937a, p. 241] in arguing that 'the rate of interest depends on the present supply of money and the demand schedule for a present claim on money in terms of a deferred claim on money', there was no dispute with the liquidity preference analysis as such. They differed from Keynes in insisting that 'measuring the convenience of holding idle money need not prevent it [the interest rate] from measuring also the marginal inconvenience of abstaining from consumption' [Robertson, 1937 p. 431].

A simple example can demonstrate the fact that while the loanable funds theorists' position is formally correct, it is also empty. Consider an economy in equilibrium, characterised by constant gross investment and consumption per time period, and with an unchanging money stock and rate of interest. A fall in liquidity preference, with an unchanged money stock, would lower the rate of interest and cause investment and possibly consumption to increase, and result in a higher level of income. Clearly, income would rise until the marginal advantage of holding idle funds was equal to the marginal advantage of spending them on securities, consumption goods or investment goods. When equilibrium was re-established it is possible for the interest rate to have returned to its original level. Awareness only of the full consummation of the process of change is quite likely to obscure the reason for the change. To take the opposite case of a rise in liquidity preference and a consequent initial rise in the rate of interest; if this results in a level of income sufficiently low that the active money balances so freed result in an interest rate below its original level, what can be said about the cause of change from observing the two equilibria?

An analogously obscure result is obtained if the expansionary effects of a budget are judged on the size of the budget deficit, either planned or actual. A device used to remove obscurity is the 'full-employment budget surplus indicator'. Here with a given government tax and transfer payments structure a budget is evaluated on the basis of the size of the deficit or surplus which would result if income were at a certain level. In this case, the level is that which would result in full employment, but the current income level could be chosen if the interest lay in predicting next year's income. This is the kind of device used by Keynes to isolate the cause of change.

1.4 *Keynes' Method of Analysis in the General Theory*

It is the view of Schumpeter [1954, pp. 472-473] and of Pasinetti [1974, pp. 42-45] that Keynes' method of analysis is similar to Ricardo's.[3] This method is one of abstraction, and concentration on fundamental relationships which, according to Pasinetti, has as a consequence the postulation of unidirectional causal relationships rather than of an interdependent system of relationships. In other words, feedback, the lifeblood of general equilibrium analysis, is abstracted from. As Joan Robinson [1975, pp. 397-398] points out, 'the Keynesian system is designed to show the consequences, over the immediate and further future, of a change taking place as an event at a moment of time, while the equilibrium system can only compare the differences between two positions on two paths conceived as coexisting in time, or rather outside of time. Harcourt [1977a, p. 290] suggests that 'Kalecki also used a similar method, in that he divided time into short periods, each with its own past and expectations of the future, and then let the process unravel as the happenings of one short period were passed on to be the historical or initial conditions of the next'.

Keynes [1936, p. vii] explains that the *General Theory*

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[3] Schumpeter [1954, p. 473] used the term "Ricardian Vice" for the 'habit of applying results of this character [those produced from models based on many simplifying assumptions] to the solution of practical problems. (See R. Jones [1831, 1859] for an early condemnation of the Ricardian method). Pasinetti [1974, p. 45], at least in respect of the policy prescriptions which flowed from Keynes' analysis, suggested that "Ricardian Virtue" was the more appropriate term.

'is primarily a study of the forces which determine changes in the scale of output'. The configuration and magnitude of these forces determine a position of effective demand and hence an equilibrium scale of output. Such an equilibrium, however, is not the homeostatic variety of neo-classical economics, but 'is the fragile coalescence of momentarily held expectations, a change in which, nervously waiting upon any change or rumoured change of news, can abruptly destroy it' [Shackle, 1967, p. 181]. While it exposits a theoretical structure with which to analyse the effect that a change in these expectations will have on the level of effective demand, the *General Theory* does not follow through the sequential repercussions of such a change:

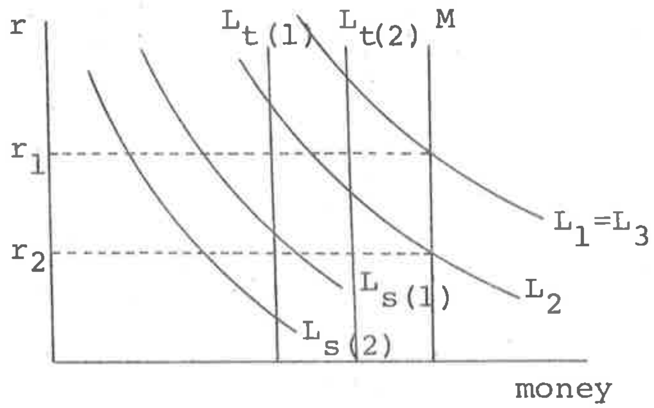
> "But the cascade of events which must be supposed to follow such a destruction and lead to a new equilibrium cannot be described or analysed by the *General Theory's* formal method". [Shackle, 1967, p. 181]

To sum up, the *General Theory* considers the determinants of change rather than the process of change itself. A good illustration of this is provided by the *General Theory's* analysis of the determination of the rate of interest.

The liquidity preference theory of interest rate determination does not rest solely on the supply of money and on the speculative demand for money. There are also the transactions and precautionary demands to be considered. Sidestepping the question of whether the precautionary demand is responsive to interest rate changes, the transactions demand is treated as being invariant to interest rate changes. But clearly it is so only in a limited sense. If a decrease in the interest rate increases income then the transactions demand for money will rise. Using this frame of reference the transactions demand for money is negatively related to the rate of interest.

A situation where a decline in the speculative demand for money decreases the interest rate, causing an increase in income just sufficient to reverse transactions demand to the extent required to re-establish the original rate of interest in shown in diagram 1.

Diagram 1



$L_{s(1)}$ and $L_{t(1)}$ are the speculative and transactions demands for money prior to the shift in the speculative demand schedule. $L_1 = L_{s(1)} + L_{t(1)}$ and M is the money supply. The interest rate initially falls to r_2 as the speculative demand falls from $L_{s(1)}$ to $L_{s(2)}$ but returns to r_1 after the consequent income change reverses the transactions demand from $L_{t(1)}$ to $L_{t(2)}$. $L_2 = L_{s(2)} + L_{t(1)}$, $L_3 = L_{s(2)} + L_{t(2)}$.[4]

There are two points to note: first, observation of the before and after position reveals the same money supply and the same rate of interest without indicating the cause of the change in income; second, the analysis conforms to the loanable funds theorists' requirements, in that the interest rate which is finally determined is the result of spending decisions. Keynes' approach keeps income constant, in the diagram at that level appropriate to $L_{t(1)}$, and investigates how the rate of interest will change as either the money stock or speculative demand changes, in order then to investigate the effects this changed interest rate will have on economic activity.

It remains to bring the finance motive into the picture to determine whether it entails any major revision of the liquidity preference approach. Keynes thought it reinforced his approach, Robertson, as pointed out on page 27, thought the contrary.

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[4] In terms of static IS-LM analysis this exact result could occur only if the investment demand schedule were perfectly elastic. However, there is no need to be so constrained. It is perfectly possible that the IS curve would shift rightwards consequent on a leftward shift in the speculative demand schedule; expectations in the real and money markets are not independent in Keynes' schema: 'the dismay and uncertainty as to the future which accompanies a collapse in the marginal efficiency of capital naturally precipitates a sharp increase in liquidity preference' [1936, p. 316]. Given this dependence it becomes, of course, even more important to disentangle cause from repercussion.

2. The Perspective of the Finance Motive

It needs to be affirmed that the loanable funds theorists did not just say that the rate of interest is determined by the supply of and demand for securities.[5] It is obvious that the rate of interest is so established, and the liquidity preference theory is consistent with this. In the *General Theory* income changes can be analysed in terms of movements between short and long term assets: movement into short (long) term assets being associated with bearishness (bullishness), consequent falls (rises) in the price of bonds, increases (decreases) in interest rates, declining (increasing) investment, and deflation (reflation). The cause of change in the real sector in this sequence is a change in interest rates; it can be equivalently expressed as a change (in the same direction) in the marginal yield on money. In the Keynesian system with a money, securities, and investment goods market, it is the discrepancy in return at the margin between the first two and the latter which initiates the process of change. A discrepancy between the rate of return on money and securities is not considered. This is because of the existence of an efficient continuous spot market in securities, which ensures that a continual partial equilibrium exists between money and security holdings.

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[5] This was true at least at this early stage of the debate, where the demand for and supply of real assets was also involved.

Where the loanable funds and liquidity preference theories differ, is in their temporal view of the process of change. The loanable funds theory looks at the demand and supply of securities when the investment goods market is in equilibrium, that is, after a general equilibrium is established. In a comparative static setting the liquidity preference theory looks at the securities market prior to any change in real investment and prior to the financial articulation of investment plans.

The supply of and demand for loanable funds can be simply expressed as:

$$I + \Delta H = S + \Delta M, \qquad \ldots\ldots\ (2.1)$$

where I is investment, ΔH is the increase in hoarding of cash balances, S is savings, and ΔM is the increase in the money supply. In order to make the equation meaningful, savings and investment have to be defined as *ex ante* or planned, or in the Robertson sense, where both savings and investment are functions of yesterday's income so that savings in the current period may exceed investment, in which case income in the current period is less than that of the previous period by the amount of this excess. Savings and investment in the current period are in addition functions of the current rate of interest. The point to note about the equation above is that savings and investment have responded to the interest rate change. The demand for loanable funds $(I + \Delta H)$ is equal to the supply of securities and the supply of loanable funds

$(S + \Delta M)$ is equal to the demand for securities. But this supply and this demand can be considered the result of an income change. While it is true that savings and investment are defined as *ex ante* concepts, they effectively stand in for the consequential income change. The equation could alternatively be written as:

$$\Delta Y + \Delta H = \Delta M \qquad \ldots\ldots\ (2.2)$$

where ΔY, the change in income, equals I - S.[6]

If the income change is excluded the equation becomes:

$$\Delta H = \Delta M \qquad \ldots\ldots\ (2.3)$$

and the rate of interest equalises the marginal advantage of holding money with that of holding securities at a level which by invoking an income change, may have repercussions on the money and securities market.

The reason Robertson thought the finance motive compromised the liquidity preference theory is that it seemed to reinstate savings and investment in equation (2.3). The answer to this is that while in a particular sense it may do so, it is up to any theorist to explicitly exclude it if there are advantages in so doing. There is no logical distinction between excluding the influence of changing transactions demand

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[6] This is the change in income after one period, that is, prior to the multiplier repercussions.

on interest rate determination, and excluding or, at least, holding constant the influence of the demand for finance. The reason that money is demanded to satisfy the finance motive is that expenditure has been planned. The cause of this planning may well have been an interest rate decline. It is proper that this decline be analysed in abstraction from its repercussions; as it is essential that the finance motive be considered when examining the path of adjustment of the rate of interest to a new equilibrium. Chapter 5 takes up this latter point.

CHAPTER 3

DAVIDSON'S ANALYSIS OF THE FINANCE MOTIVE

Introduction

It is peculiar considering the attention that Keynes' work has received that Davidson [1965] had to *resurrect* a concept to which Keynes attached considerable importance. This revival of a 'long-forgotten point',[1] of Keynes' 'coping stone'[2] or, as Davidson [1972a, p. 30] would have it, 'Rosetta stone', was necessary, presumably, because the finance motive does not feature in the *General Theory*. Although this reluctance to go beyond the *General Theory* would hardly have met with Keynes' approval.

> "I am more attached to the comparatively simple fundamental ideas which underly my theory than to the particular forms in which I have embodied them, I have no desire that the latter should be crystalized at the present stage of the debate". [Keynes, 1937c, p. 211]

Nevertheless, Keynes' theory of liquidity preference was so crystalized prior to his 1937 amendment and has in most texts remained unamended.

The objectives of this chapter are, in section 1, to

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1 [Horwich, 1966, p. 242]

2 [Keynes, 1937b, p. 667]

examine Davidson's analysis of the finance motive; in section 2, to examine the implications he draws from this analysis, and, in the third section, to consider some criticisms of this analysis made by Horwich [1966].

1. Davidson's Analysis

Davidson [1965, 1967, 1972a], on the basis of Keynes' finance demand analysis, contends that the traditional form of expressing the transactions demand function is a misspecification; that its incorporation into the 'Bastard Keynesian familiar 45^{o} diagram' leads to the result that the demand for transaction balances is a function of the output-expenditure identity line, and that, as such, it is inappropriate for the analysis of disequilibrium situations. Hansen's [1949] specification of transactions demand, $L_t = kY$, is used as a point of reference. According to Davidson the correct specification of transactions demand is:

$$L^* = \alpha C + \beta I \qquad \ldots\ldots\ (3.1)$$

where α and β are constants lying between zero and one and where C and I are planned investment expenditure and planned consumption expenditure respectively. Davidson assumes for simplicity that planned consumption expenditure is linearly related to income, Y, and that planned investment expenditure is linearly related to the rate of interest, i. These relations are written as:

$$C = a_1 + b_1 Y \qquad \ldots\ldots\ (3.2)$$

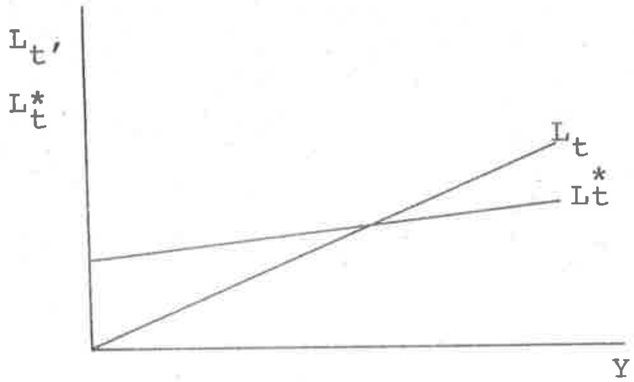
and $$I = a_2 - b_2 i \qquad \ldots\ldots\ (3.3)$$

Substituting (2) and (3) into (1) gives:

$$L^*_t = \alpha a_1 + \beta a_2 + \alpha b_1 Y - \beta b_2 i \qquad \ldots\ldots\ldots \quad (3.4)$$

If a constant rate of interest is assumed (and this is implicit in the 45° diagram) the 'correctly' specified transactions demand schedule (3.4) differs from the usually depicted transactions demand schedule in not emanating from the origin and in having a lesser slope.[3] The contrasting schedules are shown below in diagram 1.

Diagram 1



It is as well to be clear on Davidson's method. Current income of itself does not constitute the basis for the demand for active money balances. It is planned expenditure which, in this instance, is assumed to be related to income which constitutes the basis for the demand for active balances. By including finance demand in a general transactions demand framework Davidson merges all categories of planned expenditure whether, for example, it is the payment of next week's wages or

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3 The lesser slope follows from the assumption that the system is stable, that is, that $0 < b_1 < 1$.

purchase of plant. However, Davidson recognises that Keynes did separate transactions from finance balances and did attribute particular importance to changes in the demand for finance balances:

> "It is the shift in the L^*_t function induced by a change in spending propensities that Keynes was describing when he discussed the finance motive. Whenever there is a shift in the aggregate-demand function, there will be a concommitant shift in the demand for money schedule. Consequently, when there is an increase in planned investment, for example, the equilibrium quantity of money demanded will ultimately increase for two reasons: (1) a shift in the L^*_t function (i.e. the finance motive), and (2) a movement along the new L^*_t function as output increases and induces further spending via the multiplier. It is the shift in the L^*_t function which puts additional pressure on the rate of interest.
>
> Thus, every upward shift of the aggregate-demand function implies the prevalence of a 'finance motive' as spending units switch over from one money-demand function to a higher one. Once this change has occurred, spending units will maintain larger transactions balances than before *at each level of output*. At that point the dynamic finance motive merges with that static concept of the transactions motive". [Davidson, 1972a, p. 169]

Davidson considers that the 'major contribution' of the finance motive is in macro-economic path analysis. That is, as an important explanatory element in analysing the way in which the economic system behaves when it is not in equilibrium. It is interesting to note that J. Robinson [1960, p. 259] explicitly includes the finance motive in her period by period analysis of change resulting from an 'improvement in prospective profits'. This 'major contribution' of the finance motive is examined in some detail in the following two chapters.

2. The Implications of Davidson's Analysis

Three important implications of including the finance motive in Keynesian macro-economics are examined by Davidson. The first is that transactions demand, L^*_t, is much less stable than is evident from Hansen's analysis. The transactions demand schedule will shift every time the aggregate demand schedule shifts. Through time, variation in the demand for active balances will occur (a) due to movements towards equilibrium, and (b) due to shifts in equilibrium. In a short period of time, that is a period within which the aggregate demand schedule has varied only to a limited extent, observations of income and transactions demand will reflect the movement towards equilibrium and will cluster about the L^*_t schedule. It can be noted that the income elasticity of demand for actual money balances derived from such a cluster will be less than unity. Writing this elasticity as:

$\frac{dL^*t}{dY} / \frac{L^*t}{Y}$, it is easily seen that $\frac{dL^*t}{dY}$ is less than $\frac{L^*t}{Y}$ and that, therefore, the elasticity is less than unity. If a period of greater duration is considered then the cluster of observations may not conform closely to a static L^*_t schedule.

During a period within which expenditure plans have been fluctuating, the observations on transactions demand and income will cluster about different L^*_t schedules. Empirical estimates of the income elasticity of the demand for money will, as a result, tend to be higher than if observations were clustered around a single L^*_t schedule. They may, as Davidson points out, exceed unity.

Davidson offers the above theoretical explanation of the short and the long-run empirical estimates of the income elasticity of the demand for money as an alternative to Friedman's [1959] explanation. Friedman's empirical results indicate a short-run elasticity less than unity and a secular elasticity greater than unity.[4] These differing elasticities are reconciled, in the main, by distinguishing between permanent and measured values. It is argued that during the upturn of a business cycle, measured income and measured prices are likely to lie above their permanent counterpart, just as they are likely to lie below during the downturn of the cycle. Velocity of circulation of money balances based upon measured income and measured prices throughout a complete cycle will tend to indicate that velocity rises significantly as income increases. The counterpart of this rising velocity is, of course, a low estimate of elasticity. In reality, Friedman argues, it is permanent income and permanent prices which are the crucial variables in determining the demand for money. A correctly specified velocity calculation would therefore have permanent real income multiplied by the permanent price level as the numerator. This velocity would tend to lie below

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[4] Friedman estimated the long-run elasticity to be in the region of 1.8, however, in a later paper [1971] he set it a bit lower but still above unity.

measured velocity during the upturn of a business cycle and above measured velocity during the downturn. (See chapter 6 for more detail on the cyclical path of velocity).

Using cyclical average data, which largely abstracts from the dispersion of measured values about their permanent counterparts, Friedman [1959] found that in the long-run velocity falls as income increases, and estimated the long-run elasticity to be in the regions of 1.8.

In an exchange of views on the topic, Friedman, while admitting the possibility that new theoretical constructs may disturb previously held views, noted that Davidson [1972b] offered no empirical support for the theoretical construct he espoused:

> "Talk is not a substitute for evidence. I know of no empirical study of the demand for money that has ever identified variables corresponding to 'the finance motive', let alone found them to have a significant influence. An attempt to do so would certainly be an appropriate piece of research". [Friedman, 1972, p. 931]

The second important implication, of the inclusion of finance demand in the Keynesian model, is that all categories of planned expenditure will create a commensurate demand for money. In particular, Davidson notes, this will apply to the expenditure plans of government as well as to those of the private sector, although, of course, there will be quite different repercussions depending on the way in which government raises the finance.[5] A letter of Keynes' published in the 18th April 1939 edition of the *London Times* is cited as further elucidation of this point. The letter concerns the way to finance the impending rearmament expenditure of the Government and makes the point that if 'the Treasury borrows, the resources acquired by the Treasury must be at the expense of the normal liquid resources of the banks and of the public'.

The third implication examined by Davidson is that finance demand considerably strengthens the dependence between the real and the monetary sectors. He argues that a transactions demand schedule 'which emanates from the origin belongs to a world of Say's Law - a world where the aggregate demand function coincides with the 45 degree line'. While there is substance in this, the further conclusion that such a transactions demand schedule implies 'a dichotomy between the real and monetary sectors so that there can be no monetary obstacle to full employment for the real and monetary sectors are completely independent' [1972a, p. 174], is unacceptable. Such a dichotomy exists only if the monetary sectors' sole function is to determine the price level while the interest rate is determined in the real sector. A transactions demand

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5 The initial repercussions on the money supply will differ according to whether the government sells securities to the central bank, the private banks, or the non-bank sector. The subsequent repercussions will depend on the speed, the extent, and the direction of government spending, and on the reaction of the private sector to their changed port-folio position.

schedule emanating from the origin does not imply this. However, the conventional Hicksian IS-LM analysis does imply an unduly constrained dependence between the real sector and the monetary sector.

With a fixed money supply, changes in the equilibrium position in the IS-LM system can occur as a result of changing views on the future rate of interest or as a result of changing views on the prospective returns to real investment. In the first case there is an effect on the rate of interest which changes the scale of activity in the real sector - the LM schedule shifts, the IS schedule does not; in the second case there is a change in the transactions demand for money which, by inducing a change in the rate of interest, leads to an accommodating change in the speculative demand for money - the IS schedule shifts, the LM schedule does not.

The incorporation of Davidson's specification of transactions demand, L^*_t, into the IS-LM framework strengthens the dependence between the real and the monetary sectors, for now, shifts in the IS schedule will cause the LM schedule to shift as well. The two schedules are no longer independent. A rightward shift in the IS schedule will cause the LM schedule to shift leftwards. The original constrained dependence, as explained above, is still operative; to it has been added the dependence attributable to the finance motive. In the case of a rightward shift in the IS schedule it can be noted that the equilibrium of the system will occur at a lower output level and higher rate of interest when finance demand is included in the analysis than when it is not. A more detailed examination of the interdependence between the monetary sector and the real sector, using IS-LM analysis, will be left to Chapter 4 where Davidson's and Hine's specification of transactions and finance demand is compared with the specification introduced there.

3. Horwich

Horwich [1966] raises certain objections to some major propositions of Davidson's [1965] article. He suggests that contrary to Davidson's claims, the finance motive (i) 'does not qualify the traditional use of the IS-LM diagrams' and (ii) 'does not ... constitute a meaningful basis for macroeconomic path analysis'. Horwich bases his first criticism on the Keynesian division of money balances into active and idle balances, and uses the following two diagrams.

Diagram (2)

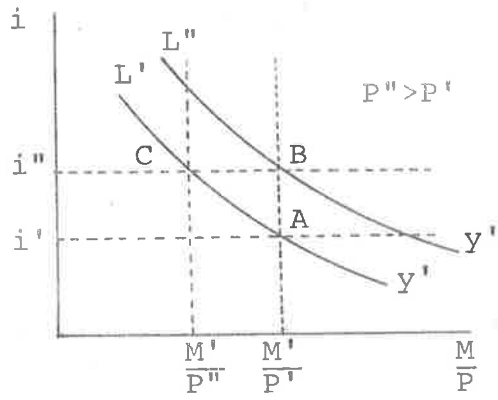


Diagram (3)

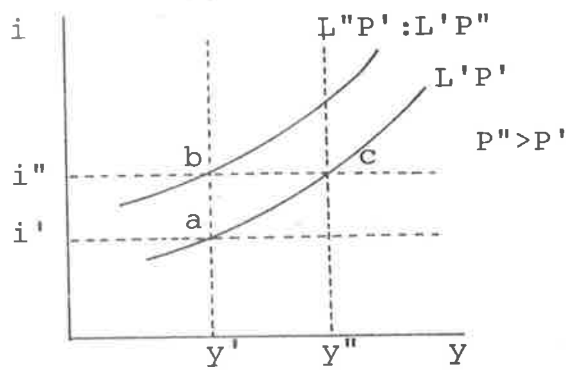


Diagram (2) has two liquidity preference schedules L' and L" which stand for the *total* demand for money; real output y', which is assumed constant throughout, is a parameter of each schedule. The initial position is at A. Horwich argues that an increase in planned investment will initially raise the demand for money and so result in a sale of 'existing' securities and a consequent rise in the rate of interest. This is depicted as a movement from position A to position B. This however, according to Horwich, is not the end of the story. Entrepreneurs in executing their plans will release money balances, and cause prices to rise from P' to P". This is shown as a movement from B to C. It will be noted that the same liquidity preference schedule obtains before and after the process of planning and execution.

Diagram (3) depicts the same process in terms of an LM framework; L'P' and L"P' : L'P" are the LM schedule analogues of the respective liquidity preference schedules L' and L" of diagram (2). The initial position in diagram (3) is a. This corresponds to position A in diagram (2). The movement from a to b corresponds to that from A to B. However, diagram (3) permits two possibilities. Either output remains constant and prices rise (the only possibility permitted in diagram (2)) or prices remain constant and output rises. If output remains constant then position b is the final position; it corresponds to position (C) in diagram (2). The shift in the LM schedule from L'P' to L"P' : L"P' is caused by prices rising. If prices remain constant then there is a further movement from b to c as output increases. There is no position in diagram (1) corresponding to position c in diagram (2).

The conclusion drawn by Horwich from the above analysis is that LM schedule shifts are not induced by changes in expenditure plans; apart from shifts which result from the effect that the execution of these plans may have on the price level.

Horwich's second objection, (ii), that is, that the finance motive does not contribute to macro-economic path analysis, is based on the contention that the liquidity preference theory of interest rate determination is primarily a theory involving stocks, with flows playing little part. In particular, of the three methods by which a firm may obtain funds for net investment, listed by Horwich as: '(1) issuing new securities, (2) selling existing securities from their portfolios and then dishoarding the obtained funds, and (3) dishoarding previously accumulated cash balances directly', (2) is described as the 'exercise of the finance motive'. While much of Horwich's analysis of the financial mechanism is difficult to follow (Davidson [1967, p. 249] notes that he is unable to comprehend part of it) the essence of the argument seems to be that a dynamic theory of interest determination must include as an important constituent the flow of new securities.

Davidson [1967] in reply to Horwich's paper convincingly disposes of the foregoing criticisms. Notwithstanding the fact that a limited familiarity with Keynes' articulation of the finance motive is all that is necessary in order to be able to rebut Horwich's argument, some important issues are thrown up by the exchange of views.

Horwich following Keynes [1937c] divides money balances into active and inactive. Keynes distinguished between money demanded to service current business transactions and money demanded to hoard. To the former he applied the term 'active' to the latter the term 'inactive'. Keynes [1937a, p. 247] describes finance demand as lying half way between active and inactive. It is so described because of the assumption that finance balances turn over at a slower rate than transactions balances. Essentially, inactive balances do not turn over at all. They are held not for the purpose of buying assets but to provide capital certainty when the risks of investment in securities is thought too great. By supposing transactions demand to be the only active demand and finance demand to be inactive, Horwich assumes that which he purports to demonstrate.

In diagram (2) it is assumed that real income does not change. If the demand for active balances is related solely to money income then it follows that only a price level change can affect this demand. The process of change resulting in a movement from A to C follows *either* from the assertions that the demand for finance balances is a once and for all demand, that is, it is not a continuing demand, and that the price level change is just sufficient for transactions demand to absorb the amount of cash previously demanded for finance purposes, in which case aggregate planned expenditure does not enter Horwich's analysis in any meaningful way, *or* from the assertions that aggregate planned expenditure is identically equal to income and that the amount of money demanded for each unit of planned expenditure is identically equal to that demanded for each unit of income. There is, however, no compelling reason to make any of these assertions. Planned expenditure ought to be considered in the same way as actual expenditure, that is, as a flow which has a continual impact. The demand for money to which planned expenditure gives rise is an active not an inactive demand. For any given level of income the amount of active balances demanded will depend on the level of planned expenditure and the amount of money demanded to service it. A change in planned expenditure, income remaining constant, will, therefore, shift the liquidity preference and LM schedules.

The same deficiencies in Horwich's analysis carry over to his second diagram - diagram (3), where output is permitted to change. There, instead of assuming that price rises are just sufficient to absorb finance balances, it is assumed that output or a combination of price and output rises are just sufficient.

Horwich's second objection is based on a too narrow interpretation of the theory of liquidity preference. Keynes [1937a, p. 246] explicitly notes that finance balances may be provided by the new issue market. Whether it is true, as Horwich believes, that Keynes thought the new supply of securities did not 'perceptibly' influence the market rate of interest, is beside the point. By how much new issues influence the rate of interest is an empirical question. Keynes' finance motive has this influence within its ambit, and so extends the usual Keynesian stock analysis of interest rate determination involving the rearrangement of existing assets into a stock-flow analysis involving both existing assets and the flow of new assets.

CHAPTER 4

A SPECIFICATION OF THE TRANSACTIONS *PLUS* FINANCE DEMAND FUNCTION

Introduction

It was explained in chapter 1 that Keynes distinguished between the transactions motive and the finance motive and furthermore attached particular importance to the finance motive in situations where planned expenditure varied from period to period. These are important considerations when designing a specification of the transactions *plus* finance demand function for money. In addition it is desirable that such a specification be both simple and amenable to theoretical and empirical analysis.

This chapter introduces a specification which has these two latter properties, and which distinguishes transactions from finance demand precisely by singling out the important element of finance demand. There are two main sections. The first presents the function, explains its underlying assumptions, and lists some of its properties and advantages. The second incorporates the function in an IS-LM framework and compares it with the alternative specification of Davidson [1965, 1972a] and Hines [1971a, b].

1. A Specification of the Transactions *plus* Finance Demand Function

1.1 *The Function*

In its most general form the function is written as:

$$L = \ell_1(Y) + \ell_2(Y^* - Y) \qquad \ell_1(0) = 0, \ \ell_2(0) = 0 \qquad \ldots\ldots (4.1)$$

where L is equal to the sum of transactions and finance demands for money; Y is money income and Y* is aggregate demand. It is important to realise that $\ell_1(Y)$ includes both the demand for transactions balances *and* the demand for the constant revolving fund of finance balances, and that $\ell_2(Y^* - Y)$ is the *excess* demand for finance balances.

The major reason for specifying the demand function in this way is to avoid the need to distinguish transactions demand from finance demand when aggregate demand is equal to current income and when, as a result, planned expenditure is being accommodated by a constant revolving fund of finance balances. However, it is necessary to bear in mind the distinction between balances held by consumers or business to accommodate non-routine expenditure and those held to accommodate recurring or routine expenditures. For while in equilibrium the perceived relationship between income and the money supply will encompass both categories of balances, in disequilibrium the momentum of the system may well require that routine and non-routine expenditure be differentiated. This is so because it is non-routine rather than routine expenditure which is likely to account for the divergence between current expenditure and planned expenditure.

The change in the demand for money resulting from this divergence between current expenditure and planned expenditure is represented in equation (4.1) by the *excess* demand term, $\ell_2(Y^* - Y)$. There are two points to consider. The first concerns the length of the period to which the planned expenditure applies, and the second concerns the attribution of all of the *excess* demand to the finance category.

The planning period cannot be given any precise length. In the present context it can most appropriately be defined as the average length of time between the attempt by spending units to rearrange their assets or to extend their liabilities in order to meet expenditure commitments, and the execution of that expenditure. However, it is not absolutely necessary to define the length of the period in this way so that equation (4.1) is compatible with any length of period. Presumably the demand for finance balances per unit of the excess of planned expenditure over actual expenditure, as exhibited in the functional operator ℓ_2, will become greater as the period length is reduced below that as define above, and will become less as the period length is extended beyond that as defined above.

The categorisation of $\ell_2(Y^* - Y)$ as the *excess* demand for finance balances rather than the *excess* demand for a combination of finance and transactions balances can be justified in two ways. One way is to assume that any *significant* disparity between planned expenditure and current income is composed of non-routine expenditure (an unexceptional assumption to make when considering first-round expenditure increases) and that, as a corollary, increases in the second-round of induced expenditure of a routine nature is accommodated by the approximation of relating transactions demand to current income. Another more rigorous way is to assume that short-period expectations are immediately fulfilled and that what is important is the level of effective demand, that is, the position of equilibrium, and not the, perhaps faltering, path towards it. (See Keynes [1936, p. 25] and Kregel's [1976] schematic analysis of Keynes' method.) The difference between aggregate demand and income (Y* - Y), in these terms, is the difference between the current period's level of aggregate demand and the level of effective demand at the end of the previous period, both measured at the income level equal to this level of effective demand. In terms of the conventional 45 degree diagram this would be the vertical distance between the previous periods equilibrium level of expenditure and the current level of aggregate demand or, in other words, the planned first-round expenditure increase.

1.2 *The Advantages of equation (4.1)*

This specification has several advantages. First, it is consistent with Keynes' emphasis on the importance of the finance motive when the revolving fund of finance is insufficient. Second, by drawing attention to the ramifications, in a growing and cyclical economy, of a divergence between planned expenditure and current income, it meets the objection that finance demand is in fact transactions demand by another name. Third, by isolating the demand for money required to service not the total of but changes in planned expenditure, and this can be properly subsumed under finance demand, it facilitates the empirical testing of at least a part of finance demand - and a critical part at that. Fourth, and this will be explained in section 2, it can be incorporated quite straightforwardly into an IS and LM framework.

2. IS-LM Analysis and the Davidson-Hines Alternative

2.1 *A Linear Version of (4.1)*

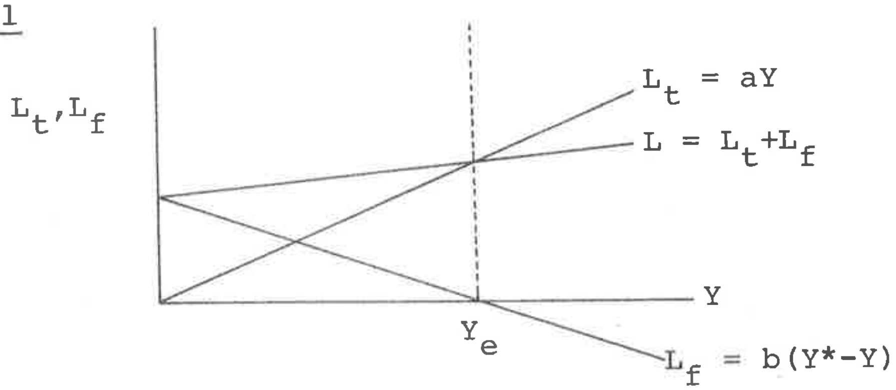
If, as a corollary of Keynes' assumed short-run constancy of the velocity of industrial circulation balances in the *Treatise* and the equivalent constancy of velocity of transactions balances in the *General Theory*, a proportional relationship between the transactions demand for money and money income is assumed, and furthermore, if a similar assumption is made for the finance motive, that is, that there is a proportional relationship between finance demand and aggregate demand for goods and services, equation (4.1) may be written as:

$$L = aY + b(Y^* - Y) \qquad \ldots\ldots (4.2)$$

Graphically (as shown below in diagram 1), the demand function of equation (4.2) differs from the usual transactions demand function in not emanating from the origin. At the equilibrium level of income, aggregate demand is equal to income and the excess demand for finance balances is zero.

It is positive at levels of income below equilibrium and negative at levels of income above equilibrium.

Diagram 1



L_t is the transactions demand plus the revolving-fund-of-finance demand schedule; L_f is the excess-finance demand schedule (drawn for convenience as a straight line),[1] and Y_e is the equilibrium level of income. The combined transactions and finance demand schedule is shown as $L_t + L_f$.

If it is assumed that aggregate demand is linearly related to income by the equation $Y^* = c + eY$, where $c > 0$ and $(0 < e < 1)$, equation (4.2) can be written as:

$$L = aY + b(c + eY - Y) \qquad \ldots\ldots (4.3)$$

---

[1] L_f would be a straight line if, for instance, in addition to the assumptions already made, aggregate demand were linearly related to income by the equation $Y^* = c + eY$, where $c > 0$ and $(0 < e < 1)$.

The income elasticity of demand for the combined transactions and finance balances derived from (4.3) is:

$$\frac{aY + b(e - 1)Y}{aY + b(e - 1)Y + bc}$$

which is easily seen to be less than unity.[2] (See chapter 3, p. 47).

2.2 *IS-LM Analysis*

IS-LM analysis divides the total stock of money into transactions and speculative holdings. If finance holdings are incorporated, these can be considered as a component of the total money stock. So long as the system is in general equilibrium in the IS-LM sense, planned investment and therefore the demand for finance is constant. In this situation, it is unnecessary to isolate finance holdings explicitly in the analysis. This is not the case when dis-equilibrium is considered, for then investment plans are either increasing or decreasing, and therefore the demand for finance balance is also increasing or decreasing. Diagram (2) superimposes

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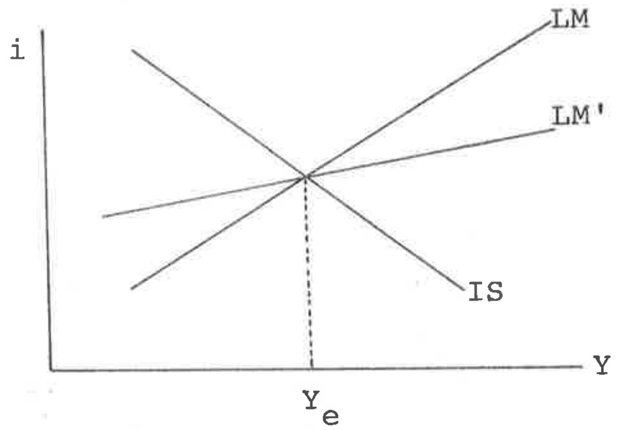
[2] This conclusion follows for $(a + be - b) > 0$. This restriction will hold when $a = b$. It will fail to hold when $(b > \frac{a}{1 - e})$. If this latter condition obtains, elasticity behaves very strangely: moving asymptotically from zero towards minus infinity as income increases towards $Y = \left|\frac{bc}{a + b(e-1)}\right|$ and from plus infinity asymptotically towards unity thereafter. It will be assumed that for real world considerations the restriction for which the conclusion follows does in fact hold.

on a conventional IS and LM diagram an LM schedule (LM') based on the transactions *and* finance demand schedule $L_t + L_f$, instead of on the conventional transactions demand schedule L_t.

Diagram 2



The conventional IS and LM schedules are independent of one another. That is, either one may shift without affecting the position of the other. Davidson and Hines show that their specification of the transactions demand function for money, which relates transactions demand to aggregate demand instead of to current income, introduces a new complexity: the two schedules are no longer independent. This complexity remains when the Davidson-Hines (D-H) specification is replaced by equation (4.1). However, as the excess demand term $\ell_2(Y^* - Y)$ becomes zero at equilibrium, it is not necessary, as it is if the (D-H) specification is used, to consider the circumstances under which the two equilibria (the conventional and the one based on the inclusion of finance demand) are the same. They are always one and the same. There is no mystery in this. The use of the (D-H) specification creates an unnecessary division between the conventional approach and one which includes the finance motive. Essentially, the specification of equation (4.1) treats as a variable something which the conventional approach treats as a parameter, and makes explicit what is implicit in that approach, namely, that an equilibrium exists only if there is a zero excess demand for finance balances.

2.3 *IS-LM Analysis: A Formal Comparison of Equation (4.2) with the (D-H) Alternative.*

LM and IS schedules may be derived by assuming the conventional linear relationships in the money and goods markets:

$$L_t = \Theta Y, \qquad \Theta > 0 \qquad \ldots\ldots(4.4)$$

$$L_s = \alpha - \beta i, \qquad \alpha > 0;\ \beta > 0 \qquad \ldots\ldots(4.5)$$

$$\overline{M} = L_t + L_s \qquad \ldots\ldots(4.6)$$

$$C = f + gY, \qquad f > 0;\ 0 < g < 1 \qquad \ldots\ldots(4.7)$$

$$I = h + ji, \qquad h > 0;\ j < 0 \qquad \ldots\ldots(4.8)$$

$$Y = C + I \qquad \ldots\ldots(4.9)$$

where Y is the level of money income, L_t is the transactions demand for money, L_s is the speculative demand for money, $\overline{M}$ is the money supply, C is planned consumption expenditure, I is planned investment expenditure, i is the rate of interest and Θ, α, β, f, g, h and j are constants.

Equations (4.4) to (4.9) lead to the following IS and LM relationships:

$$i = \frac{-(f + h)}{j} + \frac{(1 - g)\ Y}{j} \qquad \ldots\ldots(4.10)$$

$$i = \frac{\alpha - \overline{M}}{\beta} + \frac{\Theta Y}{\beta} \qquad \ldots\ldots(4.11)$$

and to the equilibrium solutions:

$$Y_e = \frac{j\ (\alpha - \overline{M}) + \beta(f + h)}{\beta\ (1 - g) - j\ \Theta} \qquad \ldots\ldots(4.12)$$

$$i_e = \frac{\Theta(f + h) + (1 - g)\ (\alpha - \overline{M})}{\beta\ (1 - g) - j\ \Theta} \qquad \ldots\ldots(4.13)$$

The specification of transactions demand favoured by Davidson and Hines implies the replacement of the conventional transactions demand function by a function relating the demand for money to aggregate demand. For equation (4.4), $L_t = \Theta Y$, they substitute $L = \ell(C, I)$ which in linear form can be written as:

$$L = \Theta_1 C + \Theta_2\ I, \quad \Theta_1 > 0\ ;\ \Theta_2 > 0 \qquad \ldots\ldots(4.14)$$

Replacing equation (4.4) with equation (4.14) and retaining equations (4.5) to (4.9) leads to the IS and LM relationships:

$$i = \frac{-(f + h)}{j} + \frac{(1 - g)\ Y}{j} \qquad \ldots\ldots(4.15)$$

$$i = \frac{\alpha - \overline{M} + \Theta_1 f + \Theta_2 h}{\beta - \Theta_2 j} + \frac{\Theta_1 g Y}{\beta - \Theta_2 j} \qquad \ldots\ldots(4.16)$$

and to the equilibrium solutions:

$$Y_e = \frac{j(\alpha - \overline{M}) + j(\Theta_1 f + \Theta_2 h) + (\beta - \Theta_2 j)(f+h)}{(\beta - \Theta_2 j)(1-g) - j\Theta_1 g} \quad \ldots (4.17)$$

$$i_e = \frac{\Theta_1 g(f + h) + (1 - g)(\alpha - \overline{M} + \Theta_1 f + \Theta_2 h)}{(\beta - \Theta_2 j)(1 - g) - j\Theta_1 g} \quad \ldots (4.18)$$

The equilibrium solutions (4.17) and (4.18) collapse to the solutions (4.12) and (4.13) respectively, only when $\Theta = \Theta_1 = \Theta_2$. In other words, *it is only when this equality holds* that the (D-H) demand function for money gives the same equilibrium solution as the conventional specification.

When these alternative IS and LM relationships are compared, that is, equation (4.10) with (4.15) and equation (4.11) with (4.16) it can be seen that the IS relationship is the same in both cases; however, the conventional LM relationship has an intercept of $\frac{\alpha - \overline{M}}{\beta}$ and a slope of Θ/β, whereas the (D-H) LM relationship has an intercept of $\frac{\alpha - \overline{M} + \Theta_1 f + \Theta_2 h}{\beta - \Theta_2 j}$ and a slope of $\Theta_1 g/(\beta - \Theta_2 j)$. Assuming that $\Theta = \Theta_1 = \Theta_2$, the intercept of the (D-H) LM relationship is greater than that of the conventional LM relationship, while the slope is less.[3]

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[3] The slope is unambiguously less. It can be shown that the intercept is greater provided the equilibrium solution value of income is greater than zero.

In the conventional version, the link between the monetary and real sectors depends exclusively on the rate of interest, implying that the LM and IS relationships may shift independently of each other. This is not so when finance demand is explicitly included. This can be seen by examining the intercept of the (D-H) alternative LM relationship. It contains the intercept coefficients of the consumption and investment functions, f and h, respectively. If either of these coefficients change the IS relationship will shift and so will the (D-H) LM relationship; the conventional LM relationship is not affected. The introduction of the finance motive therefore considerably strengthens the dependence between the real and monetary sectors.[4]

It remains to incorporate the demand function of equation (4.2) into the IS-LM framework. Equation (4.2) differs from the (D-H) specification in explicitly including income as well as planned expenditure. Equation (4.2), $L = aY + b(Y^* - Y)$, may be expanded to give:

$$L = aY + b_1 (C - C_r) + b_2 (I - I_r) \quad . . . . . (4.19)$$

where C_r and I_r are realised consumption and investment expenditure.

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[4] This dependence is within the confines of a model which holds long-period expectations constant. According to Kregel [1976] it is this type of model 'that Keynes relies upon for the first 18 chapters of the *General Theory*'.

In order to construct stable IS and LM relationships it is necessary to assume that $b_1 = b_2$ (= b).[5] Equation (4.19) may then be written as:

$$L = aY + b\ (C - C_r + I - I_r)$$

or as:

$$L = aY + b\ (C + I - Y) \qquad \ldots\ldots(4.20)$$

Substituting equations (4.7) and (4.8) into equation (4.20) and rearranging gives:

$$L = (a - b + bg)\ Y + b\ (f + h + ji) \qquad \ldots\ldots(4.21)$$

Replacing equation (4.4) with equation (4.21) and retaining equations (4.5) to (4.9) leads to the IS and LM relationships:

$$i = \frac{-\ (f + h)}{j} + \frac{(1 - g)\ Y}{j} \qquad \ldots\ldots(4.22)$$

$$i = \frac{\alpha - \bar{M} + b\ (f + h)}{\beta - bj} + \frac{(a - b + bg)\ Y}{\beta - bj} \qquad \ldots(4.23)$$

and to the equilibrium solutions:

$$Y_e = \frac{j\ (\alpha - \bar{M}) + \beta\ (f + h)}{\beta\ (1 - g) - ja} \qquad \ldots\ldots(4.24)$$

$$i_e = \frac{a\ (f + h) + (1 - g)\ (\alpha - \bar{M})}{\beta\ (1 - g) - ja} \qquad \ldots\ldots(4.25)$$

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[5] This assumption does not differ from that made when constructing the conventional IS-LM functions. It is then implicit, in relating transactions demand to income, that the demand for money is invariant to the composition of income.

Not surprisingly (given the implicit assumption that the coefficients a and Θ are equal), the same equilibrium solutions exist as in the conventional IS-LM analysis. The slope of the LM relationship of equation (4.23) is less than that of the conventional LM relationship and the intercept is greater. The interdependence between the IS and LM relationships is similar to that which obtained when the (D-H) specification was used.

The aim of this chapter has been to introduce a demand function for money which is consistent with Keynes' exposition, and which is also capable of being used with advantage, first, to investigate the theoretical implications of the finance motive and, second, to investigate the empirical significance of the finance motive. These two investigations will be the subject of the next four chapters.

CHAPTER 5

LIQUIDITY PREFERENCE *VERSUS* LOANABLE FUNDS: EXTENSION AND EVALUATION

Introduction

Chapter 2 showed that in terms of comparative statics the theories of liquidity preference and loanable funds are equivalent only in the trivial sense that each implies a zero change in the rate of interest at equilibrium. The real advantage and distinction of the liquidity preference theory in this comparative static setting is in its role of identifying the cause of change after an equilibrium has been disturbed. Note that in this setting there is no provision for analysing the *path* towards the new equilibrium. The objective of this chapter is to examine the relationship between the two theories along this path and, in particular, to examine the perspective of the finance motive in this relationship. It will be recalled that in chapter 2 the point was made that finance demand, or at least its critical part,[1] should be explicitly excluded in order to isolate the cause of change, that it should be included for present purposes is no contradiction for finance demand fits logically into a dynamic setting, that is, a setting in which the sequential repercussions of disequilibrium are considered.

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[1] This refers to finance demand in excess of the revolving fund of finance - see chapter 4.

This chapter is in two parts. The first selectively reviews the liquidity preference - loanable funds controversy of the 1950's and 1960's which essentially had as its theme the equivalence or non-equivalence of the theories of liquidity preference and loanable funds in a dynamic context. The aim is not to be exhaustive, as much of the debate, concerned with the distinction between stock and flow analysis, is largely beside the point. Furthermore, the reproduction of the contributors' algebraic models will be kept to a minimum, to do otherwise would confuse rather than clarify given the bewildering array of such models generated by the controversy. The second part of this chapter has the aim of bringing together the account and conclusions of the first part with the finance demand specification introducted in chapter 4. The resulting synthesis relies heavily on Hines' [1971a, b] contribution and can be viewed as an extension of it; it is, however, mainly explained within the framework of Johnson's [1971] diagramatic illustration of the difference between the theories of liquidity preference and loanable funds in disequilibrium situations.

1. The liquidity preference - loanable funds debate

Broadly, at issue was whether the theories of liquidity preference (LP) and loanable funds (LF) give the same implications for *movements* in the rate of interest in a dynamic context, that is, over a *period* when the goods market is in disequilibrium and when, presumably, the system is moving towards a new equilibrium.[2] Walras' law ensures that when the goods market is in equilibrium, the bond and the money markets give mutually consistent signals; this is not so clearly the case when the goods market is in disequilibrium. And it is the respective signals of these two markets which, in this extension of the earlier debate[3], demarcates the two theories. Klein's [1950a] classification to which most, if not all, contributors explicitly or implicitly concurred is:

> the theory of *liquidity preference* hypothesises that the rate of interest will rise when there is an excess demand for money and will fall when there is an excess supply of money; the theory of *loanable funds* hypothesises that the rate of interest will rise when there is an excess supply of bonds and will fall when there is an excess demand for bonds.

In symbols, at issue, therefore, is whether

$$r_t - r_{t-1} = \ell_p \, (M_t^d - M_t^s) = \ell_f (B_t^d - B_t^s),$$

Equation A

Equation B

where r is the rate of interest; M^d, M^s, B^d and B^s are the demands for and supplies of money[4] and bonds respectively, and

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[2]This presumption of a movement towards an equilibrium position does not imply *either* that such a position will be attained *or* that the position itself is immutable. (See Hahn [1973] and Garegnani [1976]).

[3]The 1937/38 debate between Keynes, Ohlin, Robertson and Hawtry- see chapter 2.

[4]M^s is the potential money supply, that is, it includes the excess reserves of the banking system.

ℓ_p and ℓ_f are the respective liquidity preference and loan-able funds functional operators, *or*, perhaps, less demandingly whether 1, 2 and 3 apply in all circumstances.

1. $M_t^d > M_t^s \Leftrightarrow B_t^d < B_t^s$

2. $M_t^d < M_t^s \Leftrightarrow B_t^d > B_t^s$

3. $M_t^d = M_t^s \Leftrightarrow B_t^d = B_t^s$

There are two ways of approaching the issue. It may be considered a matter of common sense that movements in the rate of interest (the price of bonds) must have its analogue in an imbalance in the bond market, and that therefore the issue reduces to one of deciding whether in all circumstances the money market gives the same signal as the bond market; it follows that if it does not the theory of LP is misleading and ought to be rejected. On the other hand, there may be no presumption that either theory is indubitable, and the issue remains one of deciding whether the two theories come to the same thing and if they do not which is superior. An illustration of this is provided by the exchange between Klein [1950a, b] and Fellner and Somers [1950a, b] to which Brunner [1950] also contributed.

On the basis of a specific four sector (goods, money, bonds, and labour) aggregative model of the economy, Klein concluded that the explicit incorporation in the model of the theory of LP in the form of equation A means that it is possible for the bond market to be in equilibrium yet for the rate of interest to change; similarly, the replacement of equation A with equation B means that it is possible that a changing rate of interest is consistent with equilibrium in the money market. Klein does not rule out either the theory of LP or LF, his object is to show that they are different and that '[u]ltimately the choice between the two theories will have to be based on empirical information' [1950b, p. 246].

Fellner and Somers in reply pointed out that for the price of bonds to change there must exist an imbalance between the demand for and supply of bonds, and that this so even if the initial cause of the change in price can be traced to other markets. This ('dogmatic' [Klein, 1950b, p. 246]) assertion is not supported with evidence and prompts Klein to state that it 'closes the door to scientific discussion' [1950b, p. 246]. But it only does this if, in fact, Fellner and Somers are wrong. It is the contention of this chapter that they are not and, furthermore, that real progress depends upon the realisation of this and of, therefore, accepting the former approach to the issue, that is, of deciding whether in all circumstances the money market gives the same signals as the bond market rather than of trying to decide which of the two theories is correct.

Walras' law ensures that the sum of excess demands is zero, that is, in a three commodity market system composed of goods, bonds, and money that

$$X_g + X_m + X_b = 0$$

where X_g, X_m, X_b are the money values of the three respective excess demands for goods, money, and bonds. The difficulty arises when $X_g \neq 0$, for then it is possible (or at least Walras' law does not preclude it) that both the excess demands for money and bonds are similarly signed and thus give contradictory signals. Equally, it is possible that $X_b = 0$ and that $X_m \neq 0$. This is the case considered by Hahn [1955]. It is interesting because of its implications for the two decisions faced by a consumer in the *General Theory*. The consumer must decide how much to save and also decide on the asset structure of his savings. The former decision depends mainly on the consumers level of income and the latter (assuming expectations to be constant) on the rate of interest, and, according to Keynes, [1936, p. 166] 'the mistake in the accepted theories of interest lies in their attempting to derive the rate of interest from the first of these two constituents of psychological time-preference to the neglect of the second'. But this, as Hahn points out, is precisely what is happening in the case in question where, for example, the implications of an excess demand for money matched by an excess supply of goods is that the rate of interest rises to bring spending decisions into balance with asset holdings. Hahn suggests that in the theory of liquidity preference it is the ratio of money to bonds which determines the rate of interest and not the absolute holdings of money, and that Keynes envisaged a sequence where if there were an excess demand or supply of money the rate of interest would change quickly to remove it, and thus precipate an income change only if, in consequence, the sum of the excess demands for bonds and money is not equal to zero. That is, the developed continuous spot market in securities ensures a speedy equilibrium between bonds and money. The resulting interpretation of the theory of liquidity preference is that 'the rate of interest changes if, and only if, the ratio in which assets [bonds and money] are demanded is different from the ratio in which they are supplied' [Hahn, p. 61]. If the difference between these two ratios, X_r, equals zero the interest rate will not change.

Hahn's interpretation of the theory of liquidity preference does not, however, of itself, overcome the difficulty of inconsistent signals by the bond and the money markets, for it is possible that $X_r = 0$ and that as well $X_b \neq 0$. In order to reconcile the two theories Hahn introduces a period analysis similar to Robertson's. It is assumed that the excess demand equations are *ex ante* and are held for the forthcoming production period during which time the investment plans are fulfilled. However, there is a shorter period during which the "finance" for the investment is secured [p. 62]. Thus there are two transactions in a given production period: a sale of bonds for money and a purchase of investment goods, with the former occupying a shorter time period than the latter. To use Hahn's example, if at the beginning of a period there exists an excess demand for goods and a corresponding excess supply of securities with X_r equal to zero, the liquidity preference prediction of no change in the rate of interest is reconcilable with the loanable funds prediction of an increase in the rate of interest by realising that the liquidity preference prediction is for the end of the period whereas the loanable funds prediction applies to the shorter sub-period. During this shorter period bonds will be exchanged for money in order that investment goods may be purchased, hence the rate of interest will rise. Once the purchase is made the recipients of money will reappraise their money to bond ratio and purchase bonds, thus forcing down the rate of interest until it has resumed its initial value and X_r is again equal to zero.

