THE ROLE OF MONEY IN FOUR MACROECONOMIC MODELS: A COMPARISON AND AN EVALUATION

By

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ABSTRACT

The Role of Money in Four Macroeconomic Models: A Comparison and an Evaluation - Tina Stout

The study compares and evaluates the role of money in four macroeconomic models - the H.M. Treasury, the London Business School, the National Institute of Economic and Social Research, and a post-Keynesian model. This study can be sub-divided into two parts - chapters two and three analyse the historical and theoretical background of monetary economics, whilst chapters four and five examine how the models capture various aspects of money.

Chapter two analyses the nature of financial innovation, with particular reference to the banking sector. The growing importance attributed to the liabilities of the non-bank financial institutions, facilitated by deregulation and information technology, is emphasised. This rapid evolution has important consequences for the construction of macroeconomic models, which must now capture the activities of all financial institutions and the effect of financial innovation on both the monetary and real sectors.

Chapter three discusses the evolution of monetary theory, in both a closed and open economy, with particular emphasis placed upon the channels of influence, given an expansionary monetary policy. Particular concern centres on the post-Keynesian doctrine, which emphasises the importance of 'credit-money' in a capitalist-production economy. Acceptance of this doctrine questions the viability of orthodox theories.

Chapter four reproduces stylised versions of the external monetary sector. Emphasis is placed upon those equations that constitute the transmission mechanism. The contributions of financial innovation and theory are also stressed.

Finally chapter four compares and evaluates how various monetary aspects are incorporated into the four models. These aspects are the roles of: i) financial innovation; ii) monetary control; iii) information technology; iv) monetary theory; and v) the interaction with the real sector. The models place different weights upon these aspects. The role of financial innovation is largely ignored by the orthodox models, in keeping with their theoretical beliefs. Whereas, in accordance with the post-Keynesian doctrine, the PK model emphasises its importance. The weight placed on the theoretical aspect is particularly acute in the LBS model. However, one important proviso for all the orthodox models is the utilisation of post-Keynesian mark-up models. The four models also emphasise different channels of influence, in accordance with their theoretical beliefs. Consequently, four alternative views of money in macroeconomic models are forthcoming.

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CHAPTER ONE: INTRODUCTION

I) THE BACKGOUND TO MACROECONOMIC MODEL BUILDING

Throughout the twentieth century, applied econometricians, by utilising various mathematical and statistical techniques, have attempted to validate a plethora of economic theories with the aid of econometric models. Initial research in this area was predominantly micro orientated, involving the estimation of demand and supply relationships. Research at the macro level dates back to the pioneering work of Tinbergen and Klein in the 1930's. However, one would probably class Lawerence Klein as the true father of macroeconomic model building as it stands today, based upon his formulation, in the fifties, of a macroeconomic model of the US economy (Klein, 1950). Despite this long history of application, widespread use of macroeconomic models did not occur until the late 1960's - early 1970's, with the availability of better data sources and technology.

In the UK, the first macroeconomic models, small by today's standards, were predominantly Keynesian in nature, based upon the allocative detail of the orthodox Keynesian income-expenditure framework, and designed to forecast the effects of government policy on the economy. Consequently, the importance of fiscal policy was emphasised, with the monetary sector incorporating, at most, a demand-for-money

equation. Monetary linkages with the real sector were limited, predominantly captured by various interest rates and a dummy for hire purchase controls, all of which were exogenously-determined.

However, by the late 1970's, with the advent of monetarism, the need arose for macroeconomic models to incorporate a comprehensive monetary sector, thus enabling the interaction between the real sector and the monetary sector to be explicitly analysed. Apart from the original Keynesian-based models changing their stance on monetary aspects, other models were developed, eg. Liverpool University's research group (LPL), that veered away from the Keynesian framework all together. These latter models, by rejecting the allocative detail of Keynesianism, analyses the direct impact of a monetary impulse on aggregate income and prices.[1]

Increased globalisation of international markets in recent years has meant that macroeconomic models, apart from being more comprehensive in their treatment of the monetary sector, also have to be more exhaustive in their analysis of the external sector, with particular reference to the exchange rate. This, however, has caused problems, given that the exchange rate followed does not adhere exactly to any theoretical model and that the floating of the rate, coupled with highly interest elastic capital movements, has produced a very volatile market. Consequently, many models have included a "generous amount of off-model judgement"

(Brooks et al, 1986, p.254).

Now in the late 1980's, all macroeconomic models incorporate some form of an open economy monetary sector, enabling economy-wide simulations to be undertaken and policy packages to be prescribed. Although many of the models are designed primarily for forecasting, others are designed to test economic theories. In this study, the latter consideration becomes the most important.

II) THE OBJECT OF THE RESEARCH

The evolution of monetary policy in the UK, from servant to master, and its subsequent effect upon mainstream macroeconomic model building, means that the analysis of the UK monetary sector in macroeconomic models has become an area of particular interest. A number of econometric criteria, eg. forecasting and simulations exercises, could be utilised to analyse how well alternative models capture the basic characteristics of the UK's monetary sector. However, an alternative strategy, utilised here, is to examine how the models capture reality, in terms of the evolving nature of financial innovation.

The importance of financial innovation stems from its influence on the definition of money and subsequently on the potency of monetary policy. These influences can be disaggregated into three distinct elements :- i) the effect on the role of financial institutions and the subsequent

effect on the definition of money, explicitly acknowledged by the post-Keynesians via the setting up of contracts; ii) the supply and demand effects of monetary control; and iii) the effect of technology on the demand for money. Once these effects are established, one must capture the inter-relationship between the monetary sector and the real sector, since the potency of monetary policy ultimately effects the stability of the whole economy.

Comparing the highly disaggregated nature of the structural macroeconomic models, where the transmission mechanism is examined in detail, with the broad aggregate relationships estimated in the "reduced form" models, leads one to conclude that a more meaningful comparison would be forthcoming if only structural models were analysed. Furthermore, the time span of a model is important. The Cambridge Growth Project (CGP) model, a structural Leontief input-output model embedded within a conventional Keynesian macroeconomic framework, is primarily concerned with the medium term, and thus utilises annual data. Conversely, other structural models, such as the National Institute's (NIESR) model, utilises quarterly data and analyse the short run disequilibrium position. Ideally one would like to analyse the effect of financial innovation in the short, medium and long term, however the enormity of such a task makes it impractical. Given, therefore, that some financial changes, such as `round tripping', only exhibit short term effects, it would seem more practical to analyse quarterly

models only. Also, quarterly models appear to be more appropriate for examining the volatile aspects of exchange rate changes. Consequently all models analysed are structural quarterly macroeconomic models.

The choice criteria of quarterly structural models would appear to produce very similar results. However, the evolving nature of economic theory ensures that alternative explanations on 'how the economy works' are forthcoming. Once these competing theories and their corresponding channels of influence, are established then the various models can be evaluated and compared in these terms.

The ultimate objective of this study is, therefore, to evaluate and compare how alternative UK structural macroeconomic models attempt to portray certain elements of the monetary sector, concluding with the macroeconomic model that captures these elements best. These elements, based upon the evolving nature of the real world, are: i) the role of financial institutions; ii) the influence of monetary control; iii) the importance of technology; iv) the inclusion of economic theory; and v) the analysis of the transmission mechanism. These criteria have led one to analyse the contributions of four alternative models, three of which may be classified as based upon orthodox theories and another based upon the more controversial post-Keynesian doctrine. The three orthodox models, primarily designed for forecasting, are the H.M. Treasury (HMT), the London Business School (LBS) and the National Institute of Economic and

Social Research (NIESR), whilst the fourth model, designed to test the empirical acceptability of the post-Keynesian doctrine, is the post-Keynesian (PK) model.

III) AN OVERVIEW

The study, aimed at evaluating and comparing how both financial and theoretical considerations are modelled in four alternative monetary sectors, is sub-divided into five distinct chapters.

Chapter two examines the UK monetary background, with particular reference to the commercial banks. Beginning in 1959 with the Radcliffe Report, this chapter examines how the attitude of the monetary authorities has switched from being predominately concerned with credit control, exemplified by the utilisation of quantitative controls, towards concern with monetary control, cumulating in the adoption of monetary targets in 1976. This change in attitude occurred in conjunction with the changing importance attributed to the various financial institutions.

In the pre-CCC era, the commercial banks, being the largest group of financial institutions and the major source of credit, were constrained in their lending activities by quantitative controls. These constraints then led to the establishment of secondary banks, which provided an additional sources of funds and thus undermined the effectiveness of credit control. Consequently, the

deregulatory reforms of the CCC were imposed on all banks and near-banks to introduce uniformity. However, the new found freedom of the commercial banks brought about fresh problems of monetary control, aggrevated by the widespread utilisation of `liability management', and thus the `corset' and qualitative guidelines were imposed to restrain lending. These controls were activated periodically until 1980, though they were seriously undermined in 1979 with the lifting of the exchange rate controls. The latter occurrence paved the way for further growth in the eurocurrency markets, thus providing additional funds and further emphasising the openness of the economy.

The election of a Conservative government in 1979, resolved to implement the philosophy of `laissez-faire', saw the lifting of all remaining bank regulations in the 1981 Green Paper and the subsequent deregulation of other financial services. The resulting diversification of activities by the banking sector and the building societies produced problems of definition between competing institutions and assets. This was illustrated by the periodical alteration in the theoretical definitions of money and the subsequent utilisation of new definitions. These problems, intensified by technological advances, were particularly acute, given the government's preoccupation with monetary targetry. Consequently, the evolving nature of financial innovation has important implications for the effectiveness of government policy and should, therefore, be

explicitly modelled.

Chapter three analyses alternative monetary theories and their corresponding channels of influence. Firstly, alternative orthodox closed-economy monetary theories are pinpointed and their corresponding channels of influence, given an expansionary monetary policy, are analysed. In accordance with the evolution of macroeconomics and the vintage versions of the macroeconomic models, one begins with the analysis of the orthodox Keynesian `cost of capital' channel, whereby interest rates are the major linkage with the real economy and monetary policy is subordinate to fiscal policy. One then extends this analysis to include the effect on equities, as advocated by the neo-Keynesians, and also analyse alternative channels of influence. These alternative channels of credit availability, derived from the Radcliffe Report (1959), and various wealth effects are important linkages in most present day macroeconomic models, and are thus of paramount importance. Finally the section concludes with the analysis of the monetarist `black box' solution, as utilised in the "reduced form" models.

Secondly, the major aspects of the post-Keynesian doctrine are analysed, with particular reference to the endogeneity of the money supply, given the creation of credit-money. Entrepreneurs' `animal spirits' may induce an increase in ex ante investment, however to ensure this planned increase is realised, finance must be forthcoming. Consequently, the causality implied by the post-Keynesians is

that changes in the production process induce changes in the money supply and ultimately changes in output and employment. In this situation the money supply is endogeneous.

The acceptance of a totally endogenous money stock questions the validity of orthodox theories and the justification for monetary targetry (as discussed in chapter two). Given an endogenous money stock, a situation of an excess supply of money can never exist, since any excess will be used to reduce 'credit-money' liabilities. Consequently, post-Keynesians examine how changes in the production process affect `credit-money', given both an accommodating and non-accommodating policy, and conclude that the liquidity preference of the financial institutions are an important element in influencing the strength of a business cycle. A boom may be exacerbated by overconfidence, whilst a slump may be characterised by overcautiousness. Thus the availability constraint is the most important element in analysing the interaction between the real and monetary sectors. This constraint should therefore be highlighted in the PK model.

The analysis is then extented, in keeping with the realities of the UK economy, to examine the transmission mechanism of an open economy when an expansionary domestic monetary policy is undertaken. Three competing orthodox explanations of exchange rate determination are examined - the basic international monetary model (IMM), Dornbusch's `Keynesian' exchange rate dynamics (ERD) model and a portfolio balance model. These extensions produce similar

results to those advocated by the corresponding closed economy theory. The IMM envisages no real effect, whilst the ERD advocates a short term real effect, with a corresponding neutralisation in the long term. The portfolio balance theory analyses the short term effects on the capital account, but provides ambiguous conclusions about the real effect. The important point made by these theories is that the exchange rate provides another possible channel for the transmission mechanism.

Extending the post-Keynesian theory to analyse the openness of the economy provides a situation where additional sources of funds are available. This reduces the availability constraint and helps to further exacerbate the business cycle. Consequently, the openness of an economy provides increased instability.

The importance of this third chapter stems from the analysis of the debate on the endogeneity of the money supply and consequential influence money has upon the real sector. Orthodox theories, in advocating an exogenous money supply, emphasise the link from money to nominal income, as illustrated by the quantity theory. Conversely, the post-Keynesian, believing in the endogeneity of the money supply, emphasise the link from production to the creation of 'credit money'. These theories and linkages need to be comprehensively incorporated into the various macroeconomic models, if these models are to successfully mirror reality.

Chapter four constructs stylised versions of the four

monetary sectors under-review. These stylised models examine the major equations in the monetary sector, with particular reference to those playing a leading role in the transmission mechanism. All four models are examined in a similar way. After a short resumé of the historical development of the model, a detailed treatment of the major equations and identities is undertaken. Here one examines how the researchers incorporate the various aspects of both financial innovation and economic theory. Next the various channels of the transmission mechanism are explored, with particular reference to the theoretical channels discussed in chapter three. Finally, each section ends with a summary of the major characteristics of the model.

The HMT model, the UK's largest quarterly model, pays particular attention to the modelling of the non-bank financial institutions (NBFIs) as well as banks. This interest stems from the general portfolio nature of the model, whereby the non-bank private sector's (NBPS's) wealth is allocated between the various assets and liabilities. Various monetary linkages, including the `Radcliffian' liquidity effect, are incorporated in the components of aggregate demand, in particular consumption and investment. A general portfolio model also forms the basis for the LBS model, though the additional behavioural assumption of optimisation is utilised. In this latter model, such detailed modelling of the flow-of-funds stems from a preoccupation with monetary policy, demonstrated by a wide

range of monetary instruments. The monetary linkages modelled predominately exert pressure on the real economy via the consumption function. Given the general portfolio framework of the model, the most important influence is the wealth revaluation effect.

In the remaining two models, the portfolio choice, based upon two identities, is much less exhaustive. The NIESR model, in keeping with the Keynesian tradition, de-emphasises the importance of monetary policy and concerns itself with quantity-adjustment instead. Although various monetary linkages are captured, their influence is minimal. The PK model, given its concern with empirically verifying the post-Keynesian doctrine, concentrates on the endogeneity of the money supply, the non-ergodic formulation of expectations, historical time and the importance of contracts and their corresponding institutions. The availability effect, in terms of any possible constraint on bank lending, is central to the whole sector.

Chapter five links together the three preceding chapters to evaluate and compare how the four models construct a monetary sector. The criteria utilised here can be divided into two distinct categories - financial innovation and economic theory.

The possible role of financial innovation, comprehensively discussed in chapter two, in macroeconomic models can be sub-divided into three aspects. Firstly, one examines how the four macroeconomic models incorporate the

roles of the various types of financial institutions, and their subsequent effect on monetary aggregates. The acceptability of NBFI's liabilities as possible means of credit implies that their role, as well as that of the banking sector, in the creation of credit and implication for monetary aggregates has to be comprehensively modelled. Secondly, one analyses how the implementation and removal of monetary controls, by affecting both the supply of and the demand for money and ultimately the real economy, are captured. Thirdly, technological advances, by lowering settlement cost, influence money demand and are thus examined.

The second category analyses the theoretical foundations, pinpointed in chapter three, with particular reference to the transmission mechanism. Firstly, the general framework of the models are compared, to establish the alternative assets and liabilities. This establishes the underlying theoretical background of the sectors and the range of assets and liabilities modelled. One then analyses the various theories utilised to determine the demand for money, interest rates and the exchange rate. The endogeneity element of the money supply is also analysed, given its importance in the direction of causality in the quantity theory, and the controversial role of expectations. Finally, the various financial linkages utilised are evaluated in terms of the theoretical linkages and compared. This involves examining the role of interest rates, wealth, credit

availability and the exchange rate.

Chapter six concludes the study, by attempting to evaluate these models in terms of how adequately they encapsulate the main features of the monetary sector, utilising the above criteria.

Endnotes

1) Such models are relatively small scaled and are usually referred to as the "reduced form" approach. However, most of the equations in these models do not represent the true reduced forms of any structural model. Consequently such a label is somewhat inappropriate (Thompson, 1984).

CHAPTER TWO: MONETARY BACKGROUND - THE UK ECONOMY

I) INTRODUCTION

Early versions of macroeconomic models were characterised by their cursory treatment of monetary matters, with the most sophisticated of them perhaps including a demand-for-money equation. However, in recent years, a change in emphasis has led to most models developing a large and comprehensive monetary sector. This dramatic turnaround in model construction is due, in part[1], to the rapid evolution of financial innovation and its effect, via bank lending, on monetary aggregates. In fact, large-scale financial innovation has been cited as one possible reason for the apparent erosion of the previously proposed stable relationship between certain monetary aggregates and nominal income (Goodhart, 1986).

To comprehensively establish, in chapter five, whether or not, these newly-constructed monetary sectors are adequately modelling the realities of financial evolution, as particularly applicable to the clearing banks, all major innovations in this area, and their subsequent effect on monetary control, will be discussed below. This analysis pinpoints the continually changing nature of financial innovation, which poses problems for macroeconomic modelling, given that one of the major aims of macroeconomic model building is to reflect reality.

Basically, this chapter will be sub-divided into five distinct periods, thus emphasising the changing attitudes of the monetary authorities to monetary control. Firstly, section two, examines the late fifties in terms of the contribution made by the Radcliffe Committee's report (1959) and its subsequent effect, or otherwise, on monetary thought. Secondly, section three will consider the pre-CCC era, from 1960 onwards, where strict quantitative regulations, aimed at controlling credit, were imposed on clearing banks. During this period the fundamental structure of the financial sector was dramatically altered, with the rapid growth of various unregulated markets, encouraged by the uncompetitiveness of the clearing banks. This changing environment, biased towards competition, gave rise to the imposition of reforms, as demonstrated in section four, which, though still concerned with credit, nudged towards the imposition of monetary control. These reforms were intended to place the clearing banks on equal footing with other financial intermedaries, by implementing uniform restrictions. In this section, the effect of CCC on altering clearing banks activities from traditionally "asset management" to predominantly "liability management" will be specifically examined. Following on from this, section five discusses the period immediately after the introduction of CCC and the subsequent introduction of other controls, particularly the "corset", intended to counteract the explosive effects caused by deregulation. This section will examine the major financial innovations that took place

up until 1981, when further reforms, aimed at concluding the deregulation, were imposed by the Conservative Government (1979).

Section six examines those measures advocated by the Green Paper (1981) as a means of producing a more competitive environment, and the consequences of their subsequent imposition. This desire for a more competitive environment has been promoted further by the subsequent deregulation of two other sections of the financial sector. Firstly, in 1983, deregulation for building societies took place thus blurring the definition between clearing banks and building societies and rendering the formal definitions of monetary aggregates obsolete. Then in 1986, the "Big Bang" occurred, whereby the stock market altered its rules to become more cost effective, thus more able to fight against international competition. This increased cost effectiveness has also occurred in the banking sector, where the increased use of technology has led to lower settlement costs and the subsequent emergence of interest-bearing sight deposits. This practice further emphasises the blurred distinction occurring between monetary aggregates, though this time from the viewpoint of alternative types of deposits. This blurred distinction pinpoints one of the problems associated with monetary targetry, as discussed in section seven. This section will examine the Conservative party's monetary policy, as postulated by the Medium Term Financial Strategy (MTFS) at the beginning of this decade, and its subsequent

demise.

Finally, the chapter will conclude with a summary of the most important of these financial events. This will be followed by an attempt to tackle the question of whether, or not, modelling the monetary sector is possible, given the rapid pace of financial innovation. The viability of modelling such a sector along with the extent this has been taken on board by the four models under-review will be discussed in chapter five.

II) THE RADCLIFFE REPORT

The Radcliffe Committee was appointed in May 1957 by Thorneycroft, "to inquire into the workings of the monetary and credit system and to make recommendations". Inquire it did, but the final report, published in 1959 (Radcliffe, 1959), had few concrete recommendations to make. Amongst those advocated were: the regular publication of financial statistics; more research to be undertaken into the interrelationship between monetary aggregates; and the co-ordination of policies between the Treasury and the Bank of England. These recommendations, to varying degrees, have since been undertaken. However, the major issue that emerged from the Radcliffe Committee's findings was the rejection of orthodox monetary theories, exemplified by three rebuts.

Firstly, the committee rejected control of the money supply as too narrow an objective, since spending decisions

depend upon the availability of liquidity, not just money. "[S]pending is not limited by the amount of money in existence; ...it is related to the amount of money people think they can get hold of" (1959, p.133). Instead the report advocated liquidity control, though omitted to adequately define such a concept. This led them to advocate an alternative transmission mechanism, whereby high interest rates restrict the availability of liquidity and thus dampen demand for expenditure. Therefore, the primary function of the Central Bank should be to control interest rates.

Secondly, the committee rejected the use of direct controls on bank lending, except in emergency conditions, again inadequately defined. The rationale for this stemmed from the redistributional effects of such controls, as demonstrated by the growth of the secondary banking sector in the sixties, and the disincentive to innovate.

Thirdly, the committee could find no reason for supposing, as postulated by the Keynesians, that an upper limit existed for the velocity of circulation. "[W]e cannot find any reason for supposing, nor any experience in monetary history indicating, that there is any limit to the velocity of circulation..."(p391). Such an assertion repudiates the quantity theory and thus the basis of monetarism.

The major fault of the report was that, although it was pessimistic about the state of monetary policy, it was unable to offer any solutions to the problem. Rousseas (1985, p.47) critises the Radcliffe committee for exhibiting "a monumental

failure of nerve". Perhaps liquidity is to be controlled, now that PSL2[2] has been advocated as a possible target variable, though most of the other targets are for narrower definitions of money. Direct controls have been removed, though it took over a decade for anything to be achieved. However, the supposition that the velocity of circulation is stable remains.

The Radcliffe Report's conclusions have been ignored by the mainstream economists, who merrily go on their way examining the exogenous money supply. However, the growing band of post-Keynesians have acknowledged the report and utilise many of its ideas into their analysis (see chapter three).

III) THE PRE-CCC ERA

In the UK during the fifties and sixties, clearing banks were all members of a cartelised oligopoly. Interest rates were set by collective agreement, for example, the 7-day deposit rate was fixed at the Bank rate[3] minus 2%, whilst lending rates were roughly set at 2% above. These restrictive practices meant that interbank competition could only take place in terms of non-price factors, such as banks increasing the size of their branch network to become more convenient. Such practices were later criticised by the Monopolies Commission Report (1968) as being an inefficient use of resources. Clearing banks were also compelled to hold

certain reserve asset ratios, namely a mandatory 8% cash[4] and a minimum of 28% liquidity[5]. This latter ratio was administered to limit the ability of the banks to create credit, whilst the role of the former was more ambiguous given that the Bank of England accommodated all demands for cash. Consequently, these legal constraints led, in the mid-sixties, to large scale disintermediation, depicted by the rapid growth in the unregulated secondary banking sector, where price competition became a major growth factor. This reflects the Radcliffe Report's (1959) proposition that controlling any one particular set of financial institutions merely results in that group losing business to its competitors.

Secondary banks undertook activities that clearing banks were unable to participate in, namely the buying and selling of wholesale deposits in parallel markets. This growth area heralded a major structural change in banking practices, leading to the innovation of alternative money market instruments. For example, negotiable sterling Certificates of Deposits (CDs) were introduced in 1968, following the amendment of the Exchange Control Act. The issuing of CDs, usually of three months maturity, allowed banks to utilise funds available from large organisations on an unsecured basis. This helped solve problems of liquidity, caused by changing financial conditions and sudden withdrawals.

By the late sixties most clearing banks were indirectly

participating in wholesale markets through their various subsidiaries. This meant that they gained the expertise in these markets and thus could immediately compete with the secondary banks after deregulation.

Euromarkets

One very important group that blossomed in the late fifties were the eurocurrency markets, with the largest being the eurodollar market[6] (Podolski, 1986). London proved to be a major centre for these markets due to its traditional standing as a financial centre and its relative freedom from regulations for foreign banks. In fact, it was not until the Banking Act (1979) that there was any legal prohibition for setting up a banking enterprise in Britain (Podolski, 1986).

Unlike the UK clearing banks, euromarkets had no Central Bank to regulate their activities and thus by matching the maturity of their assets and liabilities could hold minimal reserve assets and operate on a very fine margin between deposit and lending rates. Thus, their major function was to lower the brokerage cost of intermediation, leading to highly flexible markets which proved to be very effective for transferring funds across national boundaries. These markets became highly interdependent and very responsive to any market pressure, as defined by the theoretical concept of a perfectly competitive market.

Although the growth of euromarkets was predominantly due to the restrictions imposed on internal banks, the

growing need for international funds also played a significant part. The rapid increase in output and international trade, a spillover effect from the post-war boom of recovery, coupled with the fixed exchange rate regime meant that many countries were faced with a liquidity shortage and therefore turned instead towards international sources. Thus the growth in international banking was seen as a counterpart to the general increase in the growth of the "real" economy. However, the setting up of eurobanks did lead to problems of disintermediation, especially after the exchange controls were lifted in 1979, and had a subsequent effect on the autonomy of monetary control. For example, an expansionary monetary policy, by lowering interest rates and inducing an incipient capital inflow, could be rendered ineffective.

Credit control

During the sixties concern centred on credit control, with monetary instruments predominantly taking the form of quantitative controls imposed on the level of bank lending, in terms of hire purchase (HP) credit controls and lending ceilings. The former, levied on either the minimum down-payment or the maximum period of repayment, proved to be very effective in reducing demand and limiting credit. However, these effects were polarised on certain areas, namely consumer durables, and as such were undesirable. Empirical evidence for their demise was forthcoming from the

recommendations supplied by the Crowther Committee's Report (1971). Similarly, although lending ceilings were successful, they discriminated against clearing banks, by implicitly imposing a tax on lending, leading to possible credit misallocation. This, then, stunted the clearing banks growth and further paved the way for the growth of other financial institutions.

Another monetary instrument introduced in 1958, and remaining intermittently in force throughout the sixties and seventies, was the use of special deposits. These deposits, yielding low interest rates, were held by the Bank of England in special accounts, as an additional requirement to the reserve ratios. The major aim of these, particularly during the seventies, was to lower the liquidity of the banking sector, without incurring large interest rate rises.

The stability of interest rates, particularly on government securities, was the other major concern of monetary policy in the sixties. This policy, which sometimes involved "leaning into the wind" to iron out large price fluctuations, was advocated on the assumption that stable interest rates were a prerequisite for maximising sales of governmental debt (Goodhart, 1984). However, the cost of such policy was loss of control of the money supply. Thus monetary policy was forced to change direction with the implementation of monetary targets in 1968 (see section VII).

IV) CCC

The inefficiences and distortions caused by monetary policy during the fifties and sixties were clearly a cause of concern, as can be illustrated by various reports undertaken during this period. One such report by the Prices and Incomes Board (1967) advocated a more competitive system. Similarly, the Monopolies Commission Report (1968), which rejected a possible merger between Barclays, Lloyds and Martins, drew attention to the lack of price competition and the inefficiencies caused by non-price oligopolistic competition.

Whatever reforms were advocated consensus stated that the major objective was to increase competition. Thus given tnat some form of policy was obviously needed to obtain uniformity in all financial markets, Competition and Credit Control (CCC) was introduced in September 1971.

The aims of Competition and Credit Control were threefold (Hall, M., 1983): firstly, to increase interbank competition, by placing all financial institutions on an equal footing; secondly, to increase the ability of the authorities to control the money supply, through interest rates; and thirdly, to improve the regulatory system of the financial sector. With this policy, it was hoped that the allocation of credit would be primarily determined by cost, using the market mechanism of interest rates, leading to the most efficient allocation of resources. Thus credit still

remained the most important consideration, though monetary control was acknowledged.

Major reforms emerged from the implementation of CCC. Firstly, the interest rate cartel was abolished, leaving interest rates to be dictated by market forces. This allowed clearing banks to participate in a whole range of banking activities, previously restricted to their subsidiaries. Secondly, the second-best option of a balance-sheet ratio, imposed on all private sector banks and near-banks was implemented, with the old ratios discontinued. This new eligible reserve asset[7] ratio was appliciable to all eligible liabilities[8] and stood at 12.5%, though it was reduced to 10% for Discount Houses. Similarly the cash ratio, applicable to London clearing banks only, was reduced to 1.5% of the reserve asset requirement, held in the form of non-interest bearing balances. These ratios had the added advantage of variability, given the supplementation of the special deposit scheme, utilised to "mop-up" any excess liquidity (Cuthbertson, 1985c). Finally quantitative bank lending controls were suspended, with the safety-net of qualitative lending guidelines available, if the circumstances warranted them.

Liability Management

Given that clearing banks were now given complete access to wholesale markets, they could participate in 'liability management' to a greater extent. This meant that

instead of the existing volume of bank deposits and liabilities determining the volume of assets (the standard textbook interpretation of 'asset management'), banks could attempt to adjust their liabilities in proportion to their desired volume of assets ('liability management'). Thus banks could first meet the demand and then supply the appropriate resources afterwards.

Banks could increase their liabilities in a number of ways, the major ones being (Zawadski, 1981):- borrowing from the interbank market; issuing their own CDs; borrowing from large depositors (£50,000 plus), at an individually set fixed period and interest rate; or borrowing from other banks, either through repayment of interbank loans or by selling their CDs. Whatever method was utilized an appropriate inducement had to be offered, i.e. higher interest rates.

For an individual bank to use liability management successfully, the margin between the lending rate of the new advances and the higher interest rate needed to attract additional deposits must be large enough to cover any costs or risks incurred. Such a situation occured during the period immediately after the introduction of CCC, when large-scale opportunities for 'round-tripping'[9] resulted in the cosmetic swelling of the money supply figures. During this period, a large positive margin existed between borrowing and lending rates. Interest rates on CDs were relatively high, due to the intense competition for limited resources, whilst lending rates were "sticky", since they

were tied to the base rate/MLR, which in turn was influenced by the general market conditions.

Provided that some rigidities remain in the system `round tripping' is always possible, as characterised by the intermittent occurrence, to a smaller extent, of `round tripping' during the preceding decade. The realisation of this, formed part of the rationale for the further reforms that took place at the beginning of this decade (Podolski, 1986).

Summary

The CCC reforms did lead to increased competition and interdependence of the financial sector and from the point-of-view of allocative efficiency this was an improvement. However, it also brought increased problems of liquidity and financial stability. This was highlighted by the secondary banking crisis in 1973/74, which occurred because of their rapid growth and reliance on obtaining funds from the money markets and as such has been heralded as the first casualty of 'liability management' in the UK (Podolski, 1986). Fortunately, the crisis was prevented from spreading to the remainder of the banking sector by the quick rescue actions of other banks, under the direction of the Bank of England, known as the "lifeboat"[10] (Podolski, 1986). The danger of financial crisis always looms if banks are not adequately constrained, and in the present climate a crisis is now likely to be devastating, as banks are not only

interdependent nationally, but internationally as well. A recent example of this problem of interdependence occurred in October 1987, when all major stock markets experienced a devasting fall in their share prices, leading to million of pounds/yen/dollars being lost.

V) POST-CCC ERA

Between September 1971 and December 1973, the UK saw a massive increase in its money supply and bank lending figures. During 1973 alone, bank lending to the private sector (BLP) grew by 33% and sterling M3[11] grew by 28% (BEQB, 1982). This occurred because of a number of reasons: reintermediation; the widespread use of "liability management"; interest rate arbitrage (`round tripping'); and the pent-up demand for bank lending[12], caused by the former controls. Concern grew over these dramatic increases, and a reappraisal of CCC became necessary, resulting primarily in the introduction of the Supplementary Special Deposit Scheme (SSDs), or the "corset" as it became known, in December 1973.

The supplementary special deposit scheme (SSDs)

The 'corset' went against the vein of CCC policies, as it was designed to bring about a speedy end to the monetary growth by direct quantitative controls, thereby dampening interbank competition. The authorities dictated a prescribed rate of growth[13] for banks' interest bearing eligible

liabilities (IBELs), if this growth was higher, banks were penalised by a progressive, incremental tax. This scheme was intended to be more flexible than previously used controls, as the authorities could change the base period or growth rates. Also it was designed to operate for short periods only with as little impact as possible on the structure of financial markets. Unlike previous regimes, control was placed on the liability side of the banks' balance sheet rather than the asset side. This partly reflected the shift in emphasis from credit control towards monetary control whereby the prevention of credit expansion was not the major aim (Spencer, 1986).

Basically, the 'corset' was designed to drive a wedge between the marginal cost of resources (i.e. the wholesale deposit rate) and the marginal revenue from the loans (i.e. the rate on advances), thereby making 'liability management' less profitable and reducing competition for deposits. A subsidiary advantage of the scheme was that artifically low interest rates would encourage sales of public sector debt, thus assisting in controlling the money supply. However, the scheme was criticised because it penalised the more efficient, faster growing banks, whilst cushioning those less efficient. Also, the previous problem of discrimination against the clearing banks was again encountered.

Further problems arose with the implementation of the corset (Cuthbertson, 1985b; Zawadski, 1981). Banks could evade penalties by transferring business to subsidiaries or

utilising the commercial bill market[14], thus resulting in the distortion of monetary aggregates. Or, since banks were given prior warnings about the implementation of SSDs they could build up their deposits beforehand. Some banks were even willing to remain in the penalty area and pay for it, due to the massive abnormal profits they were earning. In fact, significant penalties only occurred when the system as a whole was under reserve asset pressure. However, between early 1974 and mid-1976, there was a dramatic fall in the growth of real bank borrowing (Spencer, 1986). This fall was partly due to the corset, but increased disintermediation, resulting from the secondary bank crisis, coupled with the mounting recession[15] were also contributory factors.

The 'corset' was activated three times in the period 1973 to 1980, firstly in December 1973 to February 1975, next in November 1976 to August 1977, and finally in June 1978 to June 1980 (BEQB, 1982). Its final demise occured because of the abolition of all exchange rate controls in October 1979, encouraged by Britain's EEC commitments, which led to large-scale disintermediation in to offshore markets. These removals also paved the way for further financial innovations (see section VI).

The removal of the `corset' had adverse effects on monetary aggregates. During its implementation the money supply figures were kept artificially low (Podolski, 1986) especially after the exchange controls were lifted. However, its demise, by partly causing reintermediation and partly by

new intermediation, distorted the true rate of growth upwards.

Other reforms

In conjunction with the `corset' and the stepping-up of calls for special deposits, other minor controls were also introduced, to help curb the level of bank lending. Firstly, beginning in 1972, various "requests" of a qualitative nature were announced by the authorities. These usually took the form of constraining bank lending to both the personal sector and property companies, whilst activily encouraging lending to those in manufacturing. Although such guidelines were acknowledged as a possible safety-net under the terms of the CCC, the actual outturn of twelve such "requests" was much larger than envisaged by its advocates.

The CCC reforms were further undermined in 1973 by the imposition of interest rate ceilings in September and the reintroduction of hire purchase controls in December. The former restriction, applicable to all deposits under £10,000, was similar to the American "Regulation Q", though only remained in operation until February 1975 (Dennis, 1981).

In this period, three other important monetary changes took place, which will be noted here for completeness. Firstly, sterling was floated in June 1972, thus partly releasing monetary policy from external objectives. However, this exchange rate regime has been dogged by, at least, partial intervention and as such does not always adhere to

the theoretical model postulated in chapter three. Secondly, the character and name of the pivotal Bank Rate changed, thus clearly removing the rigid link between changes in the Bank Rate and other interest rates. Installed instead was a more flexible alternative, whereby banks' base rates were merely related to the Minimum Lending Rate (MLR), introduced in October 1972. This rate, calculated by the formula of the Treasury Bill rate plus 0.5% (to the nearest 0.25%), was intended to follow, rather than lead, other interest rates. However, the authorities had the discretionary power to override the formula, thus indicating their intentions on economic activities, and did so on numerous occasions from November 1973 onwards. Finally in May 1978 the indefinite suspension of the formula was announced, reflecting the impossiblity, given such large fluctuations, of the MLR to always follow market conditions.

Thirdly, the monumental change away from credit control to monetary targetry occurred in 1976. However, the analysis of this event and that of the subsequent adoption of a monetarist strategy will be left until section VII.

VI) FURTHER REFORMS AND TECHNOLOGICAL INNOVATIONS

Britain entered the eighties under a new regime of free enterprise and competitiveness. Thus, not surprisingly, legislation was quickly brought in to remove the remaining restrictive measures levied on banks, leading to a further

increased usage of the wholesale markets. Competitiveness was further encouraged by the relaxation of stringent measures aimed at other financial institutions and the stock market. Such a procedure formed the rationale for the change, in November 1981, of definition, used as a basis for defining the various aggregates of "money", from the "banking sector"[16] to the wider encapsulating "monetary sector"[17].

1981 Green Paper

The second wave of liberalising reforms arrived with a Green Paper, implemented in August 1981, thus removing all measures still left by the CCC (Artis, 1984). Such reforms (see below) were seen as a major step towards monetary base control, with the role of the Bank of England being reduced to supervisional.

These reforms involved the abolition of the 12.5% reserve asset ratio, a previous tax on lending, and the lowering of the cash ratio to 0.5%, now used to pay for the clearing bank services at the Central Bank (Cuthbertson, 1985c). This set-up allows banks to arrange their portfolio, in such a way, as to maximise their individual profits, though they are still expected to keep some undisclosed reserve requirement for prudential reasons. Such a policy, allowing greater freedom, should lead to less cause for disintermediation, when faced with monetary control. The decision was also made to forego the announcement of the MLR, thereby depoliticizing changes in interest rates

(Cuthbertson, 1985c), though government intervention is still likely to take place, under the guise of market forces. At the short end of the market, the Central Bank was given the power to intervene to keep very short term interest rates within unpublished "bands", thus acknowledging still the importance of interest rate control. Finally, additional statistics[18] were to be collected and made available to the public. This latter move stemmed from the growing problems associated with the need for an accurate definition of the money supply, especially for transactionary purposes. As financial innovation and liberalisation increase, then more financial institutions and alternative assets affect the money supply figures, thus the old aggregates become more unreliable. This problem has been further highlighted by the periodical alteration in definition of the more established monetary aggregates.

The result of these reforms and others specifically aimed at building societies, coupled with the political environment, led to a fundamental change in competition between banks and building societies, and between building societies themselves (Podolski, 1986). Banks needed to become more aggressive to fight this competition, leading to a diversification of activities, highlighted by the banks competitively entering the residental mortgage market[19], which had a significant expansionary effect on monetary aggregates, at a time when they were constrained by the MTFS. In this situation, problems are likely to arise due to the

conflict between profitability and liquidity. Previously, bank loans were predominantly short or medium term, yet now they encounter the problems associated with lending for longer periods.

Competition has not been confined to lending activities only. Banks have needed to become more competitive in deposit markets to obtain funds to finance these increasing loans. This has manifested itself into more attractive personal sector liquid assets. Only recently has Midland Bank announced the introduction of "Vector", their new interest-bearing current account. Though such an account, intended for those on high incomes, does have the disadvantage of implicit bank charges.

A recent occurrence has been the shift away from intermediation towards "securitization", encouraged by the Less Developed Countries (LDC) debt crisis in 1982. The possible margin, and thus profits, now available between deposit and lending rates has shrunk as competition heightens. Therefore banks have moved away from the business of intermediation, which is characterised by high volumes and low margins towards the greater safety and large capital ratios available with securitization (Goodhart, 1986).

Building societies

In the late seventies and early eighties, building societies have undergone a major metamorphosis, as old legislation[20] has been removed and new technology has been

introduced, thus giving them increased independence. This has led to a major change in their mode of business. Gone are the days when building societies were only seen as a source of mortgage finance. Now building societies, like banks, participate in a whole range of banking activities. Various types of account are now available to customers, the most important being chequable interest-bearing sight deposits, resulting in the traditional distinction between current and saving accounts becoming blurred. Also, since 1979, building societies have participated in the wholesale market, with permission granted to issue their own CDs in 1983 and entrance into the eurobond market in October 1985. This has led to the adoption, to a limited extent, of 'liability management' (Temperton, 1986). Thus, the distinction between banks and building societies has also become blurred, reiterating the problem of defining "money".

The "Big Bang"

The lifting of exchange controls in 1979, coupled with the rapid improvement in technology, facilitated an environment of increased globalisation of financial services. Thus national services had to become more competitive to successfully compete internationally. However, the former restrictive rules applicable to the stock market were not congenial to such an environment and thus had to be revised.

Stimulus for this revisal occurred in July 1983, when the government decreed that the Stock Exchange was exempt

from the Restrictive Practices Act, conditional on the abolition of the minimum commission by the end of 1986. The acceptance of this agreement implied that a dual capacity dealing system would have to be introduced and the ownership rules would subsequently have to be amended. All these reforms cumulated in the "Big Bang" on 27 October 1986.

The first major development occurred on March 1 1986, with a change in the ownership rules. Previously, new entrants could only own up to 29.9% of an existing member's firm, which limited the Market's access to outside capital and prevented the development of capital intense activities (BEQB, 1985). Now outsiders were permitted to own 100%, thus inducing a substantial inflow of new capital. This lowering of the barriers to entry completely altered the whole composition of the Market, now characterised by internationally-owned conglomorates, designed to undertake all financial services, and thus leading to possible problems of conflicting interests.

The other two major developments occurred in October, when the dual capacity trading was introduced, thus abolishing the former distinction between brokers and jobbers and minimum commissions were superceded by variables rates. These reforms, aided by the installation of the latest technology and the Stock Exchange automated quotations (SEAQ) system, led to a more competitive environment with lower transactions costs. Confidence in the "new" Market was demonstrated by more people, encouraged by privatisation,

being prepared to buy shares and the bulk of the business moving away from the exchange floor to the dealing rooms. However, this increased interdependence has not occurred without risks, as exemplified by the Stock Market crash.

Technological innovation

Financial innovation, coupled with the adverse effect of high and volatile inflation, has paved the way for increased utilisation of technology, demonstrated by the rapid installation of automated teller machines (ATMs) and cash dispensers. This increased utilisation of technology, by changing the nature and cost of the payment system, has, in turn, led to financial innovation.

Banking has been traditionally seen as a labour-intensive industry, and as such, liable to high costs. Technology, although perhaps initially expensive, quickly reaps economies of scale. Thus, the increased use of computers in retail banking, particularly in the clearing system, has led to a fall in the cost of intermediation. These falling costs have then encouraged banks to increase their supply of intermediation facilities, depicted by the growing availability of alternative assets.

Greater competition, encouraged by lower entry costs[21], has meant that more deposits now have to carry some form of interest incentive. This practice has signficantly altered the composition of the personal sector's portfolios. The demand for the traditional non-interest bearing sight

deposit, and for cash, has fallen, with the demand for interest-bearing alternatives increasing. Such an eventuality has meant that the traditional definition of M1 has become less responsive to general interest rate changes. Furthermore, now that the source of many of these interest-bearing deposits are not clearing banks, the applicability of such an aggregate is questionable.

The eighties have become very much the decade of "plastic banking", with the flexibility of "loans" from credit cards and the adaptability of ATMs to banking activities. The important conclusion that arises from this evolution is that the transmission cost of switching between assets has dramatically fallen. Thus instability of demand for various aggregates has increased, whilst the distinction between assets becomes blurred.

VII) MONETARY TARGETS

Monetary targets were introduced in the UK during the late sixties. However, these targets[22], aimed at the level of domestic credit expansion (DCE)[23], were an isolated incident, brought about by the inclusion of the International Monetary Fund (IMF) as a lender of finance, after sterling's devaluation in November 1967. The more widely acceptable origin of monetary targets occurred in 1976, under the Labour administration of Harold Wilson. Such an occurrence heralded the true beginning of monetary control and with it the

gradual alteration in relative importance attributed to fiscal and monetary policies.

In the April budget of 1976, the then Chancellor of the Exchequer, Denis Healey, suggested that monetary growth (M3) should be linked with the growth of gross domestic product (GDP). Such a policy was designed to help support the Incomes Policy, introduced in the autumn of the previous year. This suggestion was quantified in July as a 12% target on monetary growth during the 1976/77 financial year. However, the formal establishment of monetary targets actually took place in December. Strict monetary control was required by the IMF in exchange for their stand-by credit of $3.9bn, needed to boost the sagging pound. Thus, 1977 began with the exchange rate rallying round and the monetary authorities entering a regime of published monetary targets.

At first, DCE and M3 were included as the major target variables, in keeping with the wishes of the IMF. However, these were soon superseded by sterling M3 (£M3), and the subsequent inclusion of other aggregates (see table 2.1).

The medium term finacial strategy

The dramatic shift in emphasis during the late seventies towards money supply control was further encouraged by disillusionment with demand-management policies, cumulated by the experience of high and volatile inflation, and the acceptance of a stable causal link between the growth in the

TABLE 2.1

Monetary Targets and Outturns

Date	Target		Outturn	
February 1980/February 1981		7-11		19.4
February 1981/April 1982		6-10		13.0
February 1982/April 1983		8-12	M1:	12.1
			£M3:	11.1
			PSL2:	11.0
February 1983/April 1984		7-11	M0:	5.7
			M1:	14.0
			£M3:	9.5
			PSL2:	12.6
February 1984/April 1985	£M3	6-10		9.5
	M0	4-8		5.5
February 1985/February 1986	£M3	5-9		9.5
	M0	3-7		5.5
June 1986/June 1987	M0	2-6		4.2

Source: Bank of England

money supply and the rate of inflation. This direct link, assumed to be influenced by economic agents expectations, and the destabilising arguments[24] against discretionary monetary policy, formed the rationale for the Conservative government's intermediate gradualist policy measures, as formalised in the budget of March 1980, under the title of the medium term financial strategy (MTFS). Basically, these measures consisted of two objectives:- to progressively lower the growth of the money supply; and to lower the public sector borrowing requirement (PSBR) as a proportion of GDP. These objectives were designed to influence peoples' expectations of increases in wages and prices through stable monetary growth, and to limit the expenditure on goods and services by government, thus preventing the "crowding-out" of private investment, leading finally to lower inflation, the major objective of government policy. In this context, fiscal policy, forbidden from performing its usual role of automatic stabiliser for output and employment, had become subordinate to monetary policy, a complete reversal of traditional economic policy. Once inflation was controlled, it was hoped that increased confidence in the economy and the use of measures[25] aimed at strengthening the supply-side of the economy, would lead to a substantial growth in output and employment

The original monetary target was £M3. This was chosen because of adequate empirical evidence on its performance and its previous stability with nominal income and interest

rates. Also, the direct arithmetic relationship with certain key counterparts of credit (see equation 2.7.1), used as a basis for control, was important.

$$£M3 = PSBR - \Delta B + \Delta BLP + EF - \Delta NDL \qquad (2.7.1)$$

where:

£M3 = changes in sterling M3

PSBR = public sector borrowing requirement

B = purchases of public sector debt by the NBPS

BLP = changes in sterling bank lending to the UK private sector

EF = net external and foreign currency counterparts

NDL = change in non-deposit liabilities

However since 1980, the emphasis of the MTFS has changed direction. For example in the 1984/85 financial year the ultimate objective of the MTFS was centred on stable prices with lower interest rates. Thus concern had once again turned towards interest rates.