Hahn's reconciliation lays the foundation for the later contributions of Tsiang and Hines by explicitly recognising (i) that the exchange of bonds for goods is mediated by money and (ii) that this mediation had been classified under 'finance demand' by Robertson.[5] However, there appears to be no foundation for the supposition that the theories of liquidity preference and loanable funds apply to different time periods. It seems purely arbitrary to assume that a value of X_r not equal to zero is not registered by the theory of liquidity preference unless it occurs at the end or beginning of some

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[5] Hahn's account is misleading in this respect, in that finance demand was devised by Keynes in response to criticism by Ohlin. Robertson came on the scene a little later - see chapter 2.

production period. If this assumption is dispensed with there is no longer any need to consider periods within periods; the analysis becomes simpler and more accurately attuned to Keynes' explanation of finance demand.[6] The analysis of Tsiang [1956, 1966] illustrates this.

Tsiang also follows Robertson in dividing time into periods. They are defined as being so short that income proceeds of the period can not be used to finance expenditure during the same period. The rate of interest is determined at the beginning of the period and planned expenditure is executed with money owned or borrowed at this time. Since sales proceeds cannot be used during the period money has to be available at the beginning of the period to meet planned commitments; this Tsiang associates with both the theory of loanable funds and also with a properly specified theory of liquidity preference.

Formally, and within the context of his period analysis, Tsiang's [1956] statement of the determination of the rate of interest according to the theory of loanable funds is:

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[6] Keynes experimented with period analysis but 'discarded it partly because it was frightfully complicated and really no sense in it, but mainly because there was no determinate time unit'. (See Keynes [1973, XIV, pp. 180-181] and also Moggridge [1976, pp. 91-92].

$$\underbrace{Y_{t-1} - C_t^*}_{\text{Planned current gross savings.}} + M_{t-1}^I - M_t^{Id} + \Delta M_t = I_t^*$$

where Y_{t-1} is gross income of the previous period, C_t^* and I_t^* are, respectively, planned consumption expenditure and planned gross investment expenditure for the current period, M_{t-1}^I is the stock of idle money at the end of the previous period, M_t^{Id} is the current demand for idle money, and ΔM_t is newly created money. According to the theory of loanable funds the rate of interest will change to produce this equality, but this, Tsiang shows, is equivalent to the theory of liquidity preference. This equivalence follows from the assumptions of the analysis. As there is no use made of sale proceeds during the period, the gross expenditure of the previous period plus the existing stock of idle money must equal the existing stock of money; this plus newly created money is equal to the money supply, so that,

$$M_t^s = Y_{t-1} + M_{t-1}^I + \Delta M_t$$

Similarly, the demand for money must equal gross planned expenditure plus the demand for idle money, so that,

$$M_t^d = C_t^* + I_t^* + M_t^{Id}$$

The loanable funds equation can therefore be expressed as $M_t^d = M_t^s$, that is, in liquidity preference terms.

Tsiang [1966] and Hines [1971a, b] recognise that the difficulty in reconciling the theories of liquidity preference and loanable funds stems from the application of Walras' law to a money economy. In order to explain this and to devise an alternative approach they both rely upon the finance motive. However, they do not each attach equal importance to it. Hines is alone in specifically differentiating transactions demand from finance demand and in seeing the importance and significance of Keynes' addendum to the *General Theory*. The difference in their approaches can be best illustrated by considering Hines' contribution before coming back to Tsiang's.

Hines attempts to bring the analysis of Clower [1965] and Leijonhufvud [1967, 1968] into the theory of the determination of the rate of interest. He examines the theoretical predictions of the loanable funds and liquidity preference approaches to the determination of the rate of interest when the goods market is in disequilibrium, and finds, that when the Keynesian model includes the finance motive, the liquidity preference and loanable funds approaches are mutually consistent.

Hines employes a three commodity, aggregative model composed of goods, bonds and money. The goods commodity includes consumption and capital goods; the money supply is assumed fixed. The analysis proceeds within one Hicksian week, the duration of which is the average period for which expenditure plans are made. Wage contracts are assumed to be fixed at the end of the previous week, so that the price level during the week is constrained by this, but is otherwise allowed to vary. The goods, bond and money markets are open for transactions. Two alternative sets of excess demand functions are presented as model 1 and model 2. The difference between the two is that in model 1, the money excess demand function includes income (lagged or current) as a variable, whereas in model 2, it excludes income but includes planned consumption expenditure and planned investment expenditure. The two sets of excess demand functions are given below:

Model 1.

$$Y_t - C(Y_{t-i}, r_t) - I(Y_{t-i}, r_t) = 0 \qquad \ldots (1)$$

$$rP.h(y_{t-i}, \frac{1}{r_t}) - rP.j(Y_{t-i}, \frac{1}{r_t}) = 0 \qquad \ldots (2)$$

$$P.L(Y_{t-i}, r_t) - M = 0 \qquad \ldots (3a)$$

Model 2.

As for model 1 . . . (1)

As for model 1 . . . (2)

$$P.L(C_t, I_t, r_t) - M = 0 \qquad \ldots (3b)$$

Y is real income, C is planned consumption expenditure, I is planned investment expenditure, r is the rate of interest, P is an index of the general level of prices, M is the money stock, and the subscripts indicate the time period. Equations (1), (2) and (3a/3b) are the conditions for equilibrium in the goods, bond, and money markets respectively. It should be noted that the (3b) version of the money excess demand function does not include finance demand as an additional demand but rather, as with Davidson's specification, transactions demand encompasses finance demand. While Hines recognises that Keynes *did* distinguish between transactions demand and finance demand he regards their separate consideration 'to be unnecessary as long as the transactions demand is made to depend on planned expenditure rather than on actual output' [Hines, 1971a, p. 8].

As models 1 and 2 are based on a three commodity system of goods, money, and bonds, Walras' law can be stated as before as the condition that:

$$X_g + X_b + X_m = 0$$

which, as Tsiang [1966, p. 331] points out is, in an exchange economy, merely a stipulation that the effective demand for one commodity must be matched by the willingness to supply another of equal value.

To repeat, it is possible on the face of it for there to be excess demand in the goods market and an exactly offsetting excess supply in the bond market. By Walras' law the money market, in this situation, has to be in equilibrium. If it were in equilibrium, however, and the bond market were not, the bond market carries the implication of a rise in the rate of interest while the money market implies no change in the rate of interest. Other combinations could be easily devised to indicate the apparent inconsistency in the signals offered by the bond and the money markets. As was indicated previously such inconsistencies do not arise while $X_g = 0$, that is, while the goods market is in equilibrium. To resolve the dilemma when $X_g \neq 0$, Hines suggests, as a first step, that the formulation of Walras' Law as presented above is not appropriate in a money economy.

In a money economy, ' money buys goods and goods buy money: but goods do not buy goods' [Clower, 1967]. In a barter economy if from an initial equilibrium a transactor wishes to exchange a quantity of commodity A for a quantity of commodity B then the situation is adequately summed up by the excess demand and supply expression $X_B = -X_A$. This is not the case in a money economy. For then, in order to acquire commodity B, the transactor first has to exchange commodity A for money. There are two exchanges involved and two excess demand and supply expressions: the first $X_m = -X_A$ refers to the exchange of commodity A for money and the second, $X_B = -X_M$ refers to the exchange of money for commodity B. To return to the example above, the exchange of bonds for goods following from the respective excess supply of and excess demand for these commodities, implies first an exchange of bonds for money, and then an exchange of money for goods. The first of these exchanges implies an excess demand for money which is of course required if the rise in the rate of interest is to be explained by the money market. It is necessary however, at this point, to refer back to the more complex excess demand equations of model 1 and model 2 for further elucidation.

Suppose that from an initial equilibrium position entrepreneurial expectations improve and planned investment increases. Adherence to model 1 implies that the interest rate will not change until output changes - see equation (3a). If the multiplier process is condensed, that is, if consumption and income respond without lags to a change in investment, then income enters equation (1) without a lag.[7] The change in income changes the requirement for transactions balances and so changes the rate of interest. But, income enters equation (3a) after a lag of one period.[8] The underlying assumption is 'that decisions about the composition of output are implemented more quickly than decisions about the composition of assets' [Hines, 1971a, p. 11]. Loanable funds theorists objected to this assumption. The alternative is to postulate a Robertsonian lag in the consumption function and no lag in the money demand function. Now an increase in investment, will cause an increase in the supply of bonds to finance it, and by equation 2, the rate of interest will rise. But,

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[7] This is considered to be Keynes' method in the *General Theory* - see Hines [1971b, p. 42] and chapter 2.

[8] This point made by Hines can be related to comments in chapter 2 where it is noted that Keynes 'stopped short', that is, he investigated the effect of changes in the economic environment on income and did not proceed further to examine the repercussions of the income change on the rate of interest. This can be interpreted as lagging the repercussions of income changes on the rate of interest.

according to equation (3a), as the level of income has not changed, neither will the rate of interest. So that the conclusion, that the two theories of interest determination offer different predictions in disequilibrium situations, is established. This conclusion, however, does not follow if equation (3a) is replaced by (3b).

Model 2 includes planned expenditure in the money excess demand function. An increase in planned expenditure therefore has a simultaneous effect on the bond excess demand equation and the money excess demand equation. A rise in the rate of interest is predicted by both, and there is no inconsistency. In terms of Walras' Law, the first transaction: $X_m = -X_b$, indicates the sale of bonds and acquisition of cash to finance the second transaction: $X_g = -X_m$, that is, the purchase of goods.

Hines notes two possibilities after the second transaction, that is, after the suppliers of capital goods have received cash. It is assumed that these suppliers have met the excess demand for their commodity by a passive decumulation of inventories. Having received an unexpected cash inflow they may either hold the cash in anticipation of using it in the following period, or they may 'retire outstanding debt by an amount equal to the bond creation of active investors [those who demanded the capital goods] reissuing it at the beginning of the next period to finance their increased expenditure' [Hines, 1971b, p. 44].

If the first possibility obtains then the rate of interest, having risen, will maintain its new level; the original excess demand for money by active investors having been taken over by passive investors. If the second possibility obtains then the rate of interest will fall to its original level, the original excess supply of bonds by active investors having been neutralised by an excess demand for bonds by passive investors. Either case can be equivalently analysed in terms of bonds or money.

A difficulty (suggested by Patinkin[1958]) is associated with shifts in the speculative demand schedule. In this case, it is possible for there to exist at the same time an excess demand for goods, an excess supply of bonds and an excess supply of money. In other words asset holders may want to move out of both money and bonds into goods. The situation in terms of Walras' Law is that: $X_g = -(X_b + X_{m1})$, where X_{m1} is the excess supply of speculative balances. On the face of it this appears to be a situation where the signals offered by the money market must differ from those offered by the bond market. This is not so, however, if cognisance is taken of finance demand. For, allied with the excess demand for goods there is an excess demand for finance balances. So that: $X_g = X_{m2}$, where X_{m2} is the excess demand for finance balances. Substituting X_{m2} for X_g in the expression above and rearranging gives: $X_{m2} + X_{m1} = -X_b$. The excess supply of bonds is exactly matched by a net excess demand for money, the net excess demand equalling the excess demand for finance balances *minus* the excess supply of speculative balances.

Hines arrives at his results by replacing income with planned expenditure in the demand function for money. Tsiang also uses planned expenditure $(C_t^* + I_t^*)$ but there is no explicit recognition that it is replacing income. This is consistent with Tsiang's view that finance demand is in fact (i) 'really the same thing' as transactions demand [1956, p. 547] and is (ii) 'really nothing but the transactions demand for money proper' [1966, p. 333]. Elsewhere (chapters 1 and 4) it has been contended that this is wrong and that the error springs from trying to differentiate transactions demand from finance demand on the basis of one being current and the other *ex ante* instead of on the basis of expenditure categories. The validity of this contention may be illustrated by Tsiang's model in which, it will be recalled, time is divided into periods short enough to constrain the transactions velocity of active money balances to equal unity. In the context of this model Tsiang [1966] proposes that in a money economy Walras' Law:

$$M^d - M^s \equiv (G^s - G^d) + (B^s - B^d)$$

be replaced with the budget constraint:

$$G^d + M^* \equiv M_o + \Delta M + (B^s - B^d)$$

This embodies the proposition that planned expenditure on goods (G^d) [= the demand for active money balances] *plus* the demand for idle money balances (M^*) *plus* the excess of the demand for bonds over the existing supply $(B^d - B^s)$, is constrained by the existing stock of money (M_o) *plus* newly created money (ΔM). In terms of this constraint to say that the rate of interest is determined in the bond market (*i.e.* when $B^s = B^d$) is equivalent to saying that it is determined in the money market (*i.e.* when $G^d + M^* = M_o + \Delta M$); the form of the constraint ensures that the respective signals of the two markets are mutually consistent. It can be noted that to write $G^d + M^* = M_o + \Delta M$ is formally equivalent in Tsiang's model to his 1956 statement of the theory of loanable funds[9] - see pages 80-81.

In Tsiang's model the community in aggregate has at the beginning of a period a stock of money equal to the gross income of the previous period plus idle balances. Leaving aside this idle cash which is presumably fulfilling some need (*i.e.* speculative or precautionary) the money supporting income transactions supports both expenditure of a routine and non-routine nature. It is important to make this distinction. For if gross expenditure planned for the current period exceeds gross income of the previous period it may be because

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[9] The transposition of one to the other is accomplished by the following substitutions:

G^d for $I^*_t + C^*_t$,

M_o for $Y_{t-1} + M^I_{t-1}$, and

M^* for M^{Id}_t.

of an increase in non-routine expenditure or it may be because of an increase in routine expenditure arising as a multiplier repercussion of a previous periods increase in non-routine expenditure. The gestation periods between the planning and execution of these expenditures are likely to be very different as are likely to be the periods between the mobilisation and expenditure of the required money balances. To be more specific, the money balances required for non-routine expenditure plans 'may be turned over so much more slowly' [Keynes, 1937b, p. 667] and thus the length of Tsiang's periods, because they are determined by the velocity of circulation of money balances, will vary according to the category of planned expenditure increases.[10] In the case of increases in routine expenditure the periods may be so short that perhaps little is lost by adopting the method of the *General Theory* and using as a first approximation current income instead of planned expenditure. In the case of increases in non-routine expenditure, the periods may be much longer, and the difference between current income and planned expenditure may be so much greater, that an explicit consideration of this difference is warranted; hence Keynes' explicit consideration of the finance motive.

The conclusions of this section are that the theory of liquidity preference, *when it is properly specified*, is

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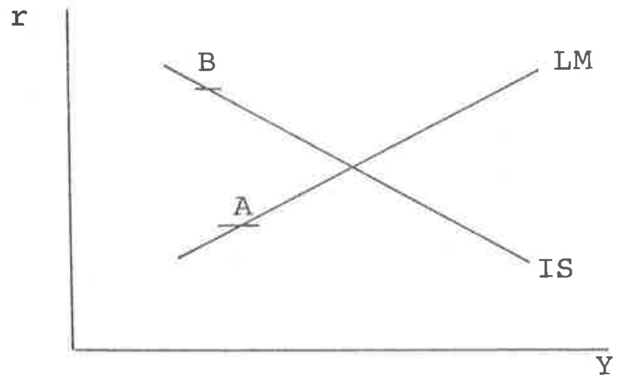
[10] It does not matter what length of period is chosen if planned expenditure is equal to current income.

consistent with the theory of loanable funds; that this proper specification involves an explicit consideration of the finance motive, and that Walras' Law, at the least, has to be qualified when placed in the context of a money economy. However, it would be wrong to create the impression that the issue is settled. The foregoing account has been selective in concentrating on the views of Hahn, Tsiang and Hines; the second section redresses the balance a little by considering the view of Johnson [1971].

2. The Equivalence of the BF Locus and the Properly Specified LM Locus

Johnson [1971] concludes that while it does not matter whether the loanable funds or liquidity preference approach is used in static equilibrium analysis, for dynamic analysis, the approaches may give different results. IS-LM analysis is used to show that the combinations of the rate of interest and income required for equilibrium in the money market are not, except in general equilibrium, coincident with those required for equilibrium in the bond market. This is demonstrated below in diagram (1).

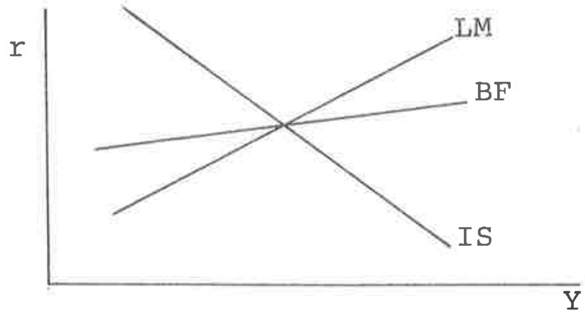
Diagram 1.



Point A is a position of equilibrium in the money market, in other words, a position of zero excess demand for money. At the income level corresponding to point A the rate of interest is too low to ensure equilibrium in the goods market: there is an excess demand for goods. If a three market system is assumed, consisting of a goods, money and bond market, then at point A, there must exist an excess supply of bonds. This is a necessary condition for the sum of excess demands to be equal to zero. At point B, there is equilibrium in the goods market, but excess supply in the money market. The bond market must therefore be in excess demand at point B.

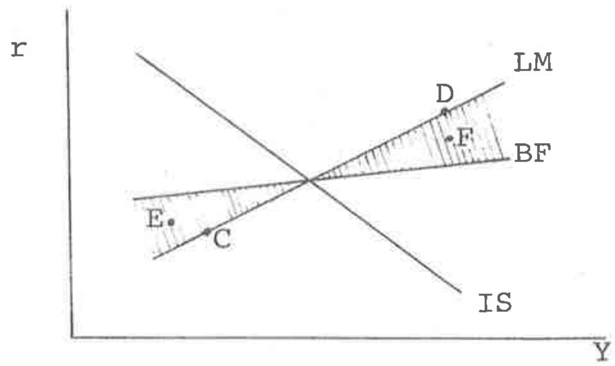
If at point A there is excess supply in the bond market and at point B excess demand, then the locus of points at which the bond market is in equilibrium must lie between points A and B. Such a locus is shown below in diagram (2) and is termed a Bonds-Funds (BF) relation by Johnson.

Diagram 2.



The position of disequilibrium, which may lead to contradictory predictions depending on whether the loanable funds or liquidity preference approach is used, are shaded in diagram (3)

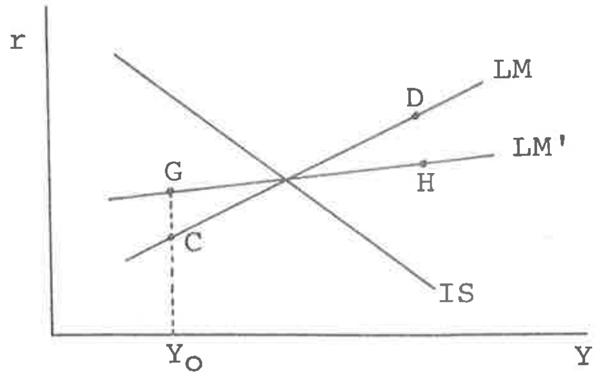
Diagram 3.



For illustrative purposes four positions - C, D, E and F - have been isolated. At positions C and D, the money market is in equilibrium while the bond market is not. For equilibrium to be attained in the bond market, the interest rate needs to rise at C and fall at D. At positions E and F, there is excess supply and excess demand respectively in the money market, and also excess supply and excess demand respectively in the bond market. Whether the interest rate will change, or in what direction apparently depends on the strength of the two markets or on the theoretical stance adopted by the onlooker. However, before accepting that an impasse has been reached, it may be pertinent to enquire into the economic rationale of the disparity between the BF and LM schedules.

Starting from position D, it is known that the attainment of general equilibrium involves a fall both in the rate of interest and in income. That both the loanable funds and the liquidity preference approach give the same interest rate in general equilibrium has been sufficiently canvassed. It is the path of adjustment which is of interest here. Presumably, for income to have reached a level corresponding to point D, investment must have been at a commensurate level. In the situation presented in diagram (3), income falls at positions to the right of general equilibrium. This implies that planned investment falls, and that the demand for money to finance it similarly falls. The obverse of a fall in the demand for money to finance planned investment is a reduction in the supply of bond issues. Other things being equal, this will tend to lower the rate of interest. A similar reasoning applies for positions C, E and F. The impasse follows, apparently, only if planned investment is excluded from the demand function for money when constructing the LM relation. The adjusted LM relation LM' based upon the transactions and finance demand function $L = \ell_1(Y) + \ell_2(Y^* - Y)$ introduced in the previous chapter by including planned expenditure *may* resolve the difficulty; it *will* do this if it can be shown that the BF and LM' relations are one and the same. Diagram 2 of the previous chapter is reproduced below (diagram 4); four positions are identified C, D, G and H.

Diagram 4.



The proposition that the BF relation is in fact the LM relation adjusted to take account of the finance motive is based on two considerations: first, the position of the LM' locus is consistent with that of the BF locus; and second, and more important, the positions G and H are not open to the same strictures as are C and D. For example, at the income level corresponding with point C, that is Y_o, there is an excess supply of money (evidenced by the gap GC) to balance the excess demand for goods. It is because *the slack has been taken up in anticipation* of investment expenditure that there is not overall an excess supply of money. In other words, point G is a position of equilibrium in the money market in a much less restricted sense than is point C. Point G takes account of the fact that, in order to finance future expenditure, money will be demanded and obversely bonds and debentures will be supplied. Thus it appears that the finance motive can resolve the dilemma posed by Johnson and reconcile loanable-funds and liquidity-preference predictions in disequilibrium situations. A more rigorous demonstration of this follows.

Johnson's BF locus is the solution to the equation:

$$B^s(r, y) - B^d(r, y) = 0$$

or, equivalently, to the equation:

$$G^d(r, y) - G^s(r, y) + M^d(r, y) - M^s(r, y) = 0$$

which, without loss of generality, may be simplified to:

$$I(r) - S(y) + \ell(r, y) - M = 0 \qquad \text{(BF)}$$

where I(r) is planned investment as a function of the rate of interest, S(y) is planned savings which are assumed to be *realised* out of current income, that is, income as at the beginning of a period or at the end of the previous period; viewed as a stock these savings are held in either bonds or money, $\ell(r, y)$ is the demand for idle and transactions money balances as a function of the rate of interest and of current income respectively, and M is the existing stock of money (including, say, the excess reserves of the banking system). The equation is a combination of stocks and flows and is meaningful only in the context of period analysis.[11] The length of each period is equal to the time between the mobilisation of funds to finance increased investment expendi-

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[11] See Patinkin [1958, 1959] and Clower [1959] for a discussion of the use in analysis of stocks and flows.

ture and the completion of the execution of this expenditure. Thus, as in Tsiang's analysis, the period is constrained to the extent that finance released by this expenditure is not reused in the same period. It is assumed that the price level, the money supply and expectations are constant throughout a period.

The LM locus is the solution to the equation:

$$\ell(r, y) - M = 0 \qquad \text{(LM)}$$

In equilibrium, that is, when $I(r) = S(y)$, the solutions to the (LM) and (BF) equations are the same. Tsiang and Hines suggest altering the (LM) equation so that it reads:

$$\ell(r, y^*) - M = 0$$

where y^* is planned expenditure. This as explained in section 1 overcomes the apparent difference between the (LM) and (BF) equations, however, it does present some conceptual problems - see Chapter 4, pp 65-71. These do not occur if discrepancies between planned and current expenditure are explicitly considered. In terms of the present analysis, that is, where increases in consumption and government expenditure can be disregarded, the equation upon which the LM' schedule is based can be written as

$$\ell(y, r) + \ell_2(I^* - I) - M = 0 \qquad \text{(LM')}$$

where I^* is planned investment and I is current investment. This is equivalent to the (BF) equation: current investment I is equal to current savings $S(y)$ by definition, and $\ell_2 = 1$

because of the requirement that released finance cannot be reused during the same period.

Johnson's analysis is, of course, a diagramatic application of Walras' Law. The divergence between the LM' [=BF] locus and the LM locus illustrates the inapplicability of this law in a money economy by drawing attention to the difference between the excess demand for a commodity other than money and that for money. Money, unlike other commodities, is demanded both as an asset to hold and, transitorily, as a medium to effect an exchange between other commodities. The LM locus reflects only the former demand; the LM' locus reflects both demands.

CHAPTER 6

CYCLICAL RELATIONSHIPS BETWEEN THE REAL AND MONETARY SECTORS

Introduction

The previous five chapters have been concerned with the articulation and development; the specification, and the theoretical perspective of the finance motive. This chapter goes a stage further and investigates the implications that would follow, for the cyclical interaction between the real and the monetary sectors, if finance demand were an important and significant component of the demand for money. This investigation is initially pursued within the context of Friedman's and Schwartz's empirical research; the implications are compared with the evidence presented by these and other researchers. There are two main sections: the first considers the relationship between the money supply and economic activity; the second brings the rate of interest into the analysis and also explicitly examines the phase of the cycle of the velocity of circulation of money balances.

1. The Cyclical Relationship Between Money and Economic Activity

1.1 *Friedman and Schwartz*

The investigation of the interaction between the money and real sectors may be resolved into several inquiries. They concern (i) the significance of the causal relationship running from increases in the money supply (not related to past economic activity) to changes in the level of economic activity; (ii) the significance of the causal relationship running from economic activity (not related to past changes in the money supply) to changes in the money supply; and (iii) the timing and quantity relationship between economic activity and the money supply.

Friedman and Schwartz [1963b] are mainly concerned with the third of these, having as Friedman [1970d, p. 322] states 'long since accepted the proposition about the direction of influence'.[1] Within this context there are two observables

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[1] Care is needed here to interpret Frieman correctly. He does not rule out influence running from economic activity to increases in the money supply. Two quotations from Friedman and Schwartz [1963b] illustrate their position.

> "The key question at issue is not whether the direction of influence is wholly from money to business or wholly from business to money; it is whether the influence running from money to business is significant, in that it can account for a substantial fraction of the fluctuations in economic activity". [p. 49]

The second quotation is a comment on major economic fluctuations in the United States.

> "The changes in the stock of money cannot consistently be explained by the contemporary changes in money income and prices. The changes in the stock of money can generally be attributed to specific historical circumstances that are not in turn attributable to contemporary changes in money income and prices. Hence, if the consistent relation between money and income is not pure coincidence, it must reflect an influence running from money to business". [p. 50]

While these two statements do not contradict each other they do indicate the distinction between the questions asked of the evidence by Friedman and his interpretation of the evidence. His interpretation is that money consistently and pervasively dictates the course of economic activity and that while in principle a reverse causation from activity to money may apply, it has not done so with any force.

for which a theoretical explanation is required: the timing relationship between variations in the money supply and variations in economic activity, and the relative magnitude of changes in the money supply compared with changes in aggregate expenditure flows.

The aims of this section are to show, first, that a Keynesian demand function for money is consistent with the evidence adduced by Friedman and Schwartz on the timing and quantity relationships between the real and the monetary sectors; furthermore to show that it is not subject to the same limitations as is the function of Friedman and Schwartz; limitations pointed out by Tobin and conceded, albeit without dismay, by Friedman, and to show, second, that Friedman's and Schwartz's empirical results are consistent with an endogenously determined money supply, that is, with (ii) above being greater than (i).

Friedman [1959, pp. 329-30] reports that while in the long run, the income velocity of circulation of money balances in the U.S.A. has declined, over the reference cycles of the National Bureau of Economic Research, velocity movements have reinforced the effects on income due to changes in the money supply.[2] Furthermore, Friedman notes that over business

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[2] R.T. Seldon [1959] reports the same results, that is, that velocity in the U.S. has declined over the long run and moved pro-cyclically over the N.B.E.R. reference cycles.

cycles, velocity has a quantitative importance comparable with that of the money supply in explaining variation in income, and that this pro-cyclical variation in velocity is explained by the distinction between measured and permanent values. When economic activity is expanding, measured money income is likely to be above its permanent counterpart just as in recessionary circumstances it is likely to be below its permanent counterpart. The cyclical configuration of velocity follows from the permanent-measured dichotomy if it is assumed that permanent income is a weighted average of current and past measured incomes; in this case in order for permanent income to rise by one unit, current measured income has to rise by an amount greater than one unit.

A.A. Walters [1965, 1973] explains the underlying dynamics of Friedman's explanation of pro-cyclical velocity by recasting Friedman's basic demand function for money into one with income as the dependent variable. The basic demand function is:

$M_t{}^d = f(Y_{p(t)})$ where $M_t{}^d$ is the demand for money in period t and $Y_{p(t)}$ is permanent income in period t. Assuming a proportional relationship between the demand for money and permanent income, and that permanent income can be represented as a geometrically-declining weighted sum of current and past measured incomes, allows the demand function for money to be written as:

$$M_t{}^d = \gamma\ [Y_t + \lambda\ Y_{t-1} + \lambda^2\ Y_{t-2} + \ldots]$$

where $\gamma > 0$ and $0 < \lambda < 1$. The money supply M_t may be substituted for M_t^d if it is assumed that the money market is in equilibrium. The expression below is derived by performing this substitution and subtracting λM_t from M_t.

$$M_t - \lambda M_{t-1} = \gamma Y_t$$

Rearranging this expression in terms of Y_t yields:

$$Y_t = \frac{1}{\gamma} [M_t - \lambda M_{t-1}].$$

From this it is possible to distinguish the first round and second round effects of an expansion in the money supply from the steady state effects. A one unit increase in the money supply will initially raise income by $\frac{1}{\gamma}$ units; in the second period income will fall by $\frac{\lambda}{\gamma}$ units; thus the steady state effect is that income rises by $\frac{1}{\gamma}$ *minus* $\frac{\lambda}{\gamma}$ units or $(\frac{1-\lambda}{\gamma})$ units. In other words, income overcompensates in the first period and so velocity rises.

The most explicit account of the monetarist transmission mechanism is in Friedman and Schwartz [1963b]. While it is admitted that precision is not possible because of 'too meager knowledge', the likely repercussions on economic activity of open market purchases of securities are explored. The reason given for income 'overshooting' its eventual equilibrium level - at least the reason pertinent to the present theme - is that 'money holders over-estimate the extent of monetary redundancy, since they evaluate money stocks at unduly low levels of prices; they are slow, that is, to revise their estimates of permanent prices upward, hence they initially seek more radical readjustments in their port-folios than will ultimately turn out to be required' [Friedman and Schwartz, 1963b, p. 62]. In other words, the overshooting of income is attributed to lags between increases in the money supply and the appreciation by money holders of the effect those increases will have on permanent income. Suppose that there were no such lags. It might still be possible to explain pro-cyclical variations in velocity by distinguishing between stock and flow effects.

Consider two equilibrium states each of which is associated with a particular configuration of financial and physical assets: the initial equilibrium and the new one that ultimately results when the first is disturbed by a monetary expansion. Suppose that each of these equilibria is static in the sense that the stock of physical assets is replenished at the rate at which it decays (where decay equals consumption plus depreciation) so that income is equal to this rate of replenishment. If it is assumed that decay per period is a constant proportion of total physical asset holdings, the initial goods market equilibrium may be expressed in equational form as:

$$A_0 = K_0 - aA_0 + Y_o$$

where A_0 is the value of total physical asset holdings at the end of period 0, and, is equal to K_0, the value of the asset holdings at the end of the preceding period, since the rate of decay aA_0 is equal to the rate of production Y_0. For analytical convenience it is assumed that production for a period takes place instantaneously at the beginning of the period. The new equilibrium in a later period i can be expressed in similar form as:

$A_i = K_i - aA_i + A_i$ where all the i subscripted terms are larger than their 0 subscripted counterparts.

If income velocity is the same in the new equilibrium state as in the old then, $\frac{Y_0}{M_0} = \frac{Y_i}{M_i}$. However, the immediate effect of an increase in the money supply is to lower velocity, that is $\frac{Y_0}{M_i} < \frac{Y_0}{M_0}$. The situation in period 1 (the period subsequent to period 0), assuming income has already risen to Y_i, can be written as:

$$A_1 = K_0 - aA_1 + Y_i$$

But this is only an equilibrium position if aA_1 equals Y_i, that is, if $a[A_0 + Y_i]$ equals Y_i. While the stock of assets is growing, that is, while income is in excess of decay, the goods market is not in equilibrium. Clearly, it is possible to explain a transitional increase in velocity beyond $\frac{Y_i}{M_i}$ if the community regards with urgency the need to restore equilibrium. This depends not on any lack of foresight but rather on the reverse.

The above explanations of pro-cyclical velocity have two things in common. First, they assume a line of causation running from an excess supply of money, and second, they do not explain a great deal about the underlying economic process. It is possible that the utilisation of a Keynesian framework may contribute to an understanding of this process.

1.2 *A Keynesian Explanation of Pro-cyclical Velocity*

Friedman [1970a, p. 217] suggests that Keynesian analysis implies a negative short-run association between velocity and the money supply. This negative association, however, results from a "Keynesian" analysis which concentrates on the speculative demand for money and ignores finance and transactions demand. A Keynesian explanation of the pro-cyclical variation of velocity follows.

The velocity equation for 'active' money balances may be written as:

$$V = w_1 \left[\frac{N}{M_1}\right] + w_2 \left[\frac{R}{M_2}\right]$$

where N is non-routine expenditure and M_1 is that part of the money stock held to satisfy the requirements of this expenditure; R is routine expenditure and M_2 is the money held to satisfy the requirements of this type of expenditure. The w's are weights.[3] It is assumed that the momentum of the system depends upon the non-routine types of expenditure.

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$$w_1 + w_2 = 1$$

$$w_1 = \frac{M_1}{M_1 + M_2}, \qquad w_2 = \frac{M_2}{M_1 + M_2}$$

With a fixed money supply and a constant non-routine expenditure flow, velocity tends to be constant. If financial provision is sought in advance for non-routine types of expenditure, an increase in planned expenditure will tend to depress velocity provided that the banking system, at least to some extent, expands loans to meet the increased demand. Consider an equilibrium in period (t-1) with expenditure flows N_{t-1} and R_{t-1} and associated money balances M_1 and M_2; the situation in period (t) after non-routine expenditure planned for the forthcoming period has increased is:

$$V_t = w'_1 \left[\frac{N_t}{M_1 + m}\right] + w'_2 \left[\frac{R_t}{M_2}\right]$$

where m is the increase in the money supply and where $N_t = N_{t-1}$ and $R_t = R_{t-1}$. Overall, velocity falls. The initial increase in velocity occurs when the non-routine expenditure plans are executed; the situation then is:

$$V_{t+1} = w''_1 \left[\frac{N_{t+1}}{M_1 + m}\right] + w''_2 \left[\frac{R_{t+1}}{M_2}\right]$$

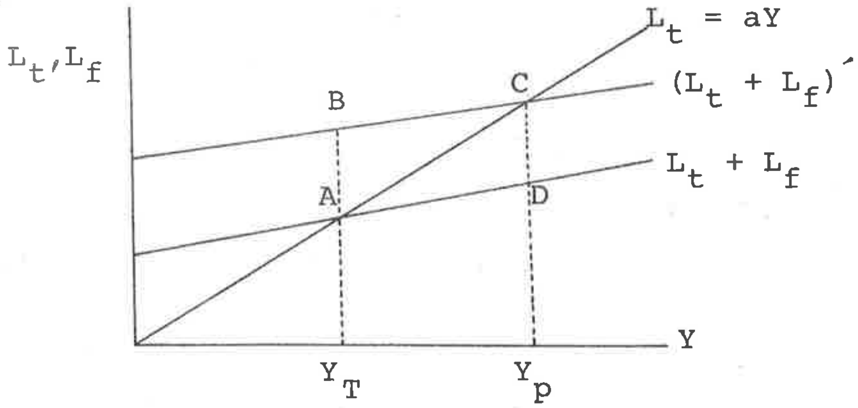
where $N_{t+1} > N_t$ but where $R_t = R_{t+1}$. This initial increase in velocity will be compounded in subsequent periods by the second-round income effects if the money supply does not increase proportionately. The money supply may not so increase (i) because the organisational expertise responsible for securing bank advances in the case of large scale expenditure plans may not be as evident during the second-round income expansion, and (ii) because the central bank may curtail the ability of the banking system to increase advances during the later part of the cyclical upswing. The situation in period (t+2) if the money supply does not increase beyond its level of period (t+1) is:

$$V_{t+2} = w'''_1 [\frac{N_{t+2}}{M_1 + m}] + w'''_2 [\frac{R_{t+2}}{M_2}]$$

where $N_{t+2} = N_{t+1}$ but where $R_{t+2} > R_{t+1}$. It is to be expected that the increase in velocity will be accompanied and, at least in part, precipitated by increases in the rate of interest. Finally, velocity may receive an additional impetus if expenditure plans and thus the money supply decline prior to income peaking - this point is developed below.

This sequence can be illustrated diagramatically (diagram 1) by making use of the combined finance and transactions demand schedule of diagram 1 of chapter 4 and by considering two levels of planned expenditure.

Diagram 1.



Consider an initial equilibrium at position A. Velocity is relatively stable while this equilibrium obtains. An increase in planned expenditure is illustrated by an upward shift in the $(L_t + L_f)$ schedule. The new equilibrium is at position C in the diagram, but income remains at Y_T until the increase in planned expenditure is executed. However, the demand for money has increased and this is illustrated by the move from A to B. If the banking system responds to this increased demand for funds, velocity will fall. The execution of the investment plans and the second-round income effects are illustrated by the move from B to C, throughout the period of which velocity is increasing.

This analysis can be carried a stage further by assuming that Y_T and Y_P are, abstracting from trend, the respective trough and peak levels of income in a typical cycle. The path of the cycle from trough to trough is represented by the path A→B→C→D→A. Starting from position A it may be observed that the increase in the demand for money occurs before the increase in income. Hence (provided that the money supply is endogenously determined) the timing relationship between the money supply and income is consistent with money leading income. The path B→C depicts income increasing from a trough to a peak. While it may seem from the diagram that the money supply peaks simultaneously with income, it must be remembered that expenditure plans precede income and that the excess of planned expenditure over actual income ($Y^* - Y$) is likely to be zero prior to the peak in income; that is, there is likely to be a lag between the time when the excess of planned expenditure changes from being positive to being negative and the time when, in consequence, income turns down. The money supply therefore, falls off before the peak in income and, of course, continues to fall after income peaks - the community in general retire loans acquired when planned expenditure exceeded current income.[4] As a result, it is possible that velocity will go on rising after income peaks. It will begin to fall when the income fall from D to A overwhelms the decline in the money supply and will fall strongly around the trough in income as the positive excess of planned expenditure (which precedes the upturn in activity) induces an increase in the money supply. It is possible, however, to be more specific about the timing relationships between the money supply and economic activity implied by the demand function for money specification introduced in chapter 4.

1.3 *Timing Relationships*

Tobin [1970] argued that while the demand for money based on permanent income can explain cyclical fluctuations in velocity, it is inconsistent with the observed *temporal* relationship between income and the money supply. In other words, the immediate response of measured income to changes in the money supply implied by Friedman's theory of the amplitude of cyclical fluctuations is not consistent with the leads (reported by Friedman) of the rate of change of the money stock over the rate of change of income and over the level of income. In reply Friedman [1970c] pointed out that the demand function referred to by Tobin was intended by Friedman and Schwartz [1963b] to be 'one element of a theory designed to account for the

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[4]Once trend is reintroduced into the analysis it may be possible on a macroeconomic level to perceive only that the money supply is increasing at a slower rate than income.

observed tendency of cyclical fluctuations of income to be wider in amplitude than cyclical fluctuations in money' and was not presented 'as accounting for the timing of observations'. However, no matter what Friedman and Schwartz may have *intended*, it is surely a serious matter when a theoretical construct, designed to explain one piece of evidence, is inconsistent with another.

Using U.S. data, Friedman and Schwartz [1963b] concluded that the rate of change of the money stock consistently leads income at business cycle peaks and troughs. Using a "Keynesian" model, with very special assumptions, Tobin [1970] demonstrated that a lead of the rate of change of the money supply over the rate of change of income and over the level of income is consistent with an endogenously determined money supply.

Tobin's model assumes that (i) the banks and monetary authorities provide sufficient funds to keep the rate of interest constant; (ii), the demand for money is the sum of an asset demand which is related to wealth and a transactions demand which is related to current income and (iii), - the critical assumption - that the government debt is a part of the private sector's wealth and that at certain high levels of income a growing budget surplus results in a sufficient decline in the asset demand for money to outweigh the increasing asset demand caused by a growing capital stock. The basic demand function is:

$$M = a_0(r)\ (D + \alpha K) + a_1\ Y \qquad \ldots\ldots (6.1)$$

where M is money (including time deposits), r is the rate of interest, D is the government debt, K is the capital stock and Y is income. As r is constant throughout, taking the total derivative of (1) with respect to time yields:

$$\frac{dM}{dt} = a_0\ [\frac{dD}{dt} + \alpha \frac{dK}{dt}] + a_1 \frac{dY}{dt} \qquad \ldots\ldots (6.2)$$

It follows from assumption (3) that $\frac{dK}{dY} > 0$, that is, the capital stock increases as income increases, and that beyond a particular level of income, say Y_1, $\frac{dD}{dY} < 0$, that is, the government debt falls as income increases. Furthermore, at some level of income $Y > Y_1$,

$$\left| a_0 \frac{dD}{dt} \Big/ dY \right| > \alpha\ a_0 \frac{dK}{dt} \Big/ dY$$ that is, the rate of fall in the asset demand for money over time through an increasing budget surplus outweighs the rate of increase in the asset demand for money over time through an increasing capital stock, so that, in total the asset demand for money falls.

Therefore, beyond a certain level of income there are two conflicting forces influencing the money supply - the asset demand tending to decrease it and the transactions demand tending to increase it. Under these circumstances, it is plausible that the rate of change of the money stock peaks prior to the peak in the rate of change of income and prior to the peak in income which of course lags its own rate of change.

Friedman [1970c] in reply pointed out that Tobin's results were obtained, not from a Keynesian demand function for money at all, but from a 'highly peculiar' construct of Tobin's own. In the present context, the significance of this exchange is that it highlights the need to provide an explanation of movements in money and expenditure flows which is securely grounded in a Keynesian model.

1.4 *A Keynesian Model of Timing Relationships*

It is assumed here, as in Tobin's model, that the banking system and monetary authorities act to keep interest rates constant by tailoring the supply of money to the demand for money. In these circumstances a simple Keynesian demand function for money can be written as:

$$M_t = aY_t + b[Y_t^* - Y_t] + c\bar{i} \qquad \ldots\ldots (6.3)$$

where M_t is the money supply (= demand). Y_t is current income, Y_t^* is the level of expenditure planned for the next period, i is the rate of interest held constant at $\bar{i}$, aY_t is the transactions and revolving fund of finance demand for money, $b[Y_t^* - Y_t]$ is the excess finance demand for money and $c\bar{i}$ is the fixed speculative demand for money. It is further assumed (i), that $[Y_t - Y_{t-1}]$ has the same sign as $[Y_{t-1}^* - Y_{t-1}]$, implying that income will start to increase one period after planned expenditure *minus* actual expenditure becomes positive and will go on increasing until one period after planned expenditure *minus* actual expenditure becomes negative; (ii), that the length of this period is about one or two quarters; (iii), that the relevant 'multiplier' is 2,[5] implying that the amplitude of fluctuations in Y is twice that of $[Y^* - Y]$; and (iv), that the time paths of Y_t and $[Y_t{}^* - Y_t]$, abstracting from trend, can be represented by sine curves.

It follows from assumption (iv) that the demand function above may be written as:

$$M_\Theta = a[K + E \sin(\Theta - F)] + b[G \sin(\Theta)] \quad . . . (6.4)$$

where Θ = 360 degrees multiplied by (t/T) where T is the time period of one complete cycle; K is constant and is the mean value of Y_t; $|E|$ is the amplitude of fluctuation of Y_t; F is the phase shift[6] - that is, the lead in degrees of $[Y_t{}^* - Y_t]$ over Y_t, and $|G|$ $(=\frac{1}{2}|E|)$ is the amplitude of fluctuations of $[Y_t{}^* - Y_t]$. The period of one complete cycle, that is, 360 degrees, is taken to represent a three-year or four-year business cycle. The results based on a four-year cycle are in brackets after the corresponding results for a three-year cycle.

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[5] The true value of the multiplier probably lies between 1 and 2.

[6] F is equal to 90 degrees + (360 degrees multiplied by the ratio of the length of time that income will be increasing after the excess of planned expenditure has ceased to be positive to the time period of one complete cycle). On the graphs F equals 120 degrees.

It is assumed for the present that a = b. A representation of the sine curves $a[K + E \sin(\Theta - F)]$ and $b[G \sin(\Theta)]$, as well as their sum *plus* $c\bar{i}$, which represents the time path of the money supply, are graphed overleaf. The graphs are based on a one-quarter lag between a negative excess of planned expenditure and the consequent downturn in income.

The graphs show that the money supply leads income by 30 degrees or by one quarter (4 months) and that the rate of change in the money supply leads income by 120 degrees or by one year (16 months).[7] Graphs based on a two-quarter lag between a negative excess of planned expenditure and the downturn in income would show leads of approximately 2.4 (3.2) months and 11.4 (15.2) months respectively.[8] These results

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[7] Graph 2 is used as the reference cycle for income. While the income cycle may have a different amplitude, its phase is the same as that of graph 2.

[8] With a two-quarter lag the income cycle peaks at 240 degrees and the phase shift, F, is equal to 150 degrees. To find the related peak in the money supply cycle, maximise:

$$M = aK + aE \sin(\Theta - F) + bG \sin(\Theta) + c\bar{i}$$

Taking the first derivative with respect to Θ, substituting in the value of F; the assumed restrictions on a, b, E and G, and setting the result equal to zero gives:

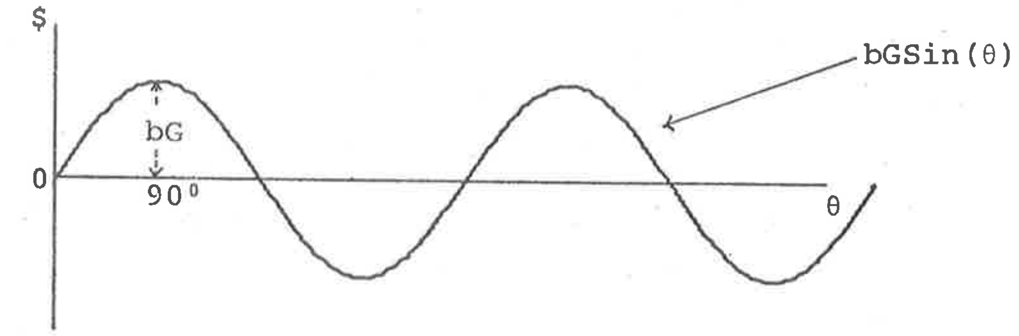
$$\cos(\Theta - 150^0) = -\tfrac{1}{2}\cos(\Theta)$$

which may be written as:

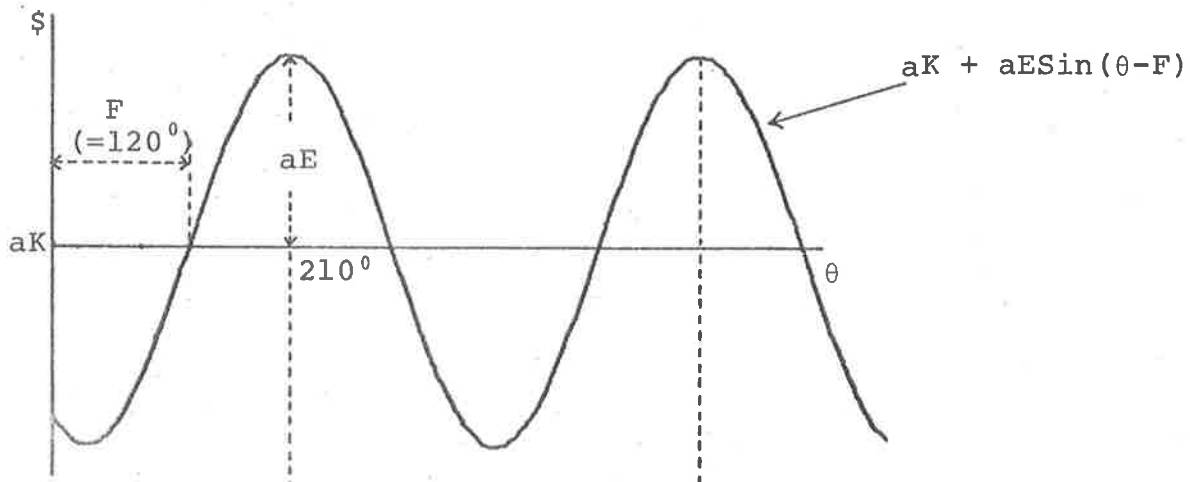
$$\cos(\Theta)\cos(150^0) + \sin(\Theta)\sin(150^0) = -\tfrac{1}{2}\cos(\Theta)$$

and solved to give a 'maximum' solution of $\Theta \simeq 216^0$. The money cycle, therefore, leads the income cycle by $(240-216)^0$ or by 2.4 months when based on a three-year reference cycle. The rate of change of the money cycle leads the income cycle by an additional 90^0 or by an additional nine months.

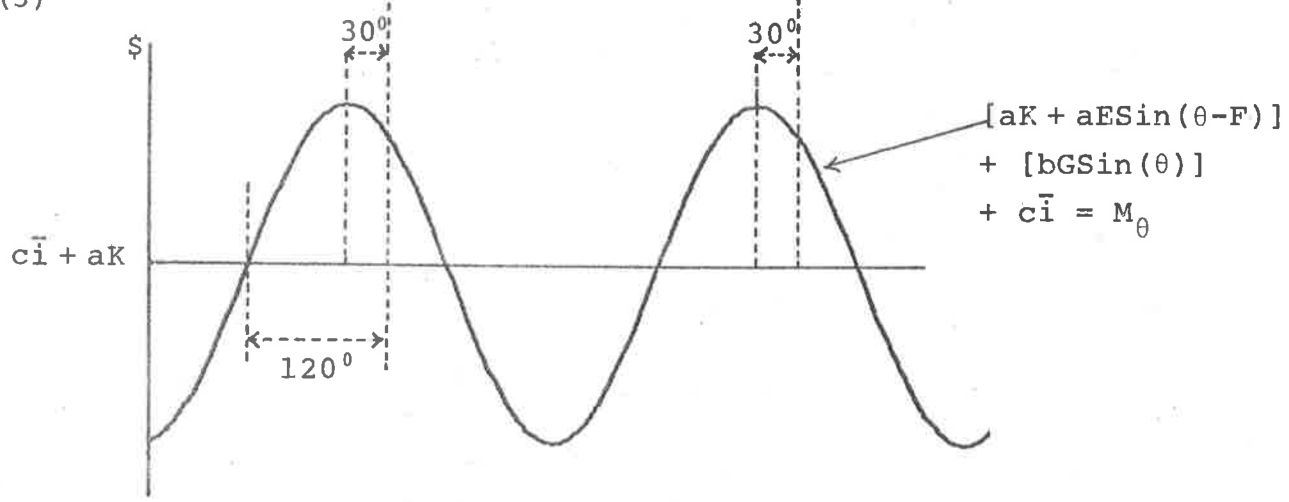
(1)


$
bGSin(θ)
bG
0
90°
θ

(2)


$
aK + aESin(θ-F)
F
(=120°)
aE
aK
210°
θ

(3)


30°
30°
$
[aK + aESin(θ-F)]
+ [bGSin(θ)]
+ cī = M_θ
cī + aK
120°

are in line with Friedman's empirical findings,[9] and show that the Keynesian construct, properly specified, can, when the money supply is endogenously determined, account for the timing relationships between money and income. The explanation further illustrates how, despite the scepticism of Friedman [1970c, p. 325], the timing relationship between money and business activity can be reconciled with an endogenously determined money supply.

It can be noted that the lead times would tend to be shorter (longer) the greater (smaller) is the magnitude of the 'multiplier' and the greater is the excess of a over b (b over a). Anything, in other words, which increases (decreases) the dominance of the income cycle over the excess of planned expenditure cycle in the demand function for money tends to reduce (increase) the lead times.[10]

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[9] See Friedman [1961] and Friedman and Schwartz [1963b]. In Friedman [1961] it is noted that on average peaks in the rate of change of the money stock precede N.B.E.R. reference cycle peaks by 16 months, and that 'such absolute peaks as occur in the money stock precede reference cycle peaks by less than five months and may even lag'.

[10] The order of magnitude of the results are, however, resilient to moderate changes in the assumptions made on page 115; readers are invited to verify this for themselves.

2. The Cyclical Path of the Rate of Interest and Velocity.

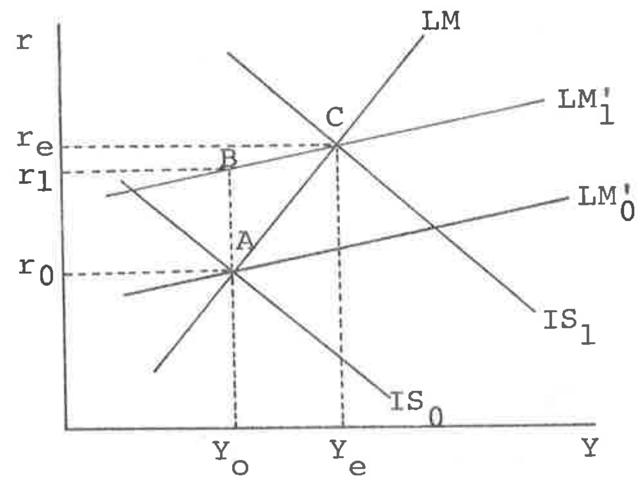
In the previous section it was shown how a Keynesian demand function for money has implications which are consistent with the cyclical quantity and timing relationships between economic activity and the money supply. This section goes a little further and sketches, perhaps speculatively, the likely path of the rate of interest throughout a cycle. The timing relationships between the money supply, economic activity, velocity and the rate of interest, are then drawn together to give a theoretical backdrop to the cross-spectral results presented in the next chapter.

2.1 *The Rate of Interest*

The analysis below is based upon and extends the analyses of the previous section and of chapter 4. Both the conventional and finance-demand-modified LM schedules are used to simulate a complete cycle. The problem is one of determining the timing relationship between disequilibrium in the money market and the consequent change in the rate of interest. On a theoretical level it is only possible to be tentative and impressionistic. The configurations traced below should be considered in this light. IS-LM analysis is used to infer a possible lag structure when the finance motive is important.

In diagram 2 below LM' is the LM schedule based upon the transactions and finance demand specification

Diagram 2.



$L_t = aY + b(Y^* - Y)$, where L_t is the sum of transactions and finance demand, Y is income, $(Y^* - Y)$ is the excess of planned expenditure over income, a is the demand for money for each one dollar of current income and b is the demand for money for each one dollar of the excess of planned expenditure over current income. The schedule LM is based upon the conventional transactions demand specification $L = aY$.

It is assumed that the system is initially in disequilibrium at an income level of Y_o and an interest rate of r_o. It is also assumed that Y_o and r_o were the equilibrium levels of income and the rate of interest in the previous period. The goods market is in disequilibrium. The money market is in a 'stationary' stock equilibrium based upon realised plans of the previous period. (See Hicks [1965, Ch. 8].) But, it is in disequilibrium if plans of the current period are considered; this is indicated by the divergence of LM_1'

from LM. The momentum of the system is initiated by the goods market disequilibrium. The disequilibrium in the money market follows on from this.