Furthermore other monetary aggregates became targets as the financial environment changed and £M3 appeared not to be the best indicator of economic conditions, depicted by its continual overshooting of targets (see table 2.1 for precise details), which led to its suspension in October 1985. For example, in 1982, multiple monetary target ranges were announced, for £M3, M1[26] and PSL2, yet the use of multiple targets may yield conflicting signals. By 1985, the emphasis had moved to the narrower monetary aggregate, MO, which was at first given equal weight to £M3 in assesssing monetary

conditions and then became the major target after £M3's demise. This elevation of such a short-lived aggregate to a monetary target was activily encouraged by both Johnston's (1984) econometric study on the transactions demand for various narrow aggregates and by the increased interest in monetary base control. The study just referred to indicated that a stable relationship existed between the monetary base, nominal income and interest rates.

Criticisms of monetary targets

The continual use of monetary targetry for over a decade has not occurred without its critics. The inflation rate in the UK, though still higher than many countries, has been kept under control for most of the eighties. However, this has been achieved at the cost of high unemployment, both in terms of labour and other factors of production, and loss of output.

Some critics scoff at Mrs. Thatcher's claim that her policies have been the cause of such price decreases and cite other arguments[27], apart from high unemployment, as the actual cause. These arguments, which predominantly involve the dramatic fall in the price of raw materials and the subsequent revival of the world economy, mainly rest on the contention that the continual overshooting of target ranges and their subsequent revision upwards, imply that monetary targetry has not been at all successful. Numerous reasons why monetary targetry has not succeeded have been advocated,

with the major ones discussed below. These include the problems of theoretical justification, controlability and suitability. Particular concern here falls on the apparant complete failure of any attempt to control £M3, with M0 and the PSBR receiving secondary attention.

Examining first the theoretical underpinnings behind money supply control, monetarists postulate a stable relationship between changes in money and nominal income. The New Classical school believes that, given the formulation of rational expectations, the effect on prices is instantaneous, whilst the orthodox gradualists school indicate that the full effect will fall completely on prices after a two year time lag. This beliefs bring into contention a number of suppositions, which will be examined in turn.

Firstly, one can question the whole stability of the demand-for-money function. Even before targetry for £M3 had been announced, its demand function had shown signs of instability, associated with the changing environment occurring after the introduction of CCC. Since then a major controversy has raged on this question of stability for many of the broad monetary aggregates. In terms of the narrow aggregate, M0, the apparant recent stability of its demand function has been cited as the major reason for its use. However, the utilisation of M0, an aggregate consisting predominantly of currency as a monetary target, has been criticised in that it appears irrelevant for controlling both the broader money supply and other macroeconomic variables

(Podolski, 1986, p.92).

Secondly, the direction of causality of the relationship is questioned. Some economists argue that changes in nominal income cause the money supply to change, citing the demand-determined nature of the money supply (i.e. its endogeneity) as their major argument (see chapter three for more details). Related to this the mystic two year time lag of the gradualists comes under attack. This assertion is usually demonstrated by the gigantic increase in the money supply during 1972/73 "causing" the near hyper-inflation in 1974/75. However, this was a unique occurrence, dictated by coincidence. The former increase was affected by the introduction of the CCC, whilst the latter was influenced by the oil crisis. Davidson and Weintraub (1973) warn against this possibility of attributing changes in economic variables to changes in the money supply, rather than extraneous events and then imputing causality[28]. Kaldor (1982) then follows this argument by citing other periods in the UK's history where no such lag exists and also other countries where the so-called time lag cannot be established.

Another problem associated with the endogeneity of the money supply is the question of controlability. This can be demonstrated by the continued overshooting of various aggregates, especially £M3, as shown in table 2.1. One must, however, acknowledge the fact that certain unusual events, such as the entrance of banks into the mortgage market and the demise of the SSDs, have caused the figures to be

slightly distorted. This distortion is further emphasised by "Goodhart's Law" (Goodhart, 1981), which states that any attempt by the authorities to control one particular aggregate will merely result in the financial system creating new substitutes. These substitutes will so greatly affect the demand and supply of the original aggregate that its behaviour will no longer reflect the course of banking business.

If one accepts the New Classical school explanation, then the formulation of rational expectations requires the continuity of a specified policy action. Such formulation has been continually undermined by the periodical revision upwards of monetary targets, when the original limits were exceeded. Furthermore, the acceptance of instantaneous price adjustment omits to acknowledge that some markets, particularly the labour market, exhibit stickiness. Alternatively, the acceptance of the more orthodox monetarist approach concentrates upon the stability exhibited in the medium to long term, and thus omits to analyse the short term, usually associated with policy making. Any dramatic short term fluctuations, injecting uncertainty into the relationship, go unheeded, since discretionary policy is seen as causing further problems.

The definitional aspect of what constitutes money becomes an additional problem. As innovation speeds merrily on its way, the traditional distinctions between both the different types of institutions and the different types of

deposits become blurred and thus the traditional definitions of monetary aggregates become less reliable. This has been overcome partly by utilising new definitions, bringing to light problems associated with inaccurate past monetary series, and partly by the use of multiple targets, which may produce conflicting results.

Closely associated with monetary targetry has been the gradual reduction in one of its counterparts, the PSBR. This has been undertaken firstly as an aid to money supply control and secondly to prevent "crowding-out", both in terms of finance and resources[29]. This subsidiary policy also has its critics, since it prevents fiscal policy from playing its role as an automatic stabilizer (Buiter and Miller, 1981). Other arguments against its objectives are raised below.

The growth in the PSBR, unless `funded', has been cited as the major cause of excessive monetary growth in recent years. However, Kaldor (1982) states that between 1977 and 1980 the "unfunded" component of the PSBR was only £390m, whilst the increase in £M3 was £18bn. This he cites, along with other similar evidence, as conclusive proof that such an assertion is completely false. Instead he propounds that the growth in bank lending to the private sector, another component of £M3, is the major element in monetary expansion. Ironically this element of the money supply has been implicitly encouraged to expand with the removal of restrictive regulations.

The belief that `funding' the PSBR causes complete

financial "crowding-out" is also disputed, at least in the short run, by most non-monetarist economists. One reason for this, advocated by Kaldor (1982), is the role of savings in the Keynesian model. As economic activity increases, due perhaps to increased government expenditure, savings increase proportionately greater than income. Thus more, rather than less, savings are available for private investment - i.e. "crowding in" occurs.

In terms of resource "crowding-out", this phenomenon is only likely to occur when full employment exists. When unemployed resources are available, as applicable to the economic situation of the eighties, then these may be utilised to increase production. Some (eg. Currie, 1981) also argue that even in the situation of full employment, fiscal policy may increase the level of capacity and labour utilisation, thus enhancing the scope for profitability and investment in the long run.

VIII) CONCLUSION

This chapter has demonstrated how in the last twenty years, given the advent of monetarism, a dramatic change in emphasis towards monetary policy and control has been experienced. This, coupled with the increased competitiveness of the financial sector, has paved the way for an equally dramatic evolution of financial services.

Prior to 1976, monetary authorities were primarily

concerned with credit control, typified by the utilisation of various bank lending controls, aimed at the asset-side of the banks' balance sheet. Although the liberalising reforms of the CCC appeared to recommend support for monetary control, this support was overshadowed by the rapid increase in the money supply figures during 1972/73. This in turn led to the reintroduction of bank lending controls, in terms of both the `corset' and qualitative guidelines. The `corset', however, was different from the previous controls, in that it affected the liability-side of the balance sheet, thus further directing attention away from credit control. The true birth of monetary control is unanimously agreed to have occurred in December 1976, with the advent of the IMF's intervention into the UK's economic policy, in order to bail out sterling.

Initially monetary policy was seen as an auxiliary to the prevailing fiscal policies. However, as monetary targetry matured, depicted by the election of the Conservative party in 1979 and the subsequent introduction of the MTFS, monetary policy became the master, with fiscal policy taking the unfamilar role of subordinate.

Whether or not, this new regime has been the cause of the dramatic fall in prices has been a matter of controversy in recent years. Numerous arguments from non-monetarists cite the irregularities of the monetarists doctrine and thereby indicate its inability in ever achieving price control. Instead other factors, such as high unemployment and the decreasing price of raw materials, have been cited as

the true causes of this dramatic fall.

The last decade and a half has also been characterised by the passing of various pieces of legislation, starting with CCC, aimed at improving competition between the various financial institutions. This has had major effects on the authorities ability to control and monitor monetary aggregates. Increased freedom, coupled with new technology, has opened up a wide range of activities both nationally and internationally to most financial institutions, thereby causing the traditional definitional barriers between the various institutions to become blurred. Furthermore, increased competitiveness has forced banks to offer more incentives, usually in the form of interest, leading to the additional blurring of definition between various types of deposits.

These dramatic changes in financial services have not been confined to the UK but are an international phenomenon. However, the UK, coupled with the US, has perhaps experienced the most innovation, due to its position as a major financial centre. One reason why increased competition and financial innovation has occurred is the need for the financial sector to continually interact with the real sector. Changes are, therefore, partly dependent upon and partly causing changes elsewhere. For a macroeconomic model to be credited with mirroring reality, this interaction between real and financial sectors needs to be adequately captured.

This chapter emphasises the evolving nature of the

monetary sector, which creates particular problems for macroeconomic model building. Firstly, a wider selection of financial institutions, not merely clearing banks, should be modelled. Thereby establishing the competitive environment now facing all financial intermedaries and the effect this has on the stability of the various definitions of money. Related to this a wider selection of monetary aggregates and alternative assets should also be modelled, thus examining the "Radcliffian" concept of liquidity. This, however, brings to the forefront the problem of consistent data series, as definitional concepts evolve through time. Secondly, the evolving nature of technology, and its subsequent effect on demand and supply needs to be modelled. However,technology does not occur periodically but is more spasmodic in nature, thus problems of utilising an appropriate proxy occur. Thirdly, the effect of past controls and their subsequent demise must also be included. Again utilising an appropriate proxy has its problems. Finally, the interaction between the real and financial sectors must be modelled, carefully accounting for the changes discussed in this chapter.

The growing importance of the monetary sector and its interaction with the real sector means that the utilisation of monetary variables in a macroeconomic model must be comprehensive. Long gone are the days when a simple demand-for-money function, susceptible to problems of instability, would suffice. The ultimate creation of money

is dependent upon the whole institutional background of the monetary sector and should thus be of paramount importance for modelling purposes. For example, prior to the introduction of `liability management', the creation of money was equivalent to the textbook explanation of an exogenous money supply. However, with the advent of `liability management', the endogeneous element of credit creation gained growing importance. The evolution of financial institutions and practices altered the whole emphasis of monetary policy; today one should look to a more general definition of liquidity, rather than just the domestic money supply.

Endnotes

1) Further reasons for this recent interest in monetary sectors will be discussed in chapter four.

2) The PSL2 aggregate is more "Radcliffian" in nature, though is confined to the private sector only. It consists of:

i) notes and coins in circulation;

ii) private sector sterling sight deposits;

iii) private sector time deposits, original maturity less than two years;

iv) private sector holdings of sterling bank CDs;

v) private sector holdings of money market instruments and certificate of tax deposit

vi) private sector holdings of building society deposits and national savings instruments;

LESS

vii) building society holdings of money-market instruments and bank deposits

3) This was the pivotal interest rate, at which the Central Bank lent to the banking system. Changes were invariably linked to the external situation, as measured by the level of foreign reserves.

4) This is the ratio of cash holdings to deposit liabilities, first implemented in 1946, comprising notes, coins and demand deposits. Prior to 1971, such a ratio applied to both bankers' balances and till money. However, post-1971, the cash ratio was applied to bankers' balances only. Such a practice may be regarded as discriminatory towards clearing banks who, due to the nature of their business, must hold a larger proportion, than non-clearing banks, of their assets as till money (Tew, 1978).

5) This ratio was originally introduced in the 1950's at approximately 30%, though was lowered in 1963 to 28%, and comprises of cash, call money, Treasury and Commercial bills.

6) This group particularly blossomed because of "Regulation Q",in the USA, which imposed a ceiling on interest rates payable to depositors, though was usually raised just before becoming operational. However, in 1966, the authorities did not ease the restriction, resulting in widespread disintermediation into the Eurodollar market.

7) Reserve assets comprise (BEQB, 1971):

i) balances at head office of branches of the Bank of England.

ii) Treasury bills.

iii) company tax reserve certificates.

iv) money at call with the London money market.

v) government stocks with one year or less to maturity.

vi) local authority bills.

vii) commercial bills (maximum 2% of total eligible liabilities).

8) Eligible liabilities were defined as follows (BEQB, 1971):

i) sterling deposits of an original maturity of two years or less.

ii) sterling deposits from banks minus claims in sterling on such banks.

iii) sterling CDs issued, less any holdings.

iv) the banks' net deposit liability in sterling to its overseas offices.

v) the banks' net liability in non-sterling currencies

LESS

vi) 60% of the net value of transit items.

9) `Round-tripping' occurred because large-scale depositors, such as multinationals, had access to both retail and wholesale deposit markets. They could borrow through overdraft facilities, in the retail market (at a relatively low interest rate) and lend back to the commercial banks in the wholesale market (with a relatively high interest rate), thereby making capital gains.

10) This process involved the Central Bank and clearing banks depositing some of their funds with the threatened institutions. In theory, market interest rates were charged on these deposits so that the Bank and the clearing banks were not losing money. However, in practice, most of this interest was deferred (Gowland, 1982).

11) Sterling M3 = M1 plus all sterling deposits held by the public and private sectors; where M1 = notes and coins plus all sterling sight deposits held by the public.

12) This period, up to the sterling crisis of June 1972, became known as the period of easy credit (Gowland, 1982).

13) In April 1974, the additional fraction of any excess IBELs above the pre-specified ceiling rose from 5% for an excess up to 3%, 25% for an excess between 3-5%, and to 50% for an excess over 5% (Gowland, 1982).

14) This is known as the "bill leak" and involves the clearing banks assisting, outside the banking system, would-be lenders in supplying their surplus funds to would-be borrowers.

15) The recession contributed in two ways (Spencer, 1986). Firstly, consumers increased their savings to offset the effect of inflation, thereby reducing bank lending.

Secondly, companies ran down their liquid assets, due to decreased profitability, reflected in the higher interest rates.

16) The banking sector basically included the UK offices of all banks observing the common reserve ratio, plus the discount market institutions.

17) The wider definition of the monetary sector consists of banks and licensed deposit-takers under the Banking Act (1979), plus the National Girobank and Trustee Savings Banks, the Banking Department of the Bank of England and other institutions observing the monetary control arrangements of August 1981.

18) The additional statistics were for a measure of "retail deposits": M2 = non-interest bearing component of M1 plus other private sector retail deposits. And the monetary base: MO = notes and coins in circulation plus banks' till money plus Bankers' Operational Balances with the Bank of England.

19) Banks first entered the residential mortgage market in a big way during 1972/73, activating the famous property boom. During that time, free from constraints, banks were confident of raising sufficient funds. However, such a situation was shortlived, given that the reintroduction of constraints quickly took place at the end of 1973.

20) eg. The abolition of the Building Societies interest rate cartel which took place in 1983.

21) Electronic banking has meant that institutions now only require an Automated Teller Machine to be able to undertake banking practices (Cuthbertson, 1985b).

22) These targets took the form of two Letters of Intent by Roy Jenkins, the then Chancellor of the Exchequer, to the IMF. The first, in 1967, stated that the money supply in 1968 would be limited to the expected growth rate of 1967. The second, in 1969, set a limit of £400m for DCE during 1969/70.

23) DCE was first introduced in 1969 and was intended to be an indicator of domestically created credit (Podolski, 1986). It is defined by:

$$DCE = PSBR - \Delta B + \Delta BLP$$

where:

ΔB = sales of government debt;

ΔBLP = changes in bank lending to the private sector;

PSBR = public sector borrowing requirement

24) Monetarists believe that the economy, left to itself, will always revert back to full employment, as epitomised by the Walrasian general equilibrium model. Any rigidities, caused by state or industrial intervention, will induce

disequilibrium. Thus employing discretionary policies, either monetary or fiscal, will aggrevate fluctuations rather than cure them (Friedman, 1968).

25) In terms of fiscal measures, lower taxation and lower government expenditure are advocated. The former is believed to provide an incentive for increasing productivity, whilst the latter presumably reduces the problem of "crowding-out", thus allowing firms easier access to resources.

Other measures, aimed at the labour force and the strength of the trade unions, have also been advocated as ways of improving efficiency. These measures rest on the assumption that no involuntary unemployment exists and thus, workers have been pricing themselves out of jobs.

25) M1 has never been treated as the main target and Goodhart (1986) advocates a number of reasons for this:

i) Although a stable equation for M1 exists, the fit is not very close.

ii) The advantage of M1 lies solely in its past econometric stability. This has become an unreliable indicator for the future as policy changes (the so-called "Lucas critique") and definitions alter.

iii) The use of M1 means the abandonment of the counterpart analysis, though this has since occurred with the suspension of £M3.

iv) The introduction of interest-bearing sight deposits will disrupt previous empirical relationships. Importance is now being attributed to relative interest rate changes rather than absolute changes.

27) Both Beckerman (1985) and Arestis (1986) emphasise the importance of the dramatic fall in the price of raw materials as a major contributory factor in controlling the rate of inflation. This concept of imported inflation is empirically justified in these two studies.

28) In keeping with the post-Keynesian doctrine, this study emphasises the importance of the money-wage variable as the crucial and causal price variable.

29) Financial "crowding-out", a demand-side phenomenom, occurs when the PSBR is "funded", i.e. the NBPS buys government securities, and thus, given no monetary expansion, resources are merely transferred from the private sector to the public sector. On the other hand, resource "crowding-out" occurs on the supply-side, such that public expenditure can only increase at the expense of private expenditure (Arestis, 1982).

CHAPTER THREE: MONETARY THEORIES AND THEIR TRANSMISSION MECHANISMS

I) INTRODUCTION

Before analysing the monetary sectors of the four macroeconomic models under-review, one needs to pinpoint the plethora of monetary theories that abound in academic circles, in terms of the determination of both the demand for and the supply of money. Once these theories are established a closely detailed examination of the various transmission mechanisms may then be explored. It is these latter channels that are particularly relevant when examining the various monetary sectors of the four models, thus establishing how closely empirical research adheres to the appropriate theoretical framework. This leads directly into the next two chapters, where one hopes to successfully partner the various macroeconomic models with their appropriate theory and then explore the implications of such a partnership.

In this chapter, alternative doctrines of monetary theory are firstly, discussed, in terms of a closed economy. This restrictive assumption is then lifted to explore the alternative explanations of exchange rate determination, cumulating in the subsequent effect on the various channels of the transmission mechanism. These latter influences are particularly important, given the highly overt nature of the

UK economy, intensified by increased globalisation of financial transactions initiated by the "Big Bang".

Section two highlights the evolution of orthodox monetary theories, in terms of the various Keynesian and monetarist strands, and the analyses the alternative transmission mechanisms advocated.

Section three examines the more unorthodox post-Kenesian theory on money, whereby post-Keynesian economists believe that the original work of Keynes has been misinterpreted in terms of the ISLM framework and thus needs to be re-examined. As opposed to the orthodox Keynesian economists, post-Keynesians concentrate on Keynes's original work on money (Keynes, 1930), thereby advocating the original division of the transactions demand for money between businesses and householders. This leads on to the investigation of the "finance motive" for holding money with the creation of "credit money" (Davidson, 1972), as opposed to "commodity money", resulting in the assertion that the money supply is endogeneously determined, This whole argument then brings into contention the viability of most orthodox theories. Post-Keynesians also stress the importance of financial institutions in credit-creation, given the need for both spot and forward contracts and the use of mark-up, as opposed to profit maximising, models.

In section four the highly unrealistic assumption of a closed economy is dispensed with and the evolution of the various orthodox explanations of exchange rate determination

is explored. The subsequent consequence of external influences on the transmission mechanism, given these theories, are then analysed. Section five extends the analysis by examining the implications to the post-Keynesian doctrine of dropping the assumption of a closed economy. Finally, section six highlights the major points raised in this chapter, with particular reference to the causality debate and the various transmission mechanisms advocated.

II) ORTHODOX MONETARY THEORIES: A CLOSED ECONOMY

Up until the mid-1930's, most economists followed the traditional classical doctrine, which emphasized the neutrality of money, i.e. money was seen as a "veil", that served only to obscure the operations of real factors (Coghlan, 1980). In terms of monetary theory the Classical doctrine was exemplified by the traditional quantity theory in America (Fisher, 1911) and the Cambridge cash-balance approach in the UK. However, in the 1930s, many major industrial economies were faced with massive unemployed resources, a phenomenon that was impossible to conceive of in the classical world of flexible wages and prices. This phenomenon helped pave the way for the general acceptance of the alternative Keynesian viewpoint of the existence of equilibrium at less than full employment and of the liquidity preference contention.

Keynesian economics was particularly popular in the

1940's and 1950's, although it was not without its critics. Some Keynesian economists acknowledged many of these criticisms and attempted to overcome them by developing other more complex theories, based on what they believed to be Keynes's original ideas. These economists, known as neo-Keynesians or the "New View", developed the inventory-theoretic approach (Baumol, 1952; Tobin, 1956) and the wider embracing portfolio approach (Tobin, 1958), as alternative explanations for the demand for money.

Another, more unorthodox, off-shoot of Keynes's work, known as post-Keynesianism, has evolved in recent years in an attempt to complete Keynes's General Theory which, according to this view, was aborted by the Hicksian ISLM analysis (Eichner and Kregal, 1975). This paradigm, challenging mainstream economics, will be examined in greater detail in section III.

Orthodox Keynesian economics remained at the forefront of economic policy until at least the mid-1960's. However, during the interim, the Chicago school, under the leadership of Milton Friedman, began to develop an alternative doctrine to challenge the viability of the Keynesian orthodoxy. These economists concentrated specifically on the demand for money, as illustrated by Friedman's (1956) "Restatement of the Quantity Theory", and many of their basic principals can be traced back to the classical dichotomy. As such these economists have become known as "modern quantity theorists" or, perhaps more popular, as monetarists. This latter label

emphasises the importance they attribute to monetary policies. Evolving from this doctrine, the controversial New Classical school, advocating the rational expectations hypothesis (REH), has emerged as another challenge to mainstream economics.

By the late 1970's, many industrial economies, disillusioned by the solutions advocated by the Keynesian orthodoxy, turned instead towards the monetarists doctrine as a means of solving their economic problems, particularly inflation. In the UK, this growing acceptance of monetarism can be exemplified by the introduction of the Medium Term Financial Strategy in March 1980 (see chapter two). Basically, such a policy advocated the control of the money supply as a means of controlling inflation.

The classical transmission mechanism

Due to the assumptions imposed by the traditional quantity theory of a constant velocity of circulation and full employment, the transmission mechanism from money to prices forms a direct link[1], crucial for the postulation of the neutrality of money. This link is more commonly known as the cash balance mechanism. Given an exogenous increase in the money stock, individuals find themselves with excess money balances. They try to run these down by buying goods, consumer durables and financial assets. However, given that output is fixed in the short run, they cannot succeed. Consequently, the excess demand for real and financial assets

merely results in higher prices. These prices will continue to rise until equilibrium is restored, which occurs when desired balances are equal to actual balances. In this situation prices have risen by the same proportion as the increase in the money stock whilst output has remained constant. At the new equilibrium, the real money supply is restored to the original level.

This simplistic approach to the interaction between the two sectors has been criticised as being applicable to a barter economy only, where all money is "commodity-money". As macroeconomics began to evolve, the creation of "credit-money" took on greater importance and with it the inclusion of other channels of influence, in particular the interest rate.

Orthodox Keynesian transmission mechanism

The analysis of the Keynesian transmission mechanism, resulting from a monetary expansion, is dependent upon the substitutability assumptions between money and liquid assets, and between money and real assets.

Any direct effect on income is immediately rejected, given the proposition of zero substitutability between money and real goods. Only indirect effects, resulting from interest rate movements, are considered.

The Keynesian transmission mechanism is much more complex than that attributed to the classical economists. Given an exogenous increase in the money supply, economic

agents will find themselves with excess idle balances and will therefore bid for bonds. Increased bidding will lead to higher prices, which will continue to rise until people are prepared to hold the excess idle balances. When this occurs portfolio equilibrium is restored[2]. Given the high level of substitutability between money and bonds, i.e. the high interest elasticity, prices are likely to rise only slightly before a new equilibrium is established.