This shift of the LM' schedule from LM'_o to LM'_1 is due directly to the IS schedule shifting from IS_o to IS_1. (See Ch. 4, pp. 69-71.) Note that by assumption the new LM' schedule must cut the new IS schedule at the same point as does the conventional LM schedule, that is, at point C. (See Ch. 4.)

The path of adjustment towards equilibrium will depend on the reaction of the banking system and monetary authorities and the portfolio preferment of business and individuals. Initially, two possible paths are suggested. The first: A→B→C, assumes a fixed money stock and completely flexible interest rate. The interest rate rise of r_o to r_1 is due to demand for finance balances; the further rise to r_e, is due to the need for cash balances to service the transactions following from the income rise of Y_o to Y_e.

The second path: A→B→A→C, differs from the first because of the portfolio preferment of those who sell capital goods. If on receipt of the cash inflow they retire debt of an equal magnitude to that which was created by those in need of finance,[11] then the interest rate will return to its original

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[11] This alternative path is suggested by Hines [1971a, b].

level. The path A→C and the associated interest rate rise of r_o to r_e is indicative of the rise in income and the associated increased requirement of transactions balances and of the revolving fund of finance balances.

If the first path obtained then an increase in planned investment would cause an increase in the rate of interest, possibly contemporaneously but more probably, if institutional impediments exist, with a lag. A lull is then likely in the rise in interest rates until expenditure plans are executed and the second round income effects initiate further demands for funds, when the interest rate again may increase.

A similar sequence of events is consistent with the second path towards equilibrium. The interest rate is likely to have a more pronounced cycle between the expansion of expenditure plans and the second round income effects, but the lag relationships should be broadly the same. It is important to realise that lags between expenditure flows and the rate of interest are attributed to institutional rigidities. They do not follow from the analysis. However, empirically, they appear to exist. Cagan [1966] found using U.S. data that on the whole the rate of interest peaked after the business cycle peaked, the Bank of England [1970] found using U.K. data that G.D.P. leads interest rates by two quarters, and, foreshadowing the results of the next chapter, cross-spectral analysis of Australian data reveals that interest rates in general lag expenditure flows by from one to two quarters at business cycle frequencies.

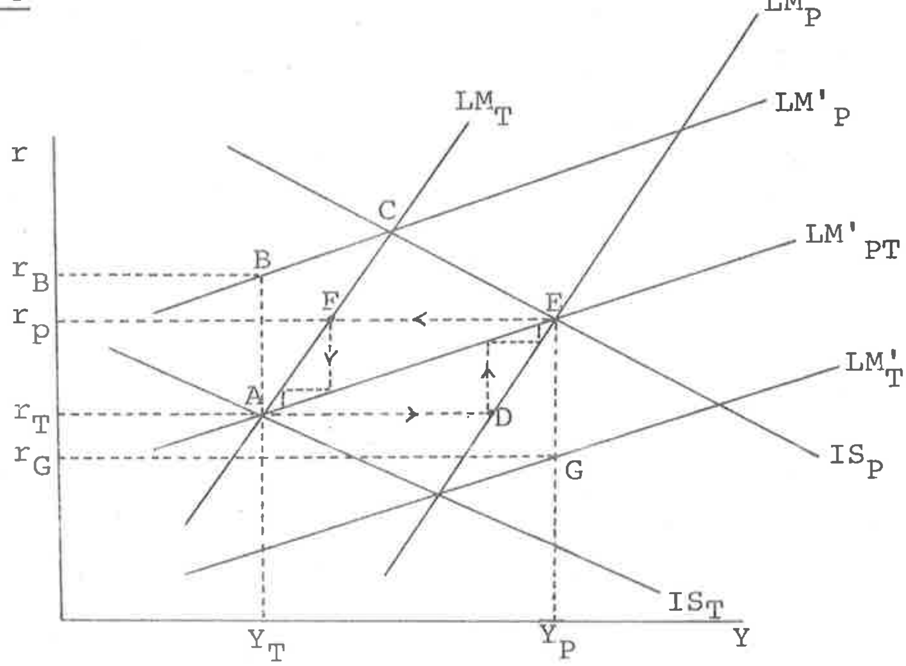
Lewis [1977], employing cross-spectral analysis and using Australian data, found that on the whole velocity movements lead interest rate movements. These results are entirely consistent, and more will be said of this later, with Cagan's, the Bank of England's and Chapter 7's conclusion that interest rates lag expenditure flows. Given this, it is at first glance surprising that the latter's conclusions seem unremarkable while Lewis's do not.

It is less surprising if either of two conventional explanations of the variation in velocity are examined. Suppose that actual velocity is made functionally dependent on an expected rate of interest (calculated as a weighted sum of current and past values), *or*, that desired velocity is made functionally dependent on the current rate of interest with the change in velocity in each period partially adjusting to the difference between desired velocity of that period and actual velocity of the previous period. Either of these explanations imply a lead of interest rates over velocity.

Lewis explains his results by assuming that interest rates bear the brunt of market clearing in the short run but that rigidities (due to market frictions, to transactions costs, and to the transitional period between the unexpected accumulation of excess cash balances and their dispersion on bond purchases) prevent the interest rate from immediately assuming its equilibrium value. In these circumstances velocity may lead interest rates even though interest rates play a causal role. At issue is the mechanism underlying movements in velocity. If these, as is usually suggested, are precipitated by changes in the rate of interest, why does the rate of interest lag and not lead? The explanation below differs from other explanations in not relying upon institutional impediments.

A diagram similar to diagram 2 is used except that the two IS schedules, abstracting from trend, are assumed to correspond to levels of planned expenditure in the trough and peak of a typical business cycle. The further crucial assumption is made that in the trough of a cycle there is sufficient slack in the economy to allow spending units to borrow from the banking system without raising the rate of interest.

Diagram 3



IS_T and IS_P are the trough and peak IS schedules respectively. There is an initial equilibrium at point A with a level of income Y_T and interest rate r_T. Consider an increase in planned expenditure shifting the IS schedule to IS_P. If the money supply does not increase, the interest rate will rise to r_B as the LM' schedule LM'_{PT} shifts to LM'_P. However, if the banking system allows spending units to borrow their requirements the interest rate will not rise. The consequent increase in the money supply is shown as a shift in the LM schedule from LM_T to LM_P, the LM' schedule remains at LM'_{PT} instead of shifting to LM'_P. The new equilibrium is at E instead of at C. Expenditure to the extent of AD can now go ahead without the rate of interest rising. It is this amount of expenditure, the horizontal distance between the pertaining LM' and LM schedules, which is the extent of the expenditure plans for which funds are available. If, as is assumed in the previous section, the second-round income effects are not supported by increases in the money supply then the rate of interest will rise as income increases beyond D. This rise is shown as the zigzag path D to E.[12] The important point is that the initial increase in expenditure and velocity is due to (i) financial provision being sought in advance of the expenditure taking place and (ii) the banking system having

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[12] The zigzag path reflects the effect on the rate of interest of successive lumps of induced expenditure. All that this is meant to indicate is that the second-round income effects will raise the rate of interest, it is not meant as a diagrammatic depiction of the actual dynamic process.

sufficient slack to enable spending units to borrow their requirements. The second-round increases in expenditure and velocity are supported by increases in the rate of interest.

Consider, after the economy has reached point E, a decrease in planned expenditure shifting the IS schedule back to IS_T. If the money supply does not decrease the interest rate will fall to r_G as the LM' schedule LM'_{pT} shifts to LM'_T. However, if spending units retire bank loans acquired when expenditure plans were high the interest rate may not fall. Suppose the decrease in the money supply is just sufficient to maintain the LM' schedule at LM'_{pT}. The LM schedule will shift from LM_P to LM_T and the new equilibrium is at A. Expenditure can now fall by FE, the extent of the expenditure plans for which funds have been depleted, without the rate of interest falling. If the money supply is not further depleted the rate of interest will fall as income falls beyond F. This fall in the rate of interest is shown as the path F to A.

To summarise: expenditure begins to rise before interest rates rise and begins to fall before interest rates fall. The path of the interest rate throughout a cycle from trough to trough is shown as A→D→E→F→A. However, the interest rate is rising and falling over only portions of the path. Specifically, it rises from D→E, and falls from F→A, coincident with the second-round income expansion and contraction respectively. Expenditure in total will, therefore, lead interest rates at the trough and peak of a cycle.

An additional explanatory note on diagram 3

The object is to trace the likely path of the rate of interest given that the finance motive is important. Two points are identified: a trough and peak equilibrium (A and E respectively).

The path between these two equilibria is traced by employing both LM schedules - one incorporating the excess of planned expenditure (the finance modified LM) the other based on the assumption that Y* = Y (the conventional LM which assumes a zero excess of planned expenditure). This latter schedule is useful because it identifies positions where the rate of interest will begin to rise and fall, *after* a period of positive or negative excess of planned expenditure for which a money supply provision is available - see points D and F.

The modified LM is useful because it shows

(i) the increase in the interest rate which would occur if planned expenditure increased and the money supply did not (A - B);

(ii) if the money supply increases just sufficiently to cater for the increase in planned expenditure, where the new equilibrium will be - at E, and

(iii) by identifying position E, the extent of expenditure which can proceed without the rate of interest rising (A - D).

The analysis uses both LM schedules to identify specific turning points.

It is not suggested that the above explanation of why interest rates lag expenditure and velocity is inherently superior because it does not involve institutional impediments; these may have to be considered in any complete explanation. What is suggested is that any complete explanation of the cyclical movement of monetary aggregates must take cognisance of the finance motive. Certain important observed monetary phenomenon, which otherwise can be explained only by contrivance, can be explained quite straightforwardly once account is taken of the finance motive.

2.2 *Velocity*

Clearly, the money supply, income and income velocity, are three variables with only two degrees of freedom. It may be thought more advantageous to consider the relationship between the money supply and velocity or, alternatively, between the money supply and income, but arithmetically it makes no difference. Given values for any two of the variables means that the third is also determined. That is to say, once an explanation of the money supply's cyclical phase and amplitude and of income's cyclical phase and amplitude have been provided, so has an explanation of income velocity's cyclical phase and amplitude.

The finance motive does provide a rationale for velocity peaking after expenditure or income has peaked; this is bound up with the money supply turning down before and as income peaks, due to the decline in planned expenditure. In fact, and this can be demonstrated algebraically,[13] if sine curves

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[13] Let the income cycle be represented by:

$$Y = \bar{Y} + 2K \sin(x)$$

and the money supply cycle by:

$$M = \bar{M} + K \sin(x + 30^0)$$

where a bar indicates an average and where K is the amplitude of fluctuations of the money supply cycle. The money cycle leads the income cycle by 30^0 or by one quarter based on a three year cycle. The income velocity cycle is given by:

$$V = \frac{Y}{M} = \frac{\bar{Y} + 2K \sin(x)}{\bar{M} + K \sin(x + 30^0)}$$

and the first order condition for a maximum is where

$$-K = \underset{(A)}{[2\bar{M} - .866\bar{Y}]} \cos(x) + \underset{(B)}{.5\bar{Y}} \sin(x) \quad \ldots (1)$$

By putting $\sin(\Theta) = \frac{B}{\sqrt{A^2 + B^2}}$ and $\cos(\Theta) = \frac{A}{\sqrt{A^2 + B^2}}$

(1) may be rewritten as:

$$-K = \sqrt{A^2 + B^2}\ [\sin(\Theta) \cos(x) + \cos(\Theta) \sin(x)]$$

and simplified to:

$$-K = \sqrt{A^2 + B^2} \sin(x + \Theta) \quad \ldots (2)$$

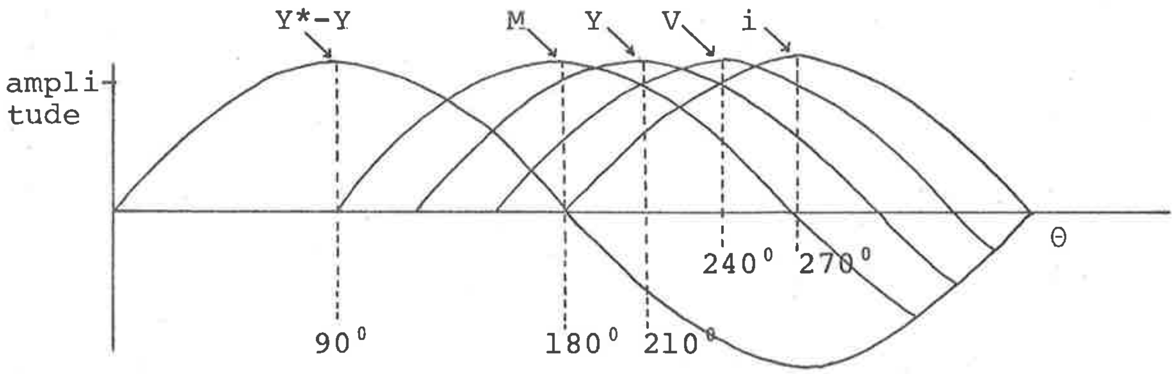
where $= \text{arcsine} \left(\frac{B}{\sqrt{A^2 + B^2}} \right)$.

An average of the Australian quarterly estimates of seasonally adjusted G.D.P. and M1 money, for the period 1952(3) to 1973(4), of \$4710m. and \$4013m. respectively, were used as estimates of $\bar{Y}$ and $\bar{M}$. The amplitude of the income cycle (2K) was taken to be 5% of the average value of income giving a value of K of \$118m. Inserting these values into equation (2) and solving, gives a *maximum* solution value of x of approximately 122^0. The velocity cycle peaks, therefore, 32^0 (or 1.07 quarters based on a three year cycle) after the income cycle peaks.

are used and reasonable values are assumed for the phase and amplitude of the money supply and of the income cycle - values consistent with those suggested in section 1 - income velocity peaks and troughs approximately one quarter after income peaks and troughs and, therefore, approximately one quarter before the rate of interest peaks and troughs.

2.3 *Summary of timing relationships*

The graph below is based upon the timing relationships suggested in this and the previous section. The emphasis is on the phase so that all cycles are drawn with the same amplitude. A three year reference cycle is used.



The graph shows the excess of planned expenditure leading income by four quarters (120°); the money supply leading income by one quarter (30°) and income leading velocity and the rate of interest by one quarter (30°) and two quarters (60°) respectively. The timing relationships between the money supply, income, velocity and the rate of interest suggested by the graph correspond approximately with the empirical evidence - some of which has been cited. It has shown that the finance motive can add considerably to an understanding of these relationships. The excess of planned expenditure series has never so far been considered in empirical work. The next chapter to an extent remedies this although, it must be admitted that by its nature, the variable may be more subject than most to measurement error. Also, the variable used refers specifically to investment plans of business and does not include consumer durable expenditure plans. Ideally both should be included.

CHAPTER 7

CROSS-SPECTRAL TESTS OF CYCLICAL TIMING RELATIONSHIPS

Introduction

The timing relationships between the real and the monetary sectors were considered in the previous chapter. This chapter reports the results of cross-spectral tests of the cyclical timing relationships between monetary and expenditure variables using Australian data. While these results, as will be explained, must be treated circumspectly, they do provide independent evidence with which to compare the findings of the previous chapter, as they may of themselves suggest new theoretical explanations.

The format of this chapter is as follows: first, there is a brief description of cross-spectral output statistics; second, the variables used in the tests are listed and some comment made on them; third, there is an explanation of the filtering procedures used; fourth, some tables of test statistics are explained and presented; fifth, there is an explanation of the way the cross-spectral results are tabulated, and last, the results are presented and suggestions made on their interpretation.

1. Cross-Spectral Output

Spectral analysis is essentially the decomposition of the variance of a time series into components attributable to different frequencies. Cross-spectral analysis investigates the association between two variables in the frequency domain. A useful summary of this association is provided by three statistics: the coherence, the phase, and the gain.

The coherence is analogous to the correlation coefficient in time domain analysis; it is the correlation between the amplitudes of the spectra of two series at a particular frequency, and is a measure of the strength of the relationship between two variables in the frequency domain. The phase is a measure of the extent to which at particular frequencies one series leads another. However, care has to be taken when interpreting the phase in terms of time lags. J.C. Hause [1971] points out that in general only in the case of pure time delay is there a simple correspondence between the phase and lags in the time domain. Where complicated lag structures link one variable to another or where, as would be expected with economic variables, feedback is present, it becomes difficult to interpret the phase. It should also be pointed out that as with time domain analysis, there is no surety that a discovered short lead is not in fact a long lag.[1]

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[1] For these reasons and (i) because of the use of bivariate as distinct from multivariate spectral analysis, and (ii) because of the concentration on a particular frequency band, the spectral results, generally, will not be used to infer lag structures for the multiple regression tests of the next chapter.

The gain is the amplitude of the output for a sinusoidal input of unit amplitude. It is analogous to a regression coefficient. This can be appreciated if it is assumed that a process Y_t is the output and a process X_t is the input. The gain is then the amount by which the amplitude of the process X_t at a particular fequency has to be multiplied in order to equal the amplitude of the process Y_t at the same frequency.

2. The Data

There are two sets of quarterly data used in the tests. They are a seasonally adjusted set and unadjusted set of undeflated expenditure, planned expenditure, and monetary data. Some experiments with annual data did not produce promising results. In some respects the available annual data set, composed of 114 observations from 1861 to 1974, is superior to the quarterly data sets. It obviously contains many more short business cycles than does the twenty or so years of quarterly data. However, where most of the lags between series are measured in quarters rather than in years, annual observations may not produce a sufficient degree of sensitivity. There is also probably an alaising problem which compounds cycles of period less than two years with those of more than two years. (See Fishman [1969, p. 37].) It was, therefore, decided to rely exclusively on the quarterly data. A list of the variables used in the tests is given below; the seasonally adjusted equivalent (separated by a comma and suffixed by the letter S) follows each unadjusted variable.

E1, E1S	-	Gross private fixed capital expenditure (unadjusted, adjusted).
E3, E3S	-	Consumer durable expenditure.
E4, E4S	-	G.N.E.
E4123, E4123S	-	E4 *minus* (E1 + E3 + Gross public fixed capital expenditure).
*C12, C12S	-	*interpolated* new capital expenditure by business on machinery, plant and buildings.
*C12A, C12AS	-	C12 anticipated six months in advance.
*X3, X3S	-	C12A/C12 (the excess of planned expenditure over actual expenditure)
M1, M1S	-	Current account deposits plus notes and coin.
M2, M2S	-	M1 plus interest bearing deposits.
M3, M3S	-	M2 plus savings bank deposits.
R2	-	Two year government bond rate.
V1E4, V1E4S	-	E4/M1.
V2E4, V2E4S	-	E4/M2.
V3E4, V3E4S	-	E4/M3.
V31E4, V31E4S	-	E4/(M3-M1).
V1Y, V1Ys	-	G.N.P./M1.

For most variables there are 87 observations from 1952(2) to 1973(4) inclusive. Series which are asterisked contain 80 observations from 1954(1) to 1973(4) inclusive. E1 and E3 are sometimes referred to as non-routine expenditure and E4123 as routine expenditure. The planned expenditure series are published as a six monthly series and have been converted to a quarterly series by the use of an interpolation procedure. More information on each of the variables is given in the data appendix. If a first difference of the logarithm is used in the tests it is indicated by prefixing the variable with the letter D. Thus DM1 is the first difference of the logarithm of M1. There is no seasonally adjusted equivalent of R2 - see the data appendix.

3. The Filtering Procedures

The twenty years of quarterly data which is available does not ideally satisfy the requirements of spectral analysis. However, following Fishman [1969] it was considered that some use could be made of the technique provided the data were adequately prewhitened. In spectral analysis it is not so much the number of observations which is important but the ratio of the number of observations to the number of frequency points for which the spectrum is to be estimated. Granger and Hatanaka [1964, p. 61] note that N/M, where N is the number of observations and M the number of lags or frequency points, should only rarely be as low as 3 and suggest 5 or 6 as reasonable. The trade off, involved in choosing the number of lags, is between good resolution of the spectrum (the more discernable the peaks the better the resolution) and a low variance of the spectrum estimates. After some experimentation using 20, 24, 28 and 32 lags it was decided that 24 gave a sufficient number of frequency points and that using extra lags did not significantly improve resolution. After filtering, the use of 24 lags resulted in N/M ratios of between 3.04 and 3.54 depending on the series involved. Although these N/M ratios are a little low, they are comparable with the N/M ratio used by Fishman [1969, Ch. 5] in analysing the income-consumption relationship of the United States.

All series were log-transformed (to the base e) to render them more homoscedastic. The filtering technique used to attenuate variations in the mean was that of quasi-differencing. The advantages of this method are that the original spectrum may be recovered, that is, the prewhitened spectrum may be recoloured, and that the method is computationally straightforward - see Fishman [1969, pp. 112-118].

With the seasonally adjusted series the object of filtering is to detrend the series; with the unadjusted series the object is to detrend and deseasonalise the series. The effect of the detrending filter is to reduce the amplitude of the long cycles while increasing the amplitude of the short cycles. In the time domain sense, trend in all of the series is adequately removed using the quasi-differencing model: $Y_t = X_t - .95X_{t-1}$ (where X_t is the original series and Y_t the filtered series), however, in the harmonic domain most power still remains in the low frequencies. It is comforting, if not helpful, to verify that the data used here, when detrended, produces what Granger [1966] calls the 'typical spectral shape of an economic variable'. In order to even out the spectra higher order quasi-differencing models were tried. In general the seasonally adjusted series is adequately filtered using a model of the form: $Y_t - X_t - \alpha^2(2)X_{t-1} + \alpha^2 X_{t-2}$, with $\alpha = .97$. Various values of α were tried, and while this model did not remove power in the lower frequencies for the money supply series it did for the interest rate and velocity series. The third order quasi-differencing model, necessary to filter adequately the money supply series, gave a disproportionate accentuation to the high frequency content of the other series. As it is necessary, in order to preserve the phase relationship between two series, to apply the same filter to them both, there was no question of applying different filters to series which were to be compared. Thus the model chosen was a compromise.

In general the unadjusted data set was filtered more successfully than the seasonally adjusted data. The unadjusted data set was deseasonalised using a filter of the form:

$$Z_t = X_t - \beta X_{t-4}$$

Various values of β were tried (.75, .80, .85, .90, .95), and $\beta = .95$ used. This filter removed seasonality from most series without inducing a pronounced dip in the spectrum at the seasonal frequency point. The filter also removed some power from the lower frequencies. A filter to remove trend was applied to the Z_t series using a model of the form:

$$Y_t = Z_t - \alpha Z_{t-1}$$

After some experimentation using values of α of .80, .90, .93, .95 and .97, it was decided that $\alpha = .90$ was adequate for most series. The complete filter used for the unadjusted data set is:

$$Y_t = X_t - \alpha X_{t-1} - \beta X_{t-4} + \alpha\beta X_{t-5} \qquad \alpha = .90, \quad \beta = .95.$$

A limited number of tests were run using first difference of logarithm data. In these cases the unadjusted data set is filtered using a filter of the form:

$$Y_t = x_t - \beta x_{t-4}, \qquad \beta = .95.$$

where the lower case letters stand for first difference data. This filter adequately removes both seasonality and any remaining trend. The seasonally adjusted data set is filtered using a filter of the form:

$$Y_t = x_t - \alpha x_{t-1}$$

where α =.35 in cases where the rate of interest is an involved series, and where α = .50 otherwise.

4. Test Statistics

The purpose of this section is to present two tables of test statistics. Table I lists significance levels for estimates of the squared coherence and Table II lists confidence bands for the phase angle. These tables will provide a convenient way to check the statistical significance of the results of Section 6.

The cross-spectral program uses Parzen II weights which implies an equivalent degrees of freedom (E.D.F.) of 3.7 N/M where N is the number of observations and M is the number of lags. Following a procedure in L.H. Koopmans [1974] the 5% and 10% significant levels for the estimated squared coherence corresponding to the different E.D.F.'s applying to the test results were calculated and are recorded below in table 4.1. It should be noted that the variance of the estimates of the gain and the phase are inversely related to the coherence [Fishman, 1969, p. 133], so that these estimates are more reliable when the coherence is high.

TABLE 4.1

E.D.F	Coherence^2	
	10%	5%
13.14	.34	.42
12.68	.35	.43
12.06	.37	.45
11.75	.38	.46
11.59	.38	.47

Table 4.2 lists for various values of estimated square coherence and for two values of E.D.F., the 95%, the 90% and the 80% confidence bands for the phase angle. These were calculated from a formula in Koopmans [1974, p. 285]. A 100 $(1-\alpha)$% confidence interval for $\emptyset_{j,k}(\lambda)$, where $\emptyset_{j,k}(\lambda)$ is the phase angle at frequency λ, is the set of all values of

$\emptyset_{j,k}(\lambda)$ which satisfy the inequality:

$$\left|\mathrm{Sin}(\hat{\emptyset}_{j,k}(\lambda) - \emptyset_{m,k}(\lambda))\right| \leqslant \left[\frac{1-\hat{P}_{j,k}(\lambda)^2}{\hat{P}_{j,k}(\lambda)^2(2n-2)}\right]^{\frac{1}{2}} t_{2n-2}(\alpha/2)$$

where $P_{j,k}(\lambda)^2$ is the squared coherence; n is equal to one half of the E.D.F. and $t_{2n-2}(\alpha/2)$ is the upper $\alpha/2$ boundary of the t distribution with 2n-2 degrees of freedom. The figures in the table are the arcsine of the right-hand side of the inequality, if these are designated as $\emptyset^*$, the confidence interval is:

$$\hat{\emptyset}_{j,k}(\lambda) - \emptyset^* \leqslant \emptyset_{j,k}(\lambda) \leqslant \emptyset_{j,k}(\lambda) + \emptyset^*$$

If the right-hand side of the inequality is equal to or greater than one, the confidence bands have not been recorded. As the coefficient of coherence become less, it grows more likely that the estimate of the phase $\hat{\emptyset}_{j,k}(\lambda)$, because of statistical error in the sign of the estimated co-spectrum and quadrature-spectrum, may be displaced by the amount Π. It is, therefore, common practise [see Koopmans, p. 286] to centre the confidence interval around $\hat{\emptyset}_{j,k}(\lambda)$ only until the right-hand side of the inequality equals one and thereafter to indicate that the phase may lie between $-\Pi$ and Π, the 'no information' interval.

All the cross-spectral results have E.D.F.'s of between 11 and 15. The confidence intervals are based on these two

E.D.F.'s and should provide a sufficiently accurate guide to the actual interval around each of the cross-spectral phase estimates.

TABLE 4.2

Confidence intervals in radians ($\pm\phi^*$)

Estimated Squared Coherence ($\hat{p}^2$)	Confidence Levels					
	95%		90%		80%	
	11 E.D.F.	15 E.D.F.	11 E.D.F.	15 E.D.F.	11 E.D.F.	15 E.D.F.
.25	-	-	-	1.02	.93	.70
.30	-	1.16	1.20	.85	.78	.61
.35	-	.96	.98	.73	.68	.54
.40	1.18	.82	.85	.65	.60	.48
.45	.99	.72	.74	.58	.54	.43
.50	.85	.64	.66	.51	.48	.38
.55	.75	.57	.59	.46	.43	.35
.60	.66	.51	.52	.41	.39	.31
.65	.59	.46	.47	.37	.35	.28
.70	.52	.40	.41	.33	.31	.25
.75	.45	.35	.36	.29	.27	.22
.80	.39	.30	.31	.25	.23	.19
.85	.32	.25	.26	.21	.20	.16

The following formula can be used to convert the confidence intervals to units of one quarter of a year (t):

$$t = \frac{\emptyset^*}{2\Pi} T$$

where T is the time period in quarters of a complete cycle

5. The Presentation of the Results

Rather than give the complete cross-spectral results for each pair of series tested an abbreviated procedure has been followed. Generally the frequency of interest is that of the short business cycle. Waterman [1972, p. 12] discerns four cycles within the period 1948 to 1964. Using the start of the 'boom phase' as a reference point, the relevant dates are November 1949, April 1954, February 1957, August 1959 and November 1962. The average length of each cycle is approximately 39 months; the shortest is 18 months and the longest 53 months. Assuming a similar pattern has obtained since 1964 it would be expected that spectral analysis would indicate some power over the frequency range .146 to .042, that is, between cycles occurring every 6.9 quarters and those occurring every 24 quarters. The procedure is to record the estimated squared coherence and phase over this frequency range and the average squared coherence over all frequencies. In addition, coherence weighted regression analysis is applied to the phase for frequencies in excess of the trend and below the seasonal. (See Praetz [1973].) Three models are tried, a fixed angle lag model, a pure time delay model, and a mixed model incorporating a fixed angle lag and a pure time delay. Where both coefficients are relatively significant using conventional 't' tests, the mixed model is recorded, otherwise the best fitting of the other models is recorded provided one or other is significant.[2]

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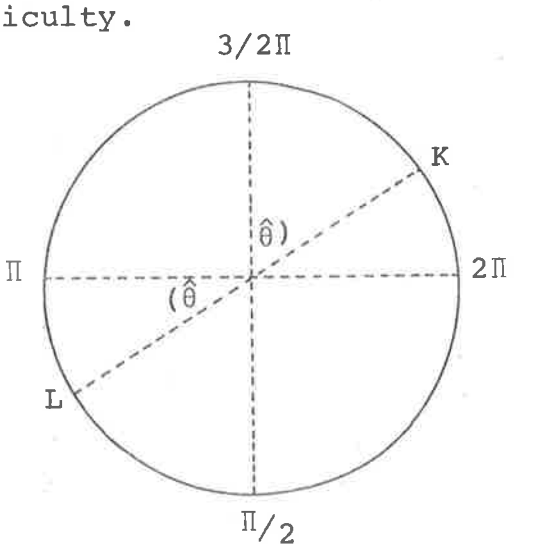
[2] Unless otherwise stated statistical significance is measured

The form of the model is C + DW, where C is the fixed angle lag in degrees and D is the pure time delay in quarters. In the tables of results a positive coefficient indicates that series A leads series B. An angle lag can be converted to its corresponding time delay by multiplying C by $T/360^0$, where T is the length in quarters of the cycle being considered.

It is mentioned in Section I that a discovered short lead may in fact be a long lag. However, the problem is a little more complicated than that. The cross-spectral program presents all phase values within the range $2\Pi \pm \Pi/2$, including those which are centred around Π and are measured from peak to trough. A circular depiction of a cycle illustrates the difficulty.



The estimate of the phase does not distinguish between series

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at the 5 per cent level; this applies both in this chapter and in chapter 8.

A leading series B by $\hat{\theta}$ radians from peak to peak and series A leading series B by $\hat{\theta}$ radians from peak to trough, that is, it does not distinguish between positions K and L. This difficulty is additional to that associated with the fact that a lead of θ radians can be interpreted as a lag of $2\Pi - \theta$ radians. However, while the latter difficulty can be solved only by resort to economic theory the former difficulty is susceptible to statistical enquiry. In particular, the sign of the cross-correlation coefficient around the time lag corresponding to the estimate of the phase, may indicate whether the lag is from peak to peak or peak to trough. A strong negative cross-correlation coefficient indicates that the lag is from peak to trough; a strong positive coefficient that it is from peak to peak. The phase estimates in the next section are therefore supplemented by relevant cross-correlation coefficients.

6. The Cross-Spectral Results

The emphasis of the tests is on the relationship between various macro-expenditure flows and monetary variables. The aim is not only to discover the phase relationship between expenditure, velocity, the money supply, and interest rates, but to see whether different categories of expenditure flows are similarly related or not. It will be observed that, notwithstanding the groundwork of the previous chapter, there is no *specific* model being tested. Empiricism is playing an overriding part. Granger and Hatanaka [1964, p. 4] provide a succinct statement in support of this approach. They note:

> "At one time the fitting of models to the available data was considered an essential part of the analysis but the more recent methods do not place any great emphasis on model-building. This is particularly true when relationships between series are considered, as the relationships are likely to be so complicated that only with great difficulty can they be fitted into an easily understood model.
>
> Applications of the results derived from an analysis will be, for economics at least, either of a predictive nature or as "facts" to be compared to a particular economic theory. The interplay between experimental results and theories in physics has led to great advances in the subject, and it is hoped that the sequence of finding theories to fit the facts and finding new facts for theories to account for will also strengthen economics. As all of the data for the important dynamic aspects of an economy consist of time series, it is clear that powerful methods of analysis are required for dealing with such data."

The empirical results have been divided, after some preliminary comments on the relationship between the planned and actual fixed capital expenditure series, into three parts. The first part (6.1) examines the relationships between the money supply and expenditure flows; the second (6.2) examines the relationship between velocity and expenditure flows; the third (6.3) examines the relationship between interest rates and expenditure flows and, to complete the analysis, examines the inter-relationships between the money supply, velocity and interest rates. A summary of the findings (6.4) completes the chapter.

As first steps the cross-spectral relationships between (i) planned new fixed capital expenditure and actual fixed capital expenditure (new and gross), and (ii) the excess of actual over planned new fixed capital expenditure and actual fixed capital expenditure (new and gross), were examined. The results are presented in tables 6.1 to 6.8.

Table 6.1

Series A - C12A Series B - E1 E.D.F. 11.59

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.74	1.58	.44	37.9 (8.7)	– (–)	+.48(2)
16.0	.60	1.95				
12.0	.54	1.85				
9.6	.44	1.37				
8.0	.35	.93				
6.9	.42	.66				

Table 6.2

Series A - C12A Series B - C12 E.D.F. 11.59

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.95	3.01	.49	– (–)	1.8 (5.1)	+.71(2)
16.0	.93	2.28				
12.0	.86	1.90				
9.6	.71	1.77				
8.0	.48	1.95				
6.9	.31	-1.42				

Table 6.3

Series A - C12AS Series B - E1S E.D.F.12.06

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model C	Cross Correlation
24.0	.97	.33	.48	– (–)	.4 (9.3)	+.31(0) +.54(2)
16.0	.83	.58				
12.0	.64	.73				
9.6	.53	.58				
8.0	.46	.39				
6.9	.53	.33				

Table 6.4

Series A - C12AS   Series B - C12S   E.D.F. 12.06

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model		Cross Correlation
				C	D	
24.0	.97	.28				
16.0	.90	.67		–	.4	+.41(0)
12.0	.77	.81	.38			
9.6	.52	.65		(–)	(3.7)	-.62(2)
8.0	.24	.48				
6.9	.11	.36				

Table 6.5

Series A - X3   Series B - E1   E.D.F. 11.59

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model		Cross Correlation
				C	D	
24.0	.66	-5.65				-.31(-3)
16.0	.51	-3.00		-92.0	1.3	-.25(-2)
12.0	.35	-2.02	.34			+.28(2)
9.6	.23	-1.98		(-3.5)	(2.3)	+.16(4)
8.0	.21	1.79				
6.9	.28	1.02				

Table 6.6

Series A - X3   Series B - C12   E.D.F. 11.59

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model		Cross Correlation
				C	C	
24.0	.92	-4.31				
16.0	.92	-2.68				-.17(-3)
12.0	.86	-1.89	.59	-72.4	.5	-.47(-2)
9.6	.77	-1.38		(-41.3)	(9.7)	-.50(0)
8.0	.65	-.99				+.42(2)
6.9	.51	-.75				+.51(4)

Table 6.7

Series A - X3S Series B - E1S E.D.F. 12.06

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.15	-5.85	.18	-97.3	1.3	-.08(-3)
16.0	.30	-3.27		(-5.3)	(3.9)	-.15(-2)
12.0	.29	-1.86				
9.6	.14	-1.28				
8.0	.04	-1.98				
6.9	.12	.74				

Table 6.8

Series A - X3S Series B - C12S E.D.F. 12.06

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.18	-5.49	.40	-77.6	.9	-.16(-2)
16.0	.39	-3.19		(-7.6)	(5.7)	+.26(4)
12.0	.46	-1.82				
9.6	.38	-.89				
8.0	.26	-.46				
6.9	.20	-.24				

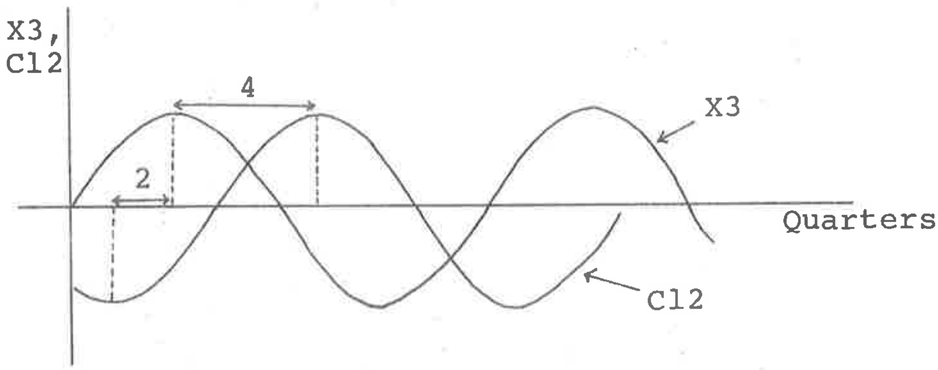
The first point to note is that the coherence between planned and actual expenditure is generally significant at the 5% level. As expected the planned expenditure series consistently leads the actual expenditure series throughout the business cycle frequencies. These results support the view that the planned expenditure series is a reasonably good predictor of actual expenditure[3] and may therefore be useful in testing the finance motive.

There is some discrepancy between the results based on the unadjusted data and those based on seasonally adjusted data. The results based on the unadjusted data indicate that the planned expenditure series leads the actual expenditure series by approximately two quarters; this accords with prior expectations and is supported by the cross-correlation statistics using both the unadjusted and seasonally adjusted data. However, the phase estimates based on the adjusted data indicate a lead of planned expenditure of something less than one quarter. There is a tendency throughout for there to be some discrepancy between the set of results based on the adjusted data and those based on the unadjusted data. In general, because the unadjusted data set was more satisfactorily filtered, more confidence can be attached to the results based on it.

---

[3] This accords with the findings of Preston [1968].

The phase estimates when comparing the excess of planned expenditure series with the actual expenditure series, on the surface, seem to suggest that actual expenditure leads by about two to four quarters. But this is clearly a peak to trough lead. The cross-correlation statistics indicate this and furthermore, at least using the unadjusted data set results, indicate a peak to peak lead of the excess of planned expenditure over actual expenditure of between two and four quarters. The graph below depicts the situation; it is based on a three year reference cycle and shows the excess of planned expenditure (X3) leading the actual expenditure cycle (C12) by 4 quarters from peak to peak.



The cross-spectral output indicates that C12 leads X3 by 2 quarters. However, the meaningful phase relationship is that of the four quarter lead of X3 over C12. This empirical result ties in very well with the theoretical analysis of section 1 of chapter 6, where it is assumed that the excess of planned expenditure cycle leads the income cycle by about 120^0 or 4 quarters based on a three year cycle.

Reference to table 4.2 shows that the phase estimates are significantly different from zero at business cycle frequencies. In most cases at the 95% level in all cases at the 80% level.

6.1 *Money and Expenditure flows*

The expectation that the money supply leads expenditure flows is borne out by the tests. Tables 6.9 to 6.32 contain results using the three usual definitions of the money supply and four expenditure flows. The four expenditure flows are private gross fixed capital investment (E1), durable consumption expenditure (E3), gross national expenditure (E4), and routine expenditure (E4123), calculated by subtracting E1, E3 and public gross fixed capital expenditure from E4.

Table 6.9

Series A - M1 Series B - E1 E.D.F. 12.68

<table>
<tr><th rowspan="2">Cycle Period</th><th rowspan="2">Squared Coherence</th><th rowspan="2">Lead of A over B</th><th rowspan="2">Average Coherence</th><th colspan="2">Phase Model</th><th rowspan="2">Cross Correlation</th></tr>
<tr><th>C</th><th>D</th></tr>
<tr><td>24.0</td><td>.46</td><td>4.32</td><td rowspan="6">.31</td><td rowspan="6">79.2
(5.5)</td><td rowspan="6">-.7
(-2.0)</td><td rowspan="6">+.40(1)
+.24(2)
+.17(3)
+.12(4)</td></tr>
<tr><td>16.0</td><td>.37</td><td>2.78</td></tr>
<tr><td>12.0</td><td>.42</td><td>2.03</td></tr>
<tr><td>9.6</td><td>.55</td><td>1.53</td></tr>
<tr><td>8.0</td><td>.54</td><td>1.10</td></tr>
<tr><td>6.9</td><td>.37</td><td>.54</td></tr>
</table>

Table 6.10

Series A - M1 Series B - E3 E.D.F. 12.68

<table>
<tr><th rowspan="2">Cycle Period</th><th rowspan="2">Squared Coherence</th><th rowspan="2">Lead of A over B</th><th rowspan="2">Average Coherence</th><th colspan="2">Phase Model</th><th rowspan="2">Cross Correlation</th></tr>
<tr><th>C</th><th>D</th></tr>
<tr><td>24.0</td><td>.48</td><td>-.27</td><td rowspan="6">.40</td><td rowspan="6">12.3
(2.2)</td><td rowspan="6">-
(-)</td><td rowspan="6">+.53(0)
+.35(1)</td></tr>
<tr><td>16.0</td><td>.44</td><td>-.02</td></tr>
<tr><td>12.0</td><td>.53</td><td>.61</td></tr>
<tr><td>9.6</td><td>.68</td><td>.79</td></tr>
<tr><td>8.0</td><td>.61</td><td>.64</td></tr>
<tr><td>6.9</td><td>.33</td><td>.08</td></tr>
</table>

Table 6.11

Series A - M1 Series B - E4 E.D.F. 12.68

<table>
<tr><th rowspan="2">Cycle Period</th><th rowspan="2">Squared Coherence</th><th rowspan="2">Lead of A over B</th><th rowspan="2">Average Coherence</th><th colspan="2">Phase Model</th><th rowspan="2">Cross Correlation</th></tr>
<tr><th>C</th><th>C</th></tr>
<tr><td>24.0</td><td>.38</td><td>2.57</td><td rowspan="6">.40</td><td rowspan="6">59.8
(13.9)</td><td rowspan="6">-
(-)</td><td rowspan="6">+.45(1)
+.27(2)
+.29(3)</td></tr>
<tr><td>16.0</td><td>.33</td><td>2.23</td></tr>
<tr><td>12.0</td><td>.50</td><td>2.20</td></tr>
<tr><td>9.6</td><td>.69</td><td>1.86</td></tr>
<tr><td>8.0</td><td>.69</td><td>1.52</td></tr>
<tr><td>6.9</td><td>.54</td><td>1.13</td></tr>
</table>

Table 6.12

Series A - M1 Series B - E4123 E.D.F. 12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.33	2.24				
16.0	.29	2.40				+.36(1)
12.0	.48	2.46	.38	67.7	-	+.24(2)
9.6	.64	2.04		(14.9)	(-)	+.26(3)
8.0	.64	1.68				
6.9	.51	1.33				

Table 6.13

Series A - M2 Series B - E1 E.D.F. 12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.33	5.22				+.28(1)
16.0	.27	3.83		102.5	-.9	+.23(2)
12.0	.39	2.67	.24	(5.3)	(-2.0)	+.16(3)
9.6	.50	1.86				+.20(4)
8.0	.37	1.31				
6.9	.14	.72				

Table 6.14

Series A - M2 Series B - E3 E.D.F. 12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model C	Cross Correlation
24.0	.21	.52				
16.0	.23	.86		59.4	-.7	+.37(0)
12.0	.49	1.20	.29			+.32(1)
9.6	.68	1.12		(3.3)	(-1.7)	+.24(2)
8.0	.52	.94				
6.9	.18	.39				

Table 6.15

Series A - M2 Series B - E4 E.D.F. 12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.29	3.64				
16.0	.27	3.30		67.8	.3	+.28(1)
12.0	.50	2.73	.30			+.30(2)
9.6	.63	2.20		(8.7)	(1.7)	+.38(3)
8.0	.55	1.89				
6.9	.37	1.66				

Table 6.16

Series A - M2 Series B - E4123 E.D.F. 12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.26	3.52				-.20(-3)
16.0	.27	3.53				-.20(-2)
12.0	.50	2.96	.32	–	-1.0	-.27(-1)
9.6	.60	-2.39		(–)	(-1.9)	+.17(1)
8.0	.54	-1.90				+.27(2)
6.9	.41	-1.53				+.38(3)

Table 6.17

Series A - M3 Series B - E1 E.D.F. 12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model C	Cross Correlation
24.0	.46	4.58				
16.0	.37	3.11		61.2	–	+.37(1)
12.0	.46	2.21	.29			+.30(2)
9.6	.59	1.61		(24.3)	(–)	+.22(3)
8.0	.51	1.15				+.18(4)
6.9	.22	.68				

Table 6.18

Series A - M3 Series B - E3 E.D.F. 12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.32	-.01				
16.0	.36	.23		21.7	-	+.48(0)
12.0	.54	.73	.35			
9.6	.70	.82		(6.6)	(-)	+.40(1)
8.0	.59	.69				
6.9	.28	.28				

Table 6.19

Series A - M3 Series B - E4 E.D.F. 12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.37	3.05				
16.0	.32	2.57		44.7	.7	+.36(1)
12.0	.47	2.31	.29			+.30(2)
9.6	.57	1.93		(8.1)	(4.9)	+.35(3)
8.0	.49	1.70				
6.9	.31	1.57				

Table 6.20

Series A - M3 Series B - E4123 E.D.F. 12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model C	Cross Correlation
24.0	.33	5.22				
16.0	.27	3.83		102.5	-.9	+.28(1)
12.0	.39	2.67	.24			+.23(2)
9.6	.50	1.86		(5.3)	(-2.0)	+.16(3)
8.0	.37	1.31				+.20(4)
6.9	.14	.72				

Table 6.21

Series A - M1S Series B - E1S E.D.F. 13.14

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model		Cross Correlation
				C	D	
24.0	.88	.30				
16.0	.82	1.00		-	.9	+.42(0)
12.0	.82	1.26	.43			
9.6	.79	1.07		(-)	(6.8)	+.55(1)
8.0	.61	.84				
6.9	.27	.78				

Table 6.22

Series A - M1S Series B - E3S E.D.F. 13.14

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model		Cross Correlation
				C	D	
24.0	.85	.32				
16.0	.72	.93		-	.7	+.37(0)
12.0	.63	1.13	.36			
9.6	.55	.89		(-)	(6.2)	+.19(1)
8.0	.33	.55				
6.9	.09	-.02				

Table 6.23

Series A - M1S Series B - E4S E.D.F. 13.14

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model		Cross Correlation
				C	C	
24.0	.90	.16				
16.0	.83	.76		-	.7	+.59(0)
12.0	.79	1.24	.61			+.56(1)
9.6	.75	1.31		(-)	(4.8)	+.45(2)
8.0	.69	1.12				
6.9	.60	.76				

Table 6.24

Series A - M1S Series B - E4123S E.D.F. 13.14

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model		Cross Correlation
				C	D	
24.0	.92	.09				
16.0	.84	.63		–	.7	+.49(0)
12.0	.71	1.23	.56			+.43(1)
9.6	.63	1.42		(–)	(4.8)	+.38(2)
8.0	.57	1.25				
6.9	.55	.85				

Table 6.25

Series A - M2S Series B - E1S E.D.F. 13.14

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model		Cross Correlation
				C	D	
24.0	.95	.01				
16.0	.87	.45		13.5	1.0	+.45(0)
12.0	.75	.71	.40			
9.6	.65	.61		(-4.3)	(7.0)	+.58(1)
8.0	.46	.41				
6.9	.12	.37				

Table 6.26

Series A - M2S Series B - E3S E.D.F. 13.14

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model		Cross Correlation
				C	C	
24.0	.92	.01				
16.0	.77	.47		–	.4	+.25(0)
12.0	.59	.80	.33			
9.6	.44	.72		(–)	(2.9)	+.29(1)
8.0	.21	.44				
6.9	.05	-.51				

Table 6.27

Series A - M2S Series B - E4S E.D.F. 13.14

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.96	-.10				
16.0	.89	.22		–	–	+.65(0)
12.0	.69	.63	.43			
9.6	.47	.90		(–)	(–)	+.53(1)
8.0	.32	.96				
6.9	.19	.93				

Table 6.28

Series A - M2S Series B - E4123S E.D.F. 13.14

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.97	-.17				
16.0	.89	.09		–	–	+.57(0)
12.0	.57	.58	.37			
9.6	.33	1.10		(–)	(–)	+.36(1)
8.0	.22	1.31				
6.9	.17	1.26				

Table 6.29

Series A - M3S Series B - E1S E.D.F. 13.14

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model C	Cross Correlation
24.0	.98	.08				
16.0	.91	.39		-9.2	.7	+.55(0)
12.0	.80	.56	.46			
9.6	.75	.51		(-2.9)	(4.9)	+.61(1)
8.0	.64	.46				
6.9	.36	.59				

Table 6.30

Series A - M3S Series B - E3S E.D.F. 13.14

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.95	.07				
16.0	.82	.39		–	.3	+.36(0)
12.0	.59	.59	.34			
9.6	.44	.47		(–)	(2.9)	+.32(1)
8.0	.26	.24				
6.9	.08	–.13				

Table 6.31

Series A - M3S Series B - E4S E.D.F. 13.14

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.99	–.02				
16.0	.94	.18		–	–	+.69(0)
12.0	.76	.43	.45			
9.6	.53	.60		(–)	(–)	+.61(1)
8.0	.34	.62				
6.9	.17	.48				

Table 6.32

Series A - M3S Series B - E412S E.D.F. 13.14

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model C	Cross Correlation
24.0	.99	–.08				
16.0	.93	.05		–	–	+.56(0)
12.0	.64	.34	.36			
9.6	.35	.67		(–)	(–)	+.46(1)
8.0	.18	.79				
6.9	.08	.60				

The evidence of tables 6.9 to 6.20 points to a two quarter lag between changes in the money supply and (except for durable consumption expenditure) the subsequent change in expenditure. Using tables 6.10 and 6.11 as an example, the lead of M1 over E3, at say the twelve quarter cycle, is significantly less at the 95% level (see table 4.2) than the lead of M1 over E4. There is some very tentative evidence, at least where coherence is highest, that M1 leads routine expenditure by a greater amount than it leads either E4 or E1.

The evidence using seasonally adjusted data (tables 6.21 to 6.32) differs slightly from the above. The lead of the money supply over expenditure is about one quarter, and while in general the lead over durable consumption expenditure is less, the difference is less marked.

The overall picture is one of the money supply, however defined, pervasively leading expenditure flows. In the main the estimated squared coherence is significant at the 5% level. There is no evidence of a geometrically declining distributed lag relationship between the money supply and gross national expenditure (see page 198 for an explanation of the kind of phase and gain results that would be expected if there were a geometrically declining distributed lag relationship between two variables).

It is unfortunate, given the distinctive phase of the durable consumption expenditure cycle, that planned durable consumption figures are not available. They are obviously important in testing the finance motive and may add significantly to any explanation of the demand for money. However, planned investment expenditure data are available and the series of special interest is the excess of planned over actual investment expenditure (X3).

It was found (page 152) that the X3 series leads actual investment expenditure by between two and four quarters. It follows, given that the money supply series lead investment expenditure by two quarters, that the X3 series should lead the money supply series by between zero and two quarters, and that the rate of change of the money supply series, because it leads the money supply series by 90^0, should lead the X3 series by between two and four quarters based on a four year cycle.

The proportional change in the money supply (the first difference of logarithms) is used in this series of tests because it seems to make more sense to associate a change in the money supply with the X3 series. The X3 series is closely related to a change-in series, it is largely devoid of trend and emphasises deviations from current levels of expenditure rather than the magnitude of the level.

Tables 6.33 to 6.42 present the cross-spectral results of testing X3 with M1, M2 and M3, and their first differences DM1, DM2 and DM3.

Table 6.33

Series A - X3 Series B - M1 E.D.F. 11.59

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model		Cross Correlation
				C	D	
24.0	.39	.76				
16.0	.22	-.07		-	-	+.23(0)
12.0	.19	-.56	.19			
9.6	.20	-.38		(-)	(-)	+.26(1)
8.0	.15	.06				
6.9	.14	.30				

Table 6.34

Series A - X3 Series B - M2 E.D.F. 11.59

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model		Cross Correlation
				C	D	
24.0	.33	.03				
16.0	.26	-.76		12.8	-1.2	+.24(-2)
12.0	.25	-.98	.15			+.15(0)
9.6	.19	-.83		(1.9)	(-7.0)	+.14(1)
8.0	.06	-.68				
6.9	.01	-1.10				

Table 6.35

Series A - X3 Series B - M3 E.D.F. 11.59

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model		Cross Correlation
				C	C	
24.0	.35	.59				
16.0	.23	-.06		30.9	-1.4	+.15(0)
12.0	.18	-.44	.12			
9.6	.13	-.24		(3.2)	(-5.5)	+.16(1)
8.0	.03	.67				
6.9	.02	-1.27				

Table 6.36

Series A - X3S Series B - M1S E.D.F. 12.06

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.17	4.13				+.17(-2)
16.0	.25	2.55		83.6	-1.5	+.15(1)
12.0	.11	1.80	.12			-.07(2)
9.6	.01	.66		(4.0)	(-3.5)	-.04(3)
8.0	.02	-.84				
6.9	.16	-.42				

Table 6.37

Series A - X3 Series B - DM1 E.D.F. 11.75

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.55	-4.14				
16.0	.34	-3.04		-58.5	–	+.14(-4)
12.0	.22	-2.72	.23			+.30(-3)
9.6	.20	-2.28		(-7.7)	(–)	+.42(-2)
8.0	.15	-1.63				
6.9	.13	-1.08				

Table 6.38

Series A - X3 Series B - DM2 E.D.F. 11.75

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model C	Cross Correlation
24.0	.52	-4.39				+.27(-4)
16.0	.39	-3.40		-70.3	1.6	+.37(-3)
12.0	.26	2.95	.22			+.39(-2)
9.6	.19	2.13		(-2.1)	(2.2)	-.23(2)
8.0	.07	1.62				-.17(3)
6.9	.02	.83				

Table 6.39

Series A - X3 Series B - DM3 E.D.F.11.75

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.52	-4.23				
16.0	.38	-3.02		-98.3	1.6	+.25(-4)
12.0	.22	-2.56	.18			+.33(-3)
9.6	.13	-2.11		(-9.8)	(6.4)	+.36(-2)
8.0	.03	-1.26				
6.9	.08	1.01				

Table 6.40

Series A - X3S Series B - DM1S E.D.F. 12.06

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.31	-4.62				
16.0	.39	-2.91		-104.7	1.6	+.16(-3)
12.0	.29	-2.02	.20			
9.6	.17	-1.42		(-3.2)	(2.1)	+.35(-2)
8.0	.09	-.98				
6.9	.12	-1.14				

Table 6.41

Series A - X3S Series B - DM2S E.D.F. 12.06

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model C	Cross Correlation
24.0	.20	-5.44				
16.0	.34	-3.50		-140.0	2.6	+.06(-4)
12.0	.33	-2.49	.20			+.14(-3)
9.6	.17	-1.83		(-9.4)	(8.9)	+.36(-2)
8.0	.03	-1.46				
6.9	.02	.86				

Table 6.42

Series A - X3 Series B - DM3S E.D.F. 12.06

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model		Cross Correlation
				C	D	
24.0	.21	-5.26				
16.0	.34	-3.22		-115.1	2.0	+.11 (-5)
12.0	.31	-2.08	.16			+.08 (-4)
9.6	.18	-1.15		(-8.9)	(6.9)	+.14 (-3)
8.0	.06	-.04				+.31 (-2)
6.9	.01	1.16				

As expected the estimated coherence is higher when the change in the money supply series are used. However, considering the limitations of the data and the particular construction of the X3 variable, a construction which makes no condescension to the pursuit of high R^2's, it is a promising result that when the unadjusted M1, M2, and M3 series are used the estimated coherence, where it is highest, is marginally significant at the 10% level. When the unadjusted DM1, DM2, and DM3 series are used the estimated coherence, where it is highest, is significant at the 5% level. The results based upon the seasonally adjusted money supply series are not as convincing, although the estimated coherence using DM1S, DM2S and DM3S maintains marginal significance at the 10% level. The results based upon M1S, M2S and M3S are not significant and only one table of results, those based upon M1S, is recorded.