A rise in the price of bonds is equivalent to a fall in the long-run interest rate. Given this, the second stage of the transmisssion mechanism can be postulated, whereby lower interest rates give rise to increased investment, shown by a movement along the marginal efficiency of capital schedule. This occurs for two reasons. Firstly, more projects now yield a higher return than the cost of borrowing and are thus financially viable. Secondly, the concept of opportunity cost comes into play, whereby investment activity is now more profitable than depositing cash into the money market. However, from a Keynesian viewpoint, the total expansion of investment is slight, given its relative insensitivity to interest rates.

The impact on the level of income occurs in the third stage, when the injection of investment, through the multiplier, leads to expansionary effects on the level of real activity. These three stages are usually termed the 'cost of capital' channel. This, however, is not the end of the process, since possible feedback effects may occur. Due

to the now higher level of income, both the transactions and precautionary demands increase, and thus money is withdrawn from speculative balances. This, in turn, leads to a rise in interest rates, followed by a fall in investment and subsequently a fall in income. Equilibrium is reached with the final outcome being that of a lower income level and a higher interest rate as compared to the first "cost of capital" stage.

The final conclusion that emerges from this analysis of a closed economy is that the more interest elastic the demand for money and the more inelastic the investment function the weaker the effect of monetary policy on real activity. This, then, is the view held by the Keynesians, that money hardly matters. On the other hand, the more interest elastic investment and more inelastic demand for money we have, the more potent monetary policy is. This alternative view is held by the monetarists.

The neo-Keynesian transmission mechanism

Compared with the orthodox Keynesian model, the neo-Keynesians emphasise more the influence of money and financial assets on real factors. As well as extending the traditional 'cost of capital' channel to encapsulate a wide spectrum of financial assets, including equities, two other possible influences are advanced, namely a wealth linkage and an availability effect.

Alternative views upon the range of assets that should

be included in the portfolio analysis have raged among neo-Keynesian economists. Tobin believes that the analysis should be extended to include the yield on equities, since these, in conjunction with the supply price of capital, determine the marginal price of profitability (Thompson, 1984). In this amended version of the 'cost of capital' channel, an expansionary monetary policy will now lead to individuals disposing of their excess money balances by purchasing a whole range of financial assets. The outcome of this will be higher prices, and lower yields, on all competing assets. The higher price attached to equities[3] will mean that a discrepancy will now exist between the market valuation of real assets (i.e the price of equities) and the cost of producing similar new assets. Such a discrepancy will stimulate investment, by producing an incentive to invest in new capital goods. Higher investment will then lead to a multiple expansion in income.

However, given that such a large range of assets may now be considered as possible substitutes for money, the importance of this channel has become questionable. Changes in the money supply will have smaller incremental effects on rates of return as the adjustment process proceeds along the liquidity spectrum. Thus the change in equity prices may be such that the stimulus to invest would be minimal. To counterbalance the possible rejection of this more traditional channel, two other channels have been advocated.

Many modern economists now emphasise the importance of

various wealth effects, which have been largely ignored in the traditional ISLM analysis. Perhaps the most well-known is Keynes's "windfall", or revaluation, effect which emphasises the effect on wealth given a change in the interest rate. When interest rates fall, following an increase in the money supply, then the market value of assets already held increases, i.e. an individual's portfolio is revalued upwards. This revaluation may then strengthen the final impact on economic activity of portfolio adjustment, given that a larger net portfolio is now available for reallocation. An alternative view to this is the "Pigou effect", induced by a fall in the price level. This price fall will increase the real value of accumulated assets, and given that expenditure is dependent upon wealth, it will increase investment and consumption.

The importance of the availability channel stems from the conclusions reached by the Radcliffe Committee's Report (Radcliffe, 1959) on credit rationing. When imperfections, such as administered mortgage rates, occur in the money market the establishment of an equilibrium market clearing price is not insured, and thus credit rationing may take place, impeding the workings of the orthodox transmission mechanism. Most of the controls imposed to ration credit (see chapter two) have predominantly been aimed at consumers and thus, in such a situation, they will lead directly to a contraction in consumption, and ultimately to income. This effect is independent of money supply changes, though an

increase in the money supply, leading to increased bank reserves, may lead to an increase in credit.

The monetarist transmission mechanism

The initial reactions of the monetarist transmission mechanism can be graphically interpreted in terms of the neo-classical synthesis. However, given the various time lags associated with changes in real income and prices, coupled with the instability of the private sector, the ultimate complexity of such an analysis cannot be explained by a framework that examines static equilibrium situations only.

Modern quantity theorists partially acknowledge the direct cash balance effect of the neo-classical economists, though it has become only a minor element in their transmission mechanism. To illustrate, let us assume a given increase in the money supply; the initial situation would be one of portfolio imbalance, with individuals holding excess money balances. Money is assumed to exhibit the unique characteristic of being a substitute for all assets, both real and financial, and thus a whole range of alternative assets will be brought. Prices will increase and yields will fall, until people are prepared to hold larger idle balances. In this situation of low interest elasticity of money demand, interest rates will have to fall by a greater extent than in the Keynesian case (of high interest elasticity of money demand) to restore equilibrium in the money market. Thus, the indirect 'cost of capital' channel will, at least

initially, be more potent than postulated by the Keynesians. This, however, is not the end of the story, since monetarists examine other effects that may affect the various sectors.

In terms of the real sector, three other effects are also taken into consideration. Firstly, due to the assumption of a much wider portfolio adjustment, a direct effect on expenditure also takes place. This increased expenditure may be the result of either a cash-balance effect or alternatively it may be due to the assumed interest sensitivity of consumption. Secondly, a wealth effect, usually in terms of a real balance effect whereby individuals feel wealthier and thus increase their consumer expenditure, may also occur. Finally future expectations, for example on price increases, may produce conflicting effects: in the case of expected future price increases, some individuals will increase their expenditure now to beat the higher price, whilst others may decrease their current expenditure to insure liquidity in the future. The resultant magnitude of the shift and its final direction is dependent upon the relative importance of these effects.

This is still not the final result, given that equilibrium in the monetary sector is also under a state of flux. Price increases, due to portfolio reallocation and the like, are equivalent to a fall in real money balances which lead to a fall in income and a further increase in nominal interest rate. Monetarists postulate, in the long run, a direct relationship between nominal interest rates and the

money supply.

As can be gleamed from these various mechanisms, the final impacts are hard to establish, especially given the various time lags involved. Thus attempting to depict such mechanisms by a series of static equilibrium situations is impossible. The only definite conclusion to emerge is that equilibrium is finally restored either through increased prices or real income adjustment, or a combination of both. If a vertical long run Phillips curve exists, then the only effect, in the long run, of a monetary expansion is a price increase. Such a theory postulates that output changes only occur in the short run, returning eventually to their "natural" level, consistent with the natural rate of employment. To those economists who are advocates of the rational expectations hypothesis (REH) this return to the natural rate is instantaneous and thus an expansionary monetary policy has no real effect, even in the short run.

Given the complexity of the whole transmission mechanism, monetarists reject the use of large-scale disaggregated models to explain the workings of the economy (see chapter four) and prefer reduced-form models instead. These latter models ignore the intimate details of the transmission mechanism, emphasising instead the close association between money and nominal income, and as such have been criticised as "black boxes".

III) POST-KEYNESIAN MONETARY THEORY: A CLOSED ECONOMY

The growing acceptance, in recent years, of the monetarists doctrine has been coupled with the apparant rejection of the orthodox Keynesian framework. To many economists, who see themselves as advocates of Keynes's original work, the latter occurrence has not been such a bad thing, given that orthodox Keynesianism has been accused of producing a bowdlerized version of Keynes's work. Some economists suggest that one needs to step back from these orthodox theories and completely re-examine Keynes's original ideas. Building on these ideas, and those advocated by some of his original followers, produces an alternative doctrine, formally known as post-Keynesianism. This particular school of thought emphasises the fact that Keynes was primarily a monetary economist, and as such, was concerned predominantly with a real-world monetary-production economy. This is at odds with the fictional world of Walrasian general equilibrium, where the workings of a barter economy are primarily examined, with money superimposed afterwards. This latter appendage, derived from the assumption of an ergodic world[4], leads to the conclusion that money does not matter and thus establishes one of the major criticisms levied, by the post-Keynesians, at the neo-classical synthesis.

Post-Keynesians, through the utilisation of three fundamental characteristics, attempt to analyse a monetary economy by reverting back to the original work of Keynes, as

set down in his "Treatise" and later reinforced in his correspondences with Bertil Ohlin, during 1937, in various issues of "The Economic Journal". Among other things, this results in the re-establishment of the "finance motive" as an additional element in the transactions demand for money.

Major characteristics of the post-Keynesian framework

The major aim of post-Keynesianism is to construct a model that mirrors reality as closely as possible, thus attempting to overcome the criticism of unrealism levied on most economic theories. However, post-Keynesians do concede that, by definition, theory must be more simplistic than reality (Davidson, 1982). They also acknowledge the fact that one can never construct just one general model that will encompass all economic problems for all times and all situations. Models must be specific, tackling one part of the problem at a time and in this context the area of concern is the monetary sector.

Bearing these restrictions in mind, post-Keynesians pinpoint three major characteristics, fundamental in explaining the role of money in a monetary-production economy. These three characteristics are: the uncertainty associated with the unknown future; irreversible historical time as opposed to logical time; and the importance of various contracts and their relevant institutions. Each characteristic will now be examined in further detail below.

In terms of uncertainty, post-Keynesians reject the

methodology of the orthodox economists who simply assume away uncertainty by the utilisation of various ergodic stochastic processes (thus converting uncertainty to the level of certainty). Acceptance of an ergodic world, coupled with the axiom of reals (Davidson, 1986, pp.12-13), produces models that provide no unique role for money, i.e. money is neutral.

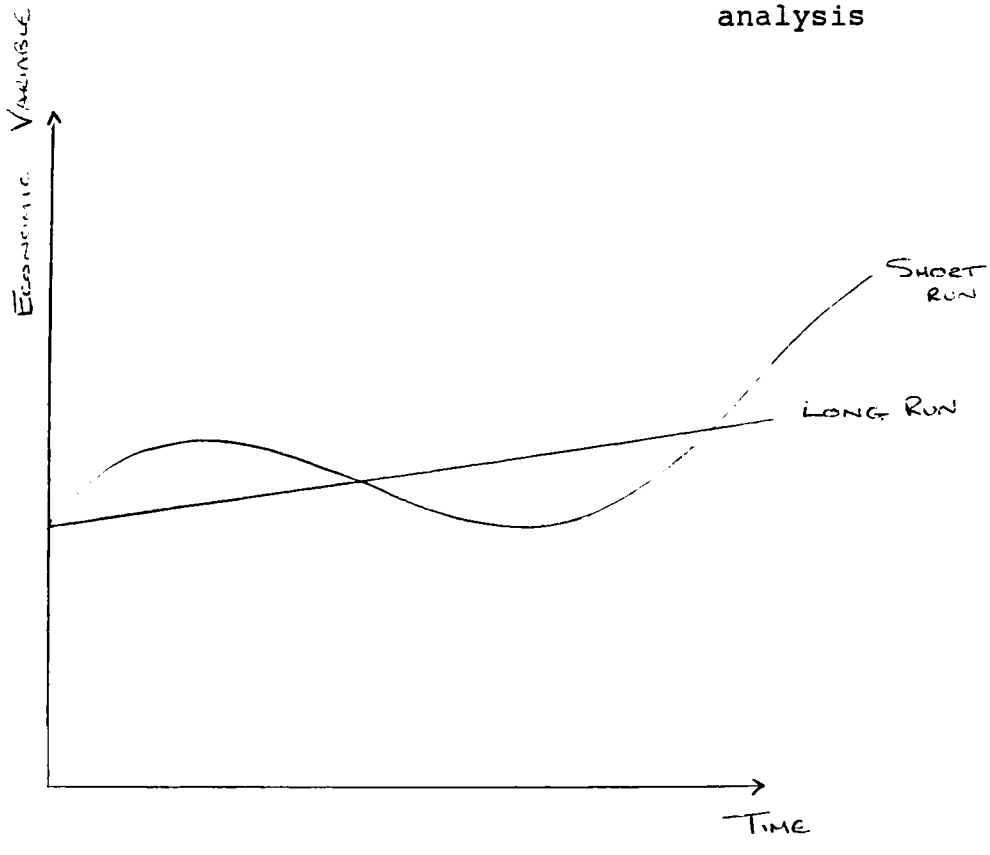
In a capitalist, monetary-production economy, the absense of uncertainty is a contradiction in terms (Davidson, 1972). Uncertainty manifests itself to most economic agents in a variety of forms. Entrepreneurs are particularly concerned about the uncertainty associated with their production processes and investment decisions, whilst householders are concerned about future consumption and future income. In the face of such widespread uncertainty, post-Keynesians emphasise the heterogeneity of expectations, both between various groups of economic agents and between individual agents in those groups. Thus, by implication, many agents will find themselves mistaken and must, therefore, adjust their future expectations accordingly. This acceptance of non-ergodic uncertainty[5] acknowledges the fact that human judgement is fallible.

Acceptance of ergodic uncertainty and the fictional Walrasian general equilibrium world, where all markets clear instantaneously, is acceptance of the long run steady state and the concept of logical time is utilised. In complete contrast to this, the second fundamental characteristic of

any post-Keynesian model is the existence of uni-directional historical time, whereby the past is known and unchangeable, whilst the future is unknown and uncertain. Thus, in terms of long run analysis, post-Keynesians are concerned with the warranted growth rate, or trend, of economic activity, whilst their short run analysis examines the oscillations that occur around the trend over time, giving rise to trade cycles (see diagram 3.1).

Diagram 3.1

Distinction between long and short run analysis



Rejection of the Walrasian general equilibrium analysis is a significant step away from orthodox economics, resulting instead in the utilisation of Marshallian partial equilibrium analysis. However, given that Keynes was originally a Classical economist, taught by Marshall himself, such methodology is in accordance with Keynes's original work. In this situation, concern lies with disequilibrium positions, as opposed to equilibrium.

Incorporating non-ergodic uncertainty into the analysis, and the existence of historical time, gives money its unique quality as a store of value, since holding money allows decisions to be deferred (Rousseas, 1986). Money is there to bind together the present with the unknown future. However, to ensure that money still retains its function as a medium of exchange, and is continually liquid, the setting up of contracts is also required. Thus the third fundamental characteristic is the inclusion of the role of monetary contracts, in both spot and forward markets. In addition, the existence of the various institutions that ensure the universal acceptability of these contracts, must also be included. These institutions consist of at least three types:- those that issue the contracts; those that enforce them; and those that act as a clearing agency. Keynes emphasised this interdependence between money and contracts in his analysis of the securities market, yet orthodox theories explicitly ignore contracts. In point of fact, the Walrasian analysis implicitly assumes that all prices are

established in spot markets.

Different goods have different degrees of organisation in spot and forward markets, thus the existence of these markets establishes the characteristics of an asset. Well-organised spot markets are essential if assets are to be attributed with the characteristic of liquidity. By definition, money is the only means available to discharge monetary contractual commitments, thus wealth held in any other form needs to be transformed into money. For this process to be easily and cheaply achieved, an asset needs to be readily resalable, at a guaranteed price, in a well-established spot market, with minimal transfer costs. This usually involves some kind of clearing system, as found in the banking sector. Given that well-organised spot markets usually only exist for financial assets, post-Keynesians, like orthodox Keynesians, emphasise the distinction between financial and real assets as substitutes for money.

The existence of forward markets make monetary debt possible and are particularly important for the smooth running of the production process. Both future input and output prices are predominantly determined on the basis of contracts, denominated in money. In the former case the most crucial are probably labour costs, resulting in 'sticky' money-wage rates (Rousseas, 1986). These contracts act as a mechanism of sharing uncertainty between the various economic agents and implicitly convert uncertainty into certainty by

reaching forward into time. This utilisation of forward contracts is a possible explanation for the apparent stability of capitalist economies, as it provides assurance of continuity between the present and the future (Davidson, 1977).

To ensure that all contracts are readily acceptable by all economic agents, legal enforcement, usually in the form of state intervention, must be forthcoming. If the community loses confidence in the ability of the state to enforce such contracts, then the monetary system breaks down and the economy reverts back to barter practices. However, such practices are usually highly inefficient and thus, providing some confidence remains, agents will prefer monetary contracts.

The finance motive

Keynes's simplification of his analysis in the "General Theory" has, according to post-Keynesians, lead to the mis-specification of the transactions demand for money. Although orthodox Keynesians took the formulation at face value, Keynes himself, saw such a simplification as a first approximation only. Keynes was quick to amend any such misconceptions through his correspondences with Ohlin, resulting in the introduction of the additional "finance motive" for holding money.

The finance motive, basically a business demand for the flow of credit, is seen as a temporary phenomenon only.

Entrepreneurs are assumed to retain some income to pay for future commitments and thus provided that contractual investment expenditure remains unchanged between time periods, no extra finance is required. Therefore, the finance motive is redundant and money demand merely depends upon aggregate expenditure. However, if for some reason, entrepreneurial 'animal spirits'[6] indicate that ex ante investment should increase then extra finance is required, and an additional demand for money occurs, prior to any expenditure being undertaken.

Whether this extra planned investment becomes realised depends on whether entrepreneurs have the ability to obtain excess funds. If no excess funds are forthcoming than that is the end of the matter. However, if funds are obtained, then as well as increased money demand from the finance motive, a multiple expansion of the transactions demand will be induced, due to the extra realised expenditure.

Funds may be obtained in one of three ways (Davidson, 1972). Firstly, households may decide to simultaneously lower their liquidity preference. Secondly, the Central Bank may decide to completely accommodate the excess demand and thus all planned investment becomes realised. This results in the reversal of Say's Law, such that demand creates its own supply. Alternatively, as a third option, the Central Bank may decide to only partially accommodate the increase, thus the investment market is faced with a shortage of cash. This then leads to the problem of "congestion" (now

more commonly known as "crowding out"), whereby entrepreneurs will attempt to "outbid" each other to obtain their required finance. The result of this is either higher interest rates, leading to a fall in ex post investment and a subsequent contraction of output, or credit rationing, which also limits investment.

The major conclusion that emerges from this analysis is that the Central Bank, through its liquidity preference, has the ability to affect the pace of economic activity. This means that the Central Bank may induce further investment in an upswing, whilst suppressing investment in a downswing (Dow, 1986/87). In the former case, banks, due to their over-confidence, may misallocate credit, in terms of either speculation or risky ventures. However, control by the Central Bank may be undermined by financial innovations, especially 'liability management', given the increased need for liquidity. In this situation, the liabilities of the NBFI's become more acceptable as means of credit. Over-confidence in the financial sector may form the basis of a financial crisis, since a hint of over-optimism may lead to creditors withdrawing their finance. Conversely, during a downswing, monetary authorities may attempt to induce a monetary expansion, yet economic agents become less willing to hold excess money balances. Post-Keynesians acknowledge the role of banks and financial institutions in the creation of "credit-money" and their possible influence in the real economy.

Endogeneous money supply

The crucial question set by the "finance motive" is whether the Central Bank completely accommodates all excess demands for credit. This leads onto the subsidiary question of whether the money supply is completely endogeneous. If, at least, partial endogeneity can be established then the viability of certain orthodox theories, and their implied direction of causality, is in jeopardy.

Most post-Keynesians believe that the money supply is, at least, partially endogeneous and cite the Radcliffe Committee's report as possible evidence. Various theories have been advocated to substantiate this proposition. Here we will examine three alternative theories, put forward by Sidney Weintraub, Nicholas Kaldor and Hyman Minsky respectively.

Weintraub's theory of an endogeneous money supply is based upon his wage theorem, whereby prices (P) are determined by some stable mark-up (K) over nominal unit labour costs (w/Q) - equation 3.3.1. The use of mark-up, as opposed to profit maximising, models are central to post-Keynesian theory on price and wage determination, as well as for determining interest rates.

$$P = K\,(w/Q) \qquad (3.3.1)$$

Dividing this ratio (w/Q) by total labour input (L), prices then become a function of the ratio between the average annual nominal wage rate (W), determined exogenously by collective bargaining and the like, and the average

productivity of employed labour (A) - equation 3.3.2.

$$P = K\,(W/A) \qquad (3.3.2)$$

If wage rate growth ($\dot{W}$) is greater than productivity growth ($\dot{A}$), then prices increase by the predetermined mark-up (K). The immediate effect of this, given the level of real output (Q), is a proportionate rise in nominal income, subsequently followed by an increase in the transactions demand for money. Therefore, to sustain the original level of real income, the money supply must increase. If full accommodation is not forthcoming, assuming a constant velocity of circulation, then the excess demand for money leads to higher interest rates followed by a fall in investment and a multiple contraction of output.

This is a theory of stagflation - higher prices and lower output - emphasising the particular role that wages play in the creation of demand-determined credit. However, it is based on the assumption that political leaders will not tolerate a significant lapse from full employment and will thus accommodate the majority of the excess demand (Rousseas, 1986). One other serious drawback of this theory is the fact that the velocity of circulation is assumed to be constant. This means that the Central Bank appears to be able to dictate its own level of accommodation, i.e. total endogeneity is not insured.

An alternative approach, advocated by Kaldor, emphasises the Central Bank's role as the "lender-of-last-resort". He argues that the Bank's major role is to

ensure the solvency of the financial sector and as such any hint of illiquidity must be met. Thus the monetary authorities have no option but to meet the "needs-of-trade", thereby demand creates its own supply, the reversal of Say's Law, and the problem of excess demand never exists. If full accommodation is not forthcoming, this theory implies that the velocity of circulation increases to meet any shortfall. Thus a perfectly elastic effective money supply curve exists at any given level of interest. i.e. The money supply is completely endogeneous.

Minsky amends the extreme conclusion of Kaldor's analysis, whereby total endogeneity is always ensured, to one where full accommodation may not always be forthcoming and thus higher interest rates are required. Financial innovation would be induced by these higher rates and the velocity of circulation would tend to increase. However, the likelihood of the increased velocity of circulation exactly matching the shortfall in accommodation is remote, since they are not perfect substitutes. Thus endogeneity is not complete.

Whichever theory is accepted, the important issue that arises from this analysis is that credit-money is, at least partially, demand-determined by the production process. Therefore the basic question of causality implied by orthodox theories comes under scruntiny. Furthermore, this analysis questions the rationale for employing monetary targets and, by implication, advocates interest rate control instead.

Causality debate

Orthodox monetary theories, utilising the money multiplier, emphasise the exogeneity of the money supply. This acceptance of an exogenous money supply implies that the causality of the quantity theory flows from the exogenous money stock to nominal income. Conversely, post-Keynesians advocate the existence of an endogeneous money supply, thus questioning the direction of causality.

The orthodox money multiplier implies that an exogenous increase in deposits will give rise to a proportional increase in loans and thereby an increase in the money supply. This increase in the money supply will then result in higher nominal incomes and subsequently inflation. Deposits are the causal factor, with the process flowing from the liability side of the banks' balance sheet to the asset side. Thus, if the monetary authorities can control the volume of deposits, or more specifically the monetary base, then they can control the money supply and the level of inflation. This idea forms the basis for monetary targetry.

However, post-Keynesians argue the converse, implying that the causality runs from assets to liabilities (Rousseas, 1986). In other words, banks first grant credit, to primarily finance the production process, and then bid for deposits. Thus loans become the causal factor, with money taking the role of a residual, created merely as a consequence of increased loan expenditure (Lavoie, 1985). Empirically this can be substantiated by the widespread use

of 'liability management'.