The phase and cross-correlation estimates indicate that the change in the money supply leads X3 by between two and four quarters. The evidence using M1, M2 and M3 is a little unclear. Where coherence is highest X3 leads by something less than a quarter but generally lags by something less than a quarter elsewhere. As none of the phase estimates are significantly different from zero at the 20% level, it is probably best to rely upon the phase estimates based upon the change in the money supply; these indicate that the X3 series leads the money supply series by about one quarter. To appreciate how this result is derived consider the phase estimate at the

16 quarter cycle in table 6.37. This indicates that DM1 leads X3 by three quarters. As the DM1 cycle is 90^0 ahead of the M1 cycle, four quarters have to be subtracted from this lead in order to derive the phase relationship between X3 and M1.

These phase estimates between X3 and the money supply are not wholly consistent with the previously presented phase estimates between the money supply and expenditure and between X3 and expenditure. The expectation from these results is that X3 would lead the money supply by about two quarters rather than one. However, it needs to be remembered that the *estimates* are precisely that and no more and that for each there is an appropriate confidence interval. In these terms the estimates are mutually consistent.

If any precise conclusion can be drawn so far it is that while the phase relationship between X3 and expenditure conforms to the predictions of the theoretical model of the previous chapter (see pp.114-131), the phase relationships between X3 and the money supply and between the money supply and expenditure differ slightly from those predictions. The money supply appears to lead expenditure by rather more than the 30^0 predicted by the model and as a corollary lags the X3 series by rather less. Two points can be made. First, the expenditure plans upon which the construction of the X3 series is based, although solicited from business six months in advance, may well have been formulated at an earlier date; thus the lead of X3 over the money supply may be greater than it really appears. Second, it is noted in chapter 6, page 118 that the length of the lead of the money supply over expenditure depends on the relative dominance of the excess of planned expenditure vis-a-vis income in determining the demand for money. If for some reason, the excess of planned expenditure were relatively more dominant than assumed in the model, the lead of the money supply over income would be greater and the lead of X3 over the money supply would be less.

6.2 *Velocity and Expenditure Flows*

Tables 6.43 to 6.60 present the results of tests of the cross-spectral relationships between three measures of gross national expenditure velocity and various expenditure flows. The three measures of velocity are computed by dividing gross national expenditure by M1, M2 and M3 respectively. The expenditure flows are: gross private fixed capital expenditure (E1), durable consumption expenditure (E3), and routine expenditure (E4123) computed as before.

Table 6.43

Series A - V1E4 Series B - E1 E.D.F. 12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.38	-1.12				
16.0	.33	-1.22		-10.3	-.9	+.22(-2)
12.0	.45	-1.37	.31			+.33(-1)
9.6	.53	-1.27		(-2.0)	(-7.1)	+.21(0)
8.0	.45	-1.07				
6.9	.31	-.87				

Table 6.44

Series A - V1E4 Series B - E3 E.D.F. 12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.25	-3.93				
16.0	.20	-3.24		-96.4	.7	+.16(0)
12.0	.40	-2.52	.29			+.34(1)
9.6	.62	-1.94		(-7.6)	(2.4)	+.12(2) +.36(3)
8.0	.53	-1.60				
6.9	.37	-1.44				

Table 6.45

Series A - V1E4 Series B - E4123 E.D.F. 12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model C	Cross Correlation
24.0	.49	-1.85				
16.0	.50	-1.41		-55.3	.7	
12.0	.71	-1.03	.73			+.84(0)
9.6	.85	-.74		(-10.7)	(7.7)	
8.0	.89	-.55				
6.9	.85	-.41				

Table 6.46

Series A - V2E4 Series B - E1 E.D.F. 12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.51	-.13				
16.0	.51	-.48		–	-.8	+.33(-1)
12.0	.57	-.96	.35			
9.6	.55	-1.00		(–)	(-9.6)	+.28(0)
8.0	.43	-.81				
6.9	.32	-.58				

Table 6.47

Series A - V2E4 Series B - E3 E.D.F. 12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.50	-2.87				
16.0	.43	-2.32		-57.3	–	+.36(-3)
12.0	.56	-2.10	.36			+.17(-2)
9.6	.68	-1.71		(-15.5)	(–)	+.38(-1)
8.0	.63	-1.40				+.27(0)
6.9	.37	-1.24				

Table 6.48

Series A - V2E4 Series B - E4123 E.D.F. 12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model C	Cross Correlation
24.0	.69	-1.44				
16.0	.72	-.97		-40.5	.6	+.04(-1)
12.0	.82	-.73	.83			
9.6	.90	-.52		(-10.8)	(8.4)	+.86(0)
8.0	.92	-.36				
6.9	.91	-.24				

Table 6.49

Series A - V3E4 Series B - E1 E.D.F. 12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.51	-.12				
16.0	.52	-.42		–	-.7	+.34 (-1)
12.0	.57	-.83	.39			
9.6	.57	-.85		(–)	(-11.1)	+.27 (0)
8.0	.47	-.69				
6.9	.38	-.53				

Table 6.50

Series A - V3E4 Series B - E3 E.D.F. 12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.52	-2.82				
16.0	.45	-2.22		-51.2	–	+.32 (-3)
12.0	.56	-1.88	.40			+.13 (-2)
9.6	.67	-1.50		(-15.3)	(–)	+.41 (-1)
8.0	.63	-1.26				+.30 (0)
6.9	.41	-1.18				

Table 6.51

Series A - V3E4 Series B - E4123 E.D.F. 12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model C	Cross Correlation
24.0	.74	-1.30				
16.0	.76	-.81		-28.1	.44	+.18 (-3)
12.0	.86	-.49	.88			
9.6	.93	-.31		(-25.9)	(22.1)	+.91 (0)
8.0	.95	-.19				
6.9	.95	-.11				

Table 6.52

Series A - V1E4S   Series B - E1S   E.D.F. 13.4

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.90	-.18				
16.0	.74	-.79		12.4	-1.2	+.25(-2)
12.0	.60	-1.17	.50			+.30(-1)
9.6	.48	-1.17		(3.3)	(-11.4)	+.35(0)
8.0	.35	-.99				
6.9	.29	-.69				

Table 6.53

Series A - V1E4S   Series B - E3S   E.D.F. 13.14

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.92	-.20				
16.0	.77	-.78		–	–	+.35(-3)
12.0	.62	-1.33	.51			.00(-2)
9.6	.54	-1.46		(–)	(–)	+.18(-1)
8.0	.40	-1.40				+.27(0)
6.9	.14	-1.01				

Table 6.54

Series A - V1E4S   Series B - E4123S   E.D.F. 13.14

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model C	Cross Correlation
24.0	.88	-.29				
16.0	.78	-1.05		–	-.3	+.35(-2)
12.0	.85	-1.15	.76			-.13(-1)
9.6	.88	-.78		(–)	(-2.2)	+.85(0)
8.0	.87	-.52				
6.9	.77	-.32				

Table 6.55

Series A - V2E4S Series B - E1S E.D.F. 13.14

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.75	.17	.36	13.8	-1.0	+.17(-1)
16.0	.54	-.60		(3.4)	(-10.5)	+.27(0)
12.0	.43	-.83				
9.6	.30	-.81				
8.0	.18	-.63				
6.9	.16	-.39				

Table 6.56

Series A - V2E4S Series B - E3S E.D.F. 13.14

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.80	.13	.43	-	-	-.03(-1)
16.0	.66	-.76		(-)	(-)	+.33(0)
12.0	.60	-1.21				
9.6	.48	-1.24				
8.0	.29	-1.15				
6.9	.08	-.64				

Table 6.57

Series A - V2E4S Series B - E4123S E.D.F. 13.14

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model C	Cross Correlation
24.0	.72	.06	.72	-26.8	.4	-.21(-1)
16.0	.57	-.84		(-3.0)	(2.3)	+.71(0)
12.0	.70	-.73				
9.6	.83	-.43				
8.0	.86	-.28				
6.9	.83	-.21				

Table 6.58

Series A - V3E4S Series B - E1S E.D.F. 13.14

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model		Cross Correlation
				C	D	
24.0	.70	.36				
16.0	.55	-.38		26.8	-1.4	+.07(-1)
12.0	.48	-.61	.32			
9.6	.36	-.63		(6.6)	(-12.9)	+.23(0)
8.0	.23	-.56				
6.9	.16	-.51				

Table 6.59

Series A - V3E4S Series B - E3S E.D.F. 13.14

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model		Cross Correlation
				C	D	
24.0	.75	.35				
16.0	.61	-.65		-11.5	-	.00(-1)
12.0	.60	-1.08	.41			
9.6	.53	-1.13		(- 1.5)	(-)	+.24(0)
8.0	.36	-1.13				
6.9	.15	- .82				

Table 6.60

Series A - V3E4S Series B - E4123S E.D.F. 13.14

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model		Cross Correlation
				C	C	
24.0	.67	.16				
16.0	.55	-.74		-23.8	.5	-.33(-1)
12.0	.73	-.54	.80			
9.6	.87	-.23		(-4.6)	(5.3)	+.71(0)
8.0	.90	-.06				
6.9	.89	.03				

As predicted in the previous chapter expenditure leads velocity. The margin for routine expenditure is about the same as that suggested in that chapter. Fixed capital expenditure leads by much the same margin, although there is some tentative evidence using unadjusted data that its lead is slightly greater. There is, however, much more convincing evidence that durable consumption expenditure leads by a greater margin. Table 6.44, for example, shows durable consumption expenditure leading V1E4 by 2.5 quarters at the 12 quarter cycle and, where coherence is higher, at the 9.6 quarter cycle by 1.9 quarters. This different phase of the durable consumption expenditure cycle is, of course, consistent with the findings reported in section 6.1. For all of the tests there is some cycle period where the estimated coherence is significant at the 5% level.

Another point is worth noting. Although it is not statistically significant, velocity when computed using the narrow definition of money (V1E4) tends to lag more strongly than does velocity computed using the two broader definitions of money (V2E4 and V3E4). This applies to both the results based upon the unadjusted data and those based upon the seasonally adjusted data, and suggests that the demand for narrow money balances per unit of national expenditure may lead the demand for broader money balances per unit of national expenditure. Further comment on this is postponed to later on in the section when more evidence is presented.

From earlier results it was expected that X3 would lead velocity by about four to five quarters at the 12 and 16 quarter period cycles. That is, a lead slightly in excess of the lead of X3 over expenditure reported at the beginning of this section. The cross-spectral relationships between X3 and velocity, and between X3 and the change in velocity are presented in tables 6.61 and 6.76. The velocity measures are supplemented by one computed by dividing gross national product by Ml (VIY).

Table 6.61

Series A - X3 Series B - V1E4 E.D.F. 11.59

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.55	5.19				
16.0	.42	-3.89				-.04(-4)
12.0	.25	-2.93	.26	-	-	-.34(-3)
9.6	.20	1.94		(-)	(-)	-.15(-2)
8.0	.18	1.11				+.32(1)
6.9	.24	.63				

Table 6.62

Series A - X3 Series B - V2E4 E.D.F. 11.59

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.09	3.43				
16.0	.28	3.60		108.1	-1.0	
12.0	.47	2.99	.24			
9.6	.31	2.24		(6.6)	(-3.0)	
8.0	.15	1.42				
6.9	.17	.68				

Table 6.63

Series A - X3 Series B - V3E4 E.D.F. 11.59

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model C	Cross Correlation
24.0	.54	5.05				
16.0	.39	-4.00		32.1	-	-.05(-4)
12.0	.24	2.99	.26			
9.6	.19	1.86		(2.6)	(-)	-.34(-3)
8.0	.19	1.06				
6.9	.26	.60				

Table 6.64

Series A - X3 Series B - V1Y E.D.F. 11.59

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.52	5.32				
16.0	.30	-3.68		-	-	-.12(-4)
12.0	.18	-2.18	.23			-.29(-3)
9.6	.10	-2.40		(-)	(-)	-.09(-2)
8.0	.16	.63				
6.9	.37	.06				

Table 6.65

Series A - X3S Series B - V1E4S E.D.F. 12.06

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.11	-5.11				-.21(-5)
16.0	.31	-2.88		-138.8	3.1	+.20(-4)
12.0	.31	-2.02	.14			-.10(-3)
9.6	.14	-1.97		(-5.2)	(4.6)	-.12(-2)
8.0	.08	1.54				+.08(1)
6.9	.19	.95				

Table 6.66

Series A - X3S Series B - V2E4S E.D.F. 12.06

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model C	Cross Correlation
24.0	.12	-5.65				-.16(-5)
16.0	.33	-3.30		-121.4	2.8	+.17(-4)
12.0	.30	-2.60	.19			-.12(-3)
9.6	.18	2.23		(-3.1)	(3.2)	-.13(-2)
8.0	.17	1.18				+.18(-1)
6.9	.31	.74				+.13(1)

Table 6.67

Series A - X3S   Series B - V3E4S   E.D.F. 12.06

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.29	-5.49				-.13(-5)
16.0	.39	-3.25		-117.8	2.5	+.17(-4)
12.0	.24	-2.70	.21			-.16(-3)
9.6	.13	1.95		(-4.2)	(3.8)	-.09(-2)
8.0	.16	.85				+.19(-1)
6.9	.33	.51				+.15(1)

Table 6.68

Series A - X3S   Series B - V1YS   E.D.F. 12.06

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.10	-4.99				-.18(-5)
16.0	.25	-2.47		-83.6	1.4	+.12(-4)
12.0	.42	-1.25	.12			-.01(-3)
9.6	.19	-.99		(-5.9)	(3.5)	-.15(-2)
8.0	.02	1.17				+.13(-1)
6.9	.10	.13				.00(1)

Table 6.69

Series A - X3   Series B - DV1E4   E.D.F. 11.25

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model C	Cross Correlation
24.0	.55	2.88				
16.0	.42	2.13		69.2	-1.2	+.32(1)
12.0	.32	1.56	.23			
9.6	.23	.96		(8.1)	(-5.3)	+.17(2)
8.0	.13	.25				
6.9	.14	-.41				

Table 6.70

Series A - X3 Series B - DV2E4 E.D.F. 11.75

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.51	2.03				
16.0	.49	1.66		58.6	-1.3	+.32(1)
12.0	.42	1.31	.27			
9.6	.32	.70		(5.8)	(-5.5)	+.11(2)
8.0	.23	-.07				
6.9	.18	-.53				

Table 6.71

Series A - X3 Series B - DV3E4 E.D.F. 11.75

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.55	1.66				
16.0	.42	1.41		52.1	-1.3	+.29(1)
12.0	.27	1.13	.27			
9.6	.18	.48		(5.3)	(-5.8)	+.06(2)
8.0	.16	-.33				
6.9	.27	-.72				

Table 6.72

Series A - X3 Series B - DV1Y E.D.F. 11.75

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model C	Cross Correlation
24.0	.63	4.52				
16.0	.47	3.10		107.6	-2.0	+.20(1)
12.0	.36	2.41	.22			+.17(2)
9.6	.23	1.82		(5.9)	(-3.3)	+.13(3)
8.0	.05	.72				+.21(4)
6.9	.11	-1.10				

Table 6.73

Series A - X3S Series B - DV1E4S E.D.F. 12.06

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.42	2.90				
16.0	.41	2.26		77.1	-1.3	+.17(1)
12.0	.33	1.89	.21			
9.6	.20	1.30		(5.8)	(-3.8)	+.07(2)
8.0	.12	.49				
6.9	.19	-.10				

Table 6.74

Series A - X3S Series B - DV2E4S E.D.F. 12.06

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.41	1.57				
16.0	.42	1.57		61.8	-1.3	+.21(1)
12.0	.35	1.56	.24			
9.6	.22	1.09		(5.1)	(-4.4)	+.06(2)
8.0	.15	.21				
6.9	.27	-.30				

Table 6.75

Series A - X3S Series B - DV3E4S E.D.F. 12.06

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model C	Cross Correlation
24.0	.50	1.23				
16.0	.44	1.31		50.5	-1.2	+.20(1)
12.0	.30	1.37	.24			
9.6	.17	.91		(3.7)	(-3.6)	+.02(2)
8.0	.12	-.03				
6.9	.26	-.50				

Table 6.76

Series A - X3S Series B - DV1YS E.D.F. 12.06

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.48	4.74				
16.0	.54	3.46		125.2	-2.2	+.11(2)
12.0	.46	2.81	.21			+.10(3)
9.6	.25	2.12		(6.2)	(-3.3)	+.08(4)
8.0	.04	.76				
6.9	.11	-.94				

Tables 6.61 to 6.63, and 6.66 and 6.67, show a lead of X3 over velocity of slightly less than expected. But otherwise the results are as expected. Apart from tables 6.65 to 6.67, containing results based upon seasonally adjusted expenditure velocity, the estimated coherence, where it is highest, is significant at the 5% level.

In order to correctly interpret some of the phase estimates it is necessary, as before, to consider the cross-correlation statistics. In table 6.61, for example, the 2.9 quarter lead of V1E4 over X3 is in fact a peak to trough lead; the cross-correlation coefficient is equal to -.34 when V1E4 leads X3 by 3 quarters.

Although the evidence of tables 6.61 to 6.68 is a little ambiguous, the results using the first difference of velocity (tables 6.69 to 6.76) support the view canvassed earlier, that V1E4 tends to lag both V2E4 and V3E4. In order to get a clearer picture the cross-spectral relationships between (1) V1E4 and V2E4; (2) V1E4 and V3E4, and (3) V1E4 and velocity computed by dividing gross national expenditure by M3 *minus* M1 (V31E4), were examined. The results are presented in tables 6.77 to 6.82.

Table 6.77

Series A - V1E4   Series B - V2E4   E.D.F.12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.77	.14				
16.0	.78	-.03		-	-.1	+.95(0)
12.0	.88	-.17	.91			
9.6	.96	-.19		(-)	(-6.6)	+.13(-1)
8.0	.97	-.16				
6.9	.96	-.14				

Table 6.78

Series A - V1E4   Series B - V3E4   E.D.F. 12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.81	-.20				
16.0	.84	-.26		-19.5	.2	+.94(0)
12.0	.91	-.39	.91			
9.6	.96	-.38		(-4.2)	(2.3)	+.12(-1)
8.0	.96	-.32				
6.9	.93	-.25				

Table 6.79

Series A - V1E4   Series B - V31E4   E.D.F. 12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model C	Cross Correlation
24.0	.54	-.33				
16.0	.55	-.47		-39.7	.4	+.85(0)
12.0	.73	-.75	.76			
9.6	.88	-.72		(-4.4)	(2.7)	+.17(-1)
8.0	.89	-.58				
6.9	.81	-.44				

Table 6.80

Series A - V1E4S Series B - V2E4S E.D.F.13.14

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model		Cross Correlation
				C	D	
24.0	.92	-.47	.89	-6.3 (-7.1)	-.1 (-4.0)	+.92(0)
16.0	.83	-.26				
12.0	.86	-.28				
9.6	.91	-.24				
8.0	.92	-.21				
6.9	.92	-.21				

Table 6.81

Series A - V1E4S Series B - V3E4S E.D.F. 13.14

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model		Cross Correlation
				C	D	
24.0	.78	-.56	.87	-16.6 (-5.0)	.1 (1.7)	+.89(0)
16.0	.74	-.29				
12.0	.84	-.43				
9.6	.91	-.40				
8.0	.92	-.33				
6.9	.89	-.29				

Table 6.82

Series A - V1E4S Series B - V31E4S E.D.F.13.14

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model		Cross Correlation
				C	C	
24.0	.62	.70	.64	- (-)	-.3 (-3.8)	+.69(0)
16.0	.03	3.85				
12.0	.49	-1.04				
9.6	.75	-.79				
8.0	.78	-.59				
6.9	.75	-.47				

The results support the hypothesis that the velocity of narrowly defined money lags the velocity of broadly defined money; similarly they support the hypothesis that the demand for narrowly defined money per unit of national expenditure leads the demand for broadly defined money per unit of national expenditure. The test of special interest is that involving the velocity of money defined to exclude M1. Tables 6.79 and 6.82 contain the results. If, for example, the 12 quarter cycle is considered, the phase estimates using both the unadjusted and seasonally adjusted data are significantly different from zero, provided that the 80% confidence band of table 4.2 constitutes the significance level. It is probable that more than one theory could be found to explain this phase difference. Of interest here is the possible relevance of the finance motive.

In the previous chapter it was suggested that a major determinant of the configuration of the demand for money cycle is the excess-of-planned-over-actual-expenditure cycle. Furthermore, it was sugggested that a downturn in this latter cycle precipitates a downturn in the money supply cycle provided that the money supply is responsive in a downward direction to a lessening of demand. This will be the case if bank advances acquired when planned expenditure is high are retired when planned expenditure falls. It is to be expected that the initial effect of these retirements will be on M1 rather than on interest bearing deposits. That is, it is to be expected that initially current account deposits will fall as loans are repaid. Thus the finance motive provides an explanation for the velocity of narrowly defined money balances lagging the velocity of broadly defined money balances; it is not, however, pretended that it is the only possible explanation.

Up to now the monetary aggregates considered have been either the money supply or velocity - the reciprocal of the money supply per unit of income. The implication, perhaps, is that it is the variation in the money supply which has to be explained when considering the demand function for money. But this may not be totally warranted. It is by no means certain that the money supply rather than the rate of interest contributes most in the short-run to the elimination of disequilibrium in the money market. Certainly, movements in the rate of interest may be a significant factor. Section 6.3 looks at the relationship between the interest rate and expenditure flows and also, to complete the cross-spectral analysis, at the relationships between the interest rate and velocity, and between the interest rate and the money supply.

6.3 *Interest Rates, Expenditure Flows, Money, and Velocity*

Tables 6.83 to 6.90 contain the results of tests of the cross-spectral relationship between the two year government bond rate (R2) and various expenditure flows. Originally the long-term government bond rate was also included in the tests. These results have not been recorded (i) because the phase estimates are similar to those obtained using the two year rate of interest, and (ii) because the estimated coherence is lower, in some cases much lower, than when the two year rate of interest is used.

Table 6.83

Series A - R2 Series B - E1 E.D.F. 12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.53	-1.65				
16.0	.29	-1.09		-30.7	-	+.25(-1)
12.0	.12	-1.10	.24			
9.6	.14	-1.71		(-2.9)	(-)	+.32(-2)
8.0	.30	-1.75				
6.9	.44	-1.70				

Table 6.84

Series A - R2 Series B - E3 E.D.F. 12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.32	5.11				+.08(-4) +.29(-3)
16.0	.23	3.05		177.9	-2.8	+.33(-2) -.32(1)
12.0	.20	2.40	.36			-.38(2) -.11(3)
9.6	.36	2.09		(3.8)	(-3.4)	-.05(4)
8.0	.52	1.75				
6.9	.51	1.39				

Table 6.85

Series A - R2 Series B - E4 E.D.F. 12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model C	Cross Correlation
24.0	.35	-3.80				
16.0	.20	-2.49		-42.4	-.4	+.36(-1)
12.0	.19	-1.64	.30			
9.6	.33	-1.34		(-5.0)	(-2.7)	+.30(-2)
8.0	.40	-1.15				
6.9	.33	-1.15				

Table 6.86

Series A - R2 Series B - E4123 E.D.F. 12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.32	-4.33				
16.0	.19	-2.83		-56.1	-	+.20(-2)
12.0	.21	-1.66	.27			
9.6	.37	-1.21		(-27.7)	(-)	+.35(-1)
8.0	.38	-.97				
6.9	.25	-.95				

Table 6.87

Series A - R2 Series B - E1S E.D.F. 13.14

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.58	-.76				
16.0	.44	-.36		-20.5	.6	+.13(-2)
12.0	.24	-.28	.18			
9.6	.09	-1.27		(-1.7)	(1.5)	+.06(-1)
8.0	.08	1.83				
6.9	.08	.82				

Table 6.88

Series A - R2 Series B - E3S E.D.F. 13.14

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model C	Cross Correlation
24.0	.52	-.94				
16.0	.31	-.85		30.4	-	
12.0	.16	-1.35	.27			
9.6	.27	2.39		(2.8)	(-)	
8.0	.49	1.53				
6.9	.48	1.18				

Table 6.89

Series A - R2 Series B - E4S E.D.F. 13.14

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.56	-1.06				
16.0	.45	-.83		-	-1.0	+.20(-2)
12.0	.39	-.68	.30			+.24(-1)
9.6	.35	-1.04		(-)	(-13.2)	-.06(0)
8.0	.36	-1.18				
6.9	.35	-1.19				

Table 6.90

Series A - R2 Series B - E4123S E.D.F. 13.14

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.56	-1.21				
16.0	.47	-1.04		-31.9	-	+.14(-2)
12.0	.46	-.85	.36			+.31(-1)
9.6	.45	-.99		(5.0)	(-)	-.12(0)
8.0	.42	-.96				
6.9	.38	-.96				

The results contained in tables 6.83 to 6.90 are similar to those obtained by Cagan [1966] and by the Bank of England [1970]. The rate of interest lags expenditure flows. For the unadjusted data (tables 6.83 to 6.86) the margin of the lag varies from 1 to 2 quarters for fixed capital expenditure (E1), to a little over that for routine expenditure (E4123), and as expected to a much greater length of from 2 to 7 quarters (3.6 quarters at the 12 quarter cycle) for durable consumption expenditure. (Note the cross-correlation coefficients in order to correctly evaluate the durable consumption expenditure lag). The estimated coherence, where it is highest, is significant at the 10% level and sometimes at the 5% level.

Using seasonally adjusted data (tables 6.87 to 6.90) the margin of the lag of the rate of interest is slightly less but nevertheless remains evident. The seasonally adjusted durable consumption expenditure cycle, as was previously discovered, does not seem to have as distinctive a phase as does the unadjusted durable consumption expenditure cycle. In fact table 6.88 is difficult to appraise because the cross-correlation statistics do not give any strong indication of the sign of the correlation between the two series when each in turn is lagged by 1 or 2 quarters. The estimated coherence, where it is highest, is in each case significant at the 5% level.

As in sections 6.1 and 6.2 the next series of tests involve the excess of planned expenditure series (X3). Again only the results using the two year rate of interest are recorded. However, this is not because of a low estimated coherence between the series (the coherence is significant using the long-term rate of interest), but because the results using the long-term rate of interest are very much the same as those recorded. Tables 6.91 to 6.94 contain the results of tests of the cross-spectral relationship between X3 and R2, and between X3 and the first difference of R2(DR2).

Table 6.91

Series A - X3 Series B - R2 E.D.F. 11.59

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model		Cross Correlation
				C	D	
24.0	.55	-4.82				-.12(-4)
16.0	.53	-3.62		-32.8	-	-.24(-3)
12.0	.54	2.96	.32			-.03(-2)
9.6	.41	-2.28		(-2.0)	(-)	-.39(-1)
8.0	.25	-1.12				+.36(3)
6.9	.35	-.55				+.27(4)

Table 6.92

Series A - X3S Series B - R2 E.D.F. 12.06

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model		Cross Correlation
				C	D	
24.0	.51	-4.68				-.07(-4)
16.0	.54	-3.60		-123.8	2.0	-.15(-3)
12.0	.43	-2.91	.31			+.30(-2)
9.6	.18	-1.88		(-8.9)	(6.8)	-.31(-1)
8.0	.18	-.66				+.20(3)
6.9	.27	-.61				+.04(4)

Table 6.93

Series A - X3 Series B - DR2 E.D.F. 11.75

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model		Cross Correlation
				C	C	
24.0	.60	1.78				
16.0	.61	1.01		-	1.0	+.48(0)
12.0	.61	.54	.35			+.54(1)
9.6	.47	.53		(-)	(6.9)	+.38(2)
8.0	.26	1.20				
6.9	.34	1.63				

Table 6.94

Series A - X3S Series B - DR2 E.D.F. 12.06

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.52	2.80	.32	31.8		+.32(0)
16.0	.55	1.45		(6.7)		+.26(1)
12.0	.58	.61				+.21(2)
9.6	.49	.40				+.24(3)
8.0	.26	.95				
6.9	.28	1.41				

The results are convincing. The estimated coherence is relatively high; it is generally significant at the 5% level for at least half of the cycle lengths recorded in each table. Care again is needed to interpret correctly the phase estimates. An examination of the cross-correlation coefficients reveals that the leads of R2 over X3 and X3S reported in tables 6.91 and 6.92 are in fact peak to trough leads. In table 6.91, for example, the 3.6 quarter lead of R2 over X3 should be interpreted as a peak to peak lead of X3 over R2 of 4.4 quarters. Tables 6.92 and 6.93 substantiate this by showing that X3 and X3S lead DR2 by about 1 quarter at the four year cycle period. Given that DR2 leads R2 by 90^0 this would mean that X3 and X3S lead R2 by 5 quarters at the four year cycle period. These phase estimates are consistent with those already reported.

There has until now been no convincing evidence of a distributed lag relationship between any two variables tested. However, the cross-spectral relationship between X3 and DR2 does indicate that the change in the rate of interest may respond in a geometrically declining lag fashion to an excess of planned expenditure.

Malinvaud [1970, p. 500] notes that a geometrically declining distributed lag model, of the form $x_t = \sum_{i=0}^{\infty} a_i z_{t-i} + \varepsilon_t$ with weights $a_i = ab^i$ where $0 < b < 1$, generates a phase relationship such that the process z_t leads x_t at all frequencies, and the gain declines regularly as frequency increases. Below is listed the gain and phase, through the frequency range .0208 to .2292, for the series X3 and DRS.

CYCLE FREQUENCY	LEAD OF X3 OVER DRS	AMPLITUDE / GAIN SPECTRUM(X3)
.0208	2.78	.57
.0417	1.78	.55
.0625	1.01	.55
.0833	.54	.54
.1042	.53	.49
.1250	1.20	.38
.1458	1.63	.42
.1667	1.34	.42
.1875	.77	.34
.2083	.02	.18
.2292	-1.03*	.07

* zero coherence at this frequency.

There is clearly some evidence of a distributed lag relationship.

So far in this section some overseas results on the phase relationship between expenditure and interest rates have been paralleled using Australian data. It has been shown that the excess of planned expenditure variable *may* contribute significantly to the explanation of variation in the change in the rate of interest and that an appropriate model to test this is a geometrically declining distributed lag model - the next chapter examines this hypothesis using regression analysis. Table 6.95 to 6.102 report the results of tests of the cross-spectral relationship between the rate of interest (R2) and velocity.

Table 6.95

Series A - R2 Series B - V1E4 E.D.F. 12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model		Cross Correlation
				C	D	
24.0	.26	1.68				
16.0	.26	1.90		55.9	-1.4	+.27(-1)
12.0	.27	.86	.21			+.18(0)
9.6	.38	-.02		(4.9(	(-5.2)	+.28(1)
8.0	.37	-.24				+.06(2)
6.9	.18	-.29				

Table 6.96

Series A - R2 Series B - V2E4 E.D.F. 12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model		Cross Correlation
				C	D	
24.0	.12	.26				
16.0	.10	.93		34.1	-1.3	+.32(-1)
12.0	.20	.21	.18			+.15(0)
9.6	.37	-.34		(2.9)	(-5.2)	+.22(1)
8.0	.36	-.50				
6.9	.18	-.68				

Table 6.97

Series A - R2 Series B - V3E4 E.D.F. 12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model		Cross Correlation
				C	C	
24.0	.15	-.09				
16.0	.11	.67		-34.2	-	+.32(-1)
12.0	.17	-.03	.20			+.13(0)
9.6	.33	-.59		(-8.0)	(-)	+.19(1)
8.0	.35	-.69				
6.9	.19	-.86				

Table 6.98

Series A - R2   Series B - V31E4   E.D.F. 12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.10	-1.90	.21	-56.8	-	+.26(-2)
16.0	.06	-1.11		(-18.7)	(-)	+.32(-1)
12.0	.13	-1.04				+.06(0)
9.6	.31	-1.13				
8.0	.35	-1.10				
6.9	.25	-1.22				

Table 6.99

Series A - R2   Series B - V1E4S   E.D.F. 13.14

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.42	-.23	.26	-	-.4	+.21(-1)
16.0	.34	.66		(-)	(-2.3)	-.12(0)
12.0	.42	.38				+.27(1)
9.6	.46	-.30				
8.0	.39	-.61				
6.9	.23	-.93				

Table 6.100

Series A - R2   Series B - V2E4S   E.D.F. 13.14

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model C	Cross Correlation
24.0	.31	-.50	.23	-23.9	-	+.24(-1)
16.0	.22	.11		(-5.1)	(-)	-.16(0)
12.0	.35	-.39				+.23(1)
9.6	.51	-.71				
8.0	.42	-.81				
6.9	.23	-.97				

Table 6.101

Series A - R2 Series B - V3E4S E.D.F. 13.14

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.41	-.51	.31	– (–)	-1.0 (-5.1)	+.24(-1) -.20(0) +.20(1)
16.0	.30	.10				
12.0	.35	-.57				
9.6	.50	-.96				
8.0	.46	-1.05				
6.9	.35	-1.21				

Table 6.102

Series A - R2 Series B - V31E4S E.D.F. 13.14

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.16	.27	.26	-59.7 (-12.6)	– (–)	+.12(-2) +.18(-1) -.29(0)
16.0	.04	-3.29				
12.0	.28	-1.69				
9.6	.50	-1.42				
8.0	.51	-1.34				
6.9	.45	-1.36				

The interesting point to emerge from the tests is that while the phase relationship between the rate of interest and the velocity of narrow money balances in unclear (see tables 6.95 and 6.99), the velocity of interest bearing deposits clearly leads the rate of interest (see tables 6.98 and 6.102). These results are in line with the previously suggested hypothesis that the velocity of narrow money balances leads the velocity of broad money balances.

It has been established in section 6.1 that the money supply leads expenditure by approximately 2 quarters and that expenditure leads the rate of interest by approximately 1 to 2 quarters. It is therefore to be expected that the money supply leads the rate of interest by approximately 3 to 4 quarters. The cross-spectral relationships between the interest rate and M1, M2 and M3 bear out this expectation. Tables 6.103 to 6.105 present the results based upon the unadjusted data set. The peak to peak lead of, for example, M1 over R2 (table 6.103) at the 12 quarter cycle is 3.7 quarters and at the 16 quarter cycle is 4.5 quarters. The estimated coherence at these cycle frequencies is significant at the 5% level as are the phase estimates.

There is also evidence of a distributed lag relationship between the money supply and the rate of interest. The gain estimates applying to the three definitions of the money supply at cycle frequencies lower than the seasonal are listed below. It can be noted that the money supply, however defined, con-

Table 6.103

Series A - R2 Series B - M1 E.D.F. 12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.73	5.39				+.24 (-5) +.32 (-4) +.42 (-3) +.39 (-2) +.14 (-1) -.19 (0) -.40 (1) -.45 (2) -.33 (3) -.12 (4)
16.0	.64	3.47		73.4	-	
12.0	.55	2.27	.47			
9.6	.55	1.56		(24.7)	(-)	
8.0	.50	1.38				
6.9	.43	1.43				

Table 6.104

Series A - R2 Series B - M2 E.D.F. 12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model D	Cross Correlation
24.0	.63	5.85				+.34 (-4) +.38 (-3) +.30 (-2) +.05 (-1) -.16 (0) -.35 (1) -.34 (2) -.22 (3) -.05 (4)
16.0	.50	3.54		86.6	-.6	
12.0	.45	1.99	.33			
9.6	.52	1.22		(8.2)	(-1.9)	
8.0	.40	1.08				
6.9	.22	1.27				

Table 6.105

Series A - R2 Series B -M3 E.D.F. 12.68

Cycle Period	Squared Coherence	Lead of A over B	Average Coherence	Phase Model C	Phase Model C	Cross Correlation
24.0	.72	5.78				+.39 (-4) +.41 (-3) +.38 (-2) +.13 (-1) -.13 (0) -.37 (1) -.39 (2) -.29 (3) -.16 (4)
16.0	.61	3.62		89.6	-.5	
12.0	.48	2.26	.40			
9.6	.48	1.46		(13.8)	(-2.9)	
8.0	.39	1.31				
6.9	.27	1.49				

sistently leads the rate of interest throughout this frequency range.

CYCLE FREQUENCY	GAIN		
	AMP./SPECT.(M1)	AMP./SPECT.(M2)	AMP./SPECT.(M3)
.0208	4.99	5.34	5.35
.0417	4.59	5.46	6.56
.0625	3.57	4.20	5.62
.0833	2.68	3.12	4.22
.1042	2.40	2.86	3.83
.1250	2.40	2.55	3.71
.1458	2.36	1.96	3.33
.1667	2.10	1.58	2.86
.1875	1.88	1.40	2.67
.2083	1.86	1.20	2.84
.2292	1.55	.85	2.94

6.4 *A Summary of the Findings*

In general the cross-spectral results are consistent with the finance motive being empirically important. The excess of planned expenditure is confirmed as an important variable as it is confirmed that the separation of various categories of actual expenditure may be important. The phase relationships between variables suggested in chapter 6 as being consistent with an empirically important finance motive have not been contradicted by the tests.

The major findings of the tests are:

(i) that the planned expenditure series is a good predictor of actual expenditure and may therefore be useful in testing the finance motive;

(ii) that the excess of planned expenditure series leads actual expenditure by about the 120^0 predicted by the theoretical model of chapter 6;

(iii) that consistent with overseas evidence, the money supply leads expenditure flows by about 2 quarters;

(iv) that the durable consumption expenditure cycle probably has a distinctive phase which may have an important bearing on the demand-for-money cycle;

(v) that the excess of planned expenditure cycle is more closely related to *the change in* the money supply cycle than to the money supply cycle;

(vi) that the excess of planned expenditure cycle leads the money supply cycle by approximately 1 quarter, a little less than predicted by the model of chapter 6.

(vii) that the velocity of money, as expected, lags expenditure flows;

(viii) that the velocity of narrow money balances probably leads the velocity of broad money balances;

(ix) that consistent with overseas evidence the rate of interest lags expenditure flows by about 1 to 2 quarters;

(x) that the excess of planned expenditure is significantly related to and leads the interest rate cycle by approximately 5 quarters at the 16 quarter period cycle - a result which is both consistent with the preceding results and with the prediction of the theoretical model, and

(xi) that the excess of planned expenditure and the change in the rate of interest may be related by a geometrically declining distributed lag model, as may be the money supply and the rate of interest. These two discovered relationships may not, of course, be mutually independent.

CHAPTER 8

MULTIPLE REGRESSION TESTS OF DEMAND FUNCTIONS FOR MONEY

Introduction

United States data and to a lesser extent United Kingdom data, have been used repeatedly to estimate demand functions for money. In comparison Australian data is virgin territory, and in a general sense this chapter will not alter this. It will not *explicitly* deal with those questions which predominate in the existing demand-for-money literature. It has the specific objective of testing the empirical significance of the finance motive. This is *not* to say that matters of definition and specification which impinge upon this objective will be ignored. It *is* to say that they are peripheral and will be treated more cursorily than usual.

Questions of definition and specification are a major preoccupation of the demand-for-money literature. Unfortunately the determination of the form of the demand function for money has tended to become an end in itself rather than a preamble to the substantive issue; namely, how the monetary and real sectors interact. The result of this is that the worth of particular functions is judged on their degree of explanation measured in terms of R^2 and on their stability over time. These are important considerations but they are not the only considerations nor are they necessarily the *most* important. It is, perhaps, equally, if not more, important to investigate the implications of particular functions for the dynamic interaction between the real and monetary sectors and to see how these implications accord with the empirical evidence. A good example of this is Friedman's use of the concept of permanent income - the main argument in his long-run demand function - to explain the observed cyclical fluctuations of velocity. (See chapter 6.)

Chapter 6 had as its major theme a theoretical explanation of the interaction between the real and the monetary sectors based upon the demand for money function introduced in chapter 4. It was found that a demand function for money which included finance demand had important implications for this interaction and that these implications were consistent with the evidence. This is a significant finding, which is not being retested in this chapter. This chapter is primarily concerned with the testing of the significance of *imperfect* proxies for the excess of planned over actual expenditure in explaining variation in interest rates and in the demand for money, and, of course, the results may be affected by the specification and definition of variables and functions.

In an effort to resolve some of these questions of definition and specification most researchers have relied upon the single-equation estimation and investigation of structural demand functions for money. Those who have relied upon more sophisticated simultaneous equation techniques, such as Brunner and Meltzer [1964], Teigen [1964] or Weintraub and Hosek [1970], have not arrived at radically different conclusions. Specific questions remain unresolved because, unlike the seventy translators of the Septuagint,[1] researchers with similar data sets at their disposal are unable to reach concord. Some issues, however, are more settled than others.

Notwithstanding the dissent of Friedman[1959] and Seldon [1959] there is a large measure of agreement that the rate of interest is an important argument in the demand function for money;[2] this is so even though the question of the *relevant* rate of interest has not yet been settled.

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[1] This analogy was used by J.M. Keynes [*Economic Journal*, March 1940, and reproduced in *The Collected Writings*, Vol. 14, p. 318] in commenting on Tinbergen's statistical method. The relevant quote is reproduced below:

> "It will be remembered that seventy translators of the Septuagint were shut up in seventy separate rooms with the Hebrew text and brought out with them, when they emerged, seventy identical translations. Would the same miracle be vouchsafed if seventy multiple correlators were shut up with the same statistical material".

[2] See for examples Brunner [1965], Brunner and Meltzer [1964], Chow [1966], Heller [1965], Klein [1973], Latanne [1954, 1960], Meltzer [1963a], Laidler [1966a, b], Teigen [1964] and Weintraub and Hosek [1970] all using United States data, and Kavanagh and Walters [1966], using United Kingdom data. Laidler [1966b] used the same data set that Friedman [1959] employed. Laidler's method varied from Friedman's to the extent of including the interest rate in the estimating function rather than trying to fit the rate of interest to the residuals calculated after velocity was estimated by regressing cyclical average velocity on cyclical average permanent income. Interest rates were found to be significant. Laidler reconciled his findings with Friedman's by suggesting that the inclusion solely of permanent income in the estimating equation meant that permanent income picked up influence properly ascribable to the rate of interest.

Theoretically, the appropriate rate of interest may depend upon the definition of money. For example, if money is defined narrowly to exclude interest bearing deposits, the short rate may be appropriate, whereas the long rate may be appropriate if money is defined more broadly.[3]

The definition of money is another unsettled issue. Friedman's definition of money which includes interest bearing deposits at trading banks is, for the most part, an empirical rather than theoretical imperative. However, once interest bearing deposits are included it becomes difficult to know where to draw the line. Should, for example, savings bank deposits be included in the definition of money, and if so, should deposits with non-bank financial institutions be considered? It is, in a sense, more satisfactory to use the narrow definition of money, for, at least, a rationale for this particular benchmark can be provided. Both Keynes [1930, *i*, pp. 42-43] and Latanne [1954, 1960] emphasise the means-of-payment approach to the demand for money and therefore exclude

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[3] Money defined exclusive of interest bearing deposits suggests a transactions approach to the demand for money and, therefore, it seems more reasonable, when the rate of interest rises, to expect a temporary economising on balances held rather than a permanent port-folio readjustment; this being so, the short rate of interest is the appropriate rate. Alternatively, money defined inclusive of interest bearing deposits suggests an asset or store of value approach to the demand for money, implying a permanent port-folio response to changes in the rate of interest; this being so, the long rate is the appropriate rate.

interest bearing deposits from their definition of money.[4]

Another unresolved issue is the appropriate constraint to use in the demand function for money. Those who favour the means of payment approach to the demand for money tend to favour current income; those who view the demand for money as being analogous to the demand for any other asset, tend to favour wealth or permanent income. Rather more important, it seems, than the particular choice of variable, is the need to relate empirical findings to the particular definitions used. For example, the conclusion that money is a luxury good is meaningless, unless it is augmented by a definition of money and by a definition of the income or wealth constraint. Meltzer's [1963a] findings that money, when narrowly defined, is *not* a luxury good, is perfectly compatible (as both authors realise) with Friedman's [1959] findings, that money, more broadly defined, *is* a luxury good.

The method of this chapter is to test the significance and robustness of the excess of planned expenditure proxies using a variety of demand function specifications and using a variety of definitions of the money supply and rates of interest. Particular results, therefore, in some respects,

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[4] Keynes did not exclude interest bearing bank deposits merely because they earned a rate of interest but because they were regarded as an investment and not a means of payment.

may well be unique to the specification and definitions used and ought to be appraised accordingly.

There are six sections to the chapter: the first considers the data and the choice of variables; the second the use of anticipation variables in economic analysis; the third the construction of the excess of planned private investment expenditure variables; the fourth the models and the statistical techniques; the fifth, and main section, contains the empirical results, and the last section summarises the major findings. There are also three appendices; the content and purpose of these will be made clear as the chapter unfolds.

1. The Data and the Choice of Variables

The data set is Australian seasonally adjusted quarterly data for the period 1954(1) to 1973(4). Data for most of the series involved in the tests are available for two or three years before 1954, but it is convenient, because the planned investment series plays a prominent part in the tests, to begin from the time that data for this series is available. In general most recently revised data estimates have been used. However, in recognition of the statistical problems associated with data revision - see Burns [1973] - it was decided not to extend the period of testing beyond 1973, although it was feasible at the time of data collection to record original estimates for 1974.

In the main gross national expenditure is used as the constraint variable in the demand function for money. G.N.E. is preferred to national income because it is more in keeping with the basic transactions and finance motive approach. The dominant theoretical approach since Keynes considers the demand for money in the context of port-folio choice with an over-riding wealth constraint. An alternative approach, best exemplified by the Fisherian quantity theory, sees money as essentially a medium of exchange with a stable relationship between the value of transactions and the demand for money. While the approach here does not correspond to either of the above, it is, in an important respect, attuned to the Fisherian approach in emphasising the medium of exchange function of money. Given this, it is considered that expenditure rather than income is the appropriate variable when transactions and finance needs are appraised by spending units. In a closed system, that is, one in which there are no international transactions, income and expenditure are equal. In an open system they are unequal to the extent that the value of exports differs from the value of imports. It should be noted that the use of G.N.E. instead of national income is unlikely to have very much effect on the statistical results.

Five definitions of money are used in the tests. M1, M2, and M3 correspond with the usual definitions of these variables. K1 is equal to M1 plus unused overdraft limits, K2 is equal to K1 plus holdings of government treasury notes and short-term money market deposits. Unused overdraft limits have been included for two reasons. First, to the holders these limits represent readily available purchasing power and therefore come within the ambit of those liquid assets which may be used to service current transaction and finance needs; second, a reasonable supposition is that those in need of liquid assets to finance future expenditure may seek to obtain an overdraft limit or to increase their existing overdraft facility, so that a part of the increased demand for money may be exhibited in overdraft limits rather than in bank deposits. Further support for the inclusion of unused overdraft limits may be gained by considering Keynes' own views. In the *Treatise* division of money into income deposits, business deposits and savings deposits, a sharp distinction is drawn between a cash facility (by which it is meant a means of payment) and an investment. Savings deposits, or in modern parlance, time deposits, are largely regarded as an investment and a 'scarcely money at all' whereas unused overdraft limits are included within the cash facility category [Keynes, 1930, *i*, pp. 42-43]. Also in the *Treatise* there is a strong indication that temporary surplus balances invested in bills and in the money market ought to be included within the definition of money, hence the K2 definition of money. The rationale is that rather than hold cash to meet anticipated expenditure commitments, business will tend to invest in relatively risk-free assets which can be readily converted into cash at the appropriate time.

The interest rates included in the tests are the two year

Government bond rate, the long-term Government bond rate and the short-term money market rate. This latter rate is included (i) because it is available for a longer period than are other short-term rate of interest series and (ii) because it is useful to have a rate of interest which is not a Government administered rate.

There are three excess of planned over actual expenditure variables used in the tests. However, for two reasons most attention is directed towards the excess of planned private new investment over actual private new investment. First, of the three, this variable is the only one based on observations of planned expenditure generated independently of actual expenditure, and second, the planned investment expenditure of business was, to say the least, highlighted by Keynes in his discussion of the finance motive, notwithstanding that consumer durable expenditure and government investment expenditure also came within the ambit of the finance motive.

A list of the variables used in the tests is given below.

E4S	-	G.N.E.
YS	-	G.D.P.
M1S	-	Current account deposits plus notes and coin.
M2S	-	M1S plus interest bearing deposits.
M3S	-	M2S plus savings banks deposits.
K1S	-	M1S plus unused overdraft limits.

K2S - K1S plus holdings of treasury notes plus S.T.M.M. deposits.

RL - long-term government bond rate.

R2 - two year government bond rate.

RMS - S.T.M.M. rate.

XCS - the excess of consumer durable planned expenditure.

XGS - the excess of government investment planned expenditure.

XP1S - the excess of private investment planned expenditure on new buildings and structures.

XP2S - the excess of private investment planned expenditure on fixed capital other than on new buildings and structures.

XP3S - XP1S + XP2S.

X3S - An unlagged version of XP3S. See the section on the construction of XP3S.

V1E4S - E4S/M1S.

V2E4S - E4S/M2S.

V3E4S - E4S/M3S.

VK1E4S - E4S/K1S.

Vk2E4S - E4S/K2S.

V1YS - YS/M1S.

V2YS - YS/M2S.

V3YS - YS/M3S.

VK1YS - YS/K1S.

VK2YS - YS/K2S.

W - A series of variables which correspond to velocity but are calculated as E_t/M_{t-1} where E_t is national expenditure in period t and M_{t-1} is the money supply lagged one quarter.

For most variables there are 80 observations from 1954(1) to 1973(4). The exceptions are RMS for which there is 59 observations from 1959(2) to 1973(4); K1S for which there is 50 observations from 1961(3) to 1973(4) and K2S for which there is 46 observations from 1962(3) to 1973(4). All the variables used in the tests are in logarithm form; if a first difference of the logarithm of a variable is used it is indicated by prefixing the variable with the letter D. A lagged variable is indicated by subscripting the variable by the number of quarters it is lagged; a variable prefixed by the letter B is in the form, x - bx, where x is the first difference of the logarithm of the variable and b is a constant with a value between zero and one; a prime after a variable indicates that it is price deflated. Generally, more information on each variable is given in the data appendix, however, the design and use in regression analysis of anticipatory variables creates special problems; these problems and their resolution for the purpose of testing are the subject of the next two sections.

2. Anticipation Variables in Economic Analysis

The main difficulty in applying regression analysis to test the finance motive is that of designing variables which accurately reflect the expenditure plans of spending units.

This is, in part, the reason for concentrating on that portion of expenditure plans which exceed or fall short of realised expenditure of the current period. Little would be gained by replacing realised expenditure with total planned expenditure in the demand function for money, if the imperfect measure of planned expenditure were, as is likely, highly correlated with the imperfect (but probably more accurate) measure of realised expenditure; that is, reliable conclusions would not follow from such a procedure.[5] On the other hand, a test of a demand function which includes both current realised expenditure and the deviation of planned expenditure has the potential to discern a distinctive and separate influence ascribable to the finance motive. The problem still remains, however, of designing variables which go some way towards accurately measuring this deviation.

For the most part the use of anticipatory variables in

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[5] The cross-correlation matrix for G.N.E. (E4S), planned private new capital expenditure (C12AS) and the money supply (M1S), is printed below:

	C12AS	E4S
E4S	.98	
M1S	.94	.98

The degree of association between the variables is evident from the matrix, and indicates the difficulty of discriminating between competing hypotheses.

economic analysis has had the objective of improving prediction. (For some evidence of this see articles by Adams and Klein [1972], Katona [1972], Hymans [1970], and Jorgenson [1971].) Seldom is the estimation of anticipations, expectations or plans an objective in itself. Rather, the objective is to predict the variation in observable economic variables. The extent to which a model does this measures its success. For example, a model incorporating the expenditure plans of consumers is usually judged on the extent to which it can predict future consumption expenditure. Clearly, a model which seeks to explain rather than predict would be better off including as a variable future consumption expenditure instead of a predicted value of future consumption expenditure. In other words, if planned consumption expenditure is to be included in an explanatory model, there is no advantage in substituting C_t^* for C_{t+i} when the *estimated* planned variable C_t^* has been designed to predict the actual observed variable C_{t+i} and when the only criterion for judging the accuracy of C_t^* is to compare it with C_{t+i}.

A major difficulty arises if a crucial aspect of some explanatory model is the distinction between planned and observed magnitudes. It is very difficult, and perhaps impossible, to estimate reliable anticipatory variables if the nature of the experiment precludes them from being tested and refined by comparing them with their corresponding future observed values. This is precisely the difficulty in directly testing the finance motive. If a planned expenditure variable is *designed* to accord with future realised expenditure, then it may be preferable to include the latter rather than the former as an explanatory variable.

This is, in fact, the technique used to construct the excess of planned durable consumption variable (XCS) and the excess of planned government investment variable (XGS). The assumptions of this technique are that non-routine expenditure of the forthcoming period is planned in the current or in a previous period and that plans are exactly realised. That is, it is assumed that $X_t^* = X_{t+i}$, where X is an expenditure variable, where the asterisk indicates expenditure planned for the next period and where the subscript refers to the time period in quarters. This is not an ideal procedure. An alternative is to go ahead and construct anticipatory variables, say, on the basis of past observations. This technique is used by Meyer and Neri [1975]. The trouble with it is that nothing really can be claimed for the accuracy of the planned variables it throws up - again, short of comparing them with future realised magnitudes. Nevertheless, an appendix to this chapter (8.2) examines Meyer and Neri's technique and results, and repeats their procedure using Australian annual data.

The ideal alternative is to use a planned expenditure series whose construction is not based on realised magnitudes and whose verification does not *require* comparison with realised magnitudes. The only way to generate such a series is by directly seeking information on planned expenditure from those involved in the planning process. The XPS series are based upon a planned investment series generated in this way. Detailed information on this latter series is in the data appendix. The construction of the XPS series, for use in regression analysis, poses a special problem and the next section considers this.

3. The Construction of the XPS Series

The demand functions for money being tested in this chapter are variants of the function introduced in chapter 4. One such general variant is the function:

$$m^d = \ell(y, r, I^* - I)$$

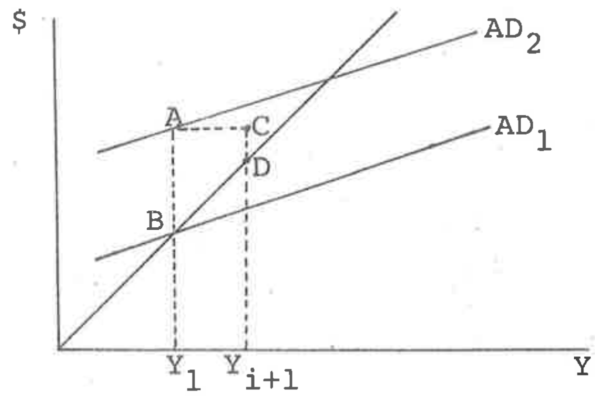
where m^d is the change in the demand for money, y is the change in income, r is the change in the rate of interest, I* is planned private investment and I is realised private investment. In the tests XPS stands for $I^* - I$. The problem is to determine the appropriate time subscripts when the demand-for-money variable m^d is replaced with the money supply (m) in the estimating equation.

The inclusion of finance demand in the demand function for money does not necessarily imply that the money supply is endogenously determined. However, the empirical verification of the finance motive using regression analysis with the stock of money as the dependent variable does require that the money supply is, at least, partially responsive to demand, although it does not require (or should not if the tests are to be of any use) that the money supply immediately and completely adjusts to a change in the demand. If the money supply does respond it is likely to lag, and it is important to determine the length of this lag especially when the explanatory variable is, as in this case, not dominated by trend. However, even if the length of the lag is determined accurately a problem remains.

The problem is one of disentangling the effects on the money supply of a change in *planned* expenditure from the effects of a change in *realised* expenditure. If, say, the money supply takes i periods to respond to an increase in planned investment and during that period realised expenditure increases [in part or in whole due to the increase in planned investment] there will be a positive correlation between the money supply and realised expenditure which is spurious to the extent that the increase in the money supply is due not to the change in realised expenditure but to the change in planned investment. This spurious correlation may give rise to misleading regression results. One way of overcoming this problem is to lag planned expenditure but not actual expenditure in the construction of the excess of planned expenditure over actual expenditure variable. The demand function to be estimated is then:

$$m_t = \ell(y_t, r_t, I^*_{t-1} - I_t)$$

The problem and the procedure suggested to overcome it can be more easily understood in the context of a diagram. The diagram below is a 45 degree diagram which shows an initial equilibrium at position B, which is disturbed in period 1 by an upward shift in the aggregate demand schedule from AD_1 to AD_2 (where aggregate demand in this instance is the expenditure flow planned for forthcoming production periods but where there is no implication that plans will be exactly realised or will remain unrevised).



Assume a discrete lag of i periods between the demand for money and the supply response and that during the period of this lag income increases to Y_{i+1}, an analysis of the relative movement of variables during the interval 2 to i+1 would show, provided the aggregate demand schedule AD_2 obtains in period i+1, a zero autonomous change in the excess of planned expenditure variable and positive changes in both the money supply and income. It is clearly necessary to lag the excess of planned expenditure variable. However, if the money supply has primarily responded in period i+1 to a change in planned expenditure in period 1 it would be misleading to explain the change in the money supply between periods 1 and i+1 in terms of the change in income between l and i+l *and as well* in terms of the excess of planned expenditure (A - B). A procedure which allows the effects of the excess of planned expenditure variable to be disentangled and isolated is to consider in period i+l the excess of planned expenditure level CD. In the diagram this is positive, it may, depending on the length of the lag and the associated change in income, be either positive or negative. It may be negative if, for example, plans are revised upwards during the period of the lag. In this case by the time the money supply has responded to the original increase in plans the revision may have carried actual expenditure beyond the originally planned level. Considering the level CD is analogous to lagging investment plans by i periods in constructing the excess of planned over actual investment expenditure variable.

3.1 *The empirical estimation of the length of the lag.*

The money supply (two definitions) was regressed on the excess of planned private investment expenditure variable (lagged from 0 to 4 quarters), G.N.E., the two year government bond rate, and the money supply lagged one period. The variables are in first difference of logarithm form except for the excess of planned expenditure variable which is already in a difference form - see p.163, pp.236-237 and p.345. The tests were run for various time periods; the object was to discover the lag which performed best. It could be argued that this procedure is methodologically questionable in that the choice of the 'best lag' may predispose later tests to assign significance to the excess of planned expenditure variable. However, there is no feasible alternative, and as well, the information on lags is useful in its own right, apart from its use in correctly forming the excess of planned expenditure variable. A selection of the results of this preliminary experimentation is given below in Table 3.1. The two definitions of money used were M1 and K2. The excess of planned expenditure variable is denoted by X_i where i is the length of the lag in quarters, X_2 is constructed, for example, by subtracting from planned expenditure of two quarters ago the actual expenditure of the current quarter.

Table 3.1

Dependent Variable	Constant	Explanatory Variables								R^2 / D.W.	time period
		x_0	x_1	x_2	x_3	x_4	DE4S	DR2	d_{-1}		
DM1S	.01 (3.90)	-.01 (0.35)	.01 (0.35)	.06 (1.09)	-.03 (-.71)	.09 (2.70)	-.10 (-.93)	.01 (.46)	.57 (2.84)	.73 1.93	[44,87]
DM1S	.01 (4.84)	.02 (.67)	-.02 (-.38)	.16 (2.92)	-.03 (-.85)	.15 (4.95)	.11 (1.22)	.04 (1.54)		.66 1.64	[44,87]
DK2S	.01 (3.07)	-.01 (-.16)	.01 (.28)	.00 (.00)	-.03 (-.55)	.12 (2.70)	.07 (.65)	-.04 (-1.18)	.45 (2.56)	.67 2.04	[44,87]
DK2S	.02 (4.11)	.02 (.60)	.00 (-.03)	.10 (1.50)	-.04 (-.82)	.18 (4.74)	.17 (1.52)	-.04 (-1.14)		.61 1.51	[44,87]
DM1S	.00 (1.39)	.01 (.44)					-.03 (-.42)	-.05 (-2.24)	.79 (7.60)	.57 2.20	[15,87]
DM1S	.00 (1.42)	.03 (1.08)					.28 (3.42)	-.02 (-.76)		.20 .87	[15,87]
DM1S	.00 (1.46)		.01 (.37)				-.03 (-.40)	-.05 (-2.19)	.80 (7.70)	.57 2.20	[15,87]
DM1S	.01 (1.73)		.02 (.55)				.30 (3.72)	-.02 (-.52)		.19 .89	[15,87]

The 't' statistic is in brackets beneath the estimated regression coefficient.

d_{-1} - lagged dependent variable. D.W - the Durbin-Watson statistic.

Table 3.1 cont.

Dependent Variable	Constant	Explanatory Variables								R^2 / D.W.	time period
		x_0	x_1	x_2	x_3	x_4	DE4S	DR2	d_{-1}		
DK2S	.01 (1.55)		-.01 (-.32)				.03 (.23)	-.07 (-1.90)	.74 (6.09)	.56 2.28	[44,87]
DK2S	.01 (2.07)		.06 (1.10)				.29 (1.88)	-.10 (-2.21)		.14 .83	[44,87]
DK2S	.01 (1.57)			-.05 (-.63)			.02 (.19)	-.07 (-2.28)	.78 (5.41)	.57 2.25	[44,87]
DK2S	.01 (4.67)			.19 (6.32)			.24 (2.73)	-.09 (-5.02)		.24 1.10	[44,87]
DK2S	.01 (1.88)				.06 (1.44)		.05 (.43)	-.06 (-2.19)	.63 (4.82)	.58 2.31	[44,87]
DK2S	.01 (3.29)				.15 (3.60)		.27 (2.03)	-.06 (-1.60)		.34 1.43	[44,87]
DK2S	.01 (3.31)					.10 (3.48)	.08 (.73)	-.04 (-1.38)	.45 (3.46)	.67 2.05	[44,87]
DK2S	.02 (5.43)					.17 (6.35)	.21 (1.95)	-.02 (-.67)		.56 1.30	[44,87]

Table 3.1 cont.

Dependent Variable	Constant	Explanatory Variables								R^2 — D.W.	time period
		x_0	x_1	x_2	x_3	x_4	DE4S	DR2	d_{-1}		
DM1S	.01 (2.86)	-.03 (-1.25)					-.12 (-.99)	-.05 (-1.65)	.85 (5.33)	.61 2.17	[44,71]
DM1S	.01 (2.29)	.01 (.48)					.20 (1.34)	-.08 (-1.60)		.13 .85	[44,71]
DM1S	.01 (2.32)		.01 (.42)				-.10 (-.91)	-.06 (-1.90)	.77 (4.85)	.59 1.93	[44,71]
DM1S	.01 (2.19)		.04 (1.14)				.20 (1.44)	-.08 (-1.75)		.17 .82	[44.71]
DM1S	.01 (2.44)			.04 (.84)			-.08 (-.66)	-.07 (-1.99)	.72 (4.23)	.60 2.12	[44,71]
DM1S	.01 (2.38)			.15 (2.32)			.23 (1.74)	-.09 (-1.94)		.28 1.21	[44,71]
DM1S	.01 (3.54)				.07 (2.46)		-.11 (-.99)	-.02 (-1.15)	.68 (4.75)	.67 2.29	[44,71]
DM1S	.01 (3.81)				.11 (2.89)		.16 (1.25)	-.03 (-.72)		.34 1.27	[44,71]

Table 3.1 cont.

Dependent Variable	Constant	Explanatory Variables								R^2 — D.W.	time period
		x_0	x_1	x_2	x_3	x_4	DE4S	DR2	d_{-1}		
DM1S	.00 (1.95)			-.03 (-.66)			-.04 (-.53)	-.05 (-2.07)	.82 (7.59)	.57 2.19	[15,87]
DM1S	.00 (1.40)			.06 (1.24)			.32 (4.14)	-.02 (-.65)		.20 .99	[15,87]
DM1S	.00 (1.71)				.03 (1.25)		.01 (.09)	-.05 (-2.19)	.76 (7.23)	.57 2.20	[15.87]
DM1S	.01 (1.96)				.08 (2.42)		.35 (4.58)	-.01 (.24)		.25 1.14	[15,87]
DM1S	.01 (2.35)					.04 (2.07)	.01 (.19)	-.03 (-1.54)	.73 (6.95)	.59 2.16	[15,87]
DM1S	.01 (3.05)					.08 (3.38)	.33 (4.55)	.01 (.56)		.30 1.16	[15,87]
DK2S	.01 (1.81)	-.03 (-.99)					.03 (.23)	-.05 (-1.48)	.76 (6.36)	.57 2.27	[44,87]
DK2S	.01 (2.07)	.03 (.64)					.30 (1.92)	-.10 (-1.95)		.13 .80	[44,87]

Table 3.1 cont.

Dependent Variable	Constant	Explanatory Variables								R^2 — D.W.	time period
		x_0	x_1	x_2	x_3	x_4	DE4S	DR2	d_{-1}		
DM1S	.01 (3.60)					.06 (2.29)	-.12 (-1.11)	-.02 (-.67)	.62 (3.93)	.66 2.03	[44,71]
DM1S	.02 (4.77)					.10 (3.64)	.07 (.63)	.00 (.00)		.44 1.06	[44,71]

When all of the lagged excess of planned expenditure variables were included together as regressors (the first four regressions), X_4 performed best in almost always having a positive coefficient significantly different from zero. It should, however, be noted that the simple correlation coefficient between X_3 and X_4 is in the region of 0.7 and that therefore too much reliance cannot be placed on the values of their respective coefficients. When the lagged variables were inserted separately, the estimated coefficient of X_0 alternated between being positive and negative and was always insignificant; the coefficient of X_1 was predominantly positive but was never significant; the coefficient of X_2 was predominantly positive and was significant a number of times; the coefficient of X_3 was always positive and usually significant, and the coefficient of X_4 was always positive and always significant. Preliminary experiments indicated that the use of more highly lagged variables did not improve on the performance of X_4.

If models which did not include the adjustment variable (the lagged dependent variable) are considered, the use of X_4 instead of a lower lagged variable (especially X_0, X_1, or X_2) significantly increases the proportion of the variation of the dependent variable explained - often converting a low R^2 into a respectable size considering the use of first difference data - and reduces the problem of first order autocorrelation of the residuals.

On the basis of these tests it was decided to lag planned new private investment expenditure by four quarters in constructing the XP3S variable. However, experiments indicated that when this variable was split into its constituent parts, XP1S and XP2S, the appropriate lags were three and four quarters respectively; these variables were constructed on this basis.

4. Regression Models and Statistical Technique

There are those economic models which have completeness and accurate prediction as their objectives, and there are those much more simply structured models which have as their objective the discovery or verification of fundamental economic relationships. The kind of models with which Friedman works provide, perhaps, some of the best examples of the latter; the former are best exemplified by models under the auspices of institutions, for example, the Reserve Bank's model of the Australian economy. The models used in this chapter belong strictly to the category of those whose objective is to discover fundamental relationships, and it is this objective which guides both the choice of the structures of the models and the choice of the testing procedure.

The models to be tested are all adaptions of a basic Keynesian demand function for money, which relates the demand for money to three variables: current expenditure, the rate of interest and the excess of planned over actual non-routine expenditure. The *a priori* attribution of variance is that current expenditure and the rate of interest explain that part of the variance of the demand for money due to the adjustment of the economy towards equilibrium; this encompasses transactions, precautionary and speculative demand, while the excess of planned expenditure explains that part due to the divergence of the economy from a previous equilibrium; this encompasses finance demand. (See chapters 3 and 4 for clarification of this demarcation.) The statistical technique used is ordinary least squares. Thus this procedure is, at least, in respect of the single equation estimation of structural demand functions for money attuned to most of the research in this area. It, of course, disregards the possibility of simultaneous-equation bias. However, the attempt to take account of this possibility by devising more complex simultaneous-equation models has its own costs; and anyway those who have used these more complex models, as has been noted, have not reached very different conclusions.

The use of quarterly data indicates that the demand functions to be estimated are short-run functions. This is clearly appropriate for testing the finance motive. The estimation of long-run functions, say by Friedman's method of using cyclical average data, would tend to involve the ironing out of fluctuations which have to be considered explicitly when testing the finance motive. Demand functions for money usually have the money supply as the dependent variable, and it is either assumed that the money supply is equal to the demand

demand for money or that the money supply responds in some stable determinable way as the demand varies (usually that changes in supply are a constant proportion of the difference between the current period's demand and the previous period's supply). However, sometimes the rate of interest is preferred as the dependent variable. The tests which follow use both specifications. (Some comment is made on the choice of dependent variables in appendix 8.1.)

In the main, except for the excess of planned expenditure variables, the variables are cast in first difference form. The excess of planned expenditure variables are, as they stand, in a 'difference' form and it is appropriate and necessary (if meaningful quantitative relationships are to be obtained) to lessen the dominance of trend in the other variables. The standard reasons for using first difference data are (i) that any time trend in the relationship under test is reduced to zero; (ii) that serial correlation, if it exists, may be significantly reduced[6] and (iii) that multicollinearity between independent variables through a common trend will be reduced. However, first difference data are likely to be more sensitive to errors of measurement; accordingly, the significant reduction in explanation which usually accompanies the transformation of data into first difference

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[6] The use of first difference data to reduce serial correlation strictly implies an autoregressive patterns of residuals of the form: $e_t = \rho e_t + u_t$; where u_t has the usual desirable properties of an error term, and where $\rho \simeq 1$.

form does not necessarily support the view that relationships found in untransformed data are due merely to a common trend. It is possible that good results obtained using untransformed data reflect causal relationships dominating errors whereas inferior results using transformed data reflect errors distorting and dominating causal relationships. Unfortunately, even if true, this is not very helpful in situations where any number of trend dominated economic variables can more than adequately explain the variation in any one variable. And, more to the point, it is, perhaps, more pertinent in growing economies to look at deviations rather than trends. In other words, the use of first difference data may be dictated by economic as much as by statistical considerations.

5. The Empirical Results

5.1 *Model 1*

Theoretically, the finance motive effect may be evident in the variation of three variables: the money supply, the velocity of circulation of money, and the rate of interest. A positive relationship would be expected between the excess of planned expenditure variable and (1) the money supply and (2) the rate of interest,[7] and a negative relationship would be expected between the excess of planned expenditure variable and velocity. These relationships are not independent. For example, the faster and more completely the money supply

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[7] See Ch. 6 for clarification.

responds to demand, the less will the rate of interest tend to rise and the greater will be the *initial* fall in velocity and the less the *subsequent* rise.

Model 1 is the most straightforward of the models being tested. It can be expressed in general form as:

$$m_t^d = \ell(e_t, r_t, X_t) \qquad \text{. . . . . . .(8.1)}$$

where m_t^d is the change in the demand for money, e_t is the change in national expenditure, r_t is the change in the rate of interest and X_t is the excess of planned over realised non-routine expenditure. The operational form of equation (1) being tested is a multiplicative or linear in logarithms specification:

$$m_t = \alpha e_t^{\beta_1} \; r_t^{\beta_2} \; X_t^{\beta_3}$$

$$\text{or:} \quad \ln m_t = \ln\alpha + \beta_1 \ln e_t + \beta_2 \ln r_t + \beta_3 \ln X_t \qquad \text{. . .(8.2)}$$

where m_t is the change in the money supply (in this model it is assumed that $m_t = m_t^d$), and α and the β_i's are structural parameters. The model is tested over four time periods, using five definitions of the money supply and three rates of interest. The excess of planned expenditure variables enter the estimating equations in several forms. Sometimes the excess of planned new investment variable (XP3S) or its constituent variables (XP1S and XP2S) enter alone, and sometimes the excess of planned consumer durable expenditure variable (XCS) is also included. The excess of planned government investment variable (XGS) is not included in the tests: this is because it is unlikely given the complications of the relationship between government expenditure and the money supply, that any useful information would be forthcoming using present methods. (See chapter 3, pp.49-50 and n.5.)

Table 5.1 presents some results using the three conventional definitions of the money supply for the inclusive period 1954(3) to 1973(4).

Table 5.1

Regression No.	Dependent Variable	Constant	Explanatory Variables						R^2	D.W.	time period – n
			DE4S	DR2	XP3S	XCS					
1.	DM1S	.01 (2.25)	.30 (4.02)	-.01 (-.35)					.18	.86	[10,87] 78
2.	DM1S	.01 (2.31)	.29 (4.02)	.02 (.76)	.05 (2.76)	.08 (2.20)			.30	1.14	[10,87] 78
3.	DM2S	.01 (4.78)	.25 (3.27)	.01 (.45)					.13	.54	[10,87] 78
4.	DM2S	.01 (5.19)	.24 (3.38)	.05 (1.78)	.07 (3.53)	.08 (2.09)			.30	.83	[10,87] 78
5.	DM3S	.01 (8.05)	.20 (3.57)	.01 (.48)					.15	.45	[10,87] 78
6.	DM3S	.01 (8.63)	.19 (3.70)	.04 (1.89)	.05 (3.61)	.07 (2.46)			.33	.74	[10,87] 78

The 't' statistic is in brackets beneath the estimated regression coefficient.

n - the number of observations.

D.W. - the Durbin-Watson statistic.

On the whole the results are not very satisfactory. Even granted that first difference data is being used the degree of explanation is poor, and there is evidence of positive serial correlation. As well, the interest rate variable (in this case the two year government bond rate) is mainly *incorrectly* signed and insignificant. However, there are some redeeming features. Both of the excess of planned expenditure variables enter the demand functions significantly with the expected sign; their entry approximately doubles the degree of explanation, and although there remains evidence of serial correlation it is somewhat reduced.

Tables 5.2, 5.3 and 5.4 present results using the same model specification but over three sub-periods. The sub-periods are; 1961(2) to 1973(4), 1961(2) to 1972(1), and 1954(3) to 1961(1). These sub-periods were chosen after some preliminary experimentation. The object of this experimentation was to discover whether relationships holding over the whole period also held over various sub-periods. It was found that they did not. Specifically, it was found that the excess of planned expenditure variables were insignificant during the 1950's or that, at least, during this period there were certain *dominant* movements in monetary aggregates which were not explained by movements in planned expenditure. Appendix 8.1 to this chapter goes into some detail on this question and reaches the conclusion, if a little tentatively, that the dominant factors influencing monetary aggregates in the 1950's were not the same as those in subsequent years; and that in fact the non-significant and even perverse relationship between planned expenditure and the money supply is to be expected. The kind of statistical results thrown up by this early period are illustrated in Table 5.4. Table 5.2 presents results for the period subsequent to the period upon which the results of table 5.4 are based. This period of the 1960's and early 1970's provides the main testing-ground for the finance motive: from an economic point of view it is a period when endogenous forces influencing monetary aggregates were relatively more dominant (see appendix 8.1); from a statistical point of view, data on overdraft limits, short-term money market holdings, treasury note holdings and the short-term money market rate of interest are not available for earlier periods. The reasons for examining the sub-period 1961(2) to 1972(1), the results of which are presented in table 5.3, are first to test the stability of the estimated parameters when the period is extended, and second to test how well estimated functions based upon this time period can predict.

Table 5.2

Regression No.	Dependent Variable	Constant	Explanatory Variables						R^2	D.W.	time period — n
			DE4S	DR2	XP3S	XCS					
7.	DM1S	.01 (3.34)	.24 (2.31)	.03 (.90)					.15	.72	[37,87] 51
8.	DM1S	.01 (4.81)	.24 (2.93)	.07 (2,79)	.13 (5.60)	.03 (.94)			.51	1.40	[37,87] 51
9.	DM2S	.02 (5.98)	.22 (2,25)	.05 (1.67)					.20	.43	[37,87] 51
10.	DM2S	.02 (8.61)	.22 (3.04)	.10 (4.07)	.13 (6.36)	.03 (.86)			.58	1.23	[37,87] 51
11.	DM3S	.02 (8.40)	.20 (2.76)	.03 (1.46)					.23	.37	[37,87] 51
12.	DM3S	.02 (11.35)	.20 (3.60)	.07 (3.64)	.09 (5.96)	.03 (1.16)			.58	.99	[37,87] 51

Table 5.3

Regression No.	Dependent Variable	Constant	Explanatory Variables						R^2	D.W.	time period — n
			DE4S	DR2	XP3S	XCS					
13.	DM1S	.01 (4.18)	.12 (1.60)	.00 (.07)					.06	1.01	[37,80] 44
14.	DM1S	.01 (4.75)	.16 (2.07)	.03 (1.22)	.06 (2.45)	.00 (.12)			.19	1.22	[37,80] 44
15.	DM2S	.01 (9.85)	.06 (.98)	.01 (.48)					.03	.86	[37,80] 44
16.	DM2S	.02 (10.97)	.09 (1.60)	.04 (1.97)	.06 (3.21)	.00 (.20)			.24	1.06	[37,80] 44
17.	DM3S	.02 (15.24)	.08 (1.85)	.00 (.26)					.08	.69	[37,80] 44
18.	DM3S	.02 (15.62)	.09 (2.31)	.02 (1.40)	.03 (2.47)	.01 (.43)			.21	.72	[37,80] 44

Table 5.4

Regression No.	Dependent Variable	Constant	Explanatory Variables						R^2	D.W.	time period – n
			DE4S	DR2	XP3S	XCS					
19.	DM1S	.00 (.24)	.20 (2.11)	-.09 (-1.96)					.34	1.17	[10,36] 27
20.	DM1S	.00 (-.65)	.20 (2.09)	-.05 (-.84)	-.03 (-1.20)	.10 (1.14)			.43	1.38	[10,36] 27
21.	DM2S	.01 (1.87)	.07 (.90)	-.08 (-1.97)					.22	1.39	[10,36] 27
22.	DM2S	.00 (1.04)	.07 (.86)	-.96 (-1.11)	-.01 (-.62)	.05 (.65)			.25	1.44	[10,36] 27
23.	DM3S	.01 (5.24)	.05 (.95)	-.05 (-1.97)					.22	1.15	[10,36] 27
24.	DM3S	.01 (3.52)	.06 (1.07)	-.02 (-.48)	.00 (-.38)	.07 (1.43)			.30	1.22	[10,36] 27

Table 5.2 provides the most promising evidence so far for the importance of the finance motive. Consider regressions number 7 and 8. The introduction of XP3S and XCS increases the degree of explanation of the variation in DM1S from .15 to .31, a result which, if not outstanding, is reasonable considering that first difference data is being used. As well, there is no conclusive indication [at the 5 per cent level] of serial correlation in regression number 8. Another point worth noting is the decline in the coefficient on the excess of planned investment variable (XP3S) when the definition of money is expanded to include savings bank deposits. It would be unlikely that increases in the money supply generated to finance planned investment would take the form of increases in savings bank deposits, and the lower coefficient when DM3S is the dependent variable is consistent with this and provides, at least, indirect support for the proposition that the empirical results are in fact reflecting a finance motive effect. There are two detracting aspects of the results: the interest rate coefficient is again perversely signed and the excess of planned durable consumption expenditure variable, although having the expected sign, is not significant.

Unfortunately, while these detracting aspects carry over to table 5.3 not all of the redeeming features do; in particular, the degree of explanation falls considerably. However, the XP3S variable remains significant at the 1 per cent level although, in common with all of the explanatory variables, the size of its regression coefficient is approximately halved.

A *Chow* stability test[8] was performed on regressions number 8 and 14. As a casual observation would suggest, and as the computed F(=4.92) value indicates, the estimated structural parameters are not stable over the period 1961(2) to 1973(4). On the face of it, it seems unlikely, given this instability, that an equation estimated for the shorter period would predict accurately; nevertheless, a *Theil* prediction coefficient[9] for regression number 14 of 0.57, calculated over

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[8] The *Chow* test is based on the F distribution and indicates that the null hypothesis be rejected, *i.e.*, that the structural parameters be considered unstable, if $F^* > F_{m,n-k}(\alpha)$, where $F_{m,n-k}(\alpha)$ is the critical value of F at the α level of significance with m and n-k degrees of freedom, and where,

$$F^* = \frac{\left(\sum_{n+m} e^2 - \sum_{n} e^2\right) / m}{\sum_{n} e^2 / (n-k)}$$

where $\sum_{n+m} e^2$ is the sum of the squared residuals resulting from the estimation over the whole period, $\sum_{n} e^2$ is the corresponding sum for the initial n observations, n+m is the total number of observations and k is the number of estimated parameters including the constant.

[9] The *Theil* prediction coefficient (U) is equal to

$$+\sqrt{\frac{\Sigma(P_i - A_i)^2 / n}{\Sigma A_i^2 / n}}$$

where P_i is the predicted change in the dependent variable, and A_i is the actual change; n is the number of observations. A value of U less than one indicates that the predictions of the model are superior to a naive zero-change hypothesis. The closer U is to zero, the better is the predictive power of the model.

the period 1972(2) to 1973(4) inclusive, represents a considerable gain on the naive no change hypothesis and is also an improvement on the prediction coefficient of .72 applying to regression number 13.

The next series of results (tables 5.5 to 5.11) involve the K1 and K2 definitions of the money supply; three rates of interest, and the change in gross domestic product (DYS) as well as DE4S. The excess of planned consumer durable expenditure is dropped from all but two of the estimating equations and XP3S is split into its constituent parts XP1S and XP2S.

Table 5.5

Regression No.	Dependent Variable	Constant	Explanatory Variables						R^2	D.W.	time period — n
			DE4S	DRL	XP3S	XP1S	XP2S				
25.	DK1S	.01 (2.98)	.17 (1.44)	-.14 (-2.50)					.16	.96	[44,80] 37
26.	DK1S	.01 (4.91)	.12 (1.14)	-.05 (-.96)	.09 (3.94)				.43	1.06	[44,80] 37
27.	DK1S	.01 (4.42)	.12 (1.22)	-.01 (-.17)		.03 (1.89)	.09 (3.68)		.48	1.07	[44,80] 37
28.	DK1S	.01 (2.13)	.38 (2.17)	-.11 (-1.49)					.11	.63	[44,87] 44
29.	DK1S	.02 (5.21)	.20 (1.61)	.02 (.30)	.18 (6.87)				.60	1.25	[44,87] 44
30.	DK1S	.02 (4.39)	.20 (1.58)	.06 (1.02)		.06 (2.82)	.15 (5.18)		.59	1.28	[44,87] 44

Table 5.6

Regression No.	Dependent Variable	Constant	Explanatory Variables						R^2	D.W.	time period — n
			DE4S	DR2	XP3S	XP1S	XP2S				
31.	DK1S	.01 (3.50)	.09 (.80)	-.07 (-2.18)					.13	.92	[44,80] 37
32.	DK1S	.01 (5.44)	.08 (.89)	-.02 (-.60)	.10 (4.08)				.42	1.00	[44,80] 37
33.	DK1S	.02 (4.92)	.11 (1.25)	.00 (.01)		.03 (1.87)	.09 (3.88)		.48	1.08	[44,80] 37
34.	DK1S	.01 (2.49)	.29 (1.85)	-.04 (-1.00)					.08	.61	[44,87] 44
35.	DK1S	.02 (5.57)	.19 (1.75)	.02 (.73)	.19 (7.12)				.59	1.29	[44,87] 44
36.	DK1S	.02 (4.68)	.22 (2.05)	.04 (1.23)		.06 (2.79)	.15 (5.44)		.60	1.39	[44,87] 44

Table 5.7

Regression No.	Dependent Variable	Constant	Explanatory Variables						R^2	D.W.	time period – n
			DE4S	DRMS	XP3S	XP1S	XP2S				
37.	DK1S	.01 (3.22)	.21 (1.86)	-.15 (-3.37)					.26	1.05	[44,80] 37
38.	DK1S	.01 (5.16)	.17 (1.83)	-.09 (-2.48)	.08 (4.10)				.51	1.06	[44,80] 37
39.	DK1S	.01 (4.41)	.19 (1.98)	-.08 (-1.91)		.03 (2.04)	.07 (3.54)		.53	1.09	[44,80] 37
40.	DK1S	.01 (1.89)	.53 (3.75)	-.19 (-4.33)					.35	.80	[44,87] 44
41.	DK1S	.01 (4.54)	.38 (3.63)	-.10 (-3.03)	.15 (6.11)				.66	1.20	[44,87] 44
42.	DK1S	.02 (3.29)	.40 (3.58)	-.09 (-2.46)		.06 (3.09)	.10 (3.94)		.64	1.27	[44,87] 44
43.	DK1S	.01 (4.24)	.37 (3.59)	-.10 (-3.07)	.15 (6.20)	XCS .06 (1.68)			.69	1.32	[44,87] 44
44.	DM1S	.01 (4.54)	.31 (2.91)	-.04 (-1.27)	.12 (4.73)				.51	1.37	[44,87] 44

Table 5.8

Regression No.	Dependent Variable	Constant	Explanatory Variables						R^2	D.W.	time period – n
			DE4S	DRL	XP3S	XP1S	XP2S				
45.	DK2S	.01 (2.81)	.25 (1.98)	-.17 (-3.00)					.22	1.16	[44,80] 37
46.	DK2S	.01 (4.26)	.20 (1.76)	-.09 (-1.63)	.08 (3.23)				.41	1.24	[44,80] 37
47.	DK2S	.01 (4.01)	.20 (1.82)	-.05 (-.77)		.03 (1.49)	.08 (3.29)		.47	1.26	[44,80] 37
48.	DK2S	.01 (2.20)	.43 (2.61)	-.18 (-2.51)					.17	.80	[44,87] 44
49.	DK2S	.02 (4.82)	.27 (2.17)	-.07 (-1.16)	.16 (6.00)				.56	1.38	[44,87] 44
50.	DK2S	.02 (4.04)	.27 (2.14)	-.02 (-.38)		.05 (2.46)	.13 (4.50)		.57	1.41	[44,87] 44

Table 5.9

Regression No.	Dependent Variable	Constant	Explanatory Variables DE4S	DR2	XP3S	XP1S	XP2S		R^2	D.W.	time period n
51.	DK2S	.01 (3.41)	.15 (1.23)	-.08 (-2.65)					.19	1.06	[44,80] 37
52.	DK2S	.01 (4.85)	.14 (1.34)	-.04 (-1.27)	.09 (3.34)				.39	1.09	[44,80] 37
53.	DK2S	.02 (4.58)	.17 (1.69)	-.02 (-.57)		.03 (1.49)	.09 (3.50)		.47	1.17	[44;80] 37
54.	DK2S	.01 (2.69)	.31 (2.02)	-.08 (-1.91)					.12	.76	[44,87] 44
55.	DK2S	.02 (5.35)	.21 (1.93)	-.02 (-.65)	1.7 (6.22)				.55	1.31	[44,87] 44
56.	DK2S	.02 (5.06)	.24 (2.20)	.00 (-.06)		.05 (2.41)	.14 (4.87)		.57	1.40	[44,87] 44

Table 5.10

Regression No.	Dependent Variable	Constant	Explanatory Variables						R^2	D.W.	time period — n
			DF4S	DRMS	XP3S	XP1S	XP2S				
57.	DK2S	.01 (3.03)	.26 (2.03)	-.14 (-2.99)					.22	1.28	[44,80] 37
58.	DK2S	.01 (4.59)	.21 (1.98)	-.09 (-2.08)	.08 (3.54)				.44	1.33	[44,80] 37
59.	DK2S	.01 (4.32)	.22 (2.11)	-.06 (-1.43)		.03 (1.52)	.08 (3.59)		.49	1.37	[44,80] 37
60.	DK2S	.01 (2.19)	.52 (3.82)	-.20 (-4.81)					.39	1.14	[44,87] 44
61.	DK2S	.01 (4.67)	.38 (3.64)	-.12 (-3.60)	.14 (5.62)				.66	1.57	[44,87] 44
62.	DK2S	.01 (3.72)	.39 (3.64)	-.11 (-2.91)		.05 (2.56)	.10 (4.01)		.64	1.62	[44,87] 44
63.	DK2S	.01 (4.37)	.37 (3.64)	-.12 (-3.72)	.14 (5.81)	XCS .07 (2.08)			.69	1.63	[44,87] 44

Table 5.11

Regression No.	Dependent Variable	Constant	Explanatory Variables						R^2	D.W.	time period — n
			DYS	DPMS	XP3S						
64.	DK1S	.01 (1.96)	.31 (2.32)	-.13 (-3.25)					.29	1.23	[44,80] 37
65.	DK1S	.01 (3.71)	.22 (1.85)	-.08 (-2.62)	.08 (3.81)				.51	1.14	[44,80] 37
66.	DK1S	.00 (.40)	.74 (4.82)	-.17 (-4.61)					.45	1.16	[44,87] 44
67.	DK1S	.01 (2.85)	.48 (3.64)	-.10 (-2.89)	.13 (5.14)				.67	1.29	[44,87] 44
68.	DK2S	.01 (2.03)	.32 (2.08)	-.12 (-2.67)					.23	1.40	[44,80] 37
69.	DK2S	.01 (3.47)	.22 (1.60)	-.07 (-1.67)	.08 (3.26)				.42	1.35	[44,80] 37
70.	DK2S	.00 (.76)	.70 (4.72)	-.18 (-5.06)					.46	1.48	[44,87] 44
71.	DK2S	.01 (3.01)	.46 (3.52)	-.11 (-3.40)	.12 (4.69)				.65	1.63	[44,87] 44

There are several interesting features of the results. It seems clear that the excess of planned investment variable (XP3S) enters more significantly into this new context than into the previous one; this is indicated by the generally higher level of statistical significance and the increased magnitude of the regression coefficients. (Compare regression number 44 with number 41; number 44 has been included in order that the different specifications may be compared over the same time period.) Moreover, the model supplemented by XP3S or XP1S and XP2S retains a much higher R^2 for the shorter period than exhibited in tables 5.1 to 5.3. Despite this there is evidence of instability: a *Chow* test performed on regressions number 38 and 41 gives an F value of 6.79. However, as before, *Theil* coefficients of .67 and .60 applying to regressions number 37 and 38 respectively, indicate that the model has some predictive power.

It will be noted that while the estimated coefficient on both the long-term and two-year government bond rate are more often than not positively signed and not significant, and thus parallel the results in table 5.1 to 5.3, the estimated coefficient on the S.T.M.M. rate is always negative and except in one case (regression number 59) significant. The explanatory power of the model is improved by the introduction of the S.T.M.M. rate instead of the long-term bond rates, lending support to the view of Bronfenbrenner and Mayer [1960], Teigen [1964], Heller [1965] and Laidler [1966b], that the short-rate is the appropriate argument in the demand function for money. The estimated short-run S.T.M.M. rate of interest elasticity of demand for money of between -0.07 and -0.20 is similar to that found by other researchers. Heller employing quarterly U.S. data found short-term interest elasticities of between -0.03 and -0.18 depending upon the definition of money and of the constraint variable. Bronfenbrenner and Mayer estimated the elasticity to be -0.09 as did Teigen. Laidler, using U.S. annual data over the period 1892-1960, estimated the short-term interest rate elasticity of demand for M2 as being -0.155 when levels of data were used and -0.097 when first difference data were used.

The estimated elasticities of the various arguments of the demand functions with respect to the demand for money are, of course, generally equal to the estimated regression coefficients. This follows from the conversion of the data into natural logarithm form. However, this is not the case with the excess of planned expenditure variables. For example, the estimated coefficient of .18 in regression number 29 should be read as an estimate of the XP3S elasticity of the *change in* the demand for money. As such it underestimates the XP3S elasticity of the demand for money. Appendix 8.3 explains this in some detail and tentatively suggests the kind of quantitative relationship that is likely to obtain between the two elasticities.

5.2 *Model 2*

Model 2 can be expressed in general form as:

$$m_t = g(m_t^d, m_{t-1}) \qquad \ldots\ldots(8.3)$$

where as in model 1, $m_t^d = \ell(e_t, r_t, X_t)$. The operational form of equation (8.3) being tested is:

$$m_t = (m_t^d / m_{t-1})^{\lambda} m_{t-1}$$

or: $$\ln m_t = \lambda\ln\alpha + \lambda\beta_1\ln e_t + \alpha\beta_2\ln r_t + \alpha\beta_3\ln X_t + (1-\lambda)\ln m_{t-1} \qquad \ldots\ldots(8.4)$$

where λ is a partial adjustment coefficient with a value between 0 and 1. The assumption of the model is that the change in the money supply only partially adjusts towards the desired change in the money supply each quarter, and further, that the adjustment which takes place is a constant proportion of the excess of the desired over the actual change of the previous period. Provided that this assumption is realistic, the model enables the estimation of both short and long-run elasticities. An estimate of long-run elasticity $(\hat{B}_i)$ is given by:

$$\hat{B}_i = [\lambda\hat{B}_i] / [1-(1-\hat{\lambda})].$$

Tables 5.12 to 5.16 present the results using much the same format as with model 1.

Table 5.12

Regression No.	Dependent Variable	Constant	Explanatory Variables						R^2	D.W.	time period — n
			DE4S	DR2		XP3S	XCS	d_{-1}			
72.	DM1S	.00 (1.91)	-.01 (-.17)	-.04 (-2.20)				.78 (8.11)	.56	2.16	[10,87] 78
73.	DM1S	.00 (1.91)	.01 (.11)	-.03 (-1.33)		.02 (1.37)	.04 (1.24)	.72 (7.01)	.58	2.17	[10,87] 78
74.	DM2S	.00 (2.26)	.02 (.45)	-.01 (-.78)				.79 (10.33)	.64	2.07	[10;87] 78
75.	DM2S	.00 (2.81)	.04 (.79)	.00 (.19)		.03 (2.39)	.02 (.94)	.72 (9.11)	.67	2.11	[10,87] 78
76.	DM3S	.00 (1.90)	-.01 (-.39)	-.02 (-2.12)				.92 (14.05)	.77	2.12	[10,87] 78
77.	DM3S	.00 (2.34)	.00 (-.11)	-.01 (-1.13)		.01 (1.59)	.02 (1.43)	.86 (12.21)	.78	2.11	[10,87] 78

d_{-1} - lagged dependent variable.

Table 5.13

Regression No.	Dependent Variable	Constant	Explanatory Variables: DE4S	DR2	DRMS	XP3S	XCS	d_{-1}	R^2	D.W.	time period / n
78.	DM1S	.01 (3.62)	-.23 (-2.51)	-.02 (-.72)				.91 (7.87)	.63	1.97	[37,87] 51
79.	DM1S	.01 (4.59)	-.11 (-1.25)	.02 (.80)		.07 (3.26)	.01 (.21)	.69 (5.46)	.70	1.96	[37,87] 51
80.	DM1S	.01 (3.72)	-.17 (-1.92)		-.06 (-2.55)			.88 (8.34)	.68	2.26	[37,87] 51
81.	DM1S	.01 (4.30)	-.10 (-1.10)		-.04 (-1.73)	.05 (2.63)	.00 (.01)	.76 (6.77)	.72	2.24	[37,87] 51
82.	DM2S	.01 (2.22)	-.03 (-.50)	.00 (-.22)				.85 (8.51)	.69	2.06	[37,87] 51
83.	DM2S	.01 (3.87)	.04 (.55)	.03 (1.55)		.07 (3.44)	.00 (.08)	.62 (5.50)	.75	1.96	[37,87] 51
84.	DM2S	.01 (2.37)	-.03 (-.42)		-.01 (-.38)			.84 (8.92)	.69	2.09	[37,87] 51
85.	DM2S	.01 (3.57)	.03 (.39)		.01 (.71)	.06 (3.07)	.00 (.03)	.70 (6.92)	.74	2.03	[37,87] 51

Table 5.13 cont.

Regression No.	Dependent Variable	Constant	Explanatory Variables						R^2	D.W.	time period — n
			DF4S	DR2	DRMS	XP3S	XCS	d_{-1}			
86.	DM3S	.00 (1.88)	-.03 (-.55)	-.02 (-1.22)				.91 (10.44)	.77	1.83	[37,87] 51
87.	DM3S	.01 (3.60)	.02 (.47)	.01 (.60)		.04 (3.50)	.01 (.52)	.73 (7.70)	.82	1.72	[37,87] 51
88.	DM3S	.00 (2.30)	-.01 (-.23)		-.02 (-1.77)			.88 (10.98)	.78	1.99	[37,87] 51
89.	DM3S	.01 (3.59)	.02 (.54)		-.01 (-.62)	.04 (3.24)	.01 (.42)	.77 (9.34)	.82	1.91	[37,87] 51

Table 5.14

Regression No.	Dependent Variable	Constant	Explanatory Variables						R^2	D.W.	time period — n
			DE4S	DR2		XP3S	XCS	d_{-1}			
80.	DM1S	.00 (-.96)	.15 (1.58)	-.04 (-.63)		-.02 (-1.01)	.11 (1.31)	.43 (2.18)	.54	1.83	[10,36] 27
91.	DM2S	.00 (.59)	.06 (.77)	-.03 (-.47)		.00 (-.19)	.07 (.88)	.28 (1.46)	.32	1.86	[10,36] 27
92.	DM3S	.00 (1.12)	.02 (.36)	.00 (-.15)		.00 (-.39)	.08 (1.77)	.54 (3.11)	.52	2.12	[10,36] 27

Table 5.15

Regression No.	Dependent Variable	Constant	Explanatory Variables DF4S	DR2	DRMS	XP3S		d_{-1}	R^2	D.W.	time period — n
93.	DK1S	.01 (2.43)	-.03 (-.33)	-.06 (-2.55)				.60 (4.46)	.46	2.20	[44,80] 37
94.	DK1S	.01 (2.30)	.07 (.74)		-.11 (-3.14)			.53 (4.00)	.50	2.12	[44,80] 37
95.	DK1S	.01 (3.89)	.08 (.89)		-.08 (-2.49)	.06 (3.35)		.39 (3.25)	.63	2.05	[44,80] 37
96.	DK2S	.01 (2.26)	.03 (.28)	-.07 (-2.44)				.52 (3.68)	.42	2.17	[44,80] 37
97.	DK2S	.01 (2.10)	.11 (.85)		-.09 (-2.02)			.46 (3.05)	.39	2.15	[44,80] 37
98.	DK2S	.01 (3.36)	.12 (1.04)		-.07 (-1.54)	.07 (2.84)		.33 (2.28)	.52	1.99	[44,80] 37

Table 5.16

Regression No.	Dependent Variable	Constant	Explanatory Variables						R^2	D.W.	time period – n
			DE4S	DR2	DRMS	XP3S		d_{-1}			
99.	DK1S	.01 (1.87)	-.08 (-.77)	-.06 (-2.44)				.87 (8.52)	.67	2.25	[44,87] 44
100.	DK1S	.00 (1.63)	.10 (.97)		-.13 (-4.70)			.74 (8.19)	.76	2.29	[44,87] 44
101.	DK1S	.01 (3.46)	.13 (1.47)		-.10 (-3.94)	.08 (3.79)		.55 (5.90)	.82	2.29	[44,87] 44
102.	DK2S	.01 (1.55)	.03 (.23)	-.07 (-2.41)				.73 (6.35)	.56	2.26	[44,87] 44
103.	DK2S	.00 (1.44)	.20 (1.63)		-.13 (-3.90)			.58 (5.23)	.64	2.35	[44,87] 44
104.	DK2S	.01 (3.20)	.23 (2.14)		-.11 (-3.43)	.09 (3.55)		.36 (3.07)	.73	2.26	[44,87] 44

The results again confirm the importance of the excess of planned investment variable. The excess of planned consumption variable, however, although correctly signed, is not statistically significant. It is as well to repeat that this does not mean that planned consumption expenditure has no significant effect on the demand for money; it means that no such effect is apparent when the XCS proxy is used.

The elasticity associated with XP3S varies with the time period under consideration and the specification of the demand function. The results of table 5.13 and 5.16 covering the time periods 1961(2) to 1973(4) and 1963(1) to 1973(4) respectively, indicate, when the S.T.M.M. rate is included in the demand function, a long-run elasticity of approximately 0.2. The evidence again supports the use of a short rather than a long rate of interest.

A disturbing feature of the results is the implausibly low elasticity associated with gross national expenditure. However, it has to be remembered, especially in the cases where a negative elasticity is reported, that the presence of a lagged dependent variable may give rise to misleading results. This is often evident when levels rather than first difference of data is used. The possibility then exists, because of high collinearity between the lagged dependent variable and (i) the dependent variable and (ii) other regressors, of the estimated coefficient on the lagged dependent variable being greater than one; a result which makes no sense when interpreted in terms of a partial adjustment model. While the use of first difference data lessens the possibility of distortion because of multicollinearity, in the present case it does not remove it. For example, in the time period 1961(2) to 1973(4) the simple correlation coefficients between DM1S and $DM1S_{-1}$, and between $DM1S_{-1}$ and DE4S are 0.76 and 0.69 respectively. The simple correlation coefficients for the period 1963(1) to 1973(4) when DK1S and DK2S are the dependent variables give rise to less concern about the problem of multicollinearity, and in fact the regression coefficients of DE4S are at least sensibly signed for this period. For the regressions which include DRMS and XP3S as regressors (number 101 and 104) the estimated long-run elasticities associated with DE4S are 0.29 when DK1S is the dependent variable and 0.36 when DK2S is the dependent variable.

Empirical estimates of the income elasticity of demand for money are subject to a deal of variability depending upon the specification of the demand function, the choice of data, and the time period. The most popular estimate is unity.[10] For example, Latane [1960], Bronfenbrenner and Mayer [1960], Heller [1965], Kavanagh and Walters [1966] (using U.K. data) and Teigen [1964] (using annual U.S. data), found this to be

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[10] Jacobs [1974] contends that where data is dominated by time trend, the use of money and income data undeflated by price and population leads to regression estimates of the income elasticity of the demand for money being biased towards unity.

approximately the case, at least, when levels of data were used. The use of first difference data generally lowers the estimate. Kavanagh and Walters reported that over a corresponding period (1926-1961) the elasticity estimate fell from 0.96 when levels of data were used to 0.38 when first difference data were used; and incidently R^2 fell from 0.97 to 0.23. It also might be worthwhile noting that when using quarterly data over the period 1946 to 1959 Teigen estimated the long-run elasticity to be 0.51.

Results based upon the use of annual data are not comparable with those based upon the use of first difference of seasonally adjusted quarterly data. What remains unclear is which is the more meaningful. The advantage of using annual data is that to an extent it makes allowance for things to work themselves out; the disadvantage is that it permits the dominance of a trend factor. Fortunately, or unfortunately, the main objective of this chapter has dictated the choice of data - see page 235.

In terms of the degree of explanation and of the apparent indications of the Durbin-Watson statistic,[11] functions which include a lagged dependent variable as an argument, as

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[11] Although the Durbin-Watson statistic is biased towards 2 if the lagged dependent variable is included on the right-hand side of a regression equation, this bias is less serious if there are other explanatory variables besides the lagged dependent variable [Koutsoyiannis, 1973, p. 299].

expected, perform better. A *Chow* stability test performed on regressions number 95 and 101 to an extent also bear this out in that the computed F value of 3.25 marginally indicates stability at the 1 per cent level.

5.3 *Model 3*

Model 3 is used to denote the price deflated equivalent of either model 1 or model 2 and can be expressed in general form as:

$$m_t - P = h(e_t - P,\ r_t,\ X_t - P^*,\ m_{t-1} - P_{-1}) \quad \ldots \quad (8.5)$$

where in the tests P is the difference in logarithms of an implicit gross national expenditure price deflator index. The same index is used to deflate the excess of planned consumption expenditure;[12] in this case the resultant variable is XCS_t/P_t, where P_t is the index for period t. This has been especially noted because of the difficulty of deciding which index of P_t and P_{t+1} to use. The difficulty becomes more acute in the case of the excess of planned investment variable. There are three options: to deflate by the index applicable (i) when the plans are made (in period t-i); (ii) when the planned expenditure is executed (in period t-g) or (iii) when the money supply is adjudged to have most markedly responded (in period t), that is, to deflate $I^*_{t-i} - I_t$ by P^*_{t-i}, P^*_{t-g},

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[12] An implicit consumer durable price index could not be calculated because of the unavailability of constant price data for the earlier part of the period.

or P^*_t, where $t-i < t-g < t$. The first option assumes that business in making plans g period ahead does not take account of expected inflation during this period, and will therefore result in an overstatement of the demand for real balances if in fact this is not the case; the third option assumes that when plans are made, account is taken of expected inflation beyond the gestation period, and will result in an understatement of the demand for real balances if this is not the case; the second option seems the more realistic by assuming that account is taken of inflation for the gestation period of planned investment, but that inflation thereafter would precipate an increase in the demand for nominal money balances in order to maintain real expenditure levels. This second option is used in the construction of the price deflated XP3S variable. The price index used, P*, is an implicit gross private fixed investment price deflator, and g is equal to 2 - the number of quarters that expenditure is planned ahead.

The tests of model 3 are more selective in considering only two definitions of the money supply and two rates of interests; nevertheless, they provide a good indication of the worth of the model. The results are presented in tables 5.17 and 5.18.

Table 5.17

Regression No.	Dependent Variable	Constant	Explanatory Variables						R^2	D.W.	time period — n
			DE4S'	DR2		XP3S'	XCS'	d_{-1}			
105.	DM1S'	.00 (-.87)	.37 (4.22)	-.03 (-.97)					.20	1.65	[10,87] 78
106.	DM1S'	.00 (-.13)	.37 (4.40)	-.02 (-.62)		.05 (2.07)	-.02 (-1.32)		.29	1.88	[10,87] 78
107.	DM1S'	.00 (-.80)	.33 (3.59)	-.03 (-.97)				.15 (1.36)	.22	1.98	[10;87] 78
108.	DM1S'	.00 (-.15)	.35 (3.93)	-.02 (-.61)		.05 (2.00)	-.01 (-1.13)	.07 (.65)	.29	2.02	[10,87] 78
109.	DM1S'	.00 (.17)	.43 (3.16)	-.01 (-.22)					.18	1.72	[37,87] 51
110.	DM1S'	.00 (.46)	.42 (3.50)	.04 (1.01)		.13 (3.86)	.02 (.93)		.39	2.11	[37,87] 51
111.	DM1S'	.00 (.16)	.42 (2.91)	-.01 (-.22)				.02 (.15)	.18	1.77	[37,87] 51
112.	DM1S'	.00 (.46)	.45 (3.52)	.04 (1.03)		.14 (3,91)	.02 (.85)	-.09 (-.74)	.40	1.93	[37,87] 51

Table 5.17 cont.

Regression No.	Dependent Variable	Constant	Explanatory Variables: DE4S'	DR2		XP3S'	XCS'	d_{-1}	R^2	D.W.	time period — n
113.	DM1S'	.00 (.38)	.18 (2.16)	.01 (.21)					.11	1.19	[37,80] 44
114.	DM1S'	.00 (.98)	.19 (2.44)	.05 (1.51)		.07 (2.73)	.02 (1.38)		.27	1.31	[37,80] 44
115.	DM1S'	.00 (.65)	.09 (.97)	.01 (.44)				.29 (2.14)	.20	1.65	[37,80] 44
116.	DM1S'	.00 (1.20)	.11 (1.25)	.04 (1.65)		.06 (2.59)	.02 (1.48)	.26 (2.03)	.34	1.73	[37,80] 44

Table 5.18

Regression No.	Dependent Variable	Constant	Explanatory Variables: DE4S		DRMS	XP3S'		d_{-1}	R^2	D.W.	time period — n
117.	DK1S'	.00 (.25)	.64 (4.93)		-.24 (-6.07)				.54	1.40	[40,87] 48
118.	DK1S'	.00 (.77)	.61 (5.68)		-.20 (-5.90)	.12 (4.72)			.70	2.01	[40,87] 48
119.	DK1S'	.00 (.09)	.61 (4.55)		-.23 (-5.63)			.10 (.95)	.55	1.67	[40,87] 48
120.	DK1S'	.00 (.84)	.62 (5.98)		-.20 (-5.84)	.13 (4.56)		-.04 (-.46)	.70	1.90	[40,87] 48
121.	DK1S'	.00 (-.35)	.42 (4.06)		-.17 (-3.71)				.37	1.32	[40,80] 41
122.	DK1S'	.00 (.37)	.41 (4.36)		-.14 (-3.07)	.07 (2.69)			.48	1.32	[40,80] 41
123.	DK1S'	.00 (-.67)	.31 (3.13)		-.11 (-2.43)			.38 (2.92)	.49	1.77	[40,80] 41
124.	DK1S'	.00 (.01)	.32 (3.45)		-.09 (-2.07)	.06 (2.39)		.33 (2.63)	.56	1.78	[40,80] 41

Table 5.18 cont.

Regression No.	Dependent Variable	Constant	Explanatory Variables						R^2	D.W.	time period — n
			DE4S'		DRMS	XP3S'	XCS'	d_{-1}			
125	DK1S'	.00 (.97)	.34 (3.50)		-.11 (-2.65)	.09 (3.43)	.03 (2.21)		.54	1.25	[40,80] 41
126.	DK1S'	.00 (.61)	.62 (5.49)		-.20 (-5.42)	.12 (3.59)	.00 (-.24)		.70	2.03	[40,87] 48

The improvement in performance of model 3 over the previous two models is most noteworthy in regression number 118. This is a convincing result. The degree of explanation is high - to explain 70% of the variation of the first difference of the price deflated seasonally adjusted money supply using three explanatory variables is probably the most that could be hoped for - and the introduction of XP3S' (compare regression number 117) rids the regression of any apparent serial correlation. The regression coefficients are plausible, and this applies, unlike the previous results, equally to the coefficient of DE4S' as to the coefficients of the other regressors. In this period at least, the introduction of a lagged dependent variable does not improve the model. The other results reported, for sub-period 1962(1) to 1972(1) with DK1S' as the dependent variable, and for those with DM1S' as the dependent variable and with DR2 as the interest rate variable, are to varying extends not as impressive. Nevertheless, the regression coefficient of XP3S' is always positively signed and significant; the same can not be said of the coefficient of XCS' which again, although in the main positive, is, with one exception, not significant.