The acceptance of this approach, based upon the "Banking Principle", stems from the belief that the Central Bank's primary role is to ensure liquidity, therefore demand must be accommodated. This leads to the post-Keynesian alternative formulation of the money multiplier (equation 3.3.3), whereby the endogeneous money supply (M) determined the monetary base (H).

$$H = (1/m)\ M \qquad (3.3.3)$$

where: (1/m) = credit divisor

The acceptance of an endogeneous money stock, determined by the production process, results in the reversal of causality implied by the orthodox quantity theory. Post-Keynesians state that the money stock is determined by effective demand, though either changes in prices or output, raising production costs, and thus leading to an increased demand for loans. Post-Keynesians, therefore, emphasise the leading role that entrepreneurs play in determining the level of credit.

The post-Keynesian transmission mechanism

Acceptance of a completely endogeneous money supply implies that "an excess supply of money" can never exist. When a traditional monetary expansion occurs, the recipients of the "excess" merely use it to reduce their liabilities of "credit-money", interest rates remain constant and the policy is ineffective (Rousseas, 1986; Arestis, 1987). Conversely,

when the money supply contracts, a combination of financial innovation and the increased velocity of circulation ensures that demand is met. Thus, in a situation of complete endogeneity, the money supply is a residual, powerless as a means of control and monetary targetry is redundant. Such a conclusion was upheld by the Radcliffe Committee's findings and a solution of control over the liquidity position was advocated instead.

The endogeneous nature of the money supply and the subsequent reversal of causality of the quantity theory leads post-Keynesians to analyse the effects that the real economy has upon the monetary sector, as opposed to the orthodox analysis of the transmission mechanism. Thus, given a fully accommodating policy, any increase in nominal income[7] will induce a sufficient increase in the money supply to accommodate the resulting increase in money demand, thus the reversal of Say's Law holds.

If only partial accommodation occurs, and one accepts either Weintraub's or Minsky's explanation of an endogeneous money supply, the resulting excess demand for money[8] can only be met by raising interest rates. In this situation, the orthodox 'cost of capital' channel comes into operation, resulting in a multiple contraction in the level of output and employment. Prices are also affected, but only indirectly through wage determination. The initial increase in wage demands, by fuelling an increase in nominal income, leads, via the mark-up model, to higher prices. However, the

subsequent fall in employment, when full accommodation is not forthcoming, helps undermine wage demand and subsequently lowers both wage rates and prices. In this situation when problems of availability occur, monetary expansion is only impotent with respect to any direct link with prices, whilst output and employment are influenced in both the short and long run. Alternatively, if one accepts Kaldor's explanation of total endogeneity of the money supply, any shortfall in accommodation is made up by changes in the velocity of circulation. No problems of credit availability exist and the former analysis applies.

The importance of 'credit-money' in influencing output and employment stems from the constraint on availability. Given the non-ergodic nature of expectations, the economy is inherently unstable and this instability may be fuelled by the liquidity preferences of the financial institutions. Downturns may well be exacerbated by the liquidity preference of the monetary authorities who become less willing to accommodate productive money demand. Conversely, overconfidence in an upswing may induce the monetary authorities to accommodate speculative money demand, leading to the premature collapse of a boom. When one examines an open economy (section V) then the possible sources of finance increase and this constraint becomes less binding. In a situation of total endogeneity, the finance motive is redundant, output and employment expand by the full multiple effect, exacerbating a possible boom.

Although the monetary authorities have no control over a totally endogeneous money supply, they can influence the exogenous market interest rate. These rates are assumed to be determined by a mark-up, dependent upon the degree of monopolistic power or profit margin, over the "cost of funds", proxied by the bank rate. A decrease in the bank rate produces a ripple effect in all markets and subsequent decreases induce an increase in investment and a multiple expansion in output and employment. Thus an excess demand for money prevails and the money supply increases.

IV) ORTHODOX MONETARY THEORIES: AN OPEN ECONOMY

With the increased globalisation of international markets, facilitated by the introduction of the flexible exchange rate era, the need for a comprehensive theory on the determination of the exchange rate has become imperative. Traditionally views on exchange rates centred on equating the flows of demand for international goods and services, illustrated by the utilisation of various current account models. However, in recent years, given the increased importance of financial transactions, facilitated by the lifting of the exchange controls in 1979 and the "Big Bang" in 1986, these types of models have been superceded by others which equate the international demand for stocks of assets. This trend has led to the establishment of alternative models of the 'monetary' or 'asset market' view and with this a

major controversy on the implications for the relationship between the exchange rate[9] and interest rates has evolved. On the one hand, the "Chicago" (Frenkel, 1974; Bilson, 1978, 1979) view postulates a negative relationship between the two variables, whereby a lower interest rate by producing an excess demand for money creates an exchange rate appreciation. On the other hand, the "Keynesian" (Dornbusch, 1976) view stipulates a positive relationship, given that lower interest rates produce a capital outflows and thus an exchange rate depreciation. One solution to this controversy has been advocated by Frankel (1979) with his more general "real interest differential" model, whereby the conflicting results are justified in terms of the size of the inflation differential.

Other models (eg. Branson, 1977), derived from the asset market view, but based more upon Tobin's portfolio balance approach, have also been developed. This type of model dispenses with the assumption of perfect substitutability between foreign and domestic liquid assets and assumes that economic agents allocate their wealth between foreign and domestic assets and domestic currency.

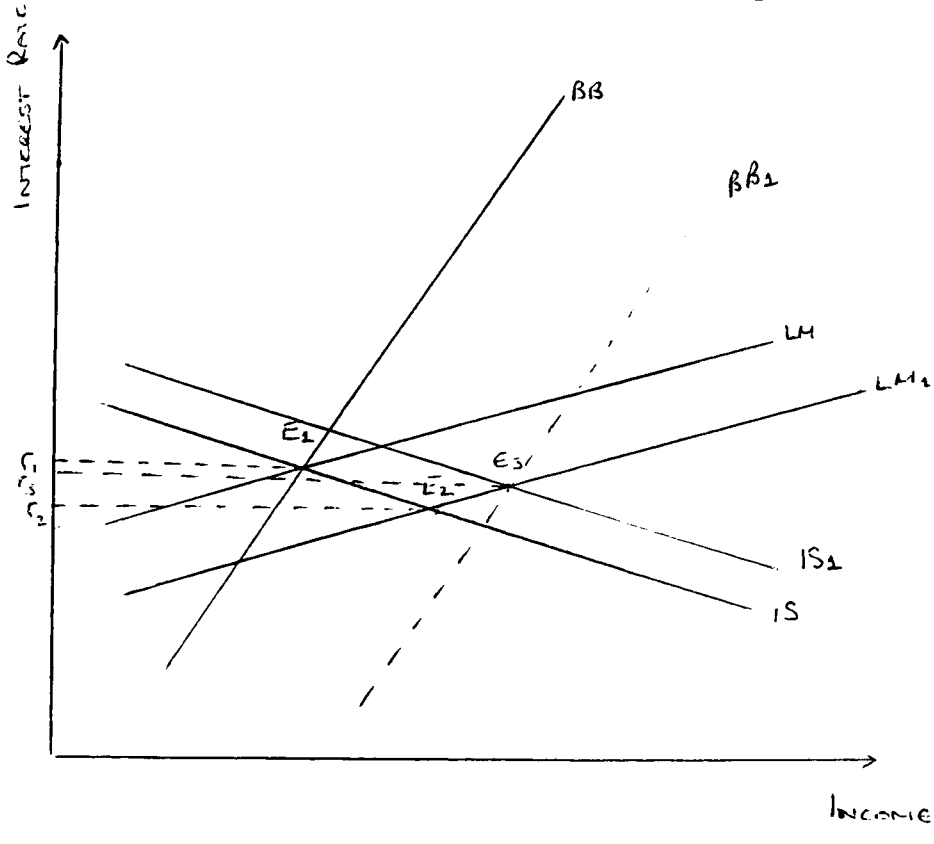
All these recent models originate from the pioneering work of Mundell (1963) and Fleming (1962), whom extended the ISLM framework to examine the workings of an open economy.

The Mundell-Fleming (M-F) model

Given the Keynesian assumption of fixed prices, the M-F model can be used to examine the effects of an expansionary monetary policy under three alternative scenarios. Firstly, diagram 3.2 depicts the case of imperfect capital mobility, under both a fixed and floating exchange rate regime. Then diagram 3.3 shows the case of perfect capital mobility, under a fully floating regime, a situation more akin to the UK.

Diagram 3.2

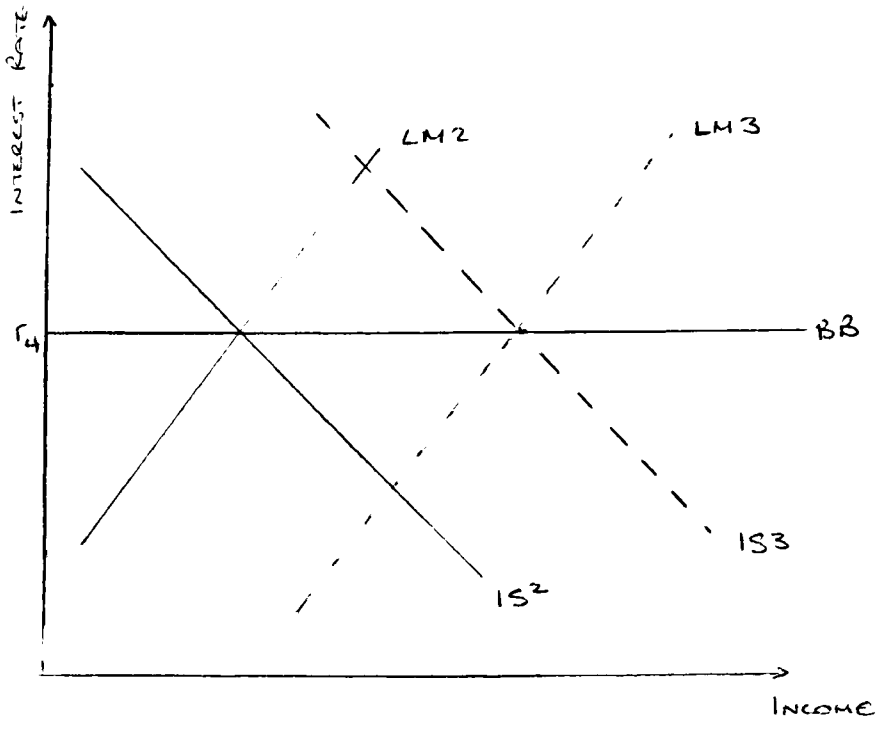
The M-F model - with imperfect capital mobility



The initial impact of a domestic monetary expansion would be to lower interest rates, producing an incipient capital outflow, and exerting an expansionary effect on expenditure and output, thereby increasing imports and concluding in a balance of payments deficit (E2). If, as prior to 1972, a fixed exchange rate regime is in operation, then foreign reserves are needed to fund the deficit and the money supply contracts to its original level (E1). The speed of this adjustment is dependent upon the degree of capital mobility, the more interest elastic is capital the quicker the adjustment. In this situation, monetary policy is sterile. If, however, as has been the case since 1972, a floating regime is followed, then the resulting deficit would cause an exchange rate depreciation and enhance competitiveness, given the elasticity conditions were satisfied, depicted by a rightward shift of the IS schedule (IS to IS1). The subsequent expansion in output would then further increase the level of income and the demand for money, with the latter producing an interest rate rise. This increase would then induce a counteracting capital inflow and appreciate the exchange rate, thus reducing the competitive advantage and dampening the expansion. The final equilibrium (E3) would be one of a lower initial interest rate and a higher income level, produced by both domestic and foreign stimuli.

Diagram 3.3

The M-F model - with perfect capital mobility



If perfect capital mobility is assumed (diagram 3.3) then an expansionary monetary policy (LM2 to LM3) is at its most potent. The subsequent increase in output and income (IS2 to IS3) needed to ensure that economic agents willingly hold the excess money balances, at the prevailing interest rate (r4), is generated by an exchange rate depreciation, activated by the incipient capital outflows, and the current account surplus, brought about by an increased competitiveness (Dornbusch, 1984).

In this analysis, given a fully floating regime, the role of the current account is paramount. When imperfect capital mobility is assumed, the initial depreciation, by enhancing competition, would activate a real expansion. However, the subsequent appreciation dampens this expansion and consequently the effectiveness of monetary policy is undermined. Alternatively, given perfect capital mobility, the enhanced competitiveness, induced by depreciation, ensures that monetary policy is at its most effective.

International monetary models

The most basic international monetary model (equation 3.4.1), sometimes known as the "Chicago" view, combines the quantity theory of money with the purchasing power parity (PPP) condition, given the assumption that domestic and foreign goods and interest-bearing assets are perfect substitutes. In this context, the exchange rate is seen as the relative price of two monies and no explicit capital account is modelled.

$$m = p + \phi y - \lambda r$$

$$m^* = p^* + \phi y^* - \lambda r^*$$

$$e = p^* - p$$

$$e = -(m - m^*) + \phi(y - y^*) - \lambda(r - r^*) \qquad (3.4.1)$$

where[10]

ϕ, λ = parameters

e = exchange rate

p = price level

r = nominal interest rate

y = real income

Under a fully floating exchange rate regime, assuming domestic output and interest rates are exogenous, an expansionary monetary policy produces an excess demand for foreign goods, given that domestic prices are tied by foreign competition. This excess demand then results in an exchange rate depreciation, thereby permitting restoration of equilibrium by allowing the domestic price level to rise by an equiproportionate amount and so become compatible with the PPP (Haache and Townend, 1981). In this situation, monetary policy has no effect on real factors, as in keeping with the closed economy monetarist models.

The simplistic international monetary model has been superceded in recent years by more complex versions (eg Bilson, 1978b), that incorporate the role of speculation and investigate the problem of portfolio selection, thus further blurring the definitional distinctions between the alternative views. These complexities have led to the amendment of the above transmission mechanism, such that an indirect speculative element of future monetary growth is also included, given the assumption of rational expectations. If the monetary expansion is in line with the exchange rate, then speculators will aid the equality between the current and equilibrium rate. If, however, there is a conflict of objectives, rational expectations will destabilise this

equality.

Another alternative extension of the simplistic monetary model has been developed by Dornbusch (1976). This model, which examines the different speeds of adjustment between the assets and goods markets, given the assumption of 'sticky' prices, has sometimes been referred to as Keynesian. Although the long run steady-state properties of the monetary model are retained, in the short run the exchange rate and interest rate may diverge from their long run levels, then monetary policy may effect real variables.

Dornbusch's exchange rate dynamics (ERD) model

In Dornbusch's ERD model although the conventional domestic demand-for-money function (equation 3.4.2) is the same as the basic monetary model and perfect capital mobility, given an anticipated change in the exchange rate (equation 3.4.3) is assumed, one major departure from the basic theory is the assumption of sluggish prices (equation 3.4.7) in the goods market (equation 3.4.6). This latter assumption, coupled with endogeneous exchange rate expectations (equation 3.4.4), provides a plausible explanation (equation 3.4.8) for exchange rates overshooting, dependent upon the price level and the characteristics of the goods market.

Monetary market:

$$m = p + \phi y - \lambda r \qquad (3.4.2)$$

$$r = r^* + x \qquad (3.4.3)$$

$$x = \theta(e - e) \qquad 0<\theta<1 \qquad (3.4.4)$$

$$e = \bar{e} - (1/\lambda\theta)(p - \bar{p}) \qquad (3.4.5)$$

Goods market:

$$d = u + \delta(e - p) + \gamma y - \sigma r \qquad (3.4.6)$$

$$p(t) = \bar{p} + (p_o - \bar{p}) \exp(-vt) \qquad (3.4.7)$$

The path of the exchange rate:

$$e(t) = \bar{e} - (1/\lambda\theta)(p_o - \bar{p}) \exp(-vt)$$

$$= \bar{e} + (e_o - \bar{e}) \exp(-vt) \qquad (3.4.8$$

where:

$\lambda, \phi, \theta, \delta, \gamma, \sigma$ = parameters

d = demand for domestic output

e = current exchange rate

$\bar{e}$ = long run exchange rate

p = price level

$\bar{p}$ = long run equilibrium price level

r = domestic interest rates

r* = world interest rate

t = time path

u = shift parameter

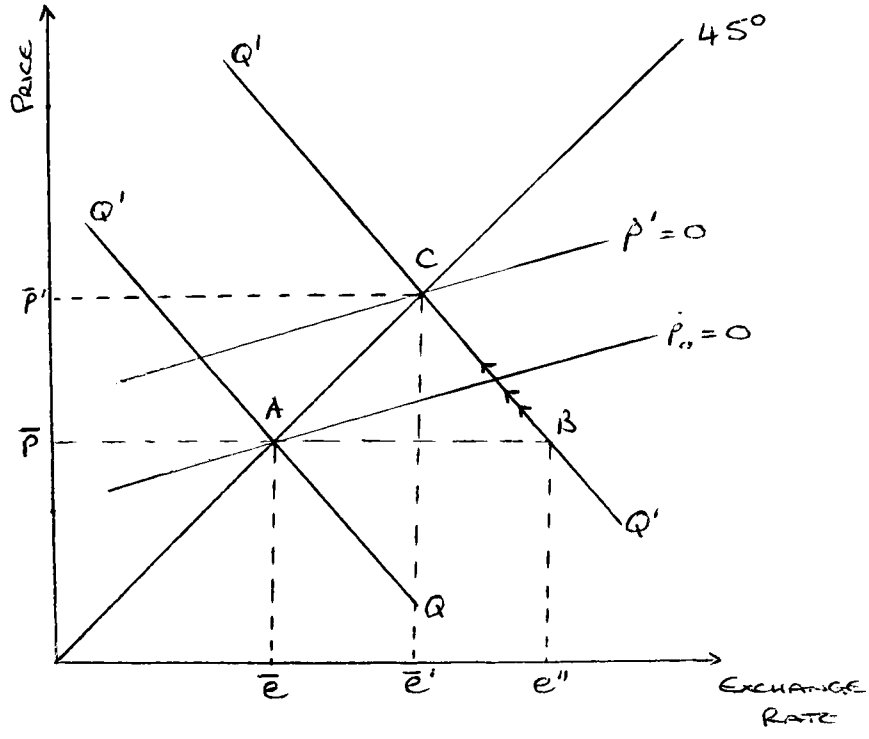
v = constant

x = expected rate of depreciation

y = real income

Diagram 3.4

Dornbusch's ERD model



Before an unanticipated domestic monetary expansion occurs, the economy is assumed to be at equilibrium position A (diagram 3.4). However, the initial reaction, assuming the expansion is to persist, is disequilibrium in both the asset market (QQ) and the goods market ($\dot{p}$), causing interest rates to be reduced and a long run exchange rate depreciation to be anticipated ($\bar{e}'$). Both these factors reduce the attractiveness of domestic assets and an incipient capital outflow results, causing the spot rate to depreciate further (e"). Thus the current exchange rate overshoots the

anticipated long run rate and a future appreciation is anticipated. The actual extent of this overshooting is dependent upon the interest response of money demand (λ) and the expectations coefficient (θ).

A short-run quasi-equilibrium situation (point B) occurs, whereby the asset market is in equilibrium, given that the anticipated exchange rate apprecation balances the reduced interest rate effect. However, an excess demand for goods (d) prevails, caused by the decline in the domestic interest rate and the subsequent depreciation in the exchange rate, thus lowering the relative price of domestic goods. In this situation real effects are exerted on interest rates, the terms of trade and aggregate demand, given that the nominal change in the money supply is equivalent to a real change.

The short run disequilibrium in the goods market exerts inflationary pressures on the economy and domestic prices begin to rise (p(t)). Thus, the real money supply begins to fall and interest rates rise, causing an incipient capital inflow and an exchange rate appreciation. The economy is finally restored to the initial real equilibrium position (C), but at a higher price level ($\bar{p}'$) and a higher exchange rate ($\bar{e}'$), equiproportionate to the monetary expansion. In the long run, there is no effect on real factors, monetary policy is sterile.

Portfolio balance model

This type of model (equation 3.4.9), usually associated with Branson (1977), relaxes the assumption of perfect substitutability between foreign and domestic bonds, such that economic agents allocate their wealth (W) between domestic currency (M), domestic bonds (B) and foreign bonds (F), given the domestic and foreign rates of return. The role of the exchange rate in this context is to balance assets demand and supplies, rather than monies.

$$\begin{aligned} M &= m(r, r^*, W) \\ B &= b(r, r^*, W) \\ (F/e) &= f(r, r^*, W) \\ W &= M + B + F/e \end{aligned} \qquad (3.4.9)$$

where:

B = domestic bonds

e = exchange rate

F = foreign bonds

M = domestic money

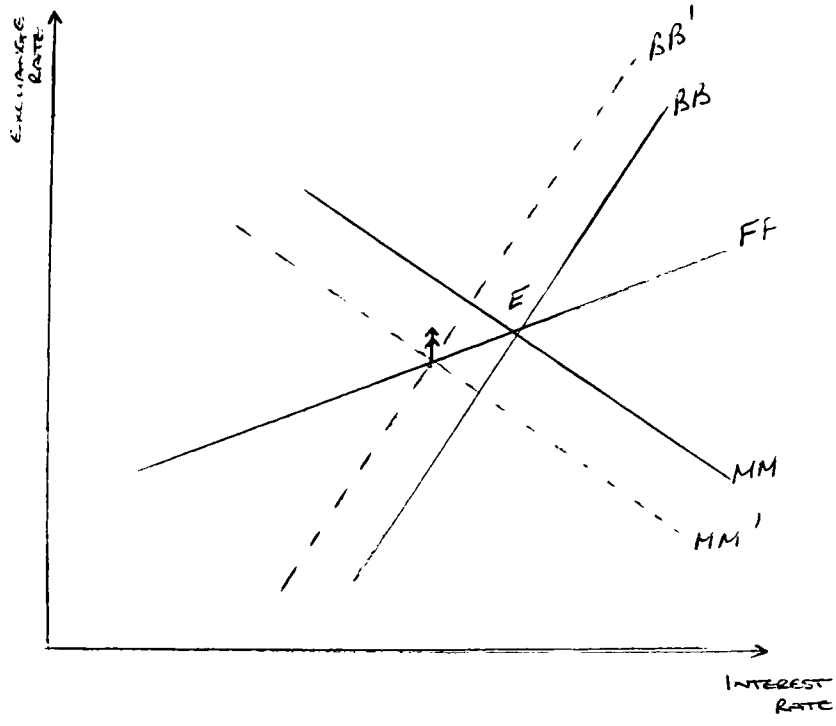
r = domestic interest rates

r* = foreign interest rates

W = total private sector wealth

Diagram 3.5

The portfolio balance model



A domestic monetary expansion (MM to MM' - diagram 3.5), brought about by the purchase of domestic bonds by the authorities, triggers off a portfolio imbalance, in terms of an excess supply of domestic money and an equal excess demand for domestic bonds. To restore domestic equilibrium, the domestic interest rate must be lowered, thus inducing an incipient capital outflow and an excess demand for foreign bonds, restored by a depreciation. However, the depreciation creates a current account surplus, given that the elasticities of trade are satisfied, and the supply of

foreign assets increases. Thus imbalance still remains, though this time in terms of an excess supply of foreign bonds and an excess demand for domestic bonds and domestic currency. To ensure that a portfolio balance occurs, the exchange rate must subsequently appreciate to eliminate the excess demand. Over- and under- shooting may occur before full equilibrium is finally achieved, thus the mechanism operates via a number of asset market equilibria.

The stability of this mechanism is dependent upon the terms of trade. When the current account improves the subsequent exchange rate appreciation may dampen the effect by lowering net exports. Conversely, increased net foreign assets, by producing higher investment income, may aggravate the current account surplus. Thus, the former effect must outweigh the latter to ensure that the initial surplus is eventually eliminated and full equilibrium is restored.

The basic portfolio balance approach, set forth here, is only partial in its analysis. Although concern lies with how individuals allocate their wealth, this approach omits to analyse how this wealth is determined. Similarly, the determination of income is excluded and thus the interaction between the real and financial sectors. Consequently, no conclusions are forthcoming on the real effects of an expansionary monetary policy.

V) POST-KEYNESIAN MONETARY THEORY: AN OPEN ECONOMY

The post-keynesian analysis can be extended to examine the international aspects of monetary theory in terms of both a fixed and floating exchange rate regime.