A *Chow* test on regressions 118 and 122 (F = 5.83) shows that deflating by a price index does not perceptibly reduce the instability found in model 1. However, *Theil* coefficients of .66 and .57 applying to regressions number 121 and 122 respectively, show that the predictive power of the model is improved by the introduction of XP3S'.

5.4 *Model 4*

In this model the expenditure velocity of circulation of money is the dependent variable. Because velocity is less dominated by trend than is the money supply, levels of data are used in the tests. The general form of the model to be tested is developed from the basic demand function:

$$M_t^d = L(E_t, R_t, X_t) \qquad \text{. . . . . (8.6)}$$

where M^d is the demand for money, E_t is gross national expenditure, and R_t is the rate of interest. Two alternative adjustment mechanisms are tried. One is based on the nominal money supply partially adjusting towards the desired money supply each period; the other is based on money per unit of nominal gross expenditure or its inverse gross expenditure velocity, partially adjusting towards its desired level each period. The two adjustment mechanisms are:

$$\text{(A1)} \quad M_t = (M_t^d \ / \ M_{t-1})^z \cdot M_{t-1}$$

in the former case, and

$$\text{(A2)} \quad \left(\frac{E}{M}\right)_t = \left[\left(\frac{E}{M}\right)^*_t \Big/ \left(\frac{E}{M}\right)_{t-1}\right]^w \cdot \left(\frac{E}{M}\right)_{t-1}$$

in the latter case. The desired velocity variable $\left(\frac{E}{M}\right)^*_t$ is related to the dependent variable of equation (8.8) below. However, writing it in this form, indicates that both income and the money supply may adjust in the short-run in response to disequilibrium.

If equation (8.6) is assumed to be homogenous in degree one in gross expenditure, its division by gross expenditure results in the following equation:

$$\frac{M_t^d}{E_t} = L(R_t, X_t) \qquad \ldots\ldots (8.7)$$

which may be inverted to give:

$$\frac{E_t}{M_t^d} = L^{-1}(R_t, X_t) \qquad \ldots\ldots (8.8)$$

An operational form of equation (8.8) is:

$$\frac{E_t}{M_t^d} = \alpha R_t^{\beta_2} X_t^{\beta_3} \qquad \ldots\ldots (8.9)$$

and the following equation, used in the tests, can be derived by substituting (A1) into (8.9).

$$\frac{E_t}{M_t} = \alpha^z R_t^{z\beta_2} X_t^{z\beta_3} \left(\frac{E_t}{M_{t-1}}\right)^{1-z} \qquad \ldots\ldots (8.10)$$

The alternative estimating equation based on the adjustment mechanism (A2) is derived by replacing $\frac{E_t}{M_t^d}$ with $\left(\frac{E_t}{M_t}\right)^*$ in equation (8.9); the substituion of (A2) into the resulting equation gives the following equation:

$$\frac{E_t}{M_t} = \alpha^w R_t^{w\beta_2} X_t^{w\beta_3} \left(\frac{E_{t-1}}{M_{t-1}}\right)^{1-w} \qquad \ldots\ldots (8.11)$$

Tables 5.19 to 5.23 present the results of testing equations (8.10) and (8.11).

Table 5.19

Regression No.	Dependent Variable	Constant	Explanatory Variables: R2		XP3S		W	d_{-1}	R^2	D.W.	time period — n
127.	V1E4S	-.01 (-.36)	.01 (.72)		-.06 (-2.01)			.98 (70.3)	.99	2.16	[10,87] 78
128.	V1E4S	-.06 (-3.41)	.04 (3.08)		-.03 (-1.56)		.95 (111.4)		.99	.77	[10,87] 78
129.	V2E4S	.00 (-.15)	.00 (-.01)		-.06 (-2.27)			.94 (34.7)	.96	1.96	[10,87] 78
130.	V2E4S	-.04 (-1.90)	.01 (.63)		-.04 (-2.38)		.93 (55.3)		.98	.58	[10,87] 78
131.	V3E4S	-.15 (-2.38)	.02 (1.12)		-.05 (-1.83)			.84 (15.4)	.85	1.99	[10,87] 78
132.	V3E4S	-.12 (-3.79)	.01 (1.29)		-.03 (-2.41)		.90 (32.0)		.96	.43	[10,87] 78
133.	V1YS	-.07 (-1.62)	.03 (2.18)		-.02 (-1.71)			.97 (102.9)	.99	2.25	[10,87] 78
134.	V1YS	-.07 (-3.99)	.04 (3.67)		-.02 (-1.18)		.95 (116.9)		.99	.80	[10,87] 78

Table 5.20

Regression No.	Dependent Variable	Constant	Explanatory Variables						R^2	D.W.	time period — n
			R2	RMS	XP3S		W	d_{-1}			
135.	V1E4S	-.03 (-1.01)	.03 (1.44)		-.12 (-3.29)			.95 (35.4)	.98	2.24	[37,87] 51
136.	V1E4S	-.05 (-2.52)	.03 (2.62)		-.08 (-3.70)		.92 (59.0)		.99	.92	[37,87] 51
137.	V1E4S	-.07 (-1.99)		.07 (2.39)	-.13 (-3.81)			.90 (24.3)	.98	2.20	[37,87] 51
138.	V1E4S	-.09 (-5.07)		.08 (5.21)	-.09 (-5.17)		.86 (46.5)		.99	.98	[37,87] 51
139.	V2E4S	-.03 (-.95)	.01 (.70)		-.13 (-3.58)			.91 (17.0)	.90	1.79	[37,87] 51
140.	V2E4S	-.02 (-.92)	.00 (-.29)		-.10 (-3.88)		.94 (24.8)		.95	.50	[37,87] 51
141.	V2E4S	-.08 (-1.94)		.04 (1.74)	-.13 (-3.96)			.84 (12.2)	.90	1.74	[37,87] 51
142.	V2E4S	-.04 (-1.20)		.00 (.24)	-.10 (-3.89)		.92 (17.8)		.95	.48	[37,87] 51

Table 5.20 cont.

Regression No.	Dependent Variable	Constant	Explanatory Variables						R^2	D.W.	time period — n
			R2	RMS	XP3S		W	d_{-1}			
143.	V3E4S	-.23 (-3.03)	.04 (2.27)		-.08 (-2.28)			.77 (9.55)	.78	1.72	[37,87] 51
144.	V3E4S	-.12 (-2.44)	.01 (1.16)		-.06 (-2.99)		.90 (17.8)		.92	.35	[37,87] 51
145.	V3E4S	-.04 (-4.51)		.08 (3.94)	-.08 (-2.87)			.60 (6.43)	.82	1.63	[37,87] 51
146.	V3E4S	-.18 (-2.77)		.03 (1.84)	-.06 (-3.39)		.83 (12.5)		.92	.33	[37,87] 51

Table 5.21

Regression No.	Dependent Variable	Constant	Explanatory Variables						R^2	D.W.	time period — n
			R2	RMS	XP3S		W	d_{-1}			
147.	V1E4S	.00 (-.08)	.01 (.40)		-.10 (-2.56)			.97 (31.9)	.98	2.12	[37,80] 44
148.	V1E4S	-.05 (-3.68)	.04 (3.53)		-.04 (-2.26)		.94 (77.4)		.99	1.19	[37,80] 44
149.	V1E4S	-.05 (-1.06)		.05 (1.33)	-.12 (-2.89)			.92 (19.5)	.98	2.08	[37,80] 44
150.	V1E4S	-.08 (-4.65)		.07 (4.51)	-.06 (-3.75)		.90 (51.0)		.99	1.35	[37,80] 44
151.	V2E4S	-.03 (-.74)	.02 (.62)		-.10 (-2.51)			.92 (14.2)	.91	1.65	[37,80] 44
152.	V2E4S	-.06 (-4.39)	.02 (2.92)		-.04 (-2.60)		.93 (45.0)		.99	1.32	[37,80] 44
153.	V2E4S	-.13 (-2.27)		.08 (2.19)	-.12 (-3.06)			.76 (8.03)	.92	1.54	[37,80] 44
154.	V2E4S	-.08 (-4.56)		.04 (3.42)	-.05 (-3.67)		.87 (28.7)		.99	1.44	[37,80] 44

Table 5.21 cont.

Regression No.	Dependent Variable	Constant	Explanatory Variables: R2	RMS	XP3S		W	d_{-1}	R^2	D.W.	time period — n
155.	V3E4S	-.25 (-2.46)	.05 (1.98)		-.06 (-1.67)			.76 (7.51)	.80	1.52	[37,80] 44
156.	V3E4S	-.13 (-5.88)	.03 (5.79)		-.01 (-1.14)		.91 (41.2)		.99	1.36	[37,80] 44
157.	V3E4S	-.51 (-4.43)		.11 (4.09)	-.07 (-2.21)			.50 (4.27)	.85	1.39	[37,80] 44
158.	V3E4S	-.16 (-4.75)		.04 (4.46)	-.02 (-2.24)		.87 (24.9)		.99	1.06	[37,80] 44

Table 5.22

Regression No.	Dependent Variable	Constant	Explanatory Variables R2	RMS	XP3S		W	d_{-1}	R^2	D.W.	time period – n
159.	VK1E4S	-.15 (-3.88)	.10 (3.93)		-.09 (-2.15)			.87 (23.5)	.98	2.36	[44,87] 44
160.	VK1E4S	-.07 (-2.33)	.03 (1.60)		-.15 (-4.71)		.94 (31.4)		.99	.96	[44,87] 44
161.	VK1E4S	-.21 (-4.53)		.14 (4.57)	-.13 (-3.79)			.80 (17.7)	.98	2.15	[44,87] 44
162.	VK1F4S	-.14 (-4.19)		.08 (3.53)	-.15 (-6.17)		.88 (25.5)		.99	.88	[44,87] 44
163.	VK2E4S	-.20 (-4.93)	.12 (4.94)		-.07 (-1.83)			.82 (20.4)	.97	2.25	[44,87] 44
164.	VK2E4S	-.11 (-3.09)	.05 (2.38)		-.13 (-4.34)		.92 (26.9)		.98	1.22	[44,87] 44
165.	VK2E4S	-.27 (-5.17)		.17 (5.17)	-.13 (-3.92)			.73 (14.0)	.97	1.92	[44,87] 44
166.	VK2E4S	-.17 (-4.22)		.10 (3.63)	-.15 (-6.21)		.85 (20.1)		.99	1.22	[44,87] 44

Table 5.23

Regression No.	Dependent Variable	Constant	Explanatory Variables R2	RMS	XP3S		W	d_{-1}	R^2	D.W.	time period — n
167.	VK1E4S	-.13 (-2.47)	.09 (2.55)		-.05 (-1.12)			.89 (19.8)	.98	2.24	[44,80] 37
168.	VK1E4S	-.07 (-2.51)	.04 (1.94)		-.08 (-3.22)		.96 (38.2)		.99	.97	[44,80] 37
169.	VK1E4S	-.20 (-3.19)		.14 (3.27)	-.10 (-2.72)			.81 (14.3)	.98	2.07	[44,80] 37
170.	VK1E4S	-.12 (-3.56)		.07 (3.07)	-.10 (-5.12)		.91 (29.0)		.99	.98	[44,80] 37
171.	VK2E4S	-.16 (-2.74)	.10 (2.77)		-.04 (-1.01)			.86 (16.7)	.98	2.14	[44,80] 37
172.	VK2E4S	-.08 (-2.13)	.04 (1.67)		-.08 (-2.71)		.95 (27.5)		.99	1.04	[44,80] 37
173.	VK2E4S	-.24 (-3.22)		.15 (3.25)	-.10 (-2.84)			.77 (11.3)	.98	1.95	[44,80] 37
174.	VK2E4S	-.12 (-2.38)		.07 (2.01)	-.10 (-4.27)		.91 (19.0)		.99	1.08	[44,80] 37

As would be expected using these types of models the degree of explanation is high. However, for the most part, the estimated adjustment coefficient is implausibly low. For example, regression number 137 indicates that only 10 per cent of the adjustment in velocity towards its desired level occurs in the first period. Rather more acceptable estimates occur when V3E4S is the dependent variable - see regressions number 145 and 157. There is nothing to choose between the alternative adjustment mechanisms in terms of the degree of explanation of the models, but the use of (A1) does result in low D.W. Statistics.

The S.T.M.M. rate of interest performs better than the two year government bond rate, thus confirming previous results, and the excess of planned investment variable enters significantly and with the expected sign. If regression 161 is used as an example, the estimated long-run interest elasticity of velocity is 0.70 and the long-run XP3S elasticity of velocity is -0.65. The estimate of the interest elasticity of velocity is similar to that found by Latane [1960] using U.S. annual data but is lower than Meltzer's [1963a] estimates of between 1.02 and 2.37 for various sub-periods between 1900 and 1958. Both Latane and Meltzer used the M1 definition of the money supply.

5.5 *Model 5*

Model 5 is similar to model 4 except that first difference data is used. Four demand functions are tested:

$$\frac{e_t}{m_t} = \alpha r_t^{\beta_2} \qquad \ldots\ldots (8.12)$$

$$\frac{e_t}{m_t} = \alpha r_t^{\beta_2} X_t^{\beta_3} \qquad \ldots\ldots (8.13)$$

$$\frac{e_t}{m_t} = \alpha^z r_t^{\beta_2} X_t^{\beta_3} \left[\frac{e_t}{m_{t-1}}\right]^{1-z} \qquad \ldots\ldots (8.14)$$

$$\frac{e_t}{m_t} = \alpha^w r_t^{\beta_2} X_t^{\beta_3} \left[\frac{e_{t-1}}{m_{t-1}}\right]^{1-w} \qquad \ldots\ldots (8.15)$$

Tables 5.24 to 5.30 present the results of tests of equations 8.12, 8.13, 8.14 and 8.15. Three definitions of the money supply and two rates of interest are used in the tests.

Table 5.24

Regression No.	Dependent Variable	Constant	Explanatory Variables						R^2	D.W.	time period — n
			DR2		XP3S		DW	d_{-1}			
175.	DV1E4S	.01 (2.52)	-.03 (-.27)		.02 (.36)				.01	1.92	[10,36] 27
176.	DV1E4S	.02 (2.67)	.04 (.33)		.03 (.62)			0.23 (10.1)	.05	1.99	[10,36] 27
177.	DV1E4S	.00 (1.04)	.07 (1.51)		.02 (.92)		.86 (10.1)		.82	1.99	[10,36] 27

Table 5.25

Regression No.	Dependent Variable	Constant	Explanatory Variables						R^2	D.W.	time period — n
			DR2	DRMS	XP3S		DW	d_{-1}			
178.	DV1E4S	.01 (2.94)	.06 (1.08)						.03	1.97	[37,80] 44
179.	DV1E4S	.01 (2.66)		.09 (1.46)					.05	1.94	[37,80] 44
180.	DV1E4S	.00 (1.51)	-.01 (-.12)		-.10 (-2.23)				.13	2.13	[37,80] 44
181.	DV1E4S	.01 (1.62)		.05 (.81)	-.09 (-2.16)				.15	2.11	[37,80] 44
182.	DV1E4S	.01 (1.96)		.06 (.95)	-.11 (-2.54)			-.22 (-1.43)	.19	1.68	[37,80] 44
183.	DV1E4S	.00 (-2.27)		-.01 (-.40)	-.04 (-1.92)		1.15 (10.8)		.78	2.13	[37,80] 44

Table 5.26

Regression No.	Dependent Variable	Constant	Explanatory Variables						R^2	D.W.	time period – n
			DR2	DRMS	XP3S		DW	d_{-1}			
184.	DV1E4S	.01 (2.08)	.05 (1.29)						.03	1.88	[37,87] 51
185.	DV1E4S	.01 (1.86)		.14 (3.23)					.18	1.93	[37,87] 51
186.	DV1F4S	.00 (1.30)	.01 (.22)		-.13 (-3.50)				.23	2.21	[37,87] 51
187.	DV1E4S	.00 (1.22)		.10 (2.32)	-.11 (-3.01)				.31	2.22	[37,87] 51
188.	DV1F4S	.00 (1.55)		.11 (2.63)	-.14 (-3.59)			-.25 (-1.88)	.36	1.70	[37,87] 51
189.	DV1E4S	.00 (-1.69)		.07 (2.83)	-.03 (-1.41)		1.05 (10.20)		.78	2.33	[37,87] 51

Table 5.27

Regression No.	Dependent Variable	Constant	Explanatory Variables						R^2	D.W.	time period — n
			DR2	DRMS	XP3S		DW	d_{-1}			
190.	DVK1E4S	.01 (3.06)	.10 (1.95)						.10	2.15	[44,80] 37
191.	DVK1E4S	.01 (2.62)		.26 (4.39)					.36	2.05	[44,80] 37
192.	DVK1E4S	.01 (1.57)	.05 (.95)		-.09 (-2.02)				.19	2.29	[44,80] 37
193.	DVK1E4S	.00 (1.49)		.23 (3.72)	-.07 (-1.81)				.41	2.19	[44,80] 37
194.	DVK1E4S	.00 (1.58)		.22 (3.56)	-.07 (-1.88)			-.09 (-.58)	.42	2.01	[44,80] 37
195.	DVK1E4S	.00 (-.72)		.11 (2.79)	-.04 (-1.77)		.77 (7.72)		.79	2.30	[44,80] 37
196.	DV1E4S	.00 (1.58)		.17 (2.56)	-.04 (-1.06)				.24	2.39	[44,80] 37

Table 5.28

Regression No.	Dependent Variable	Constant	Explanatory Variables						R^2	D.W.	time period — n
			DR2	DRMS	XP3S		DW	d_{-1}			
197.	DV1KE4S	.00 (1.37)	.11 (2.28)						.11	1.70	[44,87] 44
198.	DV1KE4S	.00 (1.13)		.25 (6.05)					.47	1.64	[44,87] 44
199	DV1KE4S	.00 (.37)	.06 (1.46)		-.16 (-4.00)				.36	2.19	[44;87] 44
200.	DV1KE4S	.00 (.20)		.21 (5.25)	-.12 (-3.67)				.60	2.12	[44,87] 44
201.	DV1KE4S	.00 (.26)		.21 (5.31)	-.13 (-3.65)			-.10 (-.88)	.61	1.89	[44,87] 44
202.	DV1KE4S	.00 (-.89)		.14 (5.27)	-.05 (-2.20)		.72 (8.16)		.85	2.35	[44,87] 44
203.	DV1E4S	.00 (.84)		.16 (3.82)	-.08 (-2.36)				.42	2.42	[44,87] 44

Table 5.29

Regression No.	Dependent Variable	Constant	Explanatory Variables						R^2	D.W.	time period – n
			DR2	DPMS	XP3S		DW	d_{-1}			
204.	DVK2E4S	.01 (2,65)	.11 (2.33)						.13	2.16	[44,80] 37
205.	DVK2E4S	.01 (2,10)		.25 (4.17)					.33	2.11	[44,80] 37
206.	DVK2E4S	.00 (1.27)	.07 (1.36)		-.08 (-1.85)				.21	2.25	[44,80] 37
207.	DVK2E4S	.00 (1.02)		.22 (3.50)	-.07 (-1.80)				.39	2.24	[44,80] 37
208.	DVK2E4S	.00 (1,15)		.22 (3.44)	-.08 (-1.91)			-.10 (-.67)	.40	2.03	[44,80] 37
209.	DVK2E4S	.00 (-.39)		.08 (1.63)	-.04 (-1,52)		.72 (5.83)		.70	2.40	[44,80] 37

Table 5.30

Regression No.	Dependent Variable	Constant	Explanatory Variables						R^2	D.W.	time period / n
			DR2	DRMS	XP3S		DW	d_{-1}			
210.	DV2KE4S	.00 (1.20)	.15 (3.10)						.19	1.78	[44,87] 44
211.	DV2KE4S	.00 (1.00)		.27 (6.56)					.51	1.86	[44,87] 44
212.	DV2KE4S	.00 (.26)	.10 (2.40)		-.14 (-3.57)				.38	2.13	[44,87] 44
213.	DV2KE4S	.00 (.13)		.23 (5.75)	-.10 (-3.26)				.61	2.20	[44,87] 44
214.	DV2KE4S	.00 (.16)		.24 (5.76)	-.12 (-3.30)			-.11 (-.90)	.62	1.98	[44,87] 44
215.	DV2KE4S	.00 (-.34)		.14 (4.26)	-.05 (-1.89)		.60 (5.35)		.78	2.41	[44,87] 44

There is a large contrast in the results. When M1 forms the basis of the dependent variable the degree of explanation is relatively low and the (A1) adjustment coefficient is negative. When either K1 or K2 form the basis of the dependent variable the degree of explanation is much higher (note especially regressions number 200 and 201) and the (A1) adjustment coefficient is sensibly signed. (Compare regression number 193 with 196 and number 200 with 203 to see, over the same period, the improvement in the model when K1 rather than M1 forms the basis of the dependent variable.) In common with both sets of results is the significance of XP3S and the improvement in the model when the two-year government bond rate of interest is replaced by the S.T.M.M. rate of interest.

The (A2) adjustment coefficient does not enter the estimating equations significantly nor does it contribute to the degree of explanation. On the basis of the (A1) adjustment coefficient and using regression number 202 (the counterpart of regression number 161, used to calculate estimates of long-run elasticity for model 4) the estimates of the long-run interest and XP3S elasticities of velocity are 0.5 and -0.18 respectively; somewhat lower than those reported for model 4.

There is evidence that the estimating equations number (8.13) and (8.14) are stable over the period 1963(1) to 1973(4). *Chow* tests performed on regressions number 193 and 200; on 195 and 202, and on 196 and 206, produce F values of

1.79, 2.06, and 1.24 respectively; none of which indicates significant instability at the 5 per cent level. Furthermore, a *Theil* prediction coefficient of 0.49 applying to regression number 193 indicates that equation number (8.13) has predictive power.

5.6 *Model 6*

Model 6 is used to denote those models which have the rate of interest as the dependent variable. There are in fact four models tested. They devolve from the basic function:

$$R_t = l(E_t, M_t, X_t) \quad \ldots\ldots \quad (8.16)$$

The operational forms are again logarithmic; the excess of planned expenditure variable X_t stands for three variables: the excess of planned investment which is constructed without a lag and therefore corresponds to X3S used in chapter 7, the excess of durable consumption expenditure, and the excess of government investment expenditure.

This latter variable, excluded from the previous tests, is now included because it is reasonable to suppose that there is a relatively straightforward relationship between planned government investment and the rate of interest, and that this relationship may be discerned using single equation regression analysis. The two-year government bond rate is used in the tests. It is preferred to the long-term bond rate because of its greater sensitivity, but, and more importantly, it is preferred to a short-term rate because of the difficulties of hypothesising the kind of relationship that would be expected between planned expenditure and a short-term rate of interest. For example, in the case of an increase in private planned investment there may be a movement out of long-term securities and into short-term securities; as a result the short-term rate of interest would tend to fall and the long-term rate to rise. However, it is not really possible to generalise on the effect on *the* short-term rate. It depends on the liquid - port-folio preferences of those who intend to invest, and on the length of the period between the mobilisation of liquid assets and the execution of the planned investment.

A positive relationship would be expected between longer-term rates of interest and the excess of planned investment.[13] It should be noted that this is essentially an immediate effect (hence the excess of planned investment variable is not lagged) and, therefore, comes within the ambit of a liquidity preference rather than a loanable funds approach, that is, it abstracts from repercussions and concentrates on the cause of change - see chapter 2.

The operational models being tested are:

---

[13] Assuming, of course, that the direction of causation is *from* a change in planned investment *to* a change in the rate of interest.

$$R_t = \theta E_t^{\delta_1} M_t^{\delta_2} X_t^{\delta_3} \quad \ldots\ldots (8.17)$$

$$R_t = \theta^{\gamma} E_t^{\gamma\delta_1} M_t^{\gamma\delta_2} X_t^{\gamma\delta_3} R_{t-1}^{1-\gamma}$$

or:

$$\frac{R_t}{R_{t-1}} = \theta^{\gamma} E_t^{\gamma\delta_1} M_t^{\gamma\delta_2} X_t^{\gamma\delta_3} R_{t-1}^{-\gamma} \quad \ldots\ldots (8.18)$$

where γ is an adjustment coefficient based on the mechanism $R_t = [R_t^* / R_{t-1}]^{\gamma} R_{t-1}$,

$$r_t = \theta e_t^{\delta_1} m_t^{\delta_2} X_t^{\delta_3} \quad \ldots\ldots (8.19)$$

$$\bar{r}_t - b\bar{r}_t = \bar{\theta} - b\bar{\theta} + \delta_1[\bar{e}_t - b\bar{e}_t] + \delta_2[\bar{m}_t - b\bar{m}_t] + a\bar{X}_t \quad \ldots\ldots (8.20)$$

where a bar over a variable indicates a logarithm.

The operational forms (8.17), (8.18) and (8.19) are straighforward enough: (8.17) and (8.18) use levels of data, (8.18) in addition has a partial adjustment mechanism, and (8.19) uses first difference data. (8.20) is slightly unusual, and is based on the contention that there may be a distributed lag relationship between the excess of planned investment and the change in the rate of interest - see chapter 7 pp. 198-199 - it is derived from equation (8.21) by the application of a Koyck transformation.

$$\bar{r}_t = \bar{\theta} + \delta_1\bar{e}_t + \delta_2\bar{m} + \sum_{i=0}^{\infty} ab^i \bar{X}_{t-i} \quad \ldots\ldots (8.21)$$

To estimate the value of b equation (8.20) was estimated with values of b, in steps of 0.05, from 0.05 to 0.95. The value chosen was that which minimised the sum of squared residuals - see p. 328 n. 1. There was some slight variation within time periods depending on the definition of the money supply; to preserve comparability the values applicable to M1 were used throughout. These were 0.35 for the period 1954(1) to 1973(4), and 0.25 for the shorter sub-periods 1961(2) to 1973(4), and 1963(1) to 1973(4).

Tables 5.31 to 5.35 present the results of some tests of the questions (8.17), (8.18), (8.19) and (8.20).

Table 5.31

Regression No.	Dependent Variable	Constant	Explanatory Variables						R^2	D.W.	time period — n
			E4S	M1S	X3S	XGS	XCS	d_{-1}			
216.	R2	-.46 (-.53)	.27 (2.62)	-.04 (-.20)					.47	.29	[8,87] 80
217.	R2	-.68 (-.79)	.26 (2.53)	.00 (.00)	-.06 (-.31)	.13 (.44)	-.40 (-1.31)		.50	.33	[8,87] 80
218.	R2	-1.25 (-3.05)	-.10 (-1.69)	.27 (2.77)				.89 (15.08)	.87	1.27	[8,87] 80
219.	R2	-.94 (-2.26)	-.08 (-1.52)	.21 (2.15)	.26 (2.73)	.22 (1.61)	-.70 (-.43)	.93 (15.89)	.89	1.42	[8,87] 80
220.	R2	-.33 (-.37)	.92 (3.55)	-.73 (-2.09)					.53	.39	[44,87] 44
221.	R2	.84 (.77)	1.26 (4.14)	-1.22 (-2.91)	.43 (1.75)	.53 (1.19)	.11 (.30)		.58	.61	[44,87] 44
222.	R2	-2.00 (-3.93)	-.59 (-2.91)	.84 (3.46)				1.10 (10.20)	.87	1.65	[44,87] 44
223.	R2	1.14 (-2.00)	-.31 (-1.47)	.44 (1.69)	.31 (2.50)	.41 (1.84)	.01 (.06)	1.07 (10.65)	.90	1.85	[44,87] 44

Table 5.32

Regression No.	Dependent Variable	Constant	Explanatory Variables						R^2	D.W.	time period — n
			F4S	K1S	K2S	X3S	XGS	XCS			
224.	R2	.50 (.59)	1.00 (5.19)	-.88 (-3.33)					.59	.40	[44,87] 44
225.	R2	.97 (1.27)	1.24 (6.33)		-1.16 (-4.52)				.65	.44	[44,87] 44
226.	R2	1.05 (1.11)	1.12 (5.44)	-1.06 (-3.68)		.48 (2.08)	.54 (1.29)	.12 (.36)	.62	.65	[44,87] 44
227.	R2	1.30 (1.58)	1.32 (6.51)		-1.28 (-4.73)	.50 (2.41)	.54 (1.38)	.13 (.41)	.68	.77	[44,87] 44

Table 5.33

Regression No.	Dependent Variable	Constant	Explanatory Variables						R^2	D.W.	time period — n
			E4S	M1S	X3S	XGS	XCS	$R2_{-1}$			
228.	DR2	-1.33 (-3.10)	-.10 (-1.80)	.29 (2.83)				-.11 (-1.99)	.17	1.24	[8,87] 80
229.	DR2	-1.14 (-2.77)	-.10 (-1.92)	.26 (2.66)	.27 (3.02)	.24 (1.80)	-.38 (-2.74)	-.09 (-1.66)	.34	1.63	[8,87] 80
230.	DR2	-1.55 (-2.86)	-.13 (-1.01)	.35 (1.84)				-.12 (-1.52)	.23	1.22	[37,87] 51
231.	DR2	-.71 (-1.39)	-.02 (-.20)	.12 (.67)	.41 (3.80)	.45 (2.51)	-.19 (-1.17)	-.05 (-.78)	.48	1.83	[37,87] 51

Table 5.34

Regression No.	Dependent Variable	Constant	Explanatory Variables						R^2	D.W.	time period — n
			DE4S	DM1S	X3S	XGS	XCS				
232.	DR2	-.01 (-1.15)	1.13 (3.93)	-.08 (-.19)					.17	1.47	[8,87] 80
233.	DR2	-.03 (-2.41)	.85 (2.68)	-.27 (-.69)	.28 (3.07)	.17 (1.22)	-.12 (-.76)		.28	1.58	[8,87] 80
234.	DR2	-.02 (-1.18)	1.10 (2.04)	.59 (.91)					.11	1.55	[44,87] 44
235.	DR2	-.04 (-2.00)	-.09 (-.15)	.13 (.22)	.45 (3.72)	.48 (1.98)	.08 (.42)		.39	1.73	[44,87] 44
236.	DR2	-.01 (-.54)	1.12 (2.06)	DK1S -.14 (-.25)					.10	1.55	[44,87] 44
237.	DR2	-.02 (-1.44)	-.16 (-.28)	-.46 (-.97)	.47 (4.00)	.48 (2.00)	.08 (.42)		.40	1.73	[44,87] 44
238.	DR2	.00 (-.08)	1.04 (1.90)	DK2S -.52 (-.92)					.11	1.55	[44,87] 44
239.	DR2	-.02 (-.97)	-.26 (-.47)	-.73 (-1.53)	.47 (4.08)	.50 (2.11)	.09 (.48)		.42	1.74	[44,87] 44

Table 5.35

Regression No.	Dependent Variable	Constant	Explanatory Variables BE4S	BM1S	BM3S	BK1S	BK2S	X3S	R^2	D.W.	time period n
240.	BR2	-.01 (-1.06)	-.25 (-.89)	-.17 (-.33)				.32 (3.76)	.16	2.06	[8,87] 80
241.	BR2	-.01 (-1.20)	-.31 (-1.11)		.34 (.45)			.31 (3.67)	.16	2.04	[8,87] 80
242.	BR2	-.03 (-2.73)	.24 (.60)	.52 (.84)				.40 (4.13)	.32	2.26	[37,87] 51
243.	BR2	-.04 (-2.63)	.15 (.37)		1.05 (1.15)			.39 (3.97)	.33	2.27	[37,87] 51
244.	BR2	-.03 (-1.80)	.32 (.69)	.24 (.35)				.38 (3.63)	.28	2.33	[44,87] 44
245.	BR2	-.04 (-1.92)	.21 (.43)		.81 (.83)			.37 (3.46)	.29	2.32	[44,87] 44
246.	BR2	-.02 (-1.34)	.42 (.91)			-.51 (-.89)		.39 (3.70)	.29	2.38	[44,87] 44
247.	BR2	-.02 (-1.10)	.48 (1.04)				-.71 (-1.26)	.37 (3.54)	.31	2.44	[44,87] 44

The first point to note is that the results are unsatisfactory when the dependent variable is in level rather than first difference form (tables 5.31 and 5.32); there is evidence of serious autocorrelation, and the model is not much improved by the inclusion of an adjustment mechanism, especially considering the implausibly low estimates of the adjustment coefficient. The only redeeming feature of these results is that the estimated coefficient attached to X3S is in the main positive and significant. The other results clearly show that, for the period 1961(2) to 1973(4) at least, the excess of planned private investment expenditure (X3S) is significant in explaining the variation in the change in the two-year government bond rate; that the excess of government investment expenditure (XGS) is also significant if not to the same extent, but that the excess of consumer durable expenditure (XCS) is not significant. The overall degree of explanation, as indicated in tables 5.33 to 5.35, is not high, nevertheless, it does increase quite dramatically when the excess of planned expenditure variables are included - see especially regressions number 234 to 239 - and it bears repeating that the data is in first difference form, and in addition there may be *erratic* seasonal influences[14] contributing to the variation in the rate of interest and these will not be accounted for.

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[14] Although the interest rate variable R2 does not exhibit significant *stable* seasonality - see the data appendix - part of its variance may, nevertheless, be due to seasonal factors.

The expected directions of the relationships between the interest rate variable and (i) national expenditure and (ii) the money supply, were not wholly confirmed by the tests. This is the case in table 5.33 but again these results based upon the inclusion of a partial adjustment mechanism are implausible; the estimated value of the adjustment coefficient, as in the tests reported in table 5.31, is very low. The results presented in table 5.34 provide an interesting comparison of the performance of different definitions of the money supply. Although none of the coefficients are statistically significant it is noteworthy that the estimated positive relationship between DR2 and the money supply narrowly defined (DM1S), changes to an *expected* estimated negative relationship when (1) overdraft limits and (2) treasury note holdings and S.T.M.M. deposits, are included in the money supply. This result carries over to table 5.35 where tests of equation (8.20) are reported. The change in sign from positive to negative and the loss of statistical significance of the regression coefficient associated with national expenditure when the excess of planned expenditure variables are included in the regression equation (table 5.34), is consistent with the hypothesis that it is these latter variables which are the prime instigators of change in monetary variables.

The results presented in table 5.35 provide some support for the hypothesised distributed lag relationship between X3S and DR2; the estimated regression coefficient associated with X3S is highly significant, however, in common with the other results, the overall explanatory power of the model is not great.

6. A Summary of the Findings

In general the tests are consistent with the finance motive being empirically important. The major findings are:

(i) that the period of the tests (1954(1) to 1973(4)) can be divided into two distinct sub-periods: up to about 1960/61 and thereafter, and that the distinction between these periods bears on the testing of the finance motive - see appendix 8.1;

(ii) that the major response of the money supply occurs four quarters after expenditure on private fixed investment is planned[15] although there is evidence of that response beginning during the second quarter;

(iii) that the excess of planned private fixed investment expenditure proxy (XP3S) is significant in explaining the variation in the change in the money supply; in velocity, and in the change in velocity;

(iv) that the explanatory power of XP3S is, if anything, greater in explaining changes in real rather than in nominal money balances;

(v) that XP3S performs better in models in which the money supply is defined as a transactions medium

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[15] Or at least four quarters after these plans have been elicited from business.

(K1S, K2S, and M1S) rather than as the broader transactions/asset medium M3S;

(vi) that the unlagged form of the excess of planned private fixed investment expenditure proxy (X3S) is significant in explaining the variation in the longer-term rate of interest, and in the change in the rate of interest. This, when viewed in conjunction with point (ii) above, suggests that the initial demand for liquid assets, following an increase in planned expenditure, precipitates first a port-folio shift out of longer-term assets, and second a delayed accommodation of the money supply;

(vii) that the excess of planned consumer durable expenditure proxy (XCS), notwithstanding some isolated indications to the contrary, is, on the whole, not significant in explaining variations in the rate of interest or in the money supply;

(viii) that the excess of planned government fixed investment expenditure proxy (XGS) on the whole does enter significantly into a demand function which has the rate of interest as the dependent variable;

(ix) that the S.T.M.M. rate of interest is more appropriate as an explanatory variable in the demand function for money than is either of the two longer-term bond rates.

APPENDIX 8.1

Introdution

Kavanagh and Walters [1966] could not decide which variable belongs on the left-hand side of the macro-demand function for money. Lewis [1977] on the basis of an Australian study concluded that the rate of interest is more appropriate than the money supply. However, whether the money supply, the rate of interest or the level of income contributes most in the short run to the removal of a non-zero excess demand for money is not a puzzle which can be solved definitively by theoretical enquiry; rather it is one whose solution for any time period depends on the then existing institutional framework. It will be argued in this appendix that the Australian monetary environment of the 1950's was different from that of the 1960's and early 1970's in respects which bear on the appropriate specification of the demand function for money and which are particularly pertinent to the testing of the finance motive. While this contention is the prime concern of this appendix it is useful for two reasons to consider first the wider but related issue of whether the money supply is endogenously or exogenously determined; (i) because it provides a contextual framework, and (ii) because of the opportunity it gives of considering the relationship of the finance motive to this issue. The first section considers this issue; the second examines some Australian institutional evidence, and the third presents some tentative statistical evidence.

1. Endogenous vs Exogenous Money Supply

There is a whole spectrum of opinion in monetary economics. However, it is possible to distill the essential difference between the assumptions - for that is what they are - of the Keynesian and monetarist approaches. The former approach assumes that certain schedules are volatile, the latter assumes that they are stable. The question of the interest elasticity of certain schedules is a side issue which has little real bearing on the debate.[1]

It is this different view of the economy - possibly devolving from the respective political and ideological stances of the protagonists - which essentially underpins the debate about the exogeneity or endogeneity of the money supply generating process. This is not to say that the workings of the economy in a particular institutional environment will not determine whether the money supply is generated endogenously or exogenously, it is to say that two observers of this process, faced with the same evidence, can reach and have reached different conclusions. Because the money supply, base money and economic activity are strongly correlated over time it is

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[1] Friedman [1969, p. 155 and 1972, p. 913], for example, has stated, quite rightly, that his model and conclusions are not affected by a high interest elasticity of demand for money provided that elasticity does not approach infinity. To continue to distinguish between the two approaches by associating a vertical LM curve with the monetarist system and a horizontal LM curve with the Keynesian system is even more difficult to understand when the originator of the liquidity trap avowed that he knew of no case of it hitherto, and no empirical study has been able to substantiate its evidence.

comparatively easy to fit a number of hypotheses which will remain unrefuted by the 'facts'. This is a contention of Kaldor [1970a] and Cramp [1970, 1971].

If Kaldor's Christmas spending example is excluded, he identifies two ways in which the money supply may be endogenously determined yet *precede* the change in activity with which it is associated. These are: (i) through some firms borrowing in order to increase their inventories; the supplying firms being content to run down their inventories before increasing production and (ii) through the built-in fiscal stabilizer ensuring that as economic activity expands, government tax receipts rise correspondingly, causing the government's borrowing requirements to fall. The crux of the argument is that the higher taxes concomitant with increasing economic activity will reduce the government's borrowing requirements and thus contribute to monetary ease (especially when delays in tax collection are taken into account) at the very time when credit restrictions may be thought appropriate. If the central bank pursues a 'passive' policy of stabilising interest rates it will act to reduce the money supply; thus the money supply may decline prior to the downturn in economic activity.

Cramp concentrates on the first, and for him crucial, monetarist transmission link: that between base money and the money supply. He considers two alternative policies of central banks in a growing economy. The underlying premise is that in such an economy there will be a tendency for the demand for credit to rise and therefore a tendency for the rate of interest to rise. The first alternative is to restrict bank lending and rely upon other financial intermediaries to supply the necessary credit and accept the consequent rise in interest rates. The second alternative is to stabilize interest rates by continually providing the means by which the commercial banking system can expand loans and accept the consequent growth in the stock of money. Cramp argues that no central bank has consistently followed the first alternative (and this, it can be noted, is certainly true of the Reserve Bank of Australia notwithstanding its acquiescence to a greater flexibility of interest rates in the 1960's and the 1970's), thus paralleling Kaldor's view that central banks, in the main, order the quantity of base money to the need to stabilize interest rates. According to Cramp the consequences of central banks not doing this, apart from the adverse effects on the government's own borrowing program, may well be the financial collapse of sections of the private sector which, during periods of monetary stringency and attendant rising interest rates, may have been forced to borrow short in anticipation of being able to refinance their debts in the, central bank induced, easier monetary climate of the future. Cramp concludes that base money is endogenously determined[2] and thus

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[2] Laidler [1960, p. 86] has suggested that the quantity of reserves made available to the commercial banking system by the central bank may be used to *identify* the demand function for money. The problem he was referring to is that of statistically estimating the demand function for money when the observable dependent variable is not the demand for money but the money stock. As this stock - at least in

the first monetarist link between base money and the money supply founders as, consequently, does the second between the money supply and economic activity.

The monetarist's response to these arguments - see particularly Friedman [1970d], Brunner [1971], and Walters [1970] - is to point out first, that they make no claim that increases in the money supply are *exclusively* exogenous; second, that while the timing evidence does not conclusively support their case, it is persuasive, and third, that their conclusions are not based upon the timing evidence alone but as well on other less quantifiable factors.

The first point is something of a quibble, in that both Kaldor and Cramp would no doubt admit the possibility of exogenous increases in the money supply; the issue is not, is it one or the other, but which is the more important and

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equilibrium - is determined by the interaction of supply and demand, single equation estimation may give misleading results. While the use of a simultaneous equation estimating procedure may overcome the problem, this is feasible, only if exogenous variables exist which be be included in one equation and excluded from the other. A *necessary* condition for identifying the demand function is that the number of exogenous (more correctly predetermined, which includes lagged endogenous) variables excluded from the equation must at least equal the number of endogenous variables included on the right-hand side. If both the supply of and the demand for money are related to the rate of interest, it is possible to identify the demand function provided that the quantity of reserves determined by the central bank can be included in the supply equation as an exogenous variable while being excluded from the demand equation. An exogenous variable is one whose value is determined outside of the system of equations. In this instance, the quantity of reserves should be uninfluenced by the demand for money, the supply of money, or the rate of interest. This is, of course, far from the case if Cramp's analysis is correct.

pervasive. (See page 101 of chapter 6 for evidence that Friedman, at least, thinks exogenous monetary change is the more important and pervasive). As regards the evidence on timing, it is true that while in general terms it is possible to reconcile peaks in the rate of change of the money supply *preceding* peaks in the level of economic activity with an endogenously determined money supply, it is much harder to explain the specific lag of between 12 and 16 months discovered by Friedman. However, chapter 6, in the context of a debate between Friedman and Tobin, explored this question in more detail and developed a model based on the finance demand for money which does explain this lag. This is one aspect of the debate where it is important explicitly to consider finance demand, another is in the context of the monetarist's amorphous third point.

The other factors besides timing evidence on which those who think the money supply is exogenously determined rely are the same as those on which those who think the money supply is endogenously determined rely. They are institutional factors; the role and the observed actions of central banks and the workings of the monetary system in general.[3] As each side has access to the same information and is imbued, presumably, with a sufficient degree of understanding, it is on the

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[3] This excludes special cases, for example, the influence of gold discoveries described by Friedman and Schwartz [1963a, ch. 4] as being the 'proximate cause of the world price rise' from 1897 to 1914.

face of it something of a mystery that they reach different conclusions. It may be that a general concensus will follow a future consideration of the evidence. However, it is possible at this stage to, at least, rationalise the different points of view.

The usual monetarist interpretation of economic change is in terms of a change in the quantity of high powered money determined independently by the monetary authority. This leads to some predictable change in the money supply which, by altering the marginal return on money vis-a-vis other assets, both real and paper, causes port-folio adjustment and a consequent change in nominal income. This avenue for change is not regarded as exclusive because of some theoretical imperative. Its relative exclusiveness devolves from the assumption that the economic system is inherently stable. A major economic fluctuation contradicts this assumption unless its cause can be ascribed to some change which occurs from without, for example, an exogenous change in the money supply. On the other hand, those who think the money supply is endogenously determined consider that their contention is validated by showing that monetary authorities are influenced by general economic conditions, by the level of interest rates, by the level of unemployment, by the level of inflation, and by the need to maintain external balance. But is it? It is, only if it is accepted that economic conditions can alter significantly without reference to prior changes in the money supply. These changes are looked for and apparently discovered by those who think the system is stable, they are not discovered by those who think the system unstable and therefore capable of generating fluctuations from within.

The finance motive is important in this context because of its association with *changes* in planned expenditure flows.[4] If the economic system is capable of generating fluctuations from within and if monetary authorities act to satisfy the demand for funds, there should be a relationship[5] between changes in expenditure plans and changes in the money supply which, both in timing and magnitude, is distinct from the relationship between realised expenditure flows and the money supply. However, a significant finance demand for money does not imply that major economic fluctuations are necessarily an endogenous phenomenon. Australian evidence of the last twenty or so years bears this out. The next section will consider some of this evidence; its relationship to the exogenous - endogenous issue, and the bearing that it has on the testing of the finance motive.

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[4] See especially chapter 4.

[5] Whether this relationship is discernable or not may depend on the availability of data.

2. Australian Evidence

The development of Australian monetary institutions and policy throughout the past twenty five years is well documented[6] and the intention is not to go over this ground in any detail. The object is the narrow one of showing that the changes which have occurred do impinge on the issue of whether the money supply was endogenously determined or not, and therefore, on the correct specification of the short-run demand function for money, and consequently, on the appropriate procedure for testing the finance motive.

If is often difficult to determine precisely the time at which change occurs. Often it occurs gradually, rendering impossible the identification of a specific break. In some respects this, almost certainly, applies to the Australian monetary institutional changes of the last two decades. However, 1960/61 does have more claim than most years to be considered a turning point.[7] Of the factors which contributed to the change perhaps only one, that is, the increased reliance

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[6] See Hirst and Wallace [1974] for a collection of papers on the scope and development of the Australian capital market and N. Runcie [1971] for a collection of papers on the development of Australian monetary policy. For a more up to date view of Australian monetary policy see Lewis and Wallace [1973a, b].

[7] See Hirst [1974, p. xvi and p. 159] - the point raised there and in a private communication is that the change in policy of the Reserve Bank was spread over a transitional phase which came to fruition in the early 1960's.

of the Reserve Bank on influencing market forces rather than on direct controls, can be specifically associated with this turning point. Nevertheless, other factors which in part precipitated and in part facilitated this change of policy became increasingly important throughout the 1960's and the 1970's. These other factors can be subsumed under the general heading of the development of a capital market which, in competition with the trading banks, provided access to loan funds. In part it was the development of this market which tempered the ability of the Reserve Bank to control as quickly as it would have liked the 1959/60 boom. However, it was precisely this development, with its attendant widening of the market for government securities, which facilitated the Reserve Bank's less fettered use of open market operations during the ensuring periods.

Open market operations provide the opportunity to control the liquidity of all financial institutions. This was important in the 1960's because of the emergence of a wider capital market and the partial failure of the Reserve Bank to control, by direct means, trading bank advances during the boom of 1960. However, a wide dispersal of government securities and the dependence on a free rather than on a captive market to place government securities implies that the monetary authorities have to be more responsive to market pressures. Ordinarily, a rigidity in interest rates indicates that the monetary authorities are playing a supportive role by increasing and reducing the money supply as the market dictates. But this is not necessarily the case, and to a degree may not have been the case in Australia during the 1950's.

In a situation where the trading banks are the main source of funds, where there is little active non-bank financial intermediary dealing in government securities, where quantitative restrictions are applied to bank interest rates, and where the lending policies of the trading banks are quantitatively controlled, the system is, to a degree, closed and the rate of interest on government securities is somewhat insulated from market pressures. In these circumstances a demand for money deemed in excess by the monetary authorities may precipitate queues rather than an increase in the money supply or an increase in interest rates; the variable which responds most markedly to restore equilibrium in the short-run may well be income. However, these implications will not survive the emergence of an active non-bank financial intermediary sector.

In a situation where non-bank financial intermediaries are significant holders of government securities and borrowers and lenders of funds, it is no longer possible for the monetary authorities to insulate the interest rate on government securities from market pressures. They can either pursue Cramp's first alternative and allow interest rates to rise and fall at will - and the dangers of this have been cited - or they can pursue Cramp's second alternative and tailor the supply of money to the demand.[8]

To argue that the Reserve Bank effectively insulated interest rates from market pressures in the 1950's but pursued a market oriented policy in the ensuing period is much too glib. Nevertheless, the institutional and policy changes which occurred are compatible with the view that the money supply determinations of the Reserve Bank during the 1950's followed a more exogenous path than during the ensuing period. Some tentative statistical support for this view is presented in section 3.

The growth of non-bank financial intermediearies and the changed policy stance of the Reserve Bank were, however, not the only factors which bore on the creation of money. Fluctuations in the world price of primary produce, particularly wool, had a much greater influence on the money supply in the 1950's than in later years.[9] From the point of view of the domestic private sector money supply changes caused by changes in world market prices for primary produce are clearly exogenous.

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[8] In practice they may alternate between the two policies; it is then a question of deciding which alternative predominates.

[9] For example, the Reserve Bank financial reports for the years 1955/6 and 1956/7 indicate that the small growth in M3 of 1 per cent during the former year and the much greater increase of 7 per cent in the subsequent year can be mainly attributed to fluctuations in the price of wool. The large increase in the money supply in 1956/7 was mainly due to a gain in export income of £208M over the previous year and to a lower level of import payments of £102M. About 3/4's of the £208M was attributed to wool export.

Another factor which probably was most significant in the 1970's but which, nevertheless, had an influence in the 1960's was the response of private capital inflow to domestic monetary stringency. Phillips [1964, p. 87] foreshadowed the concern of the Reserve Bank and the Treasury in 1972 by suggesting that the concern about the financing of development from abroad, paralleled (in 1964) the concern about the financing of development from non-bank domestic sources two or three years before 1960. The factors, both internal and external, which underly the greater domestic access to foreign capital are detailed in Hirst [1974],[10] where it is also pointed out that the character of borrowing changed from the early part of the 1960's when the borrowing of foreign-owned firms predominated to a situation ten years later when Australian-owned firms were responsible for more than 40% of total foreign investment.

The opportunity existed during the 1960's and the 1970's for enterprises operating in Australia to seek funds from foreign sources when the availability or cost of funds on the domestic market were preclusive, as did the opportunity exist for foreign sources to take advantage of interest rate differentials by short-term investment in Australia. The Treasury [1972, p. 108] concluded that there was '*prime facie*

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[10] The two most important factors are the development outside of Australia of the Eurodollar market and the development in Australia of Merchant banks.

evidence that both the timing and the extent of the sharp increase in capital inflow in the period to late 1971 [from the June quarter of 1970] were determined to a significant extent by reduced availability of domestic finance and, possibly, interest differentials between domestic and overseas financial markets'. While this conclusion applies only to a short specific period there is reason to believe that a similar qualitative inference can be drawn for the period from the early 1960's to the early 1970's. Porter [1974] examined the period from 1961(3) to 1972(4) and, on the basis of statistical results, concluded that private capital inflows reduced by 48 per cent in the same quarter the effect of a policy induced change in the monetary base.[11] There is, therefore, evidence that private capital inflow during the period 1960/61 contributed to the endogeneity of the money supply.

In summary, there are three factors which give credence to the view that the character of the process by which the money

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[11] Porter used quarterly data and employed O.L.S. His final estimated equation was:

$$TC = \underset{(4.48)}{73.98} + \underset{(2.37)}{.04\Delta Y} - \underset{(-8.68)}{.68CAD} - \underset{(-6.40)}{.484\Delta NDA} + \underset{(7.30)}{.068SPEC} - \underset{(-1.52)}{20.1R^*} \quad R^2=.86 \quad DW=2.38$$

TC - total net apparent capital inflow

ΔY - change in current GNP

CAB - current account balance

ΔNDA - a measure of the change in the net domestic assets of the Reserve Bank standing for a policy induced change in the domestic monetary base.

SPEC - speculative proxy

R* - percentage change in Eurodollar rate supply varies changed around about 1960/61. First, the growth of non-bank financial institutions precipitated and facilitated the Reserve Bank's change from the use of direct controls to more market oriented policies; second, fluctuations in the world price of primary produce was of much less significance to money supply changes in the 1960's than it was in the 1950's, and third, the greater sophistication of world and of Australian capital markets in the 1960's meant that monetary stringency within Australia could be readily relieved by an inflow of foreign capital. The conclusion drawn is that these factors are conducive to the money supply being more endogenous after than before 1960/61.

In terms of explaining, statistically, the variation in (i) the money supply or (ii) its rate of change, this implies that prior to 1960/61 variables which influence the demand for money may not be significant in explaining the variation in the supply of money. In other words, the supply of money may not be a good proxy for the demand for money in a situation where credit rationing within the banking system is an important instrument of policy; neither, however, is it reasonable to use the rate of interest on the left-hand side of the demand function, if this variable is controlled by edict rather than by market forces.

As far as the testing of the finance motive is concerned, it is clear that the use of single equation regression analysis with the money supply as the dependent variable will give misleading results when the money supply is dominated by exogenous factors. What is not clear is how this problem can be overcome or for that matter whether it is worth tackling. If the variation in the money supply during a period is dominated by exogenous factors and these factors predominantly explain the course of economic activity, possibly, that is all that need be discovered. Whether the Australian experience of the 1950's approximated this situation is conjectural. Some circumstantial and quantitative evidence has been presented which tends to support the view that it did. The main body of statistical results in chapter 8 can hardly be used as further support given that its aim is to discover the empirical significance of the finance motive; to claim that the money supply was endogenously determined in the period 1960(2) to 1973(4) because during this period planned expenditure significantly explained variation in the money supply and was exogenously determined in the period 1952(2) to 1960(1) because during this period it did not, is tantamount to making the importance of finance demand an irrefutable hypothesis. Section 3 presents some independent evidence which, although tentative, nevertheless, supports the circumstantial evidence already adduced.

3. Some Statistical Evidence

The table below shows for the 26 financial years 1948/9 to 1973/4 the change in M1 money supply and the influence on the money supply of six different flows: total private capital inflow, direct and port-folio capital inflow, the balance on current account, the overall external balance, the change in advances of trading banks, and the change in government debt.

$M

total private capital inflow *	direct & portfolio capital inflow *	balance on current account *	overall external balance *	change in advances of trading banks **	change in govt. debt **	change in M1 **	YEAR
118	73	62	331	100	-145	207	48/49
150	105	-71	308	139	55	359	49/50
139	92	250	330	209	108	695	50/51
166	124	-1088	-851	385	254	-89	51/52
28	15	389	354	-206	226	323	52/53
17	77	-4	39	241	-63	166	53/54
178	149	-477	-262	291	30	29	54/55
198	153	-448	-147	-37	123	70	55/56
195	114	217	420	-48	26	150	56/57
188	120	-309	-81	163	11	-61	57/58
205	123	-385	13	-53	133	95	58/59
372	232	-475	15	204	144	247	59/60
456	360	-735	-81	27	92	-229	60/61
217	131	-8	177	49	175	85	61/62
470	358	-460	150	178	51	85	62/63
475	314	-54	447	145	273	268	63/64
509	460	-786	-297	345	206	59	64/65
695	570	-877	57	228	103	26	65/66
403	401	-670	-124	365	217	258	66/67
954	735	-1153	79	474	304	340	67/68
979	754	-988	148	361	120	336	68/69
826	786	-716	37	519	274	235	69/70
1434	1313	-809	598	415	22	329	70/71
1297	1252	-302	1442	558	113	483	71/72
378	144	745	1079	1981	1030	1521	72/73
171	41	-836	-439	2365	630	150+	73/74

*A.B.S. "Balance of Payments" 1973/4.

**R.B.A. "Financial Supplements".

+ Certificates of deposit increased by $M 2109 in this year compared with a change of $M 334 the year before. Presumably this accounts for the low increase in M1.

If the money supply were predominantly endogenously determined it would be expected that the avenues through which this endogeneity becomes effective, that is, through private capital inflow, through a change in government debt and through bank advances,would be positively associated with changes in the money supply. These positive associations would not be expected if the money supply were exogenously determined. For the purpose of discovering whether 1960/61 was a turning point, the yearly observations were divided into two sets of thirteen. The first set covered the period from 1948/9 to 1960/1 and the second set the period from 1961/2 to 1973/4. The results of computing the simple correlation coefficient between the change in the money supply and each of the influencing flows for each of the two periods are recorded below.

	total private capital inflow	direct & port-folio capital inflow	balance on current account	overall external balance	change in adv. of trad. banks	change in govt. debt
48/9 - 60/1	-.48	-.54	+.73	+.64	-.25	-.01
61/2 - 73/4	+.03	-.06	+.68	+.65	+.55	+.76

It can be seen that for the first period the simple correlations between the change in the money supply and (i) capital inflow, (ii) the change in trading bank advances, and (iii) the change in government debt, are all negative, in the two former cases quite strongly so. Predictably, the simple correlation between the change in the money supply and the balance on current account is strongly positive. These results change significantly when the latter period is examined. In this period, there are strong positive correlations between the change in the money supply and (i) the change in trading bank advances and (ii) the change in government debt. Although the simple correlation between the change in the money supply and private capital inflow is very small and in the case of direct and port-folio inflow negative, there is still a significant change between this result and the corresponding result of the earlier period, and while the strong positive association between the change in the money supply and the balance on current account remains, it is no longer unique in this respect.

Further insight into the table can be gained by comparing the signs of the various flows with the sign of the change in the money supply. For the earlier period, the change in trading bank advances is contradictory in sign to the change in the money supply in 7 of the 13 years, the change in government debt is contradictory in 5 of the years, private capital inflow in 3 of the years, and the balance on current account in 6 of the years. For the later period, neither the change in trading bank advances nor the change in government debt nor private capital inflow is contradictory in sign to the change in the money supply in any of the years, by contrast, the balance on current account is contradictory in sign in 12 of the 13 years.

This evidence, although tentative, does support the conclusion of section 2.

APPENDIX 8.2

Introduction

Little work of any kind, much less empirical work, has been done on the finance motive. However, Meyer and Neri [1975] did attempt to distinguish between a transactions/finance motive and an asset motive approach to the demand for money. The purpose of this appendix is to examine their method and to see whether their empirical results (using United States data) are similar to those obtained using Australian data.

The first section explains Meyer and Neri's (M&N's) method, and reproduces and comments on their results and conclusions; the second section presents and comments on the results obtained using Australian data.

1. M&N's Method and Results

M&N's basic demand function for money is:

$$M_t^* = \alpha_0 + \alpha_1 Y_t^e + \alpha_2 r_t \qquad \ldots\ldots (1)$$

where M_t^* is desired real money balances, Y_t^e is *short-run* expected real income and r_t is the rate of interest. The novelty of this function lies in the inclusion of short-run expected real income instead of either the conventional-Keynesian current income or Friedman's permanent income. It is assumed (equation 2) that short-run expected real income is equal to current income (Y_t), plus a proportion of the difference between 'normal income' (Y_t^n) and current income:

$$Y_t^e = \lambda(Y_t^n - Y_t) + Y_t, \quad 0 \leq \lambda \leq 1 \qquad \ldots\ldots(2)$$

where Y_t^n is assumed to be analogous to permanent income and, for operational purposes, is calculated as a geometrically weighted average of current and past incomes as shown in equation 3:

$$Y_t^n = \sum_{i=0}^{\infty} (1-\beta)\, \beta^i\, Y_{t-i}, \quad 0<\beta<1 \qquad \ldots\ldots(3)$$

In order to estimate the structural parameters λ, α_1, α_2 and β, two reduced form equations, 4 and 5, are derived by substituting equations 3 and 2 into equation 1 and by applying a *Koyck* transformation having assumed, for equation 4, that actual money balances (M_t) equal desired money balances, and for equation 5, that actual money balances approach the desired level by a partial adjustment process of the form:

$$M_t = \gamma(M_t^* - M_{t-1}) + M_{t-1}, \text{ where } 0<\gamma<1.$$

Equations 4 and 5 are given below,

$$M_t - \beta M_{t-1} = (1-\beta)\alpha_0 + \alpha_1 (1-\lambda\beta) Y_t + \alpha_1 \beta(\lambda-1)\, Y_{t-1} + \alpha_2 (r_t - \beta r_{t-1}) \qquad \ldots\ldots(4)$$

$$M_t - \beta M_{t-1} = \gamma(1-\beta)\alpha_0 + \gamma\alpha_1 (1-\lambda\beta) Y_t + \gamma\alpha_1 \beta(\lambda-1) Y_{t-1} + \gamma\alpha_2 (r_t - \beta r_{t-1}) + (1-\gamma)(M_{t-1} - \beta M_{t-2}) \qquad \ldots\ldots(5)$$

As the structural parameters α_2 and β are overidentified, M&N estimated β by an iterative process, re-estimating equations 4 and 5 with values of β in steps of 0.05 from 0.05 to 0.95, and chose that value which resulted in the lowest standard error of the estimate.[1] Their estimating technique was O.L.S.; they used United States data for the period 1897-1960 excluding the war years 1917-1919 and 1941-1945 and their variables, all in logarithm form, were price deflated National Bureau of Economic Research unpublished figures on N.N.P., the four-six month prime commercial paper rate, the yield on twenty year corporate bonds and price deflated M1 and M2 money balances.

Table 1 presents a section of their results. As the Australian results are based on a long-term rate of interest, M&N's short-term interest rate results are excluded - they do not differ greatly from the results shown. The values of the structural parameters were unscrambled from the reduced form coefficients,[2] and the estimated standard errors - in brackets -

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[1] This criterion was preferred to maximising R^2 as the value of the dependent variable varies as β varies.

[2] If equation (4) is written as:

$$M_t - \beta M_{t-1} = C_o + C_1 Y_t + C_2 Y_{t-1} + C_3 (r_t - \beta r_{t-1}),$$

and equation (5) as:

$$M_t - \beta M_{t-1} = C_o' + C_1' Y_t + C_2' Y_{t-1} + C_3' (r_t - \beta r_{t-1}) + C_4' (M_{t-1} - \beta M_{t-2}) ;$$

in the case of equation (4):

$$\lambda = (C_1 \beta + C_2)/\beta (C_1 + C_2),$$

were derived from the standard errors of the reduced form coefficients by the application of a formula from Klien [1953].[3]

$\alpha_1 = (C_1 + C_2) / (1 - \beta),$

$\alpha_2 = C_3,$

and in the case of equation (5):

$\lambda = (C_1'\beta + C_2') / \beta(C_1' + C_2'),$

$\alpha_1 = ((C_1' + C_2') / (1 - \beta)) / (1 - C_4'),$

$\alpha_2 = C_3' / (1 - C_4').$

[3] In general terms if $y = f(x_1, x_2, \ldots, x_n)$, where the x_i's are random variables then

$$\text{Var.}(y) = \sum_{i=1}^{n} \left(\frac{\partial f}{\partial x_i}\right)^2 \text{Var.} x_i + \sum_{i \neq j} \left(\frac{\partial f}{\partial x_i}\right)\left(\frac{\partial f}{\partial x_j}\right) \text{Cov.}\ (x_i x_j)$$

Klein suggests evaluating the derivatives at the point of sample estimates. In specific terms the standard error (S.E.) of, for example, λ in equation (4) is calculated as:

$$\sqrt{\left[\frac{\beta(\beta\hat{C}_2-\hat{C}_2)}{[\beta(\hat{C}_1+\hat{C}_2)]^2}\right]^2 \text{Var}\ \hat{C}_1 + \left[\frac{\beta(\hat{C}_1-\beta\hat{C}_1)}{[\beta(\hat{C}_1+\hat{C}_2)]^2}\right]^2 \text{Var}\ \hat{C}_2}$$

$$+ 2\ \frac{\beta(\beta\hat{C}_2-\hat{C}_2)}{[\beta(\hat{C}_1+\hat{C}_2)]^2} \cdot \frac{\beta(\hat{C}_1-\beta\hat{C}_1)}{[\beta(\hat{C}_1+\hat{C}_2)]^2}\ \text{Cov}\ (\hat{C}_1\hat{C}_2).$$

Table 1

Dependent Variable	β	λ	α_1 (income elasticity)	α_2 (interest rate elasticity)	γ (Stock Adj. Coefficient)	Squared Standard error of the estimate
M1	.9	.722 (.105)	.886 (.105)	-.310 (.084)	n.a.	.0016 [1.06]
M2	.85	.878 (.094)	1.065 (.053)	-.265 (.069)	n.a.	.0009 [1.63]
M1	.85	.765 (.105)	.937 (.069)	-.354 (.092)	.992 (.061)	.0015 [1.57]
M2	.85	.877 (.068)	1.077 (.077)	-.263 (.067)	1.041 (.057)	.0010 [1.63]

S.E.E. (   ).

Mean of the dependent variable [   ].

The crucial parameter is λ. This can be understood by referring to equation (2). If λ were equal to unity the variable which M&N refer to as short-run expected income would in fact be equivalent to permanent income. A value of λ not significantly different from unity in the empirical tests would therefore tend to support the asset approach to the demand for money, at least, as far as this approach and the permanent income approach are the same. A value of λ significantly less than unity (but greater than zero?) would tend to support a transactions/finance approach to the demand for money. M&N's conclusion that the transactions/finance approach is dominant in explaining the demand for narrowly defined money is based on four factors:

i. Using an M1 definition of money the value of λ is significantly less than unity.

ii. When money is defined more broadly, the value of λ rises and although less than unity, 'the differences are of only marginal significance at the 5 per cent level'. This is in line with prior expectations that the more broadly defined is money, the more likely it is that an asset approach predominates as the more strictly money is confined to a means of payment definition, the more likely it is that a transactions/finance demand approach predominates.

iii. There is no systematic relationship between the definition of money and the interest elasticity of the demand for money. If the asset approach were dominant, a change in interest rates would tend to have a proportionately greater affect on the non-interest bearing M1 balances than on the (in part) interest bearing M2 balances. On the contrary, if finance and transaction requirements dominated the demand for M1 balances, this demand would not be very sensitive to interest rate changes. Looking at M&N's results as a whole (not just those shown in table 1 which are misleading in this respect) the pattern of short and long term interest rate elasticities give conflicting indications.

iv. This is a theoretical rather than an empirical finding, M&N present it to forestall the challenge that the expected income calculation of equation (2) may in fact be a more accurate estimate of permanent income, and that a value of λ less than unity merely indicates this. It is shown that given a particular stochastic model based on special assumptions (see M&N, pp.614-616), the form of equation (2) is an optimal predictor of income in the *short-run* while Friedman's permanent income remains optimal for *long-run* predictions.

M&N point out that the finance motive is an *ex ante* motive. However, it is equally true that the transactions motive is an *ex ante* motive - see chapter 1. The distinction between them is not that one is *ex ante* and one *ex post* but that they are associated with different categories of planned expenditure - see chapter 1. For operational purposes the critical distinction is between those planned expenditures for which current income may be used as a proxy and those for which it may be highly misleading to use current income. M&N follow Davidson [1972] and Hines [1971a, b] in lumping all categories of planned expenditure together and relating the demand for active money balances to this total. The danger in this is its failure to isolate that category of planned expenditure which may be especially volatile. This in turn may lead to the kind of model used by M&N where planned expenditure in total is related to current and past income. There is no reason - or at least M&N give none - for thinking that the modified exponential weighted average of current and past income (the result of substituting equation (3) into (2)) is an adequate proxy for expenditure plans.[4]

What the M&N results show is that a weighted average of their normal income construct and current income performs better in explaining the demand for M1 balances than does normal income or current income alone. On the face of it, various interpretations of this are possible. To support their interpretation M&N point to the fact that when money is defined more broadly λ rises and to the fact that, when their model is used, there is no systematic relationship between the definition of money and the interest rate elasticity of the demand for money. But, to be the devil's advocate, both of these facts are consistent with a more straightforward interpretation, which is that the asset demand and the transactions demand *jointly* determine the demand for active money balances. A value of λ less than unity does not necessarily imply a non-existent asset demand. It only does so if the M&N normal income construct is primarily significant because of the part it plays in forming expectations about short-run future income. If on the contrary, it is primarily significant as an indicator of human wealth (and this presumably is its role when money is broadly defined), it is to be expected that its influence would be less relative to current income for M1 than for M2 balances, and that, because of this, changes in the interest rate would

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[4] The fact that M&N's model is an optimum predictor when the time path of income is generated by independent normally distributed random shocks can hardly be accepted as a reason.

tend to have less affect on M1 than on M2 balances.[5]

A major drawback of M&N's method is the burden placed on the parameter λ. If λ is found to be equal to (or not significantly different from) zero, presumably, both the finance and asset motives are insignificant and equation (1) reduces to $M_t^* = \alpha_0 + \alpha_1 Y_t + \alpha_2 r_t$. If λ is found to be equal to (or not significantly different from) unity, presumably, the transactions/finance demand motive is insignificant and equation (1) reduces to $M_t^* = \alpha_0 + \alpha_1 Y^n_t + \alpha_2 r_t$. If λ is found to lie between zero and unity, M&N contend that the finance motive (and the transactions motive?) is significant, and the asset motive is rejected. This is a lot of work for one parameter. However, it is possible that M&N's interpretation is the correct one; it therefore seems worthwhile to repeat M&N's empirical exercise using Australian data and to compare the results.

2. Australian results

M&N used 56 annual observations between 1897 and 1960. The Australian results are based on annual observations between 1876 and 1974. Three periods are examined: (i) 80 observations over the whole period excluding the years 1888-1894[6]

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[5] It is not possible to say definitely that the interest elasticity would be less for M1, because of the counter tendency due to the interest differential between interest bearing deposits and non-interest bearing deposits.

[6] Omitted because of the lack of interest rate data for this period.

and 1939-1950;[7] (ii) 56 observations over a period excluding, in addition to the previous exclusions, the years 1951-1974; and (iii) 24 observations over the period 1951-1974. Because of the absence of a series on the public's holdings of notes and coin over the whole period, the narrow definition of money in the first two periods examined is defined as non-interest bearing deposits at trading banks (TBC) and the broader definition as TBC plus interest bearing deposits at trading banks (TBRA). For period (iii) the conventional M1 and M2 definitions are used. The income variable used is gross domestic product (GDP) and the interest rate variable is the long-term government bond yield (RLB). The source (and construction) of these variables and of the price index[8] is given in the data appendix. All the variables were log transformed to the base e.

The procedure used by M&N was applied to find the values of β: equations 4 and 5, for time period (i), were estimated with values of β ranging from 0.05 to 0.95 in steps of 0.05, and those values of β chosen that minimised the standard error of the estimate. These values were carried over to the other time periods, and not re-estimated, in order to preserve comparability between the results of the different

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[7] Omitted because of the lack of a price index; and also the war years are in this period.

[8] The price index is an implicit gross domestic product deflator index.

periods. Table (2) presents the reduced form results (of applying O.L.S. to equations 4 and 5 with different definitions of money, with the optimal values of β, and for the three times periods) and table (3) presents the corresponding structural results.

Table 2

REDUCED FORM RESULTS

Period	β	Dependent Variable	Coefficient of: Con-stant	GDP	GDP_{-1} (lagg-ed)	RLB	Depen-dent Var-iable$_{-1}$	R^2	D.W.
(i)	0.95	TBC	.018 (.32)	.345 (2.57)	-.307 (-2.28)	-.190 (-2.24)	n.a.	.26	1.98
(i)	0.85	TBC+TBRA	-.025 (-.57)	.355 (3.54)	-.220 (-2.19)	-.140 (-2.18)	n.a.	.86	1.71
(i)	0.90	TBC	-.077 (-1.29)	.364 (2.68)	-.283 (-2.05)	-.201 (-2.33)	.124 (1.16)	.62	2.05
(i)	0.80	TBC+TBRA	-.041 (-.95)	.362 (3.64)	-.208 (-2.04)	-.150 (-2.37)	.161 (1.55)	.91	1.94
(ii)	0.95	TBC	.045 (.32)	.302 (1.94)	-.268 (-1.72)	-.220 (-1.88)	n.a.	.12	1.95
(ii)	0.85	TBC+TBRA	-.084 (-.88)	.348 (3.19)	-.201 (-1.88)	-.176 (-2.19)	n.a.	.64	1.68
(ii)	0.90	TBC	-.113 (-.81)	.333 (2.09)	-.244 (-1.53)	-.213 (-1.81)	.094 (.70)	.31	1.99
(ii)	0.80	TBC+TBRA	-.151 (-1.55)	.370 (3.45)	-.196 (-1.81)	-.178 (-2.26)	.152 (1.21)	.78	1.92
(iii)	0.95	M1	.091 (.48)	1.165 (3.32)	-1.141 (-3.20)	-.044 (-.53)	n.a.	.43	2.64
(iii)	0.85	M2	-.058 (-.29)	1.019 (2.78)	- .886 (-2.36)	-.001 (-.01)	n.a.	.69	2.42
(iii)	0.90	M1	.51 (2.33)	1.81 (3.29)	-1.156 (-3.16)	.018 (.17)	-.173 (-.88)	.44	2.20
(iii)	0.80	M2	.169 (.77)	1.090 (2.84)	-.916 (-2.36)	.057 (.53)	-.168 (-.80)	.75	2.04

(The 't' statistic is in brackets beneath the regression coefficient).

* 'Dependent variable' is of the form $M_t - \beta M_{t-1}$ where M is the money supply. The variable indicated in the table is the particular definition of the money supply used.

Table 3

STRUCTURAL PARAMETERS RESULTS

Time Period	Dependent Variable	β	λ	α_1 (income elasticity)	α_2 (interest rate elasticity)	γ (adjustment coefficient	Standard Error of the estimate
(i)	TBC	0.95	.575	.760	-.190	n.a.	.06505
			(.22)	(.16)	(.08)		[.2711]
(i)	TBC+TBRA	0.85	.712	.900	-.140	n.a.	.04866
			(.13)	(.05)	(.06)		[.8751]
(i)	TBC	0.90	.612	.925	-.229	.876	.06516
			(.21)	(.11)	(.10)	(.11)	[.5193]
(i)	TBC+TBRA	0.80	.662	.918	-.179	.839	.04836
			(.18)	(.11)	(.08)	(.10)	[1.156]
(ii)	TBC	0.95	.585	.680	-.220	n.a.	.07241
			(.35)	(.44)	(.12)		[.2530]
(ii)	TBC+TBRA	0.85	.759	.980	-.176	n.a.	.04998
			(.13)	(.10)	(.08)		[.8108]
(ii)	TBC	0.90	.695	.982	-.235	.906	.07217
			(.22)	(.14)	(.13)	(.13)	[.4741]
(ii)	TBC+TBRA	0.80	.933	.790	-.210	.848	.04928
			(.17)	(.15)	(.09)	(.13)	[1.0694]
(iii)	M1	0.95	-1.61	.46	-.044	n.a.	.03605
			(2.88)	(.48)	(.08)		[.3282]
(iii)	M2	0.85	-.176	.887	-.001	n.a.	.3760
			(.61)	(.17)	(.09)		[1.0494]
(iii)	M1	0.90	-4.138	.302	.022	1.173	.03652
			(5.82)	(.04)	(.08)	(.20)	[.6525]
(iii)	M2	0.80	-.316	1.046	.069	1.168	.03826
			(.65)	(.13)	(.09)	(.21)	[1.3915]

S.E.E. ( ).

The mean of the dependent variable $M_t - \beta M_{t-1}$ [ ].

In the first instance comments on the results are restricted to the first two periods examined. Some specific points of interest are:

a. The value of λ is, in each case, less than unity and but for two cases is significantly less (at least at the 5 per cent level and sometimes at the 1 per cent level).

b. The results also conform to those of M&N in that, in each case, the value of λ is less for the narrowly defined money balances than it is for the corresponding broadly defined money balances, although, contrary to the results of M&N, in only one case is the significance (measured in standard errors) of the difference between the value of λ and unity greater for the narrowly defined money balances.

c. The values of the income elasticity, the interest rate elasticity, and the adjustment coefficient, are broadly the same as those found by M&N. There is no support for the contention that money is a luxury good; if anything the income elasticities indicate some economising on money balances as income grows. The interest elasticity estimates are low but in all cases significant (at least at the 5 per cent level); they are higher for the narrow definition of money and this is similar to the findings of M&N when they used a long rate of interest. When they used a short rate they found the opposite. The estimated adjustment coefficients are close to unity and so indicate that actual balances substantially adjust to the desired level within a year.

Provided M&N's interpretation of their model is correct the Australian results lend support to the argument that the finance motive is important.[9] However, unlike the M&N results, the Australian results do not convincingly suggest that the finance motive is of much less importance when the broader definition of money is considered. True, the value of λ increases as money is more broadly defined, but it remains with one exception, as significantly less than unity as when money is narrowly defined. But this is not an exceptional finding.

If money is demanded to finance future expenditure, it seems reasonable to conclude that the form in which it is held will depend on the length of the period between the time that the money supply responds to the demand and the time that the expenditure is executed. It is only in cases where the link between the demand for money and the supply response is direct, for example, in the case of an application for and granting of a bank advance, and where the supply responds shortly before the expenditure is executed (that is, less than the minimum time that deposits must remain in the bank to earn interest), that the association of finance demand with a rise in the interest bearing component of M2 can be completely ruled out.

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[9] The obverse does not apply. That is, if the M&N interpretation were incorrect it would not imply that the finance motive is unimportant but merely that their model is not the appropriate one to catch its effect.

The results of the third period examined differ in several respects from the results of the other periods:

a. While the income elasticity of the M2 balances is of the same order as in other periods, the income elasticity of M1 balances is much lower than in other periods. A possible reason for this is that during the past twenty years an economising of non-interest bearing deposits occurred. The availability of various short-term interest bearing investments (for example, short-term money market deposits) may have induced a substitution of interest bearing deposits (not necessarily, or substantially, at trading banks) for non-interest bearing deposits at trading banks.

b. The interest rate elasticity is not significantly different from zero. This may reflect a diminution during the period (or part of it) of the influence of demand factors on the money supply (see appendix 8.1) but a cautionary comment is warranted: the number of observations is small and the results ought, therefore, to be treated circumspectly; this applies with equal force to (c) below.

c. The value of λ is negative,[10] but is, in all cases, of a lesser magnitude than its standard error. In these circumstances no reliance can be placed on its value or sign.

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[10]A negative value of λ is not a nonsensical result even though M&N assume that its value lies between zero and unity. Expanding equation (2) gives:

$$Y_t^e = (1-\lambda)\ Y_t + \lambda Y_t^n;$$

if the variables are in logarithm form the coefficients $(1-\lambda)$ and (λ) are elasticities. $(1-\lambda)$ is the *Hicksian* elasticity of income expectations with respect to current income and λ is the elasticity of income expectations with respect to normal income. A value of $(1-\lambda)$ greater than one (which is the case when λ is negative) means that expectations with respect to current income are *elastic* or, more simply, that an increase in current income results in an expectation that income will increase by a proportionately greater amount in the future; not an unreasonable result, and one which potentially differentiates, as does a value of λ between zero and unity, a finance approach from a transactions approach.

For a negative value of λ, the immediate effects of a, once and for all, one percentage increase in income (using equations 2 and 3) is to raise expected income by:

$$(1 + |\lambda|) - |\lambda| \quad (1-\beta) = 1+\beta \text{ per cent}$$

Expected income then falls gradually. The long run change in expected income is:

$$(1 + \beta) - \sum_{i=1}^{\infty} |\lambda| \quad (1 - \beta)\ \beta^i$$

$= (1 + \beta) - |\lambda|\beta$ per cent, which may be positive or negative depending on the values of λ and β. For a value of λ between 0 and 1, the immediate effect is to increase expected income by:

$(1 - \beta)$ per cent, the long run effect is to increase expected income by:

$(1 - \beta) + \lambda\beta$ per cent.

APPENDIX 8.3

The general form of the estimating equation is

$$\frac{M_t}{M_{t-1}} = aX^b Z^c \qquad \ldots\ldots (1)$$

where M_t is the money supply in period t, X is the excess of planned expenditure over actual expenditure, and Z stands for all other explanatory variables. The estimate of b, $\hat{b}$, is an estimate of the elasticity of the proportional change in the demand for money with respect to X. It is not an estimate of the elasticity of the demand for money with respect to X. It is, however, possible to express this latter elasticity, b', in terms of b:

$$b = \frac{\partial \frac{M_t}{M_{t-1}}}{\frac{M_t}{M_{t-1}}} \bigg/ \frac{\partial X_t}{X_t}$$

or $$b = \partial \ln \frac{M_t}{M_{t-1}} \bigg/ \partial \ln X_t \qquad \ldots\ldots (2)$$

Now $$b' = \partial \ln M_t / \partial \ln X_t \qquad \ldots\ldots (3)$$

Multiplying equation (3) by $\partial \ln \frac{M_t}{M_{t-1}} \bigg/ \partial \ln \frac{M_t}{M_{t-1}}$ (=1)

gives $$b' = b' \partial \ln \frac{M_t}{M_{t-1}} \bigg/ \partial \ln \frac{M_t}{M_{t-1}}$$

$$= b\, \partial \ln M_t \bigg/ \partial \ln \frac{M_t}{M_{t-1}} \qquad \ldots\ldots (4)$$

In order to estimate $\hat{b}'$ from $\hat{b}$ information is required on the factor $\partial \ln M_t / \partial \ln \frac{M_t}{M_{t-1}}$. Information is available on the denominator. An estimate of $\partial \ln \frac{M_t}{M_{t-1}}$ is given by $\hat{b} \partial \ln X$ [$\simeq \hat{b}\ (\ln X_t - \ln X_{t-1})$ in discrete terms]. Information is not available on the numerator. One way of providing a rough estimate of the factor is to suppose that the ratio of the partial change in the logarithm of M_t as X_t varies to the partial change in the logarithm of the proportional change in M_t, is equal to the equivalent ratio using total changes in M_t, that is, as all variables are allowed to vary. An average of the ratio of discrete changes can be used to estimate this latter ratio. Using this method an estimate of b' is given by:

$$b' = \frac{b \sum_t (\ln M_t - \ln M_{t-1})}{\sum_t \Delta\ (\ln M_t - \ln M_{t-1})} \Big/ t$$

For many reasons precision can not be claimed for this procedure. There are the series of approximations necessary to derive it and once derived there is the need, with the concommitant risk of magnifying measurement error, to use a first difference of a variable already in this form. It is not therefore proposed to supplement each estimate of b with its coresponding b'. However, to provide an idea of the relationship in general between b and b', some estimates of

$$\propto = \frac{\sum_t (\ln M_t - \ln M_{t-1})}{\sum_t \Delta(\ln M_t - \ln M_{t-1}} \Big/ t$$

are listed below for the M2 definition of the money supply for two time periods.

		α			α
M2	$t \geq 10$	9	M2	$t \geq 37$	23
M2S	$t \geq 10$	17	M2S	$t \geq 37$	23
M2′	$t \geq 10$	7	M2′	$t \geq 37$	12
M2S′	$t \geq 10$	7	M2S′	$t \geq 37$	13

It is reasonably clear, as would be intuitively expected, that α is greater than one. A value of 10 would perhaps be a conservative estimate to work with.

It may be objected that the correct procedure by which to estimate b' is to do so directly by using the money supply rather than its proportional change as the dependent variable or, alternatively, if the proportional change in the money supply is persevered with, to use the proportional change in X_t as an explanatory variable. Apart from the reasons already given for preferring the estimating equation used (see p. 163 and pp. 236-237) the alternatives have major statistical problems. As the X_t variable is in a difference form, to take a first difference of X_t may seriously magnify the errors of measurement which, because of the nature of the variable, are undoubtedly present. On the other hand, to use the money supply as the dependent variable is to use a variable dominated by trend, and so to lessen the chances of discovering meaningful economic relationships.

CHAPTER 9

A SUMMARY OF THE CONCLUSIONS AND FINDINGS

Introduction

The purpose of this final chapter is to broadly review the conclusions and findings of the previous eight chapters. There will be no attempt to be comprehensive. In particular only a brief mention will be made of the empirical findings. These have already been cited both in the body and, in summary form, at the end of either chapter 7 or chapter 8.

The intention is to present an abridged summary of the conclusions and findings by juxtaposing, within the context of some of the evidence and the controversies which have featured in the preceeding chapters, the explanatory power of the theory of liquidity preference which explicitly includes the finance motive with that of the *General Theory's* version of that theory. In one or two instances, this procedure provides a slightly different perspective on the conclusions and findings from that encountered in the preceeding chapters, where most emphasis was placed on the exploration of the finance motive's theoretical implications and on testing its significance. When comparisons of alternative explanations were made, they generally involved a comparison of a non-Keynesian explanation with an explanation based on the theory of liquidity preference as modified by the inclusion of the finance motive.

There are two sections. The first reviews the conclusions and findings of chapters 1 to 5 inclusive, and the second reviews those of chapters 6 to 8.

1. Chapters 1 to 5

In the *General Theory*, the demand for transactions balances is made dependent on current money income. The problem with this is not simply that it diverts attention from the essentially *ex ante* nature of transactions demand, but that it obscures the distinction between, for example, the money demanded by a firm to pay next week's wages bill and the money demanded to finance a capital expansion. It is this latter type of demand which comes within the ambit of the finance motive. In section 1 of chapter 1 the distinction between transactions demand and finance demand was drawn in terms of expenditure categories. The concepts of *routine* and *non-routine* planned expenditure were used to give form to this distinction, and also to give precision to the critical aspect of finance demand. This critical aspect was identified and some of its ramifications were explained.

In part, chapter 1 is an interpretive exercise, however, Keynes' explanation of the finance motive is not amgibuous and so gives clear guidelines. These guidelines were built upon to explain the nature of and indicate the possible importance of the finance motive. It was shown that the finance motive is an important link between the real and the monetary sectors, and that to consider transactions demand as being the only 'active' demand for money is inconsistent with the *General Theory's* analysis of expectations and of the, closely related, investment plans of business.

In the debate which followed the publication of the *General Theory*, Keynes' theory of the determination of the rate of interest was criticised for being, if not wrong, at least misleading and incomplete. Furthermore, Robertson argued that the incorporation of the finance motive into the theory of liquidity preference effectively demonstrated this. In chapter 2 three major points were developed. First, that in a comparative static framework the theory of liquidity preference is a more powerful analytical tool than is the opposing theory of loanable funds; second, that rather than damage the theory of liquidity preference the incorporation of the finance motive highlights the essential analytical distinction between the two theories, and third, that the theory of liquidity preference is consistent with the method of analysis of the *General Theory*, a method more attuned to that of Ricardo's than to that of those critics of Keynes (including Robertson and Ohlin) whose arguments were couched in terms of general equilibrium analysis.

The substantial conclusion of chapter 2 was that, in a comparative static framework, the theory of liquidity preference is more informative in identifying the cause of economic change than is the theory of loanable funds. However, because the critical aspect of finance demand concerns change, it was argued that it is necessary, if the theory of liquidity preference is to be effective in this role of identifying the cause of change, to hold finance demand constant. In this respect it *seems* valid to suggest that the *General Theory's* version of the theory of liquidity preference is sufficient to establish the case and that the introduction of the finance motive is a hinderance rather than a help. But this is not so. For the finance motive is the link between the liquidity preference theory of the determination of the rate of interest in a comparative static context and in a dynamic context. Without it, as shown in chapter 5, the theory of liquidity preference cannot explain satisfactorily the path of the rate of interest from one equilibrium to another.

Chapter 3 basically reviewed Davidson's analysis of the finance motive. It also layed some groundwork for chapter 4 and, in the context of considering some objections made by Horwich to Davidson's analysis, cleared up some possible misconceptions about the nature of the finance motive. It was affirmed that finance demand is, like transactions demand, a continuing demand, dependent as it is on a *flow* of planned expenditure, and that it makes an important contribution to extending the usual Keynesian stock analysis of interest rate determination into one involving both existing assets and the flow of new assets.

A major difficulty of this thesis was that of testing the empirical significance of the finance motive. Chapter 4 introduced a specification of the demand function for money which eased this difficulty, and which also made possible the investigation of some of the theoretical implications of the finance motive. It was shown that this specification is superior in certain respects to the specification suggested by Davidson.

The liquidity preference - loanable funds debate was considered in two parts. Chapter 2 dealt with the original debate and chapter 5 with the later debate. This later debate, concerned with the determination of the rate of interest along the path *between* two equilibrium positions rather than *at* positions of equilibrium, provided a good opportunity to test Davidson's contention that the major contribution of the finance motive is in macro-economic path analysis. (See chapter 3, p. 46).

The major conclusions of chapter 5 were (i) that in a dynamic context the problem of reconciling the theories of liquidity preference and loanable funds can be sensibly reduced to one of deciding whether in all circumstances the money-market gives signals which are consistent with those of the bond-market; (ii) that the key to showing that the two markets do in fact give mutually consistent signals is the recognition that Walras' law has to be qualified when applied to a monetary economy, and (iii) that this qualification can be given form and substance by an explicit consideration of the finance motive. It was shown both intuitively and rigorously, using the demand function introduced in chapter 4, that Johnson's demonstration of the inconsistency between the theories of liquidity preference and loanable funds is valid only if the finance motive is excluded from the theory of liquidity preference.

2. Chapters 6 to 8

The evidence suggests that cyclical changes in the money supply precede cyclical changes in economic activity. Furthermore, Friedman reports that the income velocity of money balances moves procyclically, that is, to reinforce the effects on income of a change in the money supply. Some alternative theoretical explanations for these two pieces of evidence were examined in the first section of chapter 6.

Friedman contends (i) that the timing evidence effectively dispells the argument that the money supply is endogenously determined, and (ii) that procyclical velocity is inconsistent with Keynes' theory of liquidity preference. Both of these contentions, however, were shown to be invalid provided that the theory of liquidity preference is specified to include the finance motive. Specifically, it was shown that the demand function introduced in chapter 4 can provide mutually consistent explanations for both the evidence on timing and the evidence on velocity.

It is not surprising that the *General Theory's* version of the theory of liquidity preference cannot provide an explanation for the timing evidence, and seems inconsistent with the movements in velocity. It is attuned to the analytical method of the *General Theory*, and, as was explained in chapter 2, this is a method which examines the cause rather than the process or path of change. As such it does not, without amendment, lend itself to dynamic analysis. The finance motive provides the theory of liquidity preference with the necessary amendment.

In the second section of chapter 6 the analysis of the first section was extended to investigate the theoretical implications of the finance motive for the timing relationship between disequilibrium in the money market and changes in the rate of interest. It was found, using IS-LM analysis, that the finance motive provided an additional explanation for the evidence that interest rates lag expenditure flows. The timing relationships between the money supply, interest rates, and economic activity were then drawn together as a prelude to the cross-spectral tests of these relationships. The results of these tests were reported in chapter 7.

The main objectives of chapter 7 were to investigate the cyclical relationships between Australian monetary and aggregate expenditure data, and to see whether these relationships were consistent with the finance motive being empirically important. It was discovered that overall the cross-spectral results bore out the phase relationships worked out theoretically in chapter 6. The phase relationships between expenditure, velocity, and interest rate variables were found to be similar to those discovered by other studies based on United States and United Kingdom data, and the proxy for finance demand generally fitted into the picture in the expected way.

The demand function for money specification introduced in chapter 4 was used as a theoretical construct in chapters 5 and 6, and the findings of both chapter 6 and 7 provided *indirect* support for its validity and usefulness. This function formed the basis of the various demand functions for money tested in chapter 8. These tests were designed to *directly* test the significance of the finance motive by testing the significance of various proxies for the excess of planned over actual expenditure. The technique used was ordinary least squares multiple regression analysis.

It was found that, apart from in an early period, the excess of planned private investment expenditure variable significantly added to the explanation of the variation in the money supply and the rate of interest. Appendix 8.1 suggested some possible reasons for the findings applying to this early period. The excess of planned consumer durable expenditure variable did not on the whole add significantly to the explanation of the variation in the money supply or the rate of interest. However, a significant addition to the explanation of the variation in this latter variable was made by the excess of planned government investment expenditure variable.

To conclude, there seems good reason, both on theoretical and empirical grounds, to go along with Keynes and consider the finance motive as a seperate and distinctive motive for demanding money.

DATA APPENDIX

The purposes of this appendix are (i) to give the data sources; (ii), where necessary, to explain the construction of particular series, and (iii), if the data does not appear in an official or private publication (for example, when an interpolation or seasonal adjustment procedure has been applied to produce it), to give a listing of the series involved. These listings appear in section 3 of the appendix. There are two other sections. The first considers the quarterly data, and the second the annual data.

1. Quarterly Data

The data are all latest revised estimates at the time of collection. Unless otherwise stated each series runs from 1952(2) to 1973(4).

1.1 *Major Sources*

(A) R.V. Kennedy's estimates appearing in the *Economic Record*, 45 (June, 1969): 218-242, and in a supplement to this article which is available from the author.

(B) *Quarterly Estimates of National Income and Expenditure*, Australian Bureau of Statistics.

(C) "Australian Banking and Monetary Statistics 1945-1970". *Occasional Paper No. 4B*, Reserve Bank of Australia.

(D) *Statistical Bulletin*, Reserve Bank of Australia.

1.2 *The Series, their Sources and Construction*

E1, private gross fixed capital expenditure at current prices.

E2, public (enterprise *plus* authority) gross fixed capital expenditure at current prices.

E3, personal consumption expenditure on household durables and motor vehicles at current prices.

E4, gross national expenditure at current prices.

E1S, the seasonally adjusted equivalent of E1.

E2S, the seasonally adjusted equivalent of E2.

E3S, the seasonally adjusted equivalent of E3.

E4S, the seasonally adjusted equivalent of E4.

YS, gross domestic product at current prices, seasonally adjusted.

Sources: The data for the period from 1950(2) to 1958(2) appears in (A); 1958(3) to 1959(2) appears in the supplement to the March, 1969 of (B); 1959(3) to 1970(3) in the supplement to the December, 1973 issue of (B), and 1970(4) to 1973(4) appears in regular issues of (B), the latest available at the time of data collection being September, 1974.

M1, notes and coin in the hands of the public *plus* current account deposits with all trading banks.

M2, M1 *plus* fixed account deposits with all trading banks.

M3, M2 *plus* deposits with all savings banks.

Sources: The data for the period from 1952(2) to 1960(2) appears in (C); 1960(3) to 1973(2) in an inset to the August 1974 issue of (D), and 1973(3) to 1973(4) appears in the January 1975 issue of (D). The data prior to 1956(3) is published in a quarterly form; thereafter, monthly averages of weekly figures are available. These monthly figures were converted to quarterly figures by taking an arithmetic mean of the three monthly figures comprising each quarter.

M1S, the seasonally adjusted equivalent of M1.

M2S, the seasonally adjusted equivalent of M2.

M3S, the seasonally adjusted equivalent of M3.

Construction: These series were generated by applying the X - 11Q multiplicative seasonal adjustment program (see the U.S. Department of Commerce, Bureau of the Census, technical paper No.15, 1967) to the equivalent unadjusted series. The three adjusted series are listed in table 1 of section 3.

K1S, M1S *plus* unused overdraft limits for the 'major' trading banks, seasonally adjusted [1961(3) to 1973(4)].

Sources and construction: Unused overdraft limits were calculated by deducting *advances* from *overdraft limits outstanding*. This latter series for the period from 1961(3) to 1970(4) appears in (C); 1971(1) to 1973(4) in various issues of (D). *Advances* appears in the September, 1969 and September, 1972 financial supplements to (D) and in later issues of (D). The unused overdraft limits series was seasonally adjusted by applying the X - 11Q multiplicative program. K1S is listed in table 1 of section 3.

K2S, K1S *plus* the holdings of Australian Government Treasury notes excluding those held by the Reserve Bank; by trading and savings banks, and by authorised money market dealers *plus* the liabilities to clients other than the trading banks of the authorised short-term money market, seasonally adjusted, [1962(3) to 1973(4)].

Sources and construction: Both treasury note holdings and the liabilities of the short-term money market appear in the financial supplements to and in various issues of (D). In order to construct K2S the X - 11Q multiplicative program was applied to each of these series. K2S is listed in table 1 of section 3.

RL, the long-term Australian government bond yield. (Yields to the last date of redemption on tax rebate-able bonds).

Sources and construction: The data appears in financial supplements to and in various issues of (D). Monthly figures are published and these were converted to quarterly figures by taking an arithmetic mean. The figures prior to July, 1959 were based on securities maturing in ten years or more; those from July, 1959 to December, 1964 were a theoretical 15 year yield. From January, 1965 to December, 1971 the Reserve Bank published a 10 year and a 20 year yield series. A simple average of these two series was taken to link with the 15 year series. Since December, 1971 a rebateable 20 year series has not been published. In order to calculate a 15 years series for the remaining quarters, such a 20 year series was estimated by regressing the 20 year rebateable series (R) on the 20 year non-rebateable series (NR) for the period from November, 1968 to December, 1971. This gave the following results.

$R = .099 + .9157\ NR$, which was applied to the non-rebateable series since December, 1971 to give an estimated rebateable series. RL is listed in table 2 of section 3.

R2, the two year tax rebateable Australian government bond yield.

Sources: The data appears in financial supplements to and in various issues of (D). Monthly figures are published and these were converted to quarterly figures by taking an arithmetic mean.

Note: The X - 11Q multiplicative seasonal adjustment program was applied to both RL and R2; in neither case was stable seasonality evident at the 1 per cent level. Both of these series were, therefore, left unadjusted.

RMS, the weighted average interest rate on loans outstanding with the authorised short-term money market, seasonally adjusted, [1959(2) to 1973(4)].

Sources and construction: The data appears in financial supplements to and in various issues of (D). Monthly figures are published and these were converted to quarterly figures by taking an arithmetic mean. The X - 11Q multiplicative program was applied, and the series is listed in table 2 of section 3.

C1, new capital expenditure by private business on buildings and structures, [1954(1) to 1973(4)].

C2, new capital expenditure by private business other than on buildings and structures [1954(1) to 1973(4)].

C1A, C1 anticipated six months in advance, [1954(1) to 1973(4)].

C2A, C2 anticipated six months in advance, [1954(1) to 1973(4)].

C12, C1 *plus* C2, [1954(1) to 1973(4)].

C12A, C1A *plus* C2A, [1954(1) to 1973(4)].

X3, C12A divided by C12 - the excess of planned new capital expenditure over current expenditure, [1954(1) to 1973(4)].

C12S, the seasonally adjusted equivalent of C12, [1954(1) to 1973(4)].

C12AS, the seasonally adjusted equivalent of C12A, [1954(1) to 1973(4)].

X3S, the seasonally adjusted equivalent of X3, [1954(1) to 1973(4)].

XP1S, C1A lagged by three quarters divided by C1, seasonally adjusted - the excess of planned expenditure, [1954(1) to 1973(4)].

XP2S, C2A lagged by four quarters divided by C2, seasonally adjusted - the excess of planned expenditure, [1954(1) to 1973(4)].

XP3S, C12AS lagged by four quarters divided by C12S - the excess of planned expenditure, [1954(1) to 1973(4)].

Sources and construction: The four quarterly series C1, C2, C1A, and C2A were obtained by applying an interpolation procedure to the six-monthly series of new capital expenditure on buildings and structures, other new capital expenditure, and the anticipated counterparts of these two series, taken from the A.B.S. publication *Capital and Maintenance Expenditure by Private Business in Australia* for the period from January, 1954 to December, 1973. The anticipated expenditure in this publication is expenditure planned for the forthcoming six-month period.

The interpolation procedure is that devised by Chow and Lin [1971]. The six-monthly expenditure and anticipated expenditure series were transformed into a quarterly series by regressing them in turn on a related quarterly series. The related quarterly series used was private gross fixed capital expenditure at current prices (E1). The procedure is explained below.

Letting a particular observation in a six-monthly series be designated y_i, and a particular observation in the quarterly series be designated x_j, the six-monthly series can be designated as a vector $Y_{n,1}$ and the quarterly series as a vector $X_{2n,1}$, where n is the number of six-monthly observations. $X_{2n,1}$ is premultplied by a matrix $C_{n,2n}$, where

$$C = {}^{1}/_{2} \begin{bmatrix} 1 & 1 & 0 & 0 & . & . & . & 0 & \\ 0 & 0 & 1 & 1 & 0 & . & . & . & 0 \\ ... & & & & & & & & \\ ... & & & & & & & & \\ 0 & . & . & . & 0 & . & . & . & 1 & 1 \end{bmatrix}$$

The resultant vector contains n observations corresponding to the n six-monthly observations, each observation being one half of the sum of the two quarterly observations for the relevant six-month period. Let a particular observation in this new series be designated cx_i. y is then regressed on cx. In matrix notation the regression model is:

$$Y = (CX)\hat{B} + \hat{U}$$

Assuming that the quarterly regression residuals obtained from the relation Y* = XB* + U* (where Y* is the true quarterly counterpart of the observed six-monthly series Y) are serially uncorrelated with constant variance σ^2, Chow and Lin show that the best linear unbiased estimator Z of the required series Y* is given by:

$$Z = {}^{1}/_{2}\ [X\hat{B} + 2C'\hat{U}].$$

It is this formula which has been used to transform the six-monthly series into the quarterly series. It can be noted that for any six-month period the desirable property obtains that the sum of the two quarterly estimates equal the observed six-monthly expenditure flow.

In principle any number of related series could have been used. It was, however, considered that the series used provided an adequate basis for the procedure. Experimentation using a time trend variable, as an additional related series, showed that little was added to the explanation of each six-monthly series over the 96% of the variation explained by the related series used.

As a final note on the interpolation procedure, the E1 series was advanced six months when used as a related series for the anticipated series.

The seasonally adjusted series C12S and C12AS were formed by applying the X - 11Q multiplicative program to the sum of C1 and C2, and to the sum of C1A and C2A respectively. Additional information on the XP1S, XP2S and XP3S series is given in chapter 8. Series C1 to XP3S are listed in table 3 of section 3.

XGS, A proxy for the excess of planned government gross fixed capital expenditure over actual expenditure, seasonally adjusted.

XCS, a proxy for the excess of planned consumer durable expenditure over actual expenditure, seasonally adjusted.

Construction: XGS was calculated by dividing the E2S series advanced one quarter by the E2S series, so that:

$$XGS_t = E2S_{t+1}/E2S_t,$$

where t is the time period in quarters. XCS was similarly calculated, so that:

$$XCS_t = E3S_{t+1}/E3S_t.$$

Both the XGS and XCS series are listed in table 4 of section 3.

Price Indices, (a) an implicit gross national expenditure price deflator index, and (b) an implicit gross private fixed investment price deflator index, both seasonally adjusted.

Sources and construction: Seasonally adjusted gross national expenditure and gross private fixed investment expenditure are available on a quarterly basis at current and constant [1966/7] prices from the September quarter 1959. Kennedy did not compile constant price estimates. The indices for the period 1959(3) to 1973(4) were calculated by dividing the estimates at current prices by the corresponding estimates at constant prices. For the period from 1952(2) to 1959(2) the following procedure was adopted.

Annual estimates of gross national expenditure and gross private fixed investment expenditure are available for the period 1949/50 to 1959/60. (See the appendix to the 1972/3 issue of the A.B.S. *Australian National Accounts*.) The constant price estimates use as a base 1953/4 prices for the period up to and including 1953/4; 1959/60 prices for the period from 1953/4 to 1959/60, and 1966/7 prices thereafter. Constant price estimates are available for 1953/4 at both 1953/4 and 1959/60 prices as is the estimate for 1959/60 available at 1966/7 prices. The constant price series were linked so that all estimated were at 1966/7 prices. This was done by multiplying preceeding estimates by a factor which equalled the ratio of the revised estimate to the original in the year in which the base changed. Annual price indices were then compiled by dividing the current by the constant [1966/7] price estimates. Quarterly indices for the period 1952(2) to 1959(2) were then obtained by assuming a smooth transition throughout any one year. The method used, derived by Lisman and Sandee [1964], is explained below.

If Q_{1t}, Q_{2t}, Q_{3t}, andQ_{4t} are the desired quarterly estimates for the year t, and X_{t-1}, X_t, and X_{t+1} are the known annual estimates for the years t-1, t, and t+ 1, the quarterly estimates are obtained by:

$$\begin{bmatrix} Q_{1t} \\ Q_{2t} \\ Q_{3t} \\ Q_{4t} \end{bmatrix} = \begin{bmatrix} .291 & .793 & -.084 \\ -.041 & 1.207 & -.166 \\ -.166 & 1.207 & -.041 \\ -.084 & .793 & .291 \end{bmatrix} \begin{bmatrix} X_{t-1} \\ X_t \\ X_{t+1} \end{bmatrix}$$

The matrix of coefficients follow from the assumption that the quarterly estimates for year t can be expressed as a weighed sum of the annual estimates for the years t-1, t, and t+1, and from the conditions that (1) $\sum_{i=1}^{4} Q_{it} = 4X_t$ (a desirable property of a flow interpolation procedure - see Lumsden and Sturm [1974]); (2), if annual estimates increase (decrease) by a constant amount, the interpolated quarterly estimates must increase (decrease) by a constant amount of $^1/4$ of the annual change, and (3), if an increase in X is followed by a decrease, the interpolated quarterly estimates lie on a sinusoid. The method assumes that there is no seasonal variation.

The price indices (a) and (b) for the whole period from 1952(2) to 1973(4) are listed in table 5 of section 3.

2. Annual Data

Unless otherwise stated, each series runs from 1876 to 1973/4 inclusive.

2.1 *Major Sources*

(E) N.G. Butlin, *Australian Domestic Product, Investment* *and Foreign Borrowing, 1861 - 1938/39*, London: Cambridge University Press, 1962.

(F) *Australian National Accounts*, Australian Bureau of Statistics.

(G) "Australian Banking and Monetary Statistics, 1817 to 1945". *Occasional Paper No. 4A*, Reserve Bank of Australia.

(C))
(D)) See subsection 1.1

2.2 *The Series, their Sources and Construction*

GDP, gross domestic product.

Sources: Gross domestic product at market prices for the period from 1876 to 1937/38 appears in table 1 of (E). For the period from 1938/9 to 1947/8 official estimates quoted in table 271 of (E) are used, and thereafter the data appears in (F).

TBC, non-interest bearing deposits at Australian trading banks.

Sources: Non-interest bearing deposits for the period 1876 to 1944/5 appear in (G); 1945/6 to 1969/70 in (C), and 1970/1 to 1973/4 in (D).

TBRA, interest bearing deposits at Australian trading banks, adjusted.

Sources and construction: The interest bearing deposits at Australian trading banks have the same sources as do the non-interest bearing deposits, however, unlike this latter series, there is a discontinuity between the years 1944/5 to 1945/6. This corresponds to the change in source from (G) to (C), and is evident as a sharp drop in deposits. The main reason for this lack of continuity is the establishment, in 1945, of a General Banking Division of the Commonwealth Bank, and the subsequent exclusion of categories of deposits from the returns of that Division which were previously included, prior to 1945, in the returns of the Commonwealth Bank. Unfortunately, there is not enough statistical detail available to compile a continuous series directly.[1] The method adopted to rid the series prior to 1945 of those deposits excluded after 1945 is explained below.

Ninety six observations of interest bearing deposits (TBR) from 1861 to 1973/4 were graphed against time. Both tails of the scatter were omitted so that the remaining 56 observations from 1900/1 to 1955/6 were approximately linear. These 56 observations were then regressed on a time variable, t = 41, ..., 96, and a dummy variable, d = 41, 42 ..., 85, 0, ..., 0.[2] The zeros correspond to the years 1945/6 to 1955/6. The resulting estimated equation was:

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[1] I would like to thank Mr. R.C. White of the Reserve Bank of Australia for providing me with information on this question.

[2] An incremental dummy variable was used to take account of the *growing* magnitude, prior to 1945, of those deposits which were omitted from the published figures after 1945.

$$TBR = -446 + 10.758t + .968d; \quad R^2 = .96.$$

The TBRA series was then calculated by:

$$TBRA = TBR - .968d'$$

where d' = 1, 2, ..., 85, 0, ..., 0.

The TBRA series used in the tests runs from 1876 to 1973/4; it is listed in table 6 of section 3.

M1, notes and coin in the hands of the public *plus* current account deposits with all trading banks. [1950/1 to 1973/4].

M2, M1 *plus* fixed account deposits with all trading banks. [1950/1 to 1973/4].

Source: The data for the period 1950/1 to 1969/70 appears in (C), and for the period 1970/1 to 1973/4 in (D).

RLB, long-term Australian government bond yield.

Source and construction: The data for the period 1876 to 1924/5 are yearly averages of monthly bond yields provided by D. McL. Lamberton, "Security Prices and Yields, 1875-1955". [See *Economic Record*, 34 (August): 253-259.] For the period 1925/6 to 1935/6 the data appears in graphical form only in the Banking Supplement to the May, 1954 issue of (D). (The Reserve Bank could not supply the underlying figures, so these were calculated from the graph.) For the period 1936/7 to 1949/59 the data on the domestic yield on long-dated securities appears in issues of (D). The data for the remaining period is calculated on the same basis as is the quarterly series RL (see subsection 1.2). In fact, for the period 1952/3 to 1973/4 the RLB series is the annual average of the RL series. RLB is listed in table 6 of section 3.

Price Index, an implicit gross domestic product price deflator index. The base year is 1911.

Source and construction: For the period 1876 to 1937/8 the data appears in table 13 of (E). There is no index for the period 1938/9 to 1947/8. For the period 1948/9 to 1973/4 the data was obtained from the 1973/4 issue of (F). The index for this period was calculated by dividing G.D.P. at market prices by G.D.P. at constant prices. There were three base years 1953/4, 1959/60 and 1966/7. Initially, the constant price estimates were linked so that all estimates were at 1966/7 prices. This was done by multiplying preceeding estimates by a factor which equalled the ratio of the revised estimate to the original in the year in which the base changed.

In order to link Butlin's index for 1876 to 1937/8 with the index for 1948/9 to 1973/4, it was necessary to have an estimate of Butlin's index for the year 1948/9. This was calculated by assuming that Butlin's index would have a growth rate equal to that of the 'C' series retail price index for the period 1937/8 to 1948/9. The 'C' series appears in the December, 1954 issues of the *Quarterly Summary of Australian Statistics*, A.B.S. The index at 1966/7 prices was then converted to one at 1911 prices by multiplying the index for each year by the ratio of the Butlin estimate for 1948/9 to the index for that year based on 1966/7 prices. The price index is listed in table 6 of section 3.