Fixed exchange rate

When a fixed exchange rate regime is followed domestic and foreign currencies become perfect substitutes for each other, provided that complete confidence in the ability of the authorities to maintain the parity is sustained (Davidson, 1982, p.111). Consequently the supply of and the demand for finance become a global, rather than a domestic, issue, dependent upon relative interest rates. The endogeneity element of the money supply is further enhanced and the increased sources of availability undermine the finance motive.

Changes in the supply of finance are dependent upon both elements of the balance of payments. Generally a surplus enhances supply whilst a deficit diminishes it (Dow, 1986/87). From the viewpoint of the capital account, if relatively high interest rates occur in an upswing, due to the excess demand for finance, capital inflows are induced, thus helping to finance the expansion and prolong the boom. Conversely, relatively low interest rates, possibly applicable to the deflationary scenario of a downswing, induce capital outflows and restrict finance, thus prolonging

the slump. Consequently, one possible effect of opening up the economy is to exacerbate the business cycle, thus increasing the scope for instability.

The effect on the trade account depends on the nature of the expansion. If the expansion is generated internally, the main effect is to increase imports relative to exports. This reduces the supply of finance and modifies the expansion. Alternatively, if the expansion is export-led, it will initially be reinforced by a capital inflow. However, imports will eventually grow and net export earnings will be curtailed, thus deterring capital inflows and subsequently modifying the boom. Ultimately, therefore, the influence of the trade account is to modify the instability of the capital account.

Floating exchange rate

In an economy where a floating exchange rate regime is operative, currencies are no longer perfect substitutes and the availability of finance is not indefinite. However, liquidity may be enhanced indirectly through an exchange rate appreciation, by producing increased confidence in the economy. Similarly, the increased confidence associated with an appreciation may induce people to lower their liquidity preference. Combined these two elements imply that the availability constraint in an open economy is likely to occur later in the business cycle, than is the case for a closed economy. Thus the openness of the economy exacerbates the

business cycle.

If the expansion is internally generated, the trade and long run capital account tend to cancel each other out. High interest rates induce capital inflows and the exchange rate appreciates, whilst imports cause a depreciation, thus the expansion continues unconstrained. Conversely, an external expansion puts upward pressure on the currency during an upswing and downward pressure during a downswing, thus the cycle is aggravated.

The openness of the economy, regardless of the exchange rate regime followed, produces a situation of instability. Booms are likely to produce record highs, whilst the corresponding slumps are likely to reach even lower depths.

VI) CONCLUSION

This chapter pinpoints the various monetary theories and analyses their corresponding transmission mechanisms, given an expansionary domestic monetary policy. The effectiveness of this policy is dependent partly upon the substitutability between real and financial assets and partly upon the acceptance of an exogenous money supply. The orthodox theorists, whom all assume an exogenous money supply, examine the linkage betweeen money and nominal income.

According to the monetarist doctrine, money by

possessing the unique characteristic of being a substitute for all assets, both real and financial, is the only determinant of inflation. Thus, assuming a closed economy, monetarists postulate that, at least in the long run, a monetary expansion cause an equiproportional increase in prices with no effect on real factors. If the analysis is extended to examine an open economy than a similar conclusion emerges. The basic international monetary model envisages the extreme assumption of an instantaneous price adjustment to ensure that the PPP holds. Thus no real effects occur, even in the short run. Dornbusch (1976) modifies this analysis, by assuming the existence of 'sticky' prices in the goods market, leading him to conclude that short run real effects may occur. However, ultimately the monetary expansion causes an equi-proportional increase in prices, with no long term real effect.

The closed economy analysis of the Keynesian doctrine, by assuming close substitutability between money and financial assets only, postulates that an expansionary monetary policy has a sustained, though slight, real effect on output and employment. This effect occurs indirectly via the 'cost of capital' channel. Extending the framework (Mundell, 1963; Fleming, 1962) to examine an open economy produces similar results, with monetary policy at its most potent when perfect capital mobility is assumed.

On the other hand, the neo-Keynesians de-emphasis the importance of the 'cost of capital' channel by including a

wide spectrum of assets. Thus other effects, namely wealth and credit availability are examined instead. The extension of a portfolio balance model to an open economy (Branson, 1977), though concentrating on wealth, provides no conclusive analysis of the real effect.

In complete contrast to the orthodox monetary theories, post-Keynesians emphasise the endogeneity of the money supply. This stems from their belief in the demand-determined nature of 'credit-money', whereby production creates money. Consequently, a situation of an excess supply of money cannot occur and a traditional expansionary monetary policy is sterile. However, credit-money is very important in sustaining an increase in ex ante investment. Thus post-Keynesians analyse the link between nominal income and money. The funding of production is dependent upon the liquidity preference of the financial institutions and thus business cycles may be exacerbated by their activities. During an upswing, funds are likely to be readily available, thus promoting an expansion. Whilst during a downswing, funds are squeezed, thus prolonging a slump.

All the above theories need to be empirically tested, thus econometric models are constructed. Although macroeconomic models may not be constructed primarily to test particular theories, the theoretical foundations of a model are of paramount importance. In the next chapter we will examine the theories behind the four models under-review and the interaction between the real and financial sectors. If a

model is to capture reality then the latter linkages must be correctly modelled. Thus in chapter five the transmission mechanisms of the four models will be evaluated in terms of the theoretical mechanisms discussed above.

Endnotes

1) An indirect mechanism based upon interest rate changes has been suggested by some (e.g. Thornton, 1802); it relates to the a divergence between the natural rate of interest, which occurs when savings equal investment (i.e. at full employment equilibrium), and the market rate which occurs when the money supply increases. This divergence encourages firms to invest in new capital assets and consumer durables. However, due to the assumption of constant output, prices are forced upwards. These price increases are equivalent to a fall in the real money supply and to increases in the market interest rate. This rate continues to rise until equilibrium is restored, i.e the market rate equals the natural rate. In this situation, the proportionate rate between money and prices is still assured (Denis, 1981, pp.55-56).

2) Extending the analysis to include all financial assets, a ripple effect will run along the financial spectrum, with higher prices for all assets, until portfolio equilibrium is restored. Note that the effect is more predominant at the short end of the market, where assets are near-perfect substitutes for money, than at the longer end (Coghlan, 1980).

3) One important admission in this extended version is the importance attributred to the stock market, thus allowing

equities to exhibit the properties of liquidity.

4) All economic events, be they in the past, present or future, are presumed to be under statistical control and thus future economic outcomes can be predicted in a statistically reliable manner (Davidson, 1986).

5) The rejection of ergodic uncertainty implies that no operative model on expectations will be forthcoming, a situation prone to criticism given the increased concern with expectations. Budd (1987) further highlights the problem of rejecting ergodic formulations, given that they are fundamental to both econometrics and economic modelling.

6) The use of the term `animal spirit' as a means of justifying entrepreneurial investment decisions is seen by Tarshis (1980, p.13) as "no better than to sweep the problem under the rug".

7) Weintraub examines an exogenous increase in wage demands only, whilst Kaldor's broader explanation includes such factors as:

i) the pressure of demand;

ii) domestic investment;

iii) exports;

iv) fiscal policy;

v) the rate of wage inflation;

vi) variation in the PSBR.

8) The excess demand would be less in Minsky's analysis, given the assumption of a variable velocity of circulation. However, the transmission mechanism would be the same.

9) The exchange rate is taken to be the foreign price of domestic currency (eg. £/$) throughout.

10) An asterisk denotes a foreign variable, with the lower-case letters, except for r, denoting natural logarithms throughout.

CHAPTER FOUR: THE STYLISED MODELS - RECONSTRUCTED

I) INTRODUCTION

This chapter reconstructs the monetary sectors of the four models under-review, in terms of four stylised versions of the complete models. All four models estimate structural equations, in terms of the components of aggregate demand, in accordance with the orthodox Keynesian income-expenditure identity, thereby emphasising the importance of allocative detail and the explicit modelling of the transmission mechanism. However, given the abundance of alternative interpretations for many economic concepts and the diversity of aims of the various researchers, all four models have evolved in different directions. These differences, along with the similarities, between the models will be examined in greater depth in chapter five.

In attempting to be as impartial as possible, the models will be analysed in alphabetical order, thus no indication of their various merits, or failings, are implied. Firstly, concern lies with the largest of the UK quarterly models, namely the H.M. Treasury (HMT) model. This stylised version, which unfortunately omits much of the detailed treatment of other financial institutions (OFIs), originates from the work of Melliss (1986) and the H.M. Treasury Documentation (H.M. Treasury, 1987). Secondly, the more international monetarist, London Business school (LBS) model

is examined, in terms of the work undertaken by Budd et al (1984) and Keating (1985). Thirdly, the monetary sector of the National Institite of Economic and Social Research (NIESR), model 9 (National Institute, 1986), is analysed with the assistance of Britton (1983). Finally, concern falls on the relatively recent post-Keynesian model (PK) - Arestis, (1987/88) - based upon the methodology advocated by Eichner (1979).

No empirical regressions will be reported here, given that these are readily available from the various sources and also that they are constantly changing with continual research. Instead concern will lie with the various theoretical underpinnings that underlie the behavioural equations and identities of the four models. The equations of particular import are those that contribute to the explanation of the various channels of the transmission mechanism.

Each model, in turn, will be discussed in a similar way. After a short introduction, the historical developments of the complete model will be examined. Thereby demonstrating the growing importance of explicitly modelling a complete monetary sector, as opposed to just including a demand-for-money equation. This will be followed by the detailed treatment of the major behavioural equations and identities found in the monetary sector, including the exchange rate, that contribute to the transmission mechanism. The inference to the importance of the various aspects of

financial innovation and economic theory are analysed. Next, the various channels of the transmission mechanisms, linking together the real and financial sectors, will be thoroughly analysed, paying particular reference to the theoretical channels explored in the previous chapter. Conclusions will then be drawn in terms of the major points evolving from each model.

Finally to conclude this chapter, a brief resumé of all four models will be provided.

II) THE H.M. TREASURY MODEL[1]

The H.M. Treasury (HMT) model is, at present, the largest[2] quarterly macroeconomic model in the UK. It comprises over 1,000 variables of which 800 are endogeneous and of those, 500 are explained by behavioural equations.

The model originated in the sixties due to the growing need for official short-term forecasting. Over the years it has evolved gradually as governmental policy has changed emphasis, and both economic theory and econometric methodology have matured. It is, therefore, likely to be criticised by applied econometricians on at least one level, given that successive generations of the model have evolved via very loosely defined theoretical and empirical framework. At times coefficients have been imposed merely on the basis of outside information, without the inclusion of any coherent methodology. For example, in estimating the equation for

consumers' expenditure on non-durables the interest semi-elasticity is imposed at -0.59, whilst the income elasticity is imposed at 0.9 (H.M. Treasury, 1987, p.158). Without these impositions, the free estimation of the equation would result in the undesirable properties of a larger interest rate effect coupled with a smaller income effect. Time-consuming research is continually undertaken on various portions of the model this predominantly results in only incremental changes in the model's properties, any fundamental change in the model's specification happens relatively infrequently. The rationale of this procedure stems from the major aim of the research, which is to produce an official forecast of the UK econonmy. This particular kind of evolution, therefore, reflects, in part, the sheer size of the model, and yet it also reflects the general attitude to model building within the H.M. Treasury.

Basically, the original model analysed effective demand in real terms using the Keynesian income-expendituire framework. Before the construction of a monetary block (Spencer and Mowl, 1978), any monetary variables utilised in the model, were determined judgementally and then iteration between the real expenditure system and the monetary factors had to be carried out manually. However, as monetary policy became more important, the need for a fully integrated monetary block, describing the UK monetary system, became apparent. Thus, a monetary sector was constructed in such a way as to complement the already established income-

expenditure model.

The model basically divides the economy into four sectors - the non-bank private sector (NBPS); the public sector; the banking sector; and the overseas sector. The last two sectors are self explanatory with the first two being further disaggregated. The public sector, which has few behavioural equations despite its size, is disaggregated into central government, local authorities and public corporations, with the latter predominantly concentrating on nationalised industries. The NBPS is disaggregated into industrial and commercial companies (ICCs), the personal sector and non-bank financial institutions. The latter group involves a detailed examination of the workings of the building societies, an increasingly important area.

The monetary sector of the complete model

The complete monetary block comprises over 200 variables, of which 30 are explained by behavioural equations. The vast size of this block stems from its devotion to detail in examining the workings of building societies and other financial institutions, as well as from detailed disaggregation of various assets and liabilities. These include: i) notes and coins; ii) gilts - examining both the conventional kind and those which are index-linked; iii) national savings certificates - examined in a similar way; iv) equities; v) other public sector debt; vi) bank deposits - both interest and non-interest bearing; vii) building

societies deposits and share accounts - with the latter further disaggregated to examine the recent acquisition of wholesale deposits; viii) loans for house purchases - which are disaggregated into those available from banks, building societies and other non-bank financial institutions; ix) other loans - similarly disaggregated; x) Treasury bills; xi) commercial bills; xii) tax reserve certificates and deposits; xiii) shares and unit trusts; xiv) life assurance equity; and xv) foreign currency deposits. Such intrinsic detail results in the HMT model pertaining, at least compared to the other three models, to a general equilibrium approach (Thompson, 1984).

Earlier versions of the monetary sector incorporated no explicit demand-for-money function. Instead, preoccupation lay with the portfolio behaviour of the non-bank private sector (NBPS) between foreign and domestic financial assets and liabilities, as formulated by Tobin. Concern fell upon the respective allocation of the net financial wealth, which was estimated by cumulating the respective financial surpluses, pre-determined in the income-expenditure model, after allowing for capital revaluations due to interest rate changes. The equations were estimated using a structural framework and thus the demand-for-money equation acted as the residual item in the NBPS's portfolio, ensuring that the balance sheet constraint was obeyed. This concern with structural equations, as opposed to reduced form ones, led to attempts to examine explicitly the linkages between the real

and financial sectors. The success of this approach is dependent upon the correct specification of all real and financial relationships, particularly in terms of the transmission mechanism between the two sectors (Spencer and Mowl, 1978). The major channels of the transmission mechanism utilised in the HMT model will be examined later, though given the sheer size of the model all possible linkages cannot be indicated without the use of detailed simulation exercises.

In the present version of the model, although the methodology and preoccupation with portfolio selection remains, greater emphasis is placed on the demand-for-money by incorporating two explicit equations. Concern lies with the determination of the monetary base, M0, and with the much broader definition, £M3. This increased concern with the determinants of the money stock is probably due to the changing emphasis of monetary policy and the preoccupation with monetary targets. Note, however, that when the model is used for forecasting or simulation exercises are undertaken, given that the money supply is assumed to be unaccommodated, an average of the two definitions is usually employed as the appropriate policy/target variable.

The model as a whole can be manipulated to generate a variety of solutions in two distinct ways. Firstly, one can assume that short-term interest rates are exogenous, with the pivotal rate being the three month interbank rate, and therefore, all asset holdings (including money balances) are

endogeneous. In this case, which is the norm, any change in the demand for money is accommodated by changes in the money supply, and thus attempts at monetary targetry would be futile.

Alternatively, the model may be formulated in such a way that the money supply (or some alternative asset) is treated as exogenous and short-term interest rates vary to equate money demand with the (fixed) money supply. Here, monetary authorities are not undertaking an accommodating policy and therefore monetary targetry may be possible.

The stylised version of the monetary sector

Table 4.1 summarises the major elements of the monetary sector, excluding the explicit modelling of building societies, aimed at examining the allocation of the NBPS wealth across assets.

Table 4.1[3]

THE STYLISED MONETARY SECTOR OF THE HMT MODEL

Domestic Financial Sector

$$NAFPR = NAFIC + NAFPE + NAFFC \qquad (4.2.1)$$

$$NAF(A) = S(A) - KE(A) + KG(A) - KT(A) \qquad (4.2.2)$$

$$\Delta GROSWPR = NAFPR + \Delta BLP + \Delta B\$ \qquad (4.2.3)$$

$$BLP = BLI + BLC + BLF \qquad (4.2.4)$$

$$BLI = Bi\ (Y,\ rw,\ r,\ P,\ NAFIC) \qquad (4.2.5)$$

$Bi1>0,\ Bi2>0,\ Bi3<0,\ Bi4>0,\ Bi5<0.$

$$BLC = Bc\ (Y,\ NFIN,\ r) \qquad (4.2.6)$$

$Bc1>0,\ Bc2>0,\ Bc3<0.$

$$LIQPE = Lq\ (BLC,\ NAFPE,\ Y,\ r,\ R+EG,\ RLIQ) \qquad (4.2.7)$$

$Lq1>0,\ Lq2>0,\ Lq3>0,\ Lq4<0,\ Lq5<0,\ LQ6>0$

$$M0 = m\ (P,\ Y,\ r,\ PPBA) \qquad (4.2.8)$$

$m1>0,\ m2>0,\ m3>0,\ m4>0.\ m5<0$

$$SM3 = m\ (P,\ GROSWPR,\ B\$,\ Y,\ R+EG-r) \qquad (4.2.9)$$

$m1>0,\ m2>0,\ m3>0,\ m4>0,\ m5<0.$

$$EG = e\ (R,\ r,\ P^*,\ PSBR/NWEL) \qquad (4.2.10)$$

$e1>0,\ e2<0,\ e3<0,\ e4<0$

$$\Delta B = PSBR + \Delta BLP - \Delta SM3 \qquad (4.2.11)$$

$$r = r\ (R) \qquad (4.2.12)$$

$r1>0$

Exchange Rate System

$$ERQ = e\ (EXNST,\ (SM3+M0)/Mw,\ r-rw,\ RELC) \qquad (4.2.13)$$

$e1<0,\ e2<0,\ e3>0,\ e4<0$

$$ERE = e\ (ERQ,\ ER/ERQ) \qquad (4.2.14)$$

$e1>0,\ e2<0$

$$ER = e\ (ERE,\ r-rw,\ BB/(SM3+M0)) \qquad (4.2.15)$$

$e1>0,\ e2>0,\ e3>0$

$$BB = CB + KM - BOF \qquad (4.2.16)$$

$$CB = QX.Px - QM.Pm \qquad (4.2.17)$$

$$KM = k\ (Y,\ Yw,\ R,\ Rw) \qquad (4.2.18)$$

Glossary[4]

ΔB = non-bank private sector purchases of gilts.

$\Delta B\$$ = revaluation of holdings of gilts.

BB = basic balance (£m)

BLC = £ bank advances to the personal sector

BLF = £ bank advances to other financial institutions

BLI = £ bank advances to industrial and commercial companies

BLP = £ bank advances to the private sector

BOF = balance of official finance.

CB = balance of payments current account

EG = expected gain

ER = effective exchange rate

ERF = expected effective exchange rate.

ERQ = equilibrium effective exchange rate.

EXNST = real value of stock of expected stock of North Sea oil reserves.

GROWSPR = gross wealth of the private sector.

KE(A) = capital expenditure of (A)

KG(A) = capital grants received by (A).

KM = capital flows.

KT(A) = capital taxes paid by (A).

LIQPE = stock of personal sector liquid assets.

M0 = non-bank private sector holdings of narrow money.

NAFFC = net acquisition of financial assets of financial companies

NAFIC = net acquisition of financial assets of ICCs.

NAFPE = net acquisition of financial assets of personal sector

NAFPR = net acquisition of financial assets of private sector

NFIN = persons net financial wealth.

NWEL = net wealth of the private sector

P = aggregate price level index, 1980=100

P* = expected inflation.

Pm = £ price of imports index, 1980=100

PPBA = number of bank and building society accounts per capita

PSBR = public sector borrowing requirement.

Px = £ price of exports index, 1980=100

QM = imports of goods and services, 1980 prices

QX = exports of goods and services, 1980 prices

r = short run interest rate.

R = long run interest rate.

RELC = relative labour cost per unit of output.

RLIQ = own rate of return on persons liquid assets.

S(A) = savings of (A).

SM3 = sterling M3

Y = activity variable.

The financial sector

The present version of the model, like earlier versions, is primarily concerned with the portfolio behaviour of the NBPS gross financial wealth (GROSWPR) between various financial assets. In this highly stylised version of the system, derived from the work of Melliss (1986), the two major assets examined are broad money £M3, which includes in its definition the narrower aggregate M0, and gilt-edged securities (ΔB$). These two assets are assumed to be imperfect substitutes only.

Gross financial wealth comprises three elements, namely the net acquisition of financial assets to the private sector (NAFPR), change in bank lending to the private sector (ΔBLP)

and capital gains in gilts ($\Delta B\$$). The private sector is disaggregated into the usual components of persons, industrial and commercial companies (ICCs), and other financial institutions (OFI). Each sector's net acquisition of financial assets (NAF(A)) is dependent upon four respective non-financial variables - savings (S(A)), capital expenditure (KE(A)), capital grants (KG(A)) and capital taxes (KT(A)). All these variables are pre-determined in the income-expenditure framework of the model, thus resulting in a significant link between the two sectors.

In the stylised model of the monetary sector, bank lending to OFIs is omitted. Work at the Treasury has been carried out in this area (Spencer, 1986), primarily in terms of the interest elasticity of this sector's bank advances and the effect of supply-side constraints (eg. the 'corset'). The two remaining bank lending equations[5] (i.e. bank lending to ICCs (BLI) and bank lending to persons (BLC)), which constitute the main liabilities of the NBPS, are both positively associated with their respective sectoral activity[6], whereby as the economy expands increased confidence and activity leads to an increased need for external funds. They are also negatively associated with domestic short-term interest rates, thus incorporating the idea of opportunity cost.

It is reasonable to assume that bank lending to ICCs is basically demand driven, in that commercial banks will normally accommodate any demand made by ICCs, at the given

interest rate, usually at the expense of other customers. In other words, there is a near-infinite supply of loans to ICCs, whilst other customers may face supply constraints. This is broadly consistent with government policy, whereby high priority groups, eg. businesses concerned with exports, are given preferential treatment, whilst other areas, such as consumer credit, may be squeezed. Although this latter idea of a credit squeeze is not incorporated into the stylised version, the idea of an infinite supply of loans for ICCs is further exemplified by the added, and rather unusual, feature of being positively associated with world interest rates. This illustrates the idea that large companies, having access to a wide variety of markets, may be encouraged to borrow domestically and lend abroad if the interest differential is in their favour.

A very important aspect to note, concerning these pair of equations, is the opposing signs associated with their respective financial wealth. Firstly, in terms of the financial situation of ICCs, as this deteriorates ICCs increase their borrowing requirement to help fund their working capital, thus leading to an inverse relationship with wealth. Conversely, the personal sector only increases its bank borrowing if its net wealth[7] position improves, thereby leading to increased confidence and an anticipated positive coefficient. Finally, bank lending to ICCs is also assumed to be positively dependent upon the price level, thus incorporating the idea of real bank lending as opposed to

nominal.

The concept of the level of liquidity for the personal sector ((LIQPE) - equation 4.2.7) is important in terms of the transmission mechanism for the consumption of non-durable goods. In the complete model, consumers are assumed to hold a portfolio comprising three different liquid assets, namely bank deposits, building society deposit and share accounts[8], and national savings. The total portfolio of these liquid assets are positively dependent upon the level of gross financial wealth, proxied by bank advances and net financial assets, and the level of sectoral activity (i.e. real personal disposable income). Liquidity is also assumed to be negatively related to the returns available on alternative assets, thus the need to incorporate short term and long term rates, as well as being positively related to its own rate of return, proxied by (RLIQ).

As stated earlier, the demand-for-money equation has experienced a reversal in importance, with the flow demand for gilts ((ΔB) - equation 4.2.11) becoming the residual asset. Apart from their importance associated with monetary targetry, the demand-for-money equations are particularly relevant in this model in helping to determine movements in the real exchange rate (see below).

The equation for the monetary base (M0) can be thought of as approximately equivalent to the currency (held by the NBPS) equations estimated in other models. However, the M0 series, suffering from the problem of a being inconsistent,

is more volatile than the narrower 'notes and coins' series. This equation is basically a simple transaction specification, based upon a general functional form of the inventory-theoretical approach adopted by Baumol (1952) and Tobin (1958). Thus demand depends positively upon both the level of permanent income, a proxy for the number of transactions, and the level of prices, which in the 1987 version of the model has proven to be insignificant, and negatively upon interest rates. An additional feature of the formulation is the inclusion of a proxy variable for the level of financial innovation, designed to capture the declining nature of the brokerage fee, thus leading through time, to a fall in cash holdings. Various proxies have been utilised to portray this idea: the ratio of current accounts to the total population, the number of cash dispensers and the number of credit cards are the most important ones (for more details see Johnston, 1984). However, in this particular equation the ratio of bank and building society accounts to the level of the population (PPBA) was employed. Thus as more people open a bank account, the need to hold cash falls. This variable is very important in terms of acknowledging changes in the financial sector.

The other demand-for-money equation examines the determinants of the broad monetary aggregate, £M3. This equation is broadly based on the portfolio theory (Grice and Bennett, 1981), whereby an agent must decide how to allocate her wealth, proxied by (GROSWPR), between money (£M3) and

bonds (ΔB), assuming that the two assets are imperfect substitutes only. Thus the relative return on the competing assets are an important determinant. These returns are captured by the term (R + EG - r), which estimates the post-tax return on gilts relative to the rate of return on the endogeneous money variable (H.M. Treasury, 1987, p.556). Like other, more conventional, demand-for-money functions, the formulation also includes an activity variable (Y), proxied by total final expenditure and a price variable.

The £M3-equation, like the M0-equation, utilises the method developed by Hendry and Mizon (1978) of the general-to-the-specific. However, in this equation, certain coefficients are restricted to ensure that the model exhibits desirable characteristics.

In the present version of the model, the NBPS's purchase of gilts (ΔB) takes the role of the residual asset[9], demonstrated by equation 4.2.11. Here the sale of gilts to the NBPS is an identity, being equal to the level of the PSBR[10], changes in bank lending to the private sector and changes in £M3. However, the possibility that economic agents may wish to speculate in their holdings of gilts is recognised by equation 4.2.10, which estimates the expected gains, available from gilt holdings. This indicates that higher long run interest rates, coupled with lower inflation and lower short term interest rates, envisage larger capital gains. The ratio of the PSBR to net wealth of the private sector, as a proxy for the borrowing burden, may also have a

short term negative effect on expected gains. When more bonds are issued (i.e. the supply is increased) then prices will fall and possible capital losses may occur.

To complete the financial sector, one needs to examine the modelling of the interest rate term structure. The pivotal rate, the three month interbank rate, is assumed to be an exogenous policy instrument, feeding into over fifty equations. The other rates, both short- and long- term, are determined by simple mark-up relationships of this rate.

External Sector

In the earlier versions of the complete HMT model, the external sector had a dual role to play (Lomax and Denham, 1978). Firstly, it completed the income-expenditure framework by incorporating a balance of payments constraint - a consideration which is very important in terms of an open economy, such as the UK. Secondly, an external input into the monetary sector, by providing alternative financial assets for the NBPS's portfolio, was established. Another direct link exists between the domestic financial sector and the external sector through the determination of the long run exchange rate. This link operates through the money supply when an accommodating policy is undertaken (i.e. the money supply is endogeneous) and through the interest rate differential when the policy is non-accommodating.

The determination of the effective exchange rate comprises three distinct equations, namely the actual rate

(ER), the expected rate (ERE) and the equilibrium rate (ERQ). This system incorporates the assumption of backward-looking expectations, determined by contemporaneous and lagged values of specific variables. However, it is now possible to solve the HMT model with 'consistent expectations'. In this case, the latter two equations become redundant and the system can be solved using an equation for the actual exchange rate only.

The equilibrium exchange rate (ERQ) is basically dependent upon an implicit purchasing power parity (PPP) condition, modelled by constraining the coefficients of the relative money supplies ((£M3+M0)/Mw) and the relative labour costs (RELC), seen as an indicator of future movements in UK prices relative to world prices, to unity. This incorporates the idea that, in the long run, the exchange rate should equilibrate the flows of foreign exchange for trade and capital flows.

Apart from the PPP conditions, the equilibrium exchange rate may also appreciate in response to either a favourable change in the uncovered interest rate differential (r-rw) or in the real value of expected North Sea oil reserves (EXNST). This latter variable is designed to reflect the assumed premium, attached to North Sea oil exploration, which favorably affects the exchange rate. Furthermore, a negative time trend is included to capture the deterioration of relative non-price competition.

The expected exchange rate is an adjustment equation,

linking together the other two equations. This models the expected rate in terms of the equilibrium rate (ERQ) and an error correction term (ER/ERQ), based on the discrepancy between the actual and equilibrium rate.

To complete the set of three equations, one needs to examine the determinants of the current rate (ER). This is firstly dependent upon a positive unit change in the expected rate (ERE), the link between equations when consistent expectations are assumed. Secondly, a favourable interest rate differential may appreciate the exchange rate, by encouraging a capital inflow, assuming perfect mobility. Finally, rather than incorporating the long run PPP condition, a variable normalising the basic balance (BB), in terms of the monetary aggregate (£M3+M0), is utilised instead. When the economy suffers a basic balance deficit (i.e. more money is spent abroad by UK residents than is spent domestically by foreigners) then the exchange rate will depreciate. Conversely, when a surplus is experienced, an appreciation will occur.

The relative size of the coefficients on the two latter variables, i.e. the interest rate differential and the basic balance, are important in determining the degree of capital mobility. If the coefficient on the basic balance is not found to be statistically different from zero, then this implies perfect capital mobility, and thus the actual exchange rate is determined by the interest rate parity only.

The basic balance is an identity, incorporating the

current account (CB), the capital account (KM) and the balance of official finance (BOF), with the latter treated as exogenous. The current account is also calculated by an identity, dependent upon the difference between nominal exports and nominal imports, both of which are determined elsewhere in the income-expenditure framework. Finally, the various components of the capital flows are predominantly determined by relative incomes and relative interest rates. However, some of the components (eg sterling lending by UK banks to overseas) are also dependent upon exchange rate expectations and thus provide market clearing flows.

The Transmission Mechanism

In the HMT model, the major channels of the transmission mechanism, linking together the real and financial sectors, are nominal and real interest rates, real financial wealth and the real exchange rate (Melliss, 1986). Less effective, though still important, is the "Radcliffian" channel of credit availability, proxied by HP controls and net liquidity, incorporated into the various components of aggregate expenditure.

The traditional Keynesian 'cost of capital' effect, utilising nominal interest rates, was originally identified as being a significant element in the "fixed investment by manufacturers" (IMB) equation. However, research undertaken in 1984 into the determinates of the factor demand equations, indicated that the nominal interest effect was inferior to

the more sophisticated composite 'cost of capital' variable[11]. Thus the latter variable was incorporated into the equation as a relative factor cost ratio, with the addition of labour costs. This variable is designed to capture a much broader definition of cost than that envisaged by the orthodox Keynesians. Also included into this equation is a long term "Radcliffian" liquidity effect, designed to capture any rationing on loans imposed by banks (Melliss, 1986).

Another 'cost of capital' effect, proxied by the real interest rate minus real capital gains, is included in some components of the stock-building element of aggregate expenditure. This utilisation of a real effect is in keeping with the gradual move, since 1981, towards relating real expenditure to real, rather than nominal, rates. These set of equations also include short- and long- term liquidity effects. The long-term effect, as in the investment equation, is designed to capture the effect of rationing, whilst the short-term effect models the cost of adjustment incurred when the actual level of liquidity diverges from the desired level.

Apart from the traditional role attributed to interest rates, the HMT model also includes them in other areas of aggregate expenditure. Among these other equations, the major ones are the 'private investment in new dwellings' (IPRND) equation, a hybrid of demand and supply considerations, and the major components of consumer expenditure.

The short term interest rate included in the (IPRND)-equation is predominantly intended to reflect builders' finance costs, though the effect on housebuyers' mortgage costs is also acknowledged. The former consideration is designed to portray an availability effect, in that higher interest rates imply higher costs and thus reduce the supply of new houses (Bladen-Hovell et al, 1982). This effect is further emphasised by the inclusion of the level of house prices.

Like other macroeconomic models, the HMT model basically disaggregates consumer expenditure into spending on durables and on non-durables. Both of these elements are now formulated in terms of an error correction model, derived from the work of Hendry and Von Ungern-Sternberg (1982). The non-durable element of consumer expenditure is dependent significantly upon the real interest rate, empirically represented by the disaggregation of the variable into the nominal rate and the inflation rate, thus allowing explicitly for the "Pigou" effect. However, to ensure that this equation exhibits desirable properties, the semi-interest elasticity is imposed at -0.59. The equation is also dependent on a liquidity-income ratio, acting as an integral control measure, such that when liquidity falls consumption is curtailed until savings restore net liquidity to the desired level (H.M. Treasury, 1987, p.158).

The formulation of the equation identifying consumption on durables has recently changed direction. Prior to

September 1986, the HMT model utilised a conventional consumption function. However, in September 1986, an error correction specification was adopted, with the optimal stock level of expenditure on durables assumed to be related to disposable income, the level of real interest rate, real financial wealth and HP credit availability[12]. This latter variable, seen as a proxy for the strength of government-imposed restrictions, is important from the "Radcliffian" viewpoint of credit availability. Though perhaps a more important feature of the equation, is the incorporation of the only direct channel for changes in real financial wealth. This inclusion of a wealth variable, as opposed to a liquidity variable has important implications for the way monetary changes affect consumption. According to the liquidity theories of consumption, an increase in the personal sector's holdings of money balances will increase consumption, whereas according to wealth theories, consumption may be unaffected by such changes (Bladen-Hovell et al, 1982; Thompson, 1984).

In terms of the external sector, the interest rate differential helps determine the net trade balance, and the money supply determines the exchange rate. The exchange rate is then implicitly incorporated, through various measures of competitiveness, into various components of the import and exports equations, with a greater effect on the former. Furthermore, the exchange rate plays an important part in determining domestic prices.

Summary

The major aim of this section has been to highlight the important elements of the monetary sector which can then be compared and contrasted in the next chapter with those elements emerging from the other three models under-review. These elements have been the allocation of the NBPS's wealth between various assets and liabilities, with the most important explicitly examined; the channels of the transmission mechanism; and the inclusion of the NBFI, especially building societies. This latter element has received limited attention, given its relative unimportance as part of the transmission mechanism, though still needs to be explicitly acknowledged.

What has emerged from this overview is an inkling into how researchers at the HMT attempt to fulfil the major aim of this sector, in allocating wealth across sectors. In this stylised version, the only two available assets for portfolio selection are the imperfect substitutes of money and bonds, with the latter treated as the residual. However, even in the complete model, with the availability of numerous financial assets, both domestic and foreign, the use of a structural framework, such as the one incorporated here, still remains. To appreciate the researchers skill in achieving a level of consistency in such a large model, one needs to demonstrate the use of the complete model graphically, in terms of simulation. Thus allowing all the possible linkages between the various equations to be examined in greater detail.

As stated earlier, no one consistent theory is utilised throughout, however the model pertains to a general ISLM framework. This idea of inconsistent theory may be particularly true in terms of the exchange rate, where PPP and interest rate parity, along with the basic balance, all have distinct roles to play. Even though one may be hard pressed to find a textbook that advocates such a model, the importance here stems from its usefulness and not its theoretical underpinnings. Economic theory is important, yet the ultimate aim is to produce a model that sufficiently mirrors reality and thus produces reasonable forecasts.

III)THE LONDON BUSINESS SCHOOL MODEL[13]

The London Business School (LBS) model dates back to the mid-sixties and, like other models of its time, was originally based upon the Keynesian income-expenditure identity. Following traditional Keynesian theory, the monetary influences in the original model were very limited, with only two monetary channels modelled. These being the traditional 'cost of capital' effect on investment and the "Radcliffian" influence of credit availability on consumer durables (Holden et al, 1982). In the early vintages of the model government policy was predominantly modelled by changes in fiscal instruments, with monetary policy taking a backseat.

However, in the mid-seventies the model experienced a

major structural change away from the Keynesian paradigm, though still retaining the basis of the income-expenditure framework, to become more 'international monetarist' in character. This emphasis towards international monetarism stemmed predominantly from the inclusion of the monetary theory of the balance of payments, developed by Frenkel and Johnson (1976), and the inclusion of the distinction between the traded and non-traded good sectors, as previously employed in the so-called Scandinavian, or Nordic, inflation model.

Two main reasons for this dramatic change have been advocated (Budd et al, 1984). Firstly, the move away from the Bretton Woods regime of pegged exchange rate towards a more freely floating regime meant that the modelling of the exchange rate had to be altered. Thus, the theoretical development of the monetary theory of exchange rates, emphasising a direct link between monetary and exchange rate changes, arose as a possible contender. Secondly, and probably more importantly, was the dramatic failure of the original model, along with other similar macroeconomic models, to adequately predict the behaviour of the economy in the depth of the recession of 1975 and the subsequent existence of stagflation, thereby failing in their basic criterion of usefulness. This widespread failure by all traditional macroeconometric models has been cited by those economists who advocate "rational expectations" (eg. Sargent, 1986) as an example of the Lucas critique. Such models,

through the employment of various methodologies, produce parameters that are policy invarient, and thus susceptible to instability.

Whatever the cause, the change in emphasis altered the properties of the model dramatically. The use of fiscal policy instruments as major governmental policy tools were abandoned, and monetary policy took on primary importance. This is in keeping with the present economic policy, as experienced in the UK with the advent of Thatcherism. A further major link between monetary conditions and domestic output and prices was opened up, via the exchange rate (Budd et al, 1984). Other additional features of recent vintages of the LBS model have been the inclusion of "rational expectations", asset clearing market prices and wealth constraints. These have evolved in line with developments in macroeconomics.

The monetary sector of the complete model

The aim of the present version of the LBS financial sector is basically to allocate various financial liabilities and assets across a wide range of sectors. This idea is incorporated into a flow-of-funds framework, thus the assets and liabilities of one sector are the liabilities and assets of all other sectors[14] (Budd et al, 1984).

The financial sector of the complete model is considerably disaggregated resulting in nine distinct sectors. These are: i) persons; ii) industrial and

commercial companies (ICCs); iii) pension funds and insurance companies; iv) banks; v) building societies; vi) unit and investment trusts; vii)any remaining financial institutions; viii) the public sector; and ix) the overseas sector. The four important sectors, in terms of portfolio behaviour, are the three domestic private non-bank sectors, consisting of persons (aggregated with unit and investment trusts for estimation purposes), ICCs and pension funds / insurance companies, plus the overseas sector. Thus the behaviour of these four sectors is of particular interest and will be explicitly examined below. However, the other sectors do have their role to play in the construction of the financial sector and thus need to be acknowledged.

The government sector's holdings of assets, determined by policy considerations, is important in terms of modelling alternative policy stances. In the LBS model, given the overt monetarist influences, a relatively wide range of monetary instruments are available. These include bonds, bills and high powered money as potential domestic instruments, used as a means of setting interest rates. However, the number of potential domestic instruments is actually reduced to two, with the third determined by the government's budget constraint. External instruments, such as the impact of foreign currency intervention and the exchange rate, can also be examined. The implication of alternative government policies can be investigated, since the parameters of the model may be considered policy varient,

given that rational expectations are modelled (Lucas, 1976).

In terms of the various financial sectors, with banks in particular, their import stems from their involvement in the process of intermediation. The LBS model assumes that banks and building societies set the various interest rates by given mark-ups above or below the bill market rate. However, such an assumption may be inconsistent, given previous legal restrictions, and thus liable to the Lucas critique.

As well as considerable disaggregation in terms of sectors, the LBS model also incorporates a vast number of available financial assets and liabilities, thirteen in all. These are: i) bonds, or more precisely gilt-edged securities (gilts); ii) equities, i.e. long term stock; iii) Treasury and Local Authority bills plus bank certificates of deposits, which are all assumed to be perfect substitutes and are therefore grouped together and called simply 'bills'; iv) bank time deposits, which can be regarded as wholesale deposits, given the UK disaggregation of official statistics (see section IV); v) bank sight deposits, or retail deposits; vi) loans for house purchases; vii) other bank loans; viii) notes and coins; ix) National Saving Certificates; x) Building Society shares; xi) hire purchase loans; xii) foreign currency short-term assets; and xiii) foreign currency long term assets. The complete model assumes that not all assets and liabilities are available to all sectors, though persons have the widest choice, with access to all

assets, except bills.

The basic idea behind the financial sector is that various risk averse agents, who are assumed to be utility maximisers, individually decide on an optimising[15] portfolio, subject to a budget constraint. The ultimate choice of all the available assets is dependent upon the value of the respective expected rate of return. All the budget constraints are predetermined in the income-expenditure framework, thereby establishing a direct and interrelated link with the rest of the macroeconomic framework. In terms of the domestic sectors, their budget constraints are calculated by their respective current income, net of expenditure, plus their respective last period's asset and liability holdings, revalued to take into account the market price in the current period. The overseas budget constraint equals the previous period's revalued asset holdings minus the balance of the current account surplus (determined in the external sector - see below).

The stylised version of the monetary sector

To retain consistency with the other three models, table 4.2 illustrates the major assets and liabilities available to all, or most of, the four sectors, though other assets/liabilities are treated in a similar manner. Each equation actually represents a series of equations for the various sectors. The specific methodology employed to estimate these equations, ensuring that wealth constraints

are binding, wil be discussed below. Table 4.2 also includes the exchange rate, which has recently been integrated into the financial flow of funds framework with the adoption of a structural model, as opposed to the previous utilisation of reduced form equations.

Table 4.2[16]

THE STYLISED MONETARY SECTOR OF THE LBS MODEL

Domestic Financial Sector

$$CUR = c\ (r_r,\ a) \qquad (4.3.1)$$

$$c1>0,\ c2>0$$

$$SD = s\ (r_r,\ a) \qquad (4.3.2)$$

$$s1>0,\ c2>0$$

$$TD = t\ (r_r,\ a,\ TD_{t-1}) \qquad (4.3.3)$$

$$t1>0,\ t2>0,\ t3>0$$

$$BL = bl\ (r_r,\ a,\ BL_{t-1}) \qquad (4.3.4)$$

$$bl1>0,\ bl2<0,\ bl3>0$$

$$\Delta B = b\ (r_r,\ a,\ \Delta B_{t-1}) \qquad (4.3.5)$$

$$b1>0,\ b2>0,\ b3>0$$

$$EQ = e\ (r_r,\ a,\ EQ_{t-1}) \qquad (4.3.6)$$

$$e1>0,\ e2>0,\ e3>0$$

$$OSH = oh\ (r_r,\ a,\ OSH_{t-1} \qquad (4.3.7)$$

$$oh1>0,\ oh2<0,\ oh3>0$$

$$OSE = oe\ (r_r,\ OSE_{t-1}) \qquad (4.3.8)$$

$$oe1>0,\ oe2>0$$

$$r = r\ (r_r) \qquad (4.3.9)$$

$$r1>0$$

Exchange Rate System

$$ER = er\ (ER^e,\ r-r_f,\ w-w_f,\ p-p_f,\ CB-OF) \qquad (4.3.10)$$

$$er1>0,\ er2>0,\ er3<0,\ er4>0,\ er5>0$$

$$CB = EXP - IMP \qquad (4.3.11)$$

Glossary[17]

a	= constant
ΔB	= gilts
Bl	= bank loans
CB	= current balance
CUR	= notes and coins
EQ	= equities
ER	= effective exchange rate
EXP	= exports (nominal)
IMP	= imports (nominal)
OF	= official financing

OSE = overseas securities

OSH = overseas "shorts"

P = price level

r = interest rate

r_r = relative return and budget constraint

SD = sight deposits

TD = time deposits

w = real wealth

Theoretically speaking, the demand for every domestic asset (denoted by X_{jt}) is dependent upon three variables: the difference between the asset's own rate of return and the return on all other assets, i.e. the relative rate of return (r_r); the difference, allowing for adjustment costs, between the previous period's holding of that asset and the weighted average asset holding last period, empirically represented by the lagged dependent variable (X_{jt-1}); and the budget constraint (w), the level of a sector's real wealth, given that some assets may at times be rationed. This latter variable, determined in the income-expenditure framework, is incorporated into the relative rate of return. The `constant' term (a) is also important, as it represents the utility derived from holding assets. The expected yield/rate of return may be split into three seperate components: a coupon (i.e. the real interest received)[18]; an expected capital gain or loss[19] and a constant term representing the utility acquired from holding assets (c_j). In the model,

interest rates are determined endogeneously with the utilisation of a mark-up model (equation 4.3.9), based upon observed institutional arrangements, whilst the actual outturn of capital gains are used in place of the unobservable expected gain. These variables are multiplied by the appropriate tax rate.

In terms of rationed assets, particular events were exemplified in chapter two. For example, before the abolition of exchange rate controls in 1979, domestic agents were prevented from freely buying overseas assets. Another example, incorporated in other models by the utilisation of conventional dummies, is the introduction of various institutional controls implemented on the level of bank and building society lending, which predominantly affected the personal sector.

With regards to the first example, exact dates of the exchange controls period are known with certainty and therefore application to the appropriate asset is relatively straight-forward. However, in the second example some uncertainty clouds the issue, given that controls were continually tampered with by the authorities and that certain controls exhibited an uneven impact on different sectors. Thus, the series employed in this case may not be as accurate as one would like, but given the circumstances it is the best available. This latter point also holds for models that utilise more conventional dummies to take account of lending controls.

The overseas sector faces similar considerations and constraints as those faced by the domestic sectors. However, foreign agents, given the assumption that their choice of available assets are limited, are assumed not to be subject to any kind of rationing. Furthermore, foreign currency short term assets are assumed to be riskless. In the case of the overseas sector the demand for the various assets is still dependent upon the `own' return, the return on alternative assets and the budget constraint, with the relevant returns denominated in foreign currency it follows that any change in the exchange rate will effect the yield on sterling assets.

In terms of the number of assets estimated per sector, the personal sector had the largest choice of twelve, with ICCs having only nine assets to choose from. Pension funds and the overseas sector had an even smaller choice of six and five assets respectively. The only assets/liabilities available to all four sectors are time deposits (equation 4.3.3), gilts (equation 4.3.5) and equities (equation 4.3.6). Though one could perhaps include the demand equations for the overseas assets (equations 4.3.7 and 4.3.8) in this categorisation, given that such assets are assumed non-risky by the overseas sector and thus need not be explicitly modelled. Two important points concerning the above equations need to be noted. Firstly, the coefficients on the lagged dependent variables for the personal sector's demand for time deposits and gilts were imposed at 0.95 and 0.7 respectively. These non-zero coefficients were imposed

because the estimates began to converge on values outside the range suggested by the theory, and thus were rigorously tested. Secondly, the equities and gilts equations, except in the case of the overseas sector, were imposed with the restriction of a zero coefficient, on the assumption that no utility is received from their transactions benefits (Keating, 1985, p.100). Unlike the former restrictions, these were not rigorously tested.

At the other extreme, currency and sight deposits (equations 4.3.1 and 4.3.2) are taken as being available to the personal sector and ICCs only. Both these assets incorporate the restriction of a zero lagged dependent variable, on the assumption that the cost of adjustment is negligible.

The final equation included in the stylised version of the LBS model, is the demand for bank loans (equation 4.3.4). These are seen as a liability to all sectors, except for the pension funds / insurance companies. Given that various restrictions were imposed during the period under estimation a rationing device has been incorporated, proxied by the Bank of England's restrictions.

In the LBS model, the total demand for a specific asset can be found by summing its demand (X_j) across sectors. For example, the demand for money is built up by summing the demand for cash and bank deposits by each of the individual sectors. In the case of total demand of all assets, this can be found by summing all assets across all sectors.

Total asset demand is important in determining the market-clearing asset prices, derived from equating demand and supply given that the supply of an asset is assumed to be exogenous. Thus the LBS model explicitly calculate market-clearing asset prices, by inverting the demand curves (Keating, 1985). These prices are made `efficient' by the generation of `rational expectations', incorporating all available information.