3. Data Listings

DATA APPENDIX TABLE 1

$m

Quarter	M1S	M2S	M3S	K1S	K2S
52(2)	2651	3069	4844		
52(3)	2631	3046	4850		
52(4)	2741	3155	4979		
53(1)	2932	3344	5211		
53(2)	2977	3405	5286		
53(3)	3019	3461	5371		
53(4)	3079	3548	5480		
54(1)	3138	3697	5585		
54(2)	3145	3625	5633		
54(3)	3164	3644	5683		
54(4)	3156	3634	5702		
55(1)	3163	3637	5749		
55(2)	3176	3669	5804		
55(3)	3199	3689	5839		
55(4)	3226	3709	5878		
56(1)	3170	3634	5855		
56(2)	3107	3584	5858		
56(3)	3152	3625	5936		
56(4)	3157	3648	6015		
57(1)	3218	3734	6136		
57(2)	3298	3838	6271	n.a.	n.a.
57(3)	3304	3843	6323		
57(4)	3318	3881	6403		
58(1)	3304	3884	6436		
58(2)	3258	3855	6438		
58(3)	3245	3854	6470		
58(4)	3243	3860	6506		

Appendix Table 1 (Cont.)

$m

Quarter	M1S	M2S	M3S	K1S	K2S
59(1)	3260	3884	6581		
59(2)	3321	3958	6716		
59(3)	3397	4046	6870		
59(4)	3460	4119	7012		
60(1)	3508	4142	7095		
60(2)	3566	4213	7241		
60(3)	3574	4220	7306		
60(4)	3516	4181	7312		
61(1)	3382	4144	7283		
61(2)	3367	4218	7376		
61(3)	3332	4255	7457	4573.20	
61(4)	3356	4337	7598	4675.60	
62(1)	3407	4423	7763	4824.80	
62(3)	3441	4488	7908	4922.50	
62(3)	3444	4518	8060	4947.90	5149.80
62(4)	3438	4548	8208	4938.40	5153.60
63(1)	3468	4614	8378	4994.60	5220.60
63(2)	3512	4671	8565	5091.10	5338.20
63(3)	3580	4752	8776	5229.70	5478.20
63(4)	3660	4871	9023	5375.10	5641.10
64(1)	3762	5010	9309	5518.00	5831.10
64(2)	3801	5148	9593	5551.30	5857.30
64(3)	3855	5312	9875	5590.10	5910.90
64(4)	3873	5419	10094	5592.90	5904.40
65(1)	3879	5481	10268	5599.60	5878.30
65(2)	3855	5549	10421	5495.60	5772.50
65(3)	3804	5565	10509	5410.50	5731.90
65(4)	3793	5610	10638	5389.90	5692.90
66(1)	3814	5695	10829	5361.20	5685.80
66(2)	3876	5781	11011	5445.50	5780.60
66(3)	3950	5900	11232	5569.70	5924.70
66(4)	4056	6014	11450	5702.70	6092.90
67(1)	4105	6099	11655	5768.20	6158.00
67(2)	4137	6163	11872	5875.80	6279.00
67(3)	4213	6306	12169	5957.70	6371.90
67(4)	4301	6450	12438	6036.60	6486.20
68(1)	4370	6550	12646	6177.60	6699.60
68(2)	4452	6647	12850	6284.80	6816.30
68(3)	4530	6816	13134	6369.60	6927.00
68(4)	4589	6925	13352	6473.30	7017.20
69(1)	4711	7116	13677	6637.30	7174.50
69(2)	4817	7343	14034	6741.40	7283.70
69(3)	4898	7511	14337	6815.90	7344.70
69(4)	4984	7667	14599	6905.30	7385.70

Appendix Table 1 (Cont.)

$m

Quarter	M1S	M2S	M2S	K1S	K2S
70(1)	5099	7795	14797	6997.40	7460.30
70(2)	5104	7901	15012	7013.80	7487.00
70(3)	5146	7925	15121	7134.20	7607.50
70(4)	5217	8011	15329	7245.40	7771.00
71(1)	5262	8130	15582	7360.80	7938.90
71(2)	5345	8332	15960	7392.80	8003.00
71(3)	5465	8523	16307	7552.60	8239.40
71(4)	5508	8684	16632	7602.10	8323.10
72(1)	5598	9014	17106	7805.20	8554.20
72(2)	5823	9293	17620	8353.90	9184.20
72(3)	6101	9867	18511	8873.40	9731.40
72(4)	6489	10590	19651	9489.60	10433.90
73(1)	6817	11267	20826	10048.10	10965.30
73(2)	7281	11919	21956	10649.60	11425.50
73(3)	7611	12676	23171	11063.30	11824.80
73(4)	7704	13271	23995	11117.10	11737.50

DATA APPENDIX TABLE 2

%

Quarter	RL	RMS
52(2)	4.41	
52(3)	4.54	
52(4)	4.61	
53(1)	4.52	
53(2)	4.51	
53(3)	4.45	
53(4)	4.42	
54(1)	4.42	
54(2)	4.46	
54(3)	4.48	
54(4)	4.50	n.a.
55(1)	4.50	
55(2)	4.52	
55(3)	4.52	
55(4)	4.53	
56(1)	4.74	
56(2)	5.24	
56(3)	5.08	
56(4)	5.07	

Data Appendix Table 2 (Cont.)

	%	
Quarter	RL	RMS
57(1)	5.04	
57(2)	5.05	
57(3)	5.00	
57(4)	5.00	
58(1)	5.00	
58(2)	4.96	
58(3)	4.97	
58(4)	4.96	
59(1)	4.93	
59(2)	4.93	3.02
59(3)	4.90	3.00
59(4)	4.89	2.97
60(1)	4.92	3.06
60(2)	4.93	3.09
60(3)	4.97	3.50
60(4)	5.15	3.77
61(1)	5.36	3.81
61(2)	5.36	4.06
61(3)	5.34	3.44
61(4)	5.03	3.53
62(1)	4.94	3.48
62(2)	4.93	3.44
62(3)	4.92	3.48
62(4)	4.88	3.61
63(1)	4.85	3.57
63(2)	4.56	3.49
63(3)	4.48	3.27
63(4)	4.44	3.22
64(1)	4.45	3.32
64(2)	4.65	3.49
64(3)	4.91	3.68
64(4)	4.89	3.74
65(1)	4.99	3.68
65(2)	5.20	4.12
65(3)	5.21	4.23
65(4)	5.20	4.12
66(1)	5.20	4.30
66(2)	5.20	4.22
66(3)	5.21	4.30
66(4)	5.17	4.43
67(1)	5.13	4.25
67(2)	5.14	4.14
67(3)	5.13	4.12
67(4)	5.15	4.07

Date Appendix Table 2 (Cont.)

Quarter	RL	RMS
	%	
68(1)	5.18	4.26
68(2)	5.18	4.08
68(3)	5.18	4.05
68(4)	5.04	4.17
69(1)	4.98	4.21
69(2)	5.18	4.33
69(3)	5.59	4.42
69(4)	5.66	4.58
70(1)	5.83	4.69
70(2)	6.57	5.43
70(3)	6.53	5.35
70(4)	6.45	5.28
71(1)	6.45	5.26
71(2)	6.40	5.47
71(3)	6.39	5.64
71(4)	5.96	5.46
72(1)	5.65	5.27
72(2)	5.55	4.84
72(3)	5.46	4.31
72(4)	5.47	4.17
73(1)	5.48	4.31
73(2)	6.05	4.16
73(3)	6.96	5.09
73(4)	7.96	6.40

DATA APPENDIX TABLE 3

$m

Quarter	C1	C2	C1A	C2A	X3	C12S	C12AS	X3S	XP1S	XP2S	XP3S
54(1)	25.067	75.512	34.454	64.419	.983	106.700	102.700	.963	-	-	-
54(2)	31.133	84.088	41.746	73.381	.999	109.900	108.200	.985	-	-	-
54(3)	27.463	63.864	32.688	66.580	1.087	95.000	109.100	1.148	1.235	1.143	1.163
54(4)	33.737	72.736	44.112	80.620	1.171	101.600	118.200	1.163	1.133	1.109	1.110
55(1)	37.485	86.251	57.319	81.467	1.122	132.300	143.300	1.083	.911	.742	.779
55(2)	47.315	100.149	63.881	89.533	1.040	140.700	144.300	1.026	.848	.738	.773
55(3)	52.276	92.708	60.603	96.273	1.082	149.000	168.400	1.130	.778	.742	.732
55(4)	57.924	100.692	69.597	107.327	1.115	152.000	171.000	1.125	1.071	.781	.771
56(1)	50.630	92.629	64.997	97.718	1.136	152.900	166.000	1.086	1.058	.869	.940
56(2)	58.370	130.571	71.803	106.082	1.098	155.700	169.100	1.086	1.205	.868	.931
56(3)	60.772	104.189	62.960	92.375	.942	167.900	167.900	1.001	1.098	.947	1.004
56(4)	66.628	112.469	72.440	104.025	.985	171.500	170.100	.992	1.043	.946	.991
57(1)	62.221	96.034	66.791	103.262	1.075	170.000	173.700	1.022	.976	.983	.978
57(2)	70.379	107.566	71.409	108.938	1.013	171.900	170.700	.993	1.034	.998	.987
57(3)	61.713	105.591	57.488	101.880	.953	170.400	173.200	1.016	1.123	.903	.985
57(4)	65.687	111.209	68.912	115.920	1.045	167.300	177.500	1.061	1.103	.937	1.013
58(1)	50.685	98.851	64.532	107.070	1.148	162.900	171.200	1.051	1.158	.997	1.068
58(2)	60.515	112.749	72.068	116.330	1.087	166.900	182.200	1.092	1.129	.971	1.025
58(3)	58.258	110.116	55.188	127.880	1.087	167.700	198.200	1.182	1.143	.980	1.032
58(4)	64.742	119.284	66.612	141.920	1.133	176.400	200.700	1.138	1.039	.966	1.006
59(1)	56.985	120.551	80.360	143.675	1.262	193.800	221.000	1.140	1.061	.826	.884
59(2)	66.815	134.449	89.840	155.325	1.218	194.800	239.300	1.228	.991	.878	.936
59(3)	70.821	137.734	74.977	125.851	.963	205.500	219.100	1.066	.908	.991	.964
59(4)	78.979	149.266	94.423	149.749	1.070	220.200	235.800	1.071	1.040	.948	.911
60(1)	68.834	138.271	105.892	162.453	1.296	226.500	264.000	1.166	1.114	.951	.976
60(2)	85.566	161.929	107.108	163.947	1.095	241.000	263.600	1.094	1.022	.975	.993
60(3)	90.177	164.461	90.052	159.928	.982	250.500	269.700	1.077	1.031	.827	.874
60(4)	91.223	165.939	100.748	173.072	1.065	247.100	266.400	1.078	1.189	.903	.955

Data Appendix Table 3 (Cont.)

$m

Quarter	C1	C2	C1A	C2A	X3	C12S	C12AS	X3S	XP1S	XP2S	XP3S
61(1)	82.098	144.694	87.565	157.048	1.079	247.800	241.400	.974	1.129	1.024	1.066
61(2)	91.302	157.706	86.835	156.152	.976	242.500	235.000	.969	1.119	1.052	1.087
61(3)	83.714	171.644	83.928	136.196	.862	251.500	241.300	.959	1.189	1.001	1.072
61(4)	83.086	170.756	101.672	158.004	1.023	242.900	250.400	1.031	1.098	1.027	1.097
62(1)	78.166	144.006	101.381	162.924	1.190	244.800	261.600	1.069	.947	.989	.987
62(2)	93.434	165.594	110.619	174.276	1.100	252.100	274.400	1.088	1.026	.947	.932
62(3)	97.426	160.281	101.282	156.224	.999	254.200	284.500	1.119	1.020	.928	.949
62(4)	105.374	171.519	110.519	157.576	1.004	264.400	264.400	1.004	1.016	.928	.950
63(1)	85.326	170.581	112.288	171.080	1.107	284.500	282.800	.994	1.088	.864	.921
63(2)	93.274	181.819	123.712	185.120	1.123	264.700	295.500	1.116	1.260	.963	1.036
63(3)	103.085	168.251	107.857	162.084	.995	269.200	300.800	1.117	1.027	1.019	1.056
63(4)	112.915	182.149	139.943	201.516	1.157	278.100	325.400	1.170	1.077	.921	.950
64(1)	84.895	170.382	113.912	213.103	1.281	287.500	329.000	1.146	1.188	.908	.986
64(2)	112.505	209.417	134.088	237.897	1.156	311.100	353.600	1.137	1.114	.881	.949
64(3)	105.720	221.128	97.515	218.267	.966	325.300	353.400	1.086	1.269	.810	.925
64(4)	123.080	245.672	142.485	273.533	1.128	345.700	395.800	1.145	1.036	.823	.940
65(1)	95.153	225.446	150.435	273.943	1.307	365.500	428.900	1.173	1.072	.864	.904
65(2)	137.847	280.154	166.965	294.257	1.103	406.600	436.200	1.073	.847	.837	.869
65(3)	147.038	291.296	140.546	275.713	.950	435.700	461.500	1.059	.920	.821	.811
65(4)	161.261	311.405	164.854	305.587	.995	440.300	446.400	1.014	1.047	.890	.898
66(1)	127.342	272.564	139.994	261.236	1.003	450.700	409.300	.908	1.032	.924	.953
66(2)	148.258	302.136	153.606	277.965	.958	436.400	405.100	.928	1.116	.961	1.000
66(3)	138.993	288.820	126.092	243.586	.864	426.400	414.800	.973	1.129	1.036	1.082
66(4)	150.707	305.380	158.908	283.914	.971	422.100	416.100	.986	1.062	1.014	1.057
67(1)	118,132	247.189	154.824	281.668	1.195	416.900	446.600	1.071	.996	.970	.982
67(2)	146.368	287.111	181.076	313.932	1.142	417.900	465.800	1.115	1.034	.957	.970
67(3)	168.155	282,881	143.025	277.455	.932	448.900	468.500	1.044	.901	.940	.924
67(4)	190.745	314.819	183.375	327.045	1.010	467.300	482.600	1.033	.922	.904	.890

Data Appendix Table 3 (Cont.)
$m

Quarter	C1	C2	C1A	C2A	X3	C12S	C12AS	X3S	XP1S	XP2S	XP3S
68(1)	140.540	275.155	192.198	296.991	1.177	472.800	500.000	1.058	.999	.947	.945
68(2)	175.260	324.245	227.202	340.009	1.136	484.500	534.200	1.103	.959	.956	.961
68(3)	193.240	300.208	209.875	273.542	.980	490.800	536.800	1.094	.918	1.001	.954
68(4)	223.360	342.792	264.325	340.458	1.068	523.400	577.000	1.102	.971	.959	.922
69(1)	176.374	283.079	253.653	328.015	1.266	523.200	590.700	1.129	1.012	.973	.956
69(2)	223.226	349.321	278.447	358.485	1.112	557.600	600.400	1.077	1.063	.960	.957
69(3)	230.983	345.668	233.927	354.633	1.021	572.100	652.000	1.140	1.137	.865	.939
69(4)	252.317	375.832	284.973	417.367	1.118	580.700	669.000	1.152	1.123	.909	.994
70(1)	202.188	354.449	299.050	407.782	1.270	631.900	715.200	1.132	1.085	.862	.935
70(2)	246.112	416.551	330.650	446.618	1.173	643.400	734.700	1.142	1.090	.842	.931
70(3)	272.155	424.578	309.947	478.192	1.131	691.100	870.300	1.259	1.027	.912	.945
70(4)	299.345	463.022	364.153	544.808	1.192	706.000	867.100	1.228	1.117	.910	.949
71(1)	288.478	436.527	366.047	506.609	1.204	822.100	879.900	1.070	.913	.864	.871
71(2)	335.121	502.473	388.653	534.391	1.102	814.200	874.100	1.074	1.054	.868	.898
71(3)	342.824	499.349	300.427	358.075	.782	835.200	735.600	.881	1.038	1.044	1.044
71(4)	362.276	526.851	367.273	440.226	.908	821.300	765.300	.932	1.128	1.056	1.059
72(1)	248.690	411.988	321.512	416.253	1.117	751.000	744.800	.992	1.239	1.131	1.174
72(2)	306.210	493.311	341.688	441.047	.979	777.600	739.800	.951	1.122	1.047	1.115
72(3)	286.620	402.578	303.730	344.848	.941	686.000	728.100	1.061	1.247	.987	1.075
72(4)	303.980	427.122	379.570	438.052	1.118	671.700	773.400	1.151	1.191	1.053	1.145
73(1)	233.871	341.318	344.109	439.103	1.362	663.200	703.900	1.197	1.147	1.105	1.127
73(2)	299.129	433.582	402.691	511.097	1.247	708.300	861.500	1.216	1.166	.984	1.033
73(3)	313.640	451.666	380.618	472.978	1.115	763.800	957.900	1.254	1.174	.851	.955
73(4)	364.054	522.934	467.882	580.222	1.182	814.200	991.400	1.218	1.071	.859	.958

DATA APPENDIX TABLE 4

Quarter	XGS	XCS
52(2)	1.13	.89
52(3)	.85	1.13
52(4)	.98	1.01
53(1)	.99	.99
53(2)	1.01	1.09
53(3)	1.03	1.08
53(4)	1.05	.96
54(1)	1.14	1.12
54(2)	.88	1.06
54(3)	1.09	.98
54(4)	.99	1.05
55(1)	1.03	1.05
55(2)	1.05	1.01
55(3)	1.02	.97
55(4)	.93	.98
56(1)	.98	.99
56(2)	1.06	1.01
56(3)	.99	1.04
56(4)	1.04	1.01
57(1)	1.01	1.03
57(2)	1.00	.98
57(3)	1.02	1.04
57(4)	1.02	1.08
58(1)	.99	1.00
58(2)	1.01	1.01
58(3)	1.09	1.01
58(4)	1.04	1.00
59(1)	1.09	1.05
59(2)	.98	1.07
59(3)	.99	1.07
59(4)	.97	1.04
60(1)	1.10	1.03
60(2)	.93	1.01
60(3)	1.06	.99
60(4)	1.01	.91
61(1)	1.02	.96
61(2)	1.13	.97
61(3)	.94	1.05
61(4)	1.03	1.10
62(1)	.97	1.04
62(2)	1.01	1.05
62(3)	1.01	1.01
62(4)	1.01	1.03
63(1)	1.09	.99
63(2)	.95	1.08
63(3)	1.07	1.00
63(4)	1.01	1.00

Data Appendix Table 4 (Cont.)

Quarter	XGS	XCS
64(1)	1.09	1.05
64(2)	1.02	1.03
64(3)	1.04	1.01
64(4)	1.05	1.03
65(1)	.98	1.00
65(2)	1.06	.97
65(3)	1.04	1.19
65(4)	1.00	.82
66(1)	.98	1.01
66(2)	1.06	1.01
66(3)	.99	1.03
66(4)	1.02	1.00
67(1)	1.00	1.03
67(2)	1.06	1.04
67(3)	.99	1.05
67(4)	1.01	1.01
68(1)	1.09	1.03
68(2)	.97	.96
68(3)	1.02	1.05
68(4)	1.02	1.06
69(1)	1.02	1.02
69(2)	1.01	1.03
69(3)	1.07	1.01
69(4)	.94	1.01
70(1)	1.11	1.02
70(2)	.98	1.01
70(3)	1.02	1.04
70(4)	1.02	1.05
71(1)	.98	.99
71(2)	1.13	1.11
71(3)	1.00	.96
71(4)	.98	.99
72(1)	1.00	1.03
72(2)	1.06	1.02
72(3)	.98	1.05
72(4)	1.01	1.05
73(1)	1.00	1.06
73(2)	1.05	1.07
73(3)	1.04	1.04
73(4)	1.07	1.00

DATA APPENDIX TABLE 5

Quarter	Price Indices	
	(a)	(b)
52(2)	.65	.70
52(3)	.66	.72
52(4)	.68	.74
53(1)	.69	.75
53(2)	.69	.75
53(3)	.69	.75
53(4)	.70	.75
54(1)	.70	.75
54(2)	.71	.76
54(3)	.71	.76
54(4)	.71	.77
55(1)	.72	.77
55(2)	.73	.78
55(3)	.74	.80
55(4)	.75	.81
56(1)	.75	.81
56(2)	.77	.82
56(3)	.78	.83
56(4)	.79	.83
57(1)	.79	.84
57(2)	.79	.85
57(3)	.80	.85
57(4)	.80	.86
58(1)	.80	.87
58(2)	.81	.87
58(3)	.81	.87
58(4)	.81	.87
59(1)	.82	.87
59(2)	.82	.88
59(3)	.82	.88
59(4)	.83	.88
60(1)	.84	.89
60(2)	.86	.90
60(3)	.87	.90
60(4)	.87	.90
61(1)	.88	.90
61(2)	.88	.91
61(3)	.88	.91
61(4)	.88	.91
62(1)	.88	.91
62(2)	.88	.91
62(3)	.88	.91
62(4)	.89	.91

Data Appendix Table 5 (Cont.)

Quarter	Price Indices	
	(a)	(b)
63(1)	.90	.91
63(2)	.89	.92
63(3)	.90	.92
63(4)	.89	.92
64(1)	.91	.92
64(2)	.91	.93
64(3)	.92	.94
64(4)	.93	.95
65(1)	.94	.95
65(2)	.95	.96
65(3)	.96	.97
65(4)	.97	.97
66(1)	.97	.98
66(2)	.98	.98
66(3)	.99	.99
66(4)	1.00	.99
67(1)	1.00	1.01
67(2)	1.01	1.01
67(3)	1.02	1.02
67(4)	1.03	1.02
68(1)	1.03	1.03
68(2)	1.04	1.04
68(3)	1.05	1.05
68(4)	1.06	1.06
69(1)	1.07	1.07
69(2)	1.08	1.07
69(3)	1.09	1.08
69(4)	1.10	1.09
70(1)	1.13	1.12
70(2)	1.14	1.13
70(3)	1.14	1.14
70(4)	1.16	1.16
71(1)	1.20	1.19
71(2)	1.22	1.21
71(3)	1.24	1.23
71(4)	1.25	1.25
72(1)	1.29	1.27
72(2)	1.30	1.28
72(3)	1.33	1.30
72(4)	1.33	1.32
73(1)	1.35	1.34
73(2)	1.32	1.37
73(3)	1.45	1.42
73(4)	1.48	1.45

DATA APPENDIX TABLE 6

YEAR	TBRA $m	RLB %	PRICE INDEX
1876	33	4.65	1.075
1877	40	4.38	1.056
1878	41	4.44	1.010
1879	43	4.51	1.013
1880	42	4.36	1.002
1881	45	3.88	0.994
1882	53	3.88	1.095
1883	66	3.88	1.064
1884	75	4.26	1.038
1885	81	4.20	1.042
1886	85	4.18	1.012
1887	81	4.05	0.978
1888	93	-	1.031
1889	106	-	1.045
1890	112	-	1.050
1891	113	-	0.958
1892	117	-	0.922
1893	133	-	0.873
1894	90	3.75	0.818
1895	80	3.34	0.822
1896	74	3.08	0.867
1897	66	3.03	0.883
1898	60	3.10	0.887
1899	59	3.04	0.903
1900	61	3.16	0.888
1900/1	62	3.29	0.931
1901/2	63	3.60	0.951
1902/3	62	3.64	0.944
1903/4	61	3.81	0.952
1904/5	68	3.97	0.944
1905/6	76	3.51	0.969
1906/7	79	3.49	0.990
1907/8	82	3.57	1.007
1908/9	86	3.65	0.969
1909/10	91	3.79	0.998
1910/11	101	3.71	1.000
1911/12	109	3.95	1.089
1912/13	112	4.44	1.083
1913/14	115	4.43	1.159
1914/15	120	4.55	1.276
1915/16	121	4.98	1.323

YEAR	TBRA $m	RLB %	PRICE INDEX
1916/17	120	5.26	1.445
1917/18	130	5.06	1.524
1918/19	154	5.29	1.608
1919/20	157	5.81	1.859
1920/21	175	6.88	1.805
1921/22	181	6.58	1.712
1922/23	204	5.84	1.815
1923/24	218	5.80	1.815
1924/25	217	5.81	1.866
1925/26	234	5.30	1.852
1926/27	255	5.35	1.855
1927/28	275	5.20	1.883
1928/29	295	5.55	1.887
1929/30	313	6.80	1.704
1930/31	315	4.80	1.546
1931/32	343	3.90	1.430
1932/33	361	3.60	1.406
1933/34	363	3.40	1.458
1934/35	369	3.80	1.504
1935/36	350	3.90	1.570
1936/37	365	3.94	1.664
1037/38	399	3.75	1.686
1938/39	408	3.85	-
1939/40	422	3.68	-
1940/41	443	3.13	-
1941/42	427	3.16	-
1942/43	457	2.97	-
1943/44	500	3.24	-
1944/45	566	3.25	-
1945/46	492	3.25	-
1946/47	459	3.20	-
1947/48	442	3.16	-
1948/49	464	3.13	2.661
1949/50	499	3.13	2.903
1950/51	559	3.21	3.613
1951/52	543	3.95	3.799
1952/53	514	4.55	4.346
1953/54	581	4.44	4.464
1954/55	645	4.50	4.495
1955/56	651	4.76	4.632
1956/57	722	5.06	4.955

Data Appendix Table 6 (Cont.)

YEAR	TBRA	RLB	PRICE INDEX
1957/8	841	4.99	4.955
1958/9	922	4.95	4.955
1959/60	974	4.91	5.185
1960/1	1089	5.21	5.347
1961/2	1352	5.06	5.415
1962/3	1522	4.80	5.490
1963/4	1724	4.51	5.695
1964/5	2113	5.00	5.844
1965/6	2434	5.20	6.018

YEAR	RBRA	RLB	PRICE INDEX
1966/7	2608	5.16	6.217
1967/8	2852	5.16	6.391
1968/9	3156	5.10	6.603
1969/70	3494	5.91	6.901
1970/1	3638	6.46	6.274
1971/2	4181	5.89	6.772
1972/3	5341	5.62	8.468
1973/4	7166	7.83	9.693

A SELECTED BIBLIOGRAPHY

Adams, F. Gerard, and Duggal, G. Vijaya. [1974] "Anticipation Variables in an Econometric Model: Performance of the Anticipations Version of Wharton Mark III". *International Economic Review*, 15 (June): 267-284.

Adams, F. Gerard, and Klein, Lawrence R. [1972] "Anticipations Variables in Macro-econometric Models". *Human Behaviour in Economic Affairs*. Edited by Burkhard Strumpel, James N. Morgan, and Ernest Zahn. Amsterdam: Elsevier Scientific Publishing Co.

Baumol, W.J. [1952] "The Transactions Demand for Cash: An Inventory Theoretic Approach". *Quarterly Journal of Economics*, 66 (November): 545-556.

Bosworth, Barry. [1971] "Patterns of Corporate External Financing". *Brooking Papers on Economic Activity*, (No. 2): 253-284.

Bronfenbrenner, Martin and Mayer, Thomas. [1960] "Liquidity Functions in the American Economy". *Econometrica*, 28 (October): 810-834.

Brunner, Karl. [1950] "Stock and Flow Analysis: Discussion". *Econometrica*, 18 (July): 247-251.

Brunner, Karl. [1965] "Institutions and Monetary Policy". *Journal of Political Economy*, 73 (February): 197-218.

Brunner, Karl. [1971] "The Monetarist View of Keynes-ian Ideas". *Lloyds Bank Review*, (October): 35-49.

Brunner, Karl, and Meltzer, Allan H. [1964] "Some Further Investigations of Demand and Supply Functions for Money". *Journal of Finance*, 19 (May): 240-283.

Brunner, Karl, and Meltzer, Allan H. [1972] "Friedman's Monetary Theory". *Journal of Political Economy*, 80 (September/October): 837-851.

Burns, M.E. [1973] "A Note on the Choice of Data in Econometric Studies". *Economic Record*, 49 (March): 24-30.

Cagan, Phillip. [1965] "A Commentary on Some Current Issues in the Theory of Monetary Policy". *Patterns of Market Behaviour*, Edited by Michael J. Brennan, Providence Rhode Island: Brown University Press.

Cagan, Phillip. [1965] *Determinants and Effects of Changes in the Stock of Money 1875-1960*. New York: National Bureau of Economic Research.

Cagan, Phillip. [1966] "Changes in the Cyclical Behaviour of Interest Rates". *Review of Economics and Statistics*, 48 (August): 219-250.

Cagan, Phillip. [1971] "Changes in the Cyclical Behaviour of Interest Rates". *Essays on Interest Rates*. Vol. II Edited by Jack M. Guttentag. New York: National Bureau of Economic Research.

Chow, G.C. [1966] "On the Long-Run and Short-Run Demand for Money". *Journal of Political Economy*, 74 (April): 111-131.

Chow, G.C. and Lin, An-loh [1971] "Best Linear Unbiased Interpolation, Distribution, and Extrapolation of Time Series by Related Series". *Review of Economics and Statistics*, 53 (November): 372-375.

Clower, R.W. [1959] "Stock and Flow Quantitites: A Common Fallacy". *Economica*, 26 (August): 251-252.

Clower, R.W. [1965] "The Keynesian Counter-Revolution: A Theoretical Appraisal". *The Theory of Interest Rates.* Edited by F.H.Hahn and F. Brechling. London: Macmillan.

Clower, R.W. [1967] "A Reconsideration of the Microfoundations of Monetary Theory". *Western Economic Journal,* 6 (December): 1-9.

Clower, R.W. [1975] "Reflections on the Keynesian Perplex". *Zeitschrift für Nationalökonomie,* Vol. 35: 1-24.

Cramp, A.B. [1970] "Does Money Matter?" *Lloyds Bank Review,* (October): 23-37.

Cramp, A.B. [1971] "Monetary Policy: Strong or Weak". *Conflicts in Policy Objectives.* Edited by Nicholas Kaldor. Oxford: Basil Blackwell.

Conard, Joseph W. [1966] *An Introduction to the Theory of Interest.* Berkeley and Los Angeles: University of California Press.

Davidson, Paul. [1965] "Keynes's Finance Motive". *Oxford Economic Papers,* 17 (March): 47-65.

Davidson, Paul. [1967] "The Importance of the Demand for Finance". *Oxford Economic Papers,* 19 (July): 245-253.

Davidson, Paul [1969] "A Keynesian View of the Relationship Between Accumulation, Money and the Money Wage Rate". *Economic Journal,* 79 (June): 300-323.

Davidson, Paul [1972a] *Money and the Real World.* London: Macmillan.

Davidson, Paul	[1972b]	"A Keynesian View of Friedman's theoretical Framework for Monetary Analysis". *Journal of Political Economy*, 80 (September/October): 864-882.
Downing, R.I., Perkins, J.O.N., Boxer, A.H. and Isaac, J.E.	[1973]	*The Australian Economy*. London: Weidenfeld and Nicolson.
Eichner, A.S. and Kregel, J.A.	[1975]	"An Essay on Post-Keynesian Theory: A New Paradigm in Economics". *Journal of Economic Literature*, 13 (December): 1293-1314.
Fand, David I.	[1972]	"High Interest Rates and Inflation in the U.S. Cause or Effect". *Banca Nazionale Del Lavoro Quarterly Review*, 25 (March): 23-64.
Feige, Edgar L.	[1964]	*The Demand for Liquid Assets: A Temporal Cross-Section Analysis*. Englewood Cliffs, N.J.: Prentice Hall.
Feige, Edgar L.	[1967]	"Expectations and Adjustments in the Monetary Sector". *American Economic Review Papers and Proceedings*, 57 (May): 462-473.
Feldstein, Martin S.	[1970]	"Inflation, Specification Bias, and the Impact of Interest Rates". *Journal of Political Economy*, 78 (November/December): 1325-1339.
Feldstein, Martin and Eckstein, Otto.	[1970]	"The Fundamental Determinants of the Interest Rate". *Review of Economics and Statistics*, 52 (November): 363-375.

Fellner, W. and Somers, H.M. [1950a] "Stock and Flow Analysis: Comment". *Econometrica*, 18 (July): 242-245.

Fellner, W. and Somers, H.M. [1950b] "Stock and Flow Analysis" Note on the Discussion". *Econometrica*, 18 (July): 252.

Fisher, Irving. [1896] "Appreciation and Interest". *American Economic Association*, 11 (August): 331-442.

Fisher, Irving. [1930] *The Theory of Interest.* New York: Macmillan.

Fishman, George S. [1969] *Spectral Methods in Econometrics.* Cambridge, Massachusetts: Harvard University Press.

Friedman, Milton. [1953] "The Effects of a Full-Employment Policy on Economic Stability: A Formal Analysis". *Essays in Positive Economics.* Edited by Milton Friedman. The University of Chicago Press.

Friedman, Milton. [1959] "The Demand for Money: Some Theoretical and Empirical Results". *Journal of Political Economy*, 67 (August): 327-351.

Friedman, Milton. [1960] *A Program for Monetary Stability.* New York: Fordham University Press.

Friedman, Milton. [1961] "The Lag in the Effect of Monetary Policy". *Journal of Political Economy*, 69 (October): 447-466.

Friedman, Milton. [1969] "Interest Rates and the Demand for Money". *The Optimum Quantity of Money and Other Essays.* Edited by Milton Friedman. New York: Macmillan.

Friedman, Milton. [1970a] "A Theoretical Framework for Monetary Analysis". *Journal of Political Economy*, 78 (March/April): 193-238.

Friedman, Milton. [1970b] "The Counter-Revolution in Monetary Theory". *Institute of Economic Affairs Occassional Paper*, No. 33.

Friedman, Milton. [1970c] "Comment on Tobin". *Quarterly Journal of Economics*, 74 (May): 318-327.

Friedman, Milton. [1970d] "The New Monetarism - Comment". *Lloyds Bank Review*, (October): 52-53.

Friedman, Milton. [1971] "A Note on U.S. and U.K. Velocity of Circulation". *Monetary Theory and Monetary Policy in the 1970's*. Edited by G. Clayton, J.C. Gilbert and R. Sedgwick. London: Oxford University Press.

Friedman, Milton. [1972] "Comments on the Critics". *Journal of Political Economy*, 80 (September/October): 906-950.

Friedman, Milton. [1975] ""Discussion" - 25 years After the Rediscovery of Money". *American Economic Review Papers and Proceedings*, 65 (May): 176-179.

Friedman, Milton and Schwartz, A.J. [1963a] *A Monetary History of the United States 1867-1960*. Princeton: Princeton University Press.

Friedman, Milton and Schwartz, A.J. [1963b] "Money and Business Cycles". *Review of Economics and Statistics*, 45 (February Supplement): 32-78.

Garegnani, Pierangelo. [1976] "On a Change in the Notion of Equilibrium in Recent Work on Value and Distribution". *Essays in Modern Capital Theory*. Edited by M.Brown, K.Sato, and P. Zarembka. Amsterdam: North Holland.

Gibson, William E. [1970a] "Price Expectations Effects on Interest Rates". *Journal of Finance*, 25 (March): 19-34.

Gibson, William E. [1970b] "The Lag in the Effect of Monetary Policy on Income and Interest Rates". *Quarterly Journal of Economics*, 84 (May): 288-300.

Granger, C.W.J. [1966] "The Typical Spectral Shape of and Economic Variable". *Econometrica*, 34 (January): 150-161.

Granger, C.W.J. and Hatanaka, M [1964] *Spectral Analysis of Economic Time Series.* Princeton University Press.

Grant, A.T.K. [1972] *The Strategy of Financial Pressure.* London: Macmillan.

Hahn, F.H. [1955] "The Rate of Interest and General Equilibrium Analysis". *Economic Journal*, 65 (March): 52-66.

Hahn, F.H. [1973] *On the Notion of Equilibrium in Economics.* An Inaugural Lecture. Cambridge: Cambridge University Press.

Hamburger, Michael J. [1966] "The Demand for Money by Households, Money Substitutes, and Monetary Policy". *Journal of Political Economy*, 74, (December): 600-623.

Hansen, A. [1949] *Monetary Theory and Fiscal Policy.* New York: McGraw-Hill.

Harcourt, G.C. [1977a] "The Theoretical and Social Significance of the Cambridge Controversies in the Theory of Capital: An Evaluation". *The Subtle Anatomy of Capitalism.* Edidted by Jesse Schwartz. Santa Monica, California: Goodyear Publishing Co. Inc.

Harcourt, G.C. [1977b] "On Theories and Policies". Forthcoming in *Essays in*

Australian Economic Policy. Edited by J. Niewenhuysen and P. Drake. Melbourne University Press.

Harrod, R.F. [1969] *Money.* London: Macmillan.

Hause, John C. [1971] "Spectral Analysis and the Detection of Lead-Lag Relations". *American Economic Review,* (March): 213-217.

Hawtry, R.G. [1937] "Alternative Theories of the Rate of Interest". *Economic Journal,* 47 (September): 436-443.

Hayek, Von F.A. [1932] "Reflections on the Pure Theory of Money of Mr. J.M. Keynes". *Economica,* 12 (February):22-44.

Heller, H.R. [1965] "The Demand for Money: The Evidence from the Short-Run Data". *Quarterly Journal of Economics,* 79 (May): 291-303.

Hicks, J.R. [1946] *Value and Capital,* 2nd edition. London: Oxford University Press.

Hicks, J.R. [1950] *A Contribution to the Theory of the Trade Cycle.* London: Oxford University Press.

Hicks, J.R. [1965] *Capital and Growth.* Oxford University Press.

Hicks, J.R. [1970] "Inflation and Interest". *Bonca Nazionale Del Lavoro Quarterly Review,* 23 (September): 261-275.

Hicks, J.R. [1970] "Expected Inflation". *The Three Banks Review,* 87 (September): 3-21.

Hines, A.G. [1971a] Alternative Theories of the Rate of Interest". Mimeograph.

Hines, A.G. [1971b] *On the Reappraisal of Keynesian Economics.* London: Martin Robertson.

Hirst, R.R. [1974] "Finance for Economic Development" *The Australian Capital Market.* Edited by R.R. Hirst and R.H. Wallace. Melbourne: Cheshire.

Horwich, G. [1966] "Keynes' Finance Motive: Comment". *Oxford Economic Papers*, 18 (July): 242-251.

Hudson, Michael, and Laumas, G.S. [1968] "Statistical Tests of the Keynesian Demand Function for Money: Comments". *Journal of Finance*, 23 (September): 672-673.

Hymans, Saul H. [1970] "Consumer Durable Spending: Explanation and Prediction". *Brookings Papers on Economic Activity*, (No. 2): 173-199.

Jacobs, R.L. [1974] "Estimating the Long-Run Demand Function for Money from Time Series Data". *Journal of Political Economy*, 82 (November/December): 1221-1237.

Johnson, H.G. [1962] "Monetary Theory and Policy". *American Economic Review*, 52 (June): 335-384.

Johnson, H.G. [1971] *Macroeconomics and Monetary Theory.* London: Gray Mills.

Johnson, H.G. [1974] "Major Issues in Monetary Economics". *Oxford Economic Papers*, 26 (July): 212-225.

Johnson, H.G. and Nobay, A.R. (Editors) [1971] *The Current Inflation.* London: Macmillan.

Jones, R. [1831] *An Essay on the Distribution of Wealth.* New York: Kelley and Millman.

Jones, R. [1859] *Literary Remains.* New York: Kelley

Jorgenson, Dale W. [1971] "Econometric Studies of Investment Behaviour: A Survey". *Journal of Economic Literature*, 9 (December): 1111-1147.

Kahn, R.F. [1954] "Some Notes on Liquidity Preference". *The Manchester School of Economic and Social Studies*, 22 (September): 229-257.

Kaldor, N. [1960] *Essays on Economic Stability and Growth.* London: Gerald Duckworth & Co. Ltd.

Kaldor, N. [1970a] "The New Monetarism". *Lloyds Bank Review*, (May): 1-17.

Kaldor, N. [1970b] "Reply". *Lloyds Bank Review*, (October): 54-55.

Kalecki, Michael. [1971] *Selected Essays on the Dynamics of the Capitalist Economy 1933-1970*. Cambridge: Cambridge University Press.

Katona, George. [1972] "Theory of Expectations". *Human Behaviour in Economic Affairs*. Edited by Burkhard Strumpel, James N. Morgan, and Ernest Zahn. Amsterdam: Elsevier Scientific Publishing Co.

Kavanagh, N.J. and Walters, A.A. [1966] "Demand for Money in the U.K., 1877-1961". *Bulletin of Oxford University Institute of Economics and Statistics*, 28 (May): 93-116.

Kennedy, Charles. [1960] "Inflation and the Bond Rate". *Oxford Economic Papers*, 12 (October): 269-273.

Kennedy, R.V. [1969] "Quarterly Estimates of National Income and Expenditure: 1950-51 to 1957-58". *Economic Record*, 45 (June): 218-242.

Kessel, Reuben A. and Alchian, Armen, A. [1962] "Effects of Inflation". *Journal of Political Economy*, 70 (December): 521-537.

Keynes, John Maynard. [1930] *A Treatise on Money*. Volumes i and ii. London: Macmillan.

Keynes, John Maynard. [1936] *The General Theory of Employment Interest and Money*. London: Macmillan.

Keynes, John Maynard. [1937a] "Alternative Theories of the Rate of Interest". *Economic Journal*, 47 (June): 241-252.

Keynes, John Maynard. [1937b] "The 'Ex-Ante' Theory of the Rate of Interest". *Economic Journal*, 47 (December): 663-669.

Keynes, John Maynard. [1937c] "The General Theory of Employment". *Quarterly Journal of Economics*, 51 (February): 209-223.

Keynes, John Maynard. [1938] "Mr. Keynes and Finance: Comment". *Economic Journal*, 48 (June): 318-322.

Keynes, John Maynard. [1939] "The Process of Capital Formation". *Economic Journal*, 49 (September): 569-574.

Keynes, John Maynard. [1940] *How to Pay for the War.* London: Macmillan.

Keynes, John Maynard. [1973] *The Collected Writings of John Maynard Keynes.* Vols. XIII and XIV. Edited by Donald Moggridge. London: Macmillan.

Klein, Benjamin. [1973] "Income Velocity, Interest Rates, and the Money Supply Multiplier". *Journal of Money Credit and Banking*, 5 (May): 656-668.

Klein, L.R. [1950a] "Stocks and Flow Analysis in Economics". *Econometrica*, 18 (July): 236-241.

Klein, L.R. [1950b] "Stock and Flow Analysis: Further Comment". *Econometric*, 18 (July): 246.

Klein, L.R. [1953] *A Textbook of Econometrics.* New York: Row, Peterson & Co.

Koopmans, Lambert Herman. [1974] *The Spectral Analysis of time Series.* New York: Academic Press.

Koutsoyiannis, A. [1973] *Theory of Econometrics.* London: Macmillan.

Kregel, J.A. [1973] *The Reconstruction of Political Economy: An Introduction to Post-Keynesian Economics.* London: Macmillan.

Kregel, J.A. [1976] "Economic Methodology in the Face of Uncertainty: The Modeling Methods of Keynes and the Post-Keynesians". *Economic Journal*, 86 (June): 209-225.

Laidler, David. [1966a] "Some Evidence on the Demand for Money". *Journal of Political Economy*, 74 (February): 55-68.

Laidler, David. [1966b] "The Rate of Interest and the Demand for Money - Some Empirical Evidence". *Journal of Political Economy*, 74 (December): 543-555.

Laidler, David. [1969] *The Demand for Money: Theories and Evidence.* Scranton: International Text-book Co.

Laidler, David. [1973] "The Current Inflation - The Problem of Explanation and the Problem of Policy". *After Keynes.* Edited by Joan Robinson. Oxford: Basil Blackwell.

Latane, Henry Allen. [1954] "Cash Balances and the Interest Rates - A Pragmatic Approach". *Review of Economics and Statistics*, 36 (November): 456-460.

Latane, Henry Allen. [1960] "Income Velocity and Interest Rates: A Pragmatic Approach". *Review of Economics and Statistics*, 42 (August): 445-449.

Lee, Tong Hun. [1967] "Alternative Interest Rates and the Demand for Money: The Empirical Evidence". *American Economic Review*, 57 (December): 1168-1181.

Leijonhufvud, Axel. [1967] "Keynes and the Keynesians: A Suggested Interpretation". *American Economic Review Papers and Proceedings*, 57 (May): 401-410.

Leijonhufvud, Axel. [1968] *On Keynesian Economics and the Economics of Keynes*. New York: Oxford University Press.

Lewis, M.K. [1977] "Velocity and Interest Rates: A Re-Examination". Forthcoming in the *Economic Record*.

Lewis, M.K. and Wallace, R.H. [1973a] "The Changing Rational of Australian Monetary Policy". *The Bankers Magazine*, 216 (September): 111-116.

Lewis, M.K. and Wallace, R.H. [1973b] "Current Issues of Monetary Policy in Australia". *The Bankers Magazine*, 216 (October): 160-164.

Lisman, J.H.C. and Sandee, J. [1964] "Derivation of Quarterly Figures from Annual Data". *Applied Statistics*, 13 (No. 2): 87-90.

Lumsden, M.A. and Sturm, A.B. [1974] "An Interpolation Procedure to Obtain Quarterly Time Series Data". *Reserve Bank of New Zealand Research Paper*, No. 13 (June).

Malinvaud, E. [1970] *Statistical Method of Econometrics*. Amsterdam-London: North Holland.

Meiselman, David. [1963] "Bond Yields and the Price Level: The Gibson Paradox Regained". *Banking and Monetary Studies*. Edited by Deane Carson. Homewood, Illinois: Richard D. Irwin, Inc.

Meltzer, Allan H. [1963a] "The Demand for Money: The Evidence from the Time Series". *Journal of Political Economy*, 71 (June): 219-246.

Meltzer, Allan H. [1963b] "The Demand for Money: A Cross-Section Study of Business Firms". *Quarterly Journal of Economics*, 77 (August): 405-422.

Meyer, P.A. and Neri, J.A. [1975] "A Keynesian Friedman Money Demand Function". *American Economic Review*, 65 (September): 610-623.

Minsky, Hyman P. [1975] *John Maynard Keynes*. New York: Columbia University Press.

Modigliani, F. [1964] "Some Empirical Tests of Monetary Management and of Rules Versus Discretion". *Journal of Political Economy*, 72 (June): 211-245.

Modigliani, F., Rasche, R., and Cooper, J.P. [1970] "Central Bank Policy, the Money Supply and the Short-Term Rate of Interest". *Journal of Money Credit and Banking*, 2 (May): 166-218.

Moggridge, D.E. [1976] *Keynes*. Glasgow: Fontana.

Moggridge, D.E., and Howson, Susan. [1974] "Keynes on Monetary Policy, 1910-1946". Oxford Economic Papers, 26 (July): 226-247.

Motley, Brian. [1967] "A Demand-for-Money Function for the Household Sector - Some Preliminary Findings". *Journal of Finance*, 22 (September): 405-418.

Mundell, Robert. [1963] "Inflation and Real Interest". *Journal of Political Economy*, 71 (June): 280-283.

Ohlin, Bertil. [1937a] "Some Notes on the Stockholm Theory of Savings and Investment. I." *Economic Journal*, 47 (March): 53-69.

Ohlin, Bertil. [1937b] "Some Notes on the Stockholm Theory of Savings and Investment. II." *Economic Journal*, 47 (June): 221-240.

Ohlin, Bertil. [1937c] "Alternative Theories of the Rate of Interest". *Economic Journal*, 47 (September): 423-427.

Okun, Arthur James. [1967] "Monetary Policy, Debt Management, and Interest Rates: A Quantative Appraisal". *Financial Markets and Economic Activity*. Edited by Donald D. Hester and James Tobin. New York: John Wiley & Sons, Inc.

Passinetti, L.L [1974] *Growth and Income Distribution Essays in Economic Theory*. Cambridge University Press.

Patinkin, Don. [1958] "Liquidity Preference and Loanable Funds: Stock and Flow Analysis". *Economica*, 25 (November): 300-318.

Patinkin, Don. [1959] "Reply to R.W.Clower and H. Rose". *Economica*, 26 (August): 253-255.

Patinkin, Don. [1972a] "On the Short-Run Non-Neutrality of Money in the Quantity Theory". *Banca Nazionale Del Lavoro Quarterly Review*, 25 (March): 3-22.

Patinkin, Don. [1972b] "Friedman on the Quantity Theory and Keynesian Economics". *Journal of Political Economy*, 80 (September/October): 883-905.

Phillips, J.G. [1964] "Recent Developments in Monetary Policy in Australia". Reprinted in *Australian Monetary and Fiscal Policy*. Edited by N. Runcie. University of London Press.

Porter, M.G. [1974] "The Interdependence of Monetary Policy and Capital Flows in Australia". *Economic Record*, 50 (March): 1-20.

Praetz, P.D. [1973] "A Spectral Analysis of Australian Share Prices". *Australian Economic Papers*, 15 (June): 70-78.

Preston, Esme. [1968] "On the Predictive Value of the Australian Investment Survey". *Economic Record*, 44 (March): 42-55.

Price, L.D.D. [1972] "The Demand for Money in the United Kingdom: A Further Investigation". *Bank of England Quarterly Bulletin*. 12 (March): 43-55.

Pyle, David H. [1972] "Observed Price Expectations and Interest Rates". *Review of Economic and Statistics*, 54 (August): 275-280.

Robertson, D.H. [1936] "Some Notes on Mr. Keynes' General Theory of Employment". *Quarterly Journal of Economics*. 51 (November): 168-191.

Robertson, D.H. [1937] "Alternative Theories of the Rate of Interest". *Economic Journal*, 47 (September): 428-436.

Robertson, D.H. [1938a] "Mr. Keynes and Finance: A Note". *Economic Journal*, 48 (June): 314-318.

Robertson, D.H. [1938b] "Mr. Keynes and "Finance"." *Economic Journal*, 48 (September): 555-556.

Robinson, Joan [1952] *The Rate of Interest and Other Essays*. London: Macmillan.

Robinson, Joan [1956] *The Accumulation of Capital*. London: Macmillan.

Robinson, Joan [1960] *Collected Economic Papers*. Vol. 2. Oxford: Basil Blackwell.

Robinson, Joan [1975] "Review of L.L. Pasinetti, Growth and Income Distribution Essays in Economic Theory, 1974". *Economic Journal*, 85 (June): 397-398.

Roe, A.R. [1973] "The Case for Flow of Funds and National Balance Sheet Accounts". *Economic Journal*, 83 (June): 399-420.

Sargent, Thomas J. [1969] "Commodity Price Expectations and the Interest Rate". *Quarterly Journal of Economics*, 83 (February): 127-140.

Schumpeter, J.A. [1954] *History of Economic Analysis*. London: Allen and Unwin.

Seldon, H.T. [1959] "Monetary Velocity in the United States". *Studies in the Quantity Theory of Money*. Edited by M. Friedman. Chicago: University of Chicago Press.

Shackle, G.L.S. [1961] "Recent Theories Concerning the Nature and Role of Interest". *Economic Journal*, 71 (June): 209-254.

Shackle, G.L.S. [1967] *The Years of High Theory*. Cambridge: Cambridge University Press.

Shackle, G.L.S. [1972] *Epistemics and Economics*. Cambridge: Cambridge University Press.

Shapiro, A.A. [1973] "Inflation, Lags, and the Demand for Money". *International Economic Review*, 14 (February): 81-96.

Smith, Lawrence B. and Winder, John W.L. [1971] "Price and Interest Rate Expectations and The Demand for Money in Canada". *Journal of Finance*, 26 (June): 671-682.

Smith, Warren L. [1970] "On Some Current Issues in Monetary Economics: An Interpretation". *Journal of Economic Literature*, 8 (September): 766-782.

Starleaf, Dennis R. and Reimer, Richard. [1967] "The Keynesian Demand Function for Money: Some Statistical Tests". *Journal of Finance*, 22 (March): 71-76.

Teigen, Ronald L. [1964] "Demand and Supply Functions for Money in the United States: Some Structural Estimates". *Econometrica*, 32 (October): 476-509.

The Australian Treasury. [1972] "Overseas Investment in Australia. *Treasury Economic Paper*, (No. 1, May).

The Bank of England. [1970] "Timing Relationships Between Movements of Monetary and National Income Variables". *Bank of England Quarterly Bulletin*, 10 (December): 459-468.

Thornton, Henry. [1802] *An Enquiry into the Nature and Effects of the Paper Credit of Great Britain.* London: Allen and Unwin.

Tobin, James. [1956] "The Interest Elasticity of Transactions Demand for Cash". *Review of Economic and Statistics*, 38 (August): 241-247.

Tobin, James. [1958] "Liquidity Preference as Behaviour Towards Risk". *Review of Economic Studies*, 25 (February): 65-86.

Tobin, James. [1970] "Money and Income: Post Hoc Ergo Propter Hoc?" *Quarterly Journal of Economics*, 84 (May): 301-317.

Tobin, James. [1971] *Essays in Economics Vol. 1: Macro economics.* London: North Holland.

Tobin, James. [1972] "Friedman's Theoretical Framework". *Journal of Political Economy,* 80 (September/October): 852-863.

Tsiang, S.C. [1956] "Liquidity Preference and Loanable Funds Theories, Multiplier and Velocity Analysis: A Synthesis". *American Economic Review,* 46 (September): 539-564.

Tsiang, S.C. [1966] "Walras' Law, Say's Law and Liquidity Preference in General Equilibrium Analysis". *International Economic Review,* 7 (September): 329-345.

Turnovsky, Stephen J. [1974] "On the Role of Inflationary Expectations in a Short-Run Macro-Economic Model". *Economic Journal,* 84 (June): 317-337.

Wagner, John R. [1974] "Reflections on the Interest Elasticity of Demand for Money". *Economic Journal,* 84 (March): 156-158.

Walters, A.A. [1965] "Professor Friedman on the Demand for Money". *Journal of Political Economy,* 73 (October): 545-551.

Walters, A.A. [1970] "Kaldor on Monetarism". *The Banker,* (October): 1052-1060.

Walters, A.A. [1973] "A Note on Friedman and Schwartz by the Editor". *Money and Banking.* Edited by A.A. Walters. Penguin.

Waterman, A.M.C. [1972] *Economic Fluctuations in Australia 1946 to 1964.* Canberra: Australian National University Press.

Weintraub, Robert and Hosek, William R. [1970] "Further Reflections on and Investigations of Money Demand". *Journal of Finance,* 25 (March): 109-125.

Whalen, Edward L. [1965] "A Cross-Section Study of Business Demand for Cash". *Journal of Finance,* 20 (September): 423-443.

Whalen, Edward L. [1966] "A Rationalisation of the Precautionary Demand for Cash". *Quarterly Journal of Economics*, 80 (May): 314-324.

Whittington, Geoffrey. [1971] *The Prediction of Profitability*. Cambridge: Cambridge University Press.

Wicksell, Knut. [1936] *Interest and Prices*. London: Macmillan.

Wood, Adrian. [1975] *A Theory of Profits* Cambridge University Press.

Zellner, A. and Huang,D.S. and Chau, L.C. [1965] "Further Analysis on the Short-Run Consumption Function with Emphasis of the Role of Liquid Assets". *Econometrica*, 33 (July): 571-581.