External sector

When the LBS model changed its stance from Keynesian to `International Monetarist', one of the major contributory factors was the adoption of the monetary theory of the balance of payments (see chapter three).

For a number of years equation (3.4.1) had been the basis of the exchange rate equation in the LBS model, with the addition of an adjustment process to explain short-run movements away from the long run PPP condition. However, the recent version of the model has abandoned this reduced form approach and has developed instead a more general portfolio model, based upon the structural equations for asset demand, determined in the financial sector above. This change of direction implicitly implies that the LBS model has perhaps once again began to alter its stance on economic theory. The apparent rejection of a monetarist reduced form model for the exchange rate, where the precise details of the transmission mechanism are ignored (the 'black box' criticism), has been

superceded by the more Keynesian idea of allocative detail, demonstrated by the utilisation of structural equations.

The previous use of equation (3.4.1) assumed that the exchange rate was dependent upon relative money supplies only. The recent utilisation of a portfolio theory stresses the idea that apart from relative money supplies, the relative supplies of a much wider range of interest-bearing assets also affect the exchange rate. Thus, in this situation, no one estimation equation can be labelled as `the' exchange rate equation.

The exchange rate system is based upon the portfolio behaviour of all domestic and foreign sectors in terms of all assets, given the restrictions of availability discussed above. For simplicity these assets may be categorised into two groups: non-interest bearing, hereafter labelled as money, or interest bearing, labelled as bonds. Each type of asset may be denominated in terms of either foreign or domestic currency units.

Looking first at the assumed portfolio behaviour of each sector in terms of bonds (both domestic and foreign), the following observations are in order the real demand for domestic bonds of all sectors is positively associated with both the uncovered interest rate differential, adjusted for expected parity changes, and the relevant sector's wealth. Whilst the real demand for foreign bonds, which are assumed to be imperfect substitutes for domestic bonds, requires the examination of domestic and foreign sectors separately. The

domestic sectors' demand is negatively dependent upon the interest rate differential, since speculators hope to make capital gains when interest rates fall, and positively upon wealth. The overseas demand for their own bonds is positively dependent upon their own interest rate and their own foreign wealth. Interest rates are important since they take into consideration the effect of the relative returns on the exchange rate. For example, a favourable change in the relative return of foreign to domestic assets may lead to a capital inflow and thus improve the domestic exchange rate. The wealth variable, determined in the income-expenditure framework, is adjusted for risk to help give a clearer picture of the various sectors' actual behaviour as they have more funds available.

In terms of the relative money supplies, though it is assumed that all sectors hold all interest-bearing bonds, only foreign sectors hold foreign money and domestic sectors hold domestic money. Therefore, the relevant demand for real money balances is simply negatively associated with the relevant interest rate, incorporating the concept of opportunity cost, and positively associated with the relevant level of real wealth.

The model assumes that there is cross substitutability between all assets and that given a floating exchange rate the market clears when the balance of payments is in equilibruim. In other words, given the possibility that intervention, in terms of official finance (OF), by the

monetary authorities may occur, then the capital account, proxied by the changes in the demand for foreign and domestic bonds, will finance any current account (equation 4.3.12) deficit or surplus. Including all the above ideas, and the concept of rational expectations, into the group of `exchange rate' equations, then the determinants are as in equation 4.3.10.

The coefficient on the relative interest rate term measures the interest elasticity of capital flows. If the extreme case of perfect substitution between domestic and foreign bonds occurs, then this term tends to infinity and the exchange rate equation reduces to the uncovered parity condition. i.e. $_t\hat{e}_{t+1} = e^e + r - r_f$

where: $_t\hat{e}^e_{t+1} = e^e_{t+1}$

Thus the exchange rate is dependent upon the expected exchange rate, given rational expectations, and the interest rate differential.

However, given the usual assumption that different types of bonds are only imperfect substitutes for each other, then the exchange rate is also affected by the cumulative balance of payments (CB), the cumulative foreign market intervention (OF), and both domestic and foreign wealth (w) and prices (p).

Transmission mechanism

Although the LBS model has been labelled as `international monetarist', it still retains certain

structural characteristics of an income-expenditure model and thus embodies channels of the transmission mechanism which are identified as `Keynesian'. The major influence that financial variables exert on the real sector occur via the consumption function. Unlike the other three models, the LBS model concentrates on aggregate consumer expenditure, which is dependent upon the interest rate, real disposable income, the rate of inflation and a composite variable, seen as a proxy for real net financial wealth and the real value of housing stock.

Changes in interest rates affect consumer expenditure in a number of ways. Firstly, a direct substitution effect between current and future consumption is captured by the inclusion of the interest rate itself, whilst indirect effects are modelled by the inclusion of the other variables. The income effect of a change in the interest rate is captured by real disposble income, whilst a wealth effect, known as the `windfall effect', caused by an alternation in the present value of assets, is captured by the composite variable. Finally another wealth effect, the 'Pigou effect' is included in the equation, via the inflation rate.

Interest rate effects, capturing the `cost of capital' channel, are present in various investment equations, ranging from the stock-building equation to the total investment equation. In the `investment in house purchases' equation, this cost element is portrayed by the ratio of house prices to other prices.

The exchange rate is another important channel in the LBS model. Its major role stems from its implicit and explicit inclusion in the various components of foreign trade. Changes in the exchange rate also alter domestic prices. However, the general properties of the Scandinavian model ensures that changes in the nominal exchange rate cannot permanently alter competitiveness (Budd et al, 1984). Furthermore, a change in the exchange rate effects the value of the assets that the personal sector holds overseas and thus indirectly effects the consumption function, via the wealth component.

The final connection between the income-expenditure framework and the financial flow-of-funds, this time in the reverse direction, is via the budget constraints. Any difference between total income and total expenditure is allocated between a number of competing assets (discussed above). Thus the real sector directly affects the portfolio allocation decisions of all assets.

Summary

From this overview of the LBS model, one striking feature emerges, in that the detailed disaggregation of the monetary sector stems from a strong theoretical basis. The modellers at the LBS have attempted to construct a general portfolio model that rests upon the optimising behaviour of risk averse utility maximisers. This procedure involves employing a number of cross restrictions to ensure that

consistency is achieved. Furthermore, given that convergence, governed by the data, sometimes throws up undesirable values other, less acceptable, restrictions are also imposed. Such detailed modelling of the financial flow-of-funds framework stems from the importance attributed to monetary policy, as illustrated by the availability of numerous monetary instruments and the cross links between the real and financial sectors. For example, the budget constraints, determined in the income-expenditure framework, provide a ceiling on the portfolio choice, whilst the rate of interest affects both consumption and investment decisions.

The LBS model attempts to overcome many of the criticisms levied on applied work, such as policy invarient coefficients (the Lucas critique) and the employment of sub-optimal estimation techniques. However, not all these criticisms are overcome and, those that have may be seen as being achieved via enforced complexity. Thus many have complained that this has made research undertaken by the naive user very difficult.

IV)THE NATIONAL INSTITUTE OF ECONOMIC AND SOCIAL RESEARCH MODEL[20]

The National Institute of Economic and Social Research (NIESR) model was first commissioned in the late sixties to produce an alternative and independent forecast of the UK economy. At that stage, the model was highly aggregated,

consisting of only ten behavioural equations, based upon the Keynesian income-expenditure framework. Now, although its basis still lies within this framework, it has grown considerably to consist of over 275 variables, incorporated into approximately 90 behavioural equations. This growth has partly been a result of the increased disaggregation undertaken in terms of the income-expenditure framework, reflecting the Keynesian belief that allocative detail is vital in understanding the workings of the economy (Thompson, 1984), and partly because of the formulation of the monetary sector in the mid-seventies.

The formulation of the model may be considered to be in terms of quantity adjustment, as opposed to the monetarist idea of price adjustment. In other words, the model is predominantly driven by changes in expenditure, rather than changes in factor prices (Wallis et al, 1984). This kind of formulation emphasises the importance of the real side of the economy and results in monetary factors exhibiting only a minor role. This is very much in keeping with the Keynesian tradition that the model professes to follow. Thus, in terms of policy considerations, the use of fiscal policy tends to have a greater effect on aggregate demand than monetary policy.

However, an important development, which may be seen as diverging away from traditional Keynesian methodology, has occurred in the last two generations of the model. This new development, the utilisation of rational expectations,

usually associated with the New Classical school, has occurred in the wake of widespread attention directed towards incorporating expectations in macroeconometric models, following the Lucas critique. However, Hall and Herbert (1986) argue that the introduction of forward looking expectations is in keeping with the Keynesian methodology and that, although the dynamic responses to a shock may alter, the underlying nature of the model should not.

The monetary sector of the complete model

The original monetary sector (Savage, 1978b) was constructed for two basic reasons. Firstly, a link with the income-expenditure framework was required to carry out various economy-wide simulations, given particular assumptions about specific monetary aggregates, usually sterling M3. Secondly, as monetary policy began to dominate the scene, exemplified by the growing importance of sterling M3 as a monetary target variable, a monetary sector was obviously needed to explain the determination of the money supply. It is this latter consideration that will be discussed first.

Until recently, the monetary sector of the NIESR model followed closely the traditions set out by Savage (1978b), in terms of both the identities employed and the behavioural equations investigated. The only changes that occurred between the various versions were those of parameter revaluation, resulting from data revision and/or updating.

However, as stated earlier the latest versions of the model (nos. 8 & 9) have seen dramatic changes in the determination of some behavioural equations. These changes have not just been confined to the monetary sector and are evident in the income-expenditure framework, for example in the determination of the stock-building equation. These changes have resulted from the incorporation of "forward-looking" (i.e. rational) expectations, thus implying that current decisions are affected by expectations of the future behaviour of the economy (NIESR, 1986). Given this inclusion, Hall and Henry (1986) argue that the NIESR model is more policy variant, as in keeping with the Lucas critique.

In terms of the monetary sector, rational expectations are now embodied in two equations, the demand-for-money, M1, which is a buffer-stock equation (Davidson and Ireland, 1987), and the real exchange rate. The exact specifications employed in both cases will be examined in greater detail below.

The stlyised version of the monetary sector

Table 4.3 reproduces the major elements of the latest version of the NIESR model.

Table 4.3[21]

THE STYLISED MONETARY SECTOR OF THE NIESR MODEL

Domestic Financial Sector

$$\Delta SM3 = \Delta BLG + \Delta BLP + \Delta CUR + \text{other exogenous items} \quad (4.4.1)$$

$$\Delta BLG = PSBR - \Delta CUR - \Delta B\$ + \text{other exogenous items} \quad (4.4.2)$$

$$\Delta BLP = \Delta BLI + \Delta BLOH + \Delta BLH + \Delta BLF \quad (4.4.3)$$

$$\Delta BLI = Bi\ (Y, r, RT, BR, Dc^{1}) \quad (4.4.4)$$

$Bi1>0$, $Bi2<0$, $Bi3>0$, $Bi4>0$, $Bi5>0$.

$$\Delta BLOH = Bo\ (Y, r, Dc^{s}, NAFp) \quad (4.4.5)$$

$Bo1>0$, $Bo2<0$, $Bo3>0$, $Bo4>0$

$$\Delta QCUR = c\ (TIM, CER) \quad (4.4.6)$$

$c1<0$, $c2>0$

$$M1 = CUR + SD \quad (4.4.7)$$

$$QM1 = m\ (QM_{-i}, Pe, Ye, re) \quad (4.4.8)$$

$m1>0$, $m2>0$, $m3>0$, $m4<0$

$$\Delta B\$ = \Delta B + NS \quad (4.4.9)$$

$$\Delta B = b\ (R,\ r,\ LGF) \qquad (4.4.10)$$

$b1>0,\ b2<0,\ b3>0$

$$NS = n\ (r,\ r_o) \qquad (4.4.11)$$

$n1<0,\ n2>0$

$$R = R\ (R_{-1},\ r) \qquad (4.4.12)$$

$R1>0,\ R2>0$

Exchange Rate System

$$QER = e\ (\Delta CB,\ \Delta(Qr-Qrw),\ QER_{+i},\ QER_{-i}) \qquad (4.4.13)$$

$e1>0,\ e2>0,\ e3>0,\ e4>0$

$$CB = X - M \qquad (4.4.14)$$

Glossary[22]

ΔB	= stock of other debt to the NBPS
$\Delta B\$$	= stock of debt to the NBPS
BLF	= £ bank lending to OFIs
BLG	= £ bank lending to the public sector
BLH	= £ bank lending to persons for house purchases
BLI	= £ bank lending to ICCs
BLOH	= £ bank lending to persons excluding house purchases

BLP = £ bank lending to private sector

BR = net borrowing requirement of ICCs, deflated by the total final expenditure price index, 1980=100

CB = current balance

CER = real consumers expenditure

CUR = notes and coins in circulation

Dc^l = long run dummy for CCC, value of unity from 1971(Q4) onwards, zero elsewhere.

Dc^s = short run dummy for CCC, value of unity between 1971(Q4) and 1973(Q4) inclusive, zero elsewhere.

ER = effective exchange rate

LGF = ratio of other debt to stock of financial assets (persons and company sectors)

M = nominal imports

M1 = money stock, M1 definition

NAFp = net acquisition of financial assets, persons

NS = national savings

PSBR = public sector borrowing requirement

r = short term interest rate

R = long term interest rate (2.5% consol rate)

r_o = own rate of return

RT = `round tripping'

rw = world interest rate

SD = sterling sight deposit

SM3 = money stock, sterling M3 definition

TIM = time trend

X = nominal export

Y = real activity variable

Domestic monetary sector

Unlike research into the demand-for-money, the methodology employed to construct the monetary sector of the NIESR model incorporated no explicit behavioural equation for sterling M3. Instead, a general portfolio approach has been adopted. The particular approach utilised diverges from that advocated by Tobin in that no attempt is made to examine all portfolio decisions undertaken by the various sectors. Instead emphasis is placed upon modelling the aggregate relationships of a particular set of assets and liabilities (Thompson, 1984, p.142). The actual choice of the relevant set is derived from the government's budget constraint (equation 4.4.2) which, along with the `changes in sterling M3' identity (equation 4.4.1) form the basis of the monetary sector.

Before examining the various equations which determine the portfolio behaviour of the NBPS, one important simple accounting identity needs to be included - the banks' consolidated balance sheet (identity A). Basically this analyses the same items in two different ways, firstly in terms of the various assets available to the NBPS, then in terms of the liabilities held by the various sectors. In this instance, (ΔOSD), (ΔNDL) and (ΔBLOS) are assumed to be

exogenous.

$$\Delta TD + \Delta SD + \Delta OSD + \Delta NDL = \Delta BLP + \Delta BLG + \Delta BLOS \quad (A)$$

where:

BLG = £ bank lending to the public sector

BLOS = £ bank lending to the overseas sector

BLP = £ bank lending to the private sector

NDL = non-deposit liabilities

OSD = overseas deposits

SD = £ sight deposits

TD = £ time deposits

To help further understand the logic of identity A, one needs to investigate the workings of the commercial banks, whom have access to two types of markets, namely retail and wholesale. In each market, banks can make loans (their output) and collect deposits (their inputs). Assuming that no legal controls are in operation, banks issue retail loans to the NBPS at the market rate whilst simultanously accepting any retail deposits. In this situation, they are price-setters and quantity-takers.[23]. However, since loans and deposits are implemented by different economic agents, there is no reason to assume that their respective levels will be equal. Therefore, dependent upon the initial outcome, commercial banks will enter the wholesale market to either bid for deposits or to make loans, thus equating the total

number of loans issued to deposits, given a specific deposit ratio. The wholesale market can be thought of as a source of or repository for marginal funds (Wills, 1982), where commercial banks are price-takers and quantity-setters.

The traditional differences between the two potential types of deposits stem from their marketability and rate of return. Retail deposits are predominantly short term and unmarketable, offering an uncompetitive interest rate, whilst wholesale deposits are usually of three-month duration and are negotiable, yielding an interest rate similar to that attainable in the money market. Thus the former is usually held for transactions purposes, allowing the NBPS to take advantage of the banks' money transmission services (Savage, 1978b), whilst the latter is held for speculative motives.

When one attempts to empirically distinguish between retail and wholesale deposits, problems arise in acquiring appropriate data. This is due to the methods employed in disaggregating UK official statistics, and therefore the rougher distinction between sight deposits (SD), as a proxy for retail deposits, and time deposits (TD), for wholesale, must be employed instead. Note, however, that in recent years this distinction has become blurred as increased competition between financial intermeditaries has occurred and more favourable assets, such as interest-bearing sight deposits, have been made available to the NBPS.

In the NIESR model, the portfolio behaviour of the NBPS in terms of sight deposits is not directly estimated, but is

analysed indirectly through the determinants of M1, the narrower definition of the money supply, of which they comprise the largest element. Furthermore, time deposits are treated as the residual asset in the banks' balance sheet. This assumes that banks accommodate the balance sheet by adjusting the interest rate offered on wholesale deposits (Holden et al, 1982). Using time deposits as a residual in this way has been criticised as unrealistic since they are predominantly demand-dependent and should therefore be explicitly modelled. The determination of time deposits has often been called the `missing' equation (Savage, 1978b).

The NIESR model is very scathing in its treatment of the portfolio behaviour of many of the assets available to the NBPS, though debt sales and currency are explored to a greater depth. Concern instead lies with the other side of identity A, which models the various elements of bank lending, with bank lending to the overseas sector (ΔBLOS) treated as exogenous.

Bank lending to the public sector (ΔBLG) can be manipulated to portray the government's budget constraint, i.e.:

$$PSBR = \Delta BLG + \Delta CUR + \Delta B\$$$

This examines the alternative ways available to finance the public sector's borrowing requirement (PSBR), predetermined elsewhere in the income-expenditure framework, thus resulting in a direct link between the sectors. (ΔBLG) is treated as the residual source of public sector finance, which is quite

an acceptable assumption to make and can be exemplified by events occuring in recent years. For example, with the introduction of the MTFS, (ΔBLG) has, at times, been curtailed to offset any excessive monetary growth, in an attempt to keep the money supply within published bands. The behavioural equations for currency (ΔCUR) and governmental debt (ΔB$) will be examined in detail below.

The other important element of bank lending, representing the major liabilities of the NBPS, is bank lending to the private sector (ΔBLP). The private sector is disaggregated into broadly similar sectors as those utilised in the HMT model, with the portfolio behaviour of OFIs treated as exogenous. The disaggregation of bank lending to the personal sector into loans for house purchases (ΔBLH), which is assumed to be exogenous, and loans for purchases other than houses (ΔBLOH), is also included. This further disaggregation has become necessary due to the recent distortion in bank lending figures, resulting from the banking sector competitively entering the residential mortgage market in the early eighties.

The two main bank lending equations utilise a similar set of explanatory variables as employed in the HMT model, namely an appropriate sectoral activity variable, a short term interest rate and a wealth variable, where the latter is treated as predetermined elsewhere in the model. In terms of a wealth variable incorporated into the (ΔBLI)-equation, such a definition is not strictly accurate, since the variable

utilised represents the ICCs borrowing requirement. This variable, however, can be broadly thought of as the reciprocal of an appropriate wealth variable, in that an increase in the borrowing requirement is equivalent to a contraction in the level of wealth. Therefore, in both equations, these three variables have the same expected signs as envisaged by the HMT model, with the inverse expectation of a positive sign on the net borrowing requirement.

In the NIESR model, the two bank equations also identify two other factors - a variable for `round tripping' (RT), designed to capture the speculative element of bank borrowing, and dummies (Dc^1 and Dc^5), designed to capture the explosive effect of Competition and Credit Control (CCC).

The `round tripping' variable, calculated by the difference between the short term interest rate[24] and the banks' own rate, is only employed in the ($\Delta$BLI)-equation, since it is usually assumed that most persons are not wealthy enough to participate in the wholesale market. `Round tripping' involves borrowing from the retail market, at a relatively low interest rate, to re-deposit in the wholesale market, at a relatively high interest rate, thus making capital gains. This took place to a large extent between the introduction of CCC and the implementation of the `corset'. However, these activities may not be adequately captured by quarterly data, since the periods involved were of such a short duration (MBR, 1984). The variable (RT) may still exhibit a positively significant coefficient, since it can be

alternatively thought of as a relative interest rate, incorporating once again the idea of opportunity cost.

In terms of the supply-side influences on the level of bank lending, two dummies have been utilised to take account of the effects of the introduction of the CCC. Firstly, in terms of the (ΔBLI)-equation, a long run dummy (Dc^l), taking the value of unity from 1971(Q4) onwards and zero elsewhere, was employed. Thus implying a positive structural change in bank lending to the ICCs, unaffected by future supply constraints, aimed predominantly at other sectors. Secondly, in the (ΔBLOH)-equation, a shorter dummy (Dc^s), taking the value of unity between 1971(Q4) and 1973(Q4) inclusive, and zero elsewhere, was utilised. This attempts to capture the rapid increase in bank lending to persons associated with CCC, which was just as quickly curtailed with the introduction of the `corset'.

Returning again to the asset-side of the banks' consolidated balance sheet, sight deposits, as well as currency, become important when concentrating on the narrow M1 definition of the money supply. Both variables are assumed to be demand driven, since the banks will normally accommodate the needs of the NBPS. Currency is particularly important in this model because of its inclusion in the government's budget constraint, as well as in the broader monetary aggregate (sterling M3) identity. The currency equation, expressed in real terms, is similar to the HMT's M0 equation, in that it is a simple transactions specification,

positively dependent on the distributed lag of an activity variable, proxied by real consumers expenditure, and negatively dependent upon a time trend. This latter variable plays a similar role to that envisaged by the PPBA variable in the HMT model, in that as financial innovation evolves through time, cash holdings fall. However, utilisation of a time trend in this situation has been criticised (Podolski, 1986), since it assumes that technical changes occur uniformally, rather than spadmodically. Other variables attempting to capture possible yield effects (i.e. interest rates and inflation) were experimented with, but proved to be insignificant, as the former two variables dominated the equation (Cuthbertson, 1983).

The M1 demand-for-money equation formulation has changed emphasis from previous versions with the introduction of forward-looking expectations into the NIESR model. The demand for M1 has now become a buffer stock equation[25], thus suggesting that the demand for such balances is dependent upon two elements - a planned component and an unplanned component. The planned component depends upon the adjustment cost of depositing excess balances, determined by the discount rate (r). Unlike conventional models, myopic behaviour is not assumed, and thus future values of the discount rate (re) are also taken into consideration. The unplanned component is assumed to be related to innovation in the money supply process, which provides unforeseen changes (Artis and Cuthbertson, 1985). Given that such innovation is

likely to be synonymous with the nominal income generation process, the unplanned component is assumed to be dependent upon real incomes (Y/Ye) and prices (P/Pe), as well as interest rates (r/re).

The important point to note in terms of this recent formulation is the utilisation of forward-looking expectations, to help solve the problem of omitted variables. However, only weakly rational variables, generated by autoregressive schemes, are utilised rather than the `Muth-rational' expectations, which require the use of the complete model.

The final component in the government's budget constraint is the NBPS's purchase of gilts (ΔB$), disaggregated into two components, National Savings (NS) and other debt sales (ΔB). Both equations incorporate the idea of portfolio demand by including the negative effect of the opportunity cost of alternative assets, proxied by a representative short run interest rate, and the positive effect of the `own' rate, represented by the interest rate on national savings and the yield on 2.5% consols respectively. The equation for other debt also attempts to incorporate a wealth effect, by utilising the variable (LGF). This is the ratio of other public debt to the cumulative sum of the net acquisition of financial assets of the NBPS. As the NBPS becomes wealthier it is assumed that they will place more money in bonds, thus a positive coefficient is expected.

Like most equations for gilts, problems still remain

here when one attempts to adequately model the NBPS's response. One fundamental underlying difficulty may be of measurement and valuation, in terms of both adequate representations for the stock of gilts held and the respective sector's wealth (Cuthbertson, 1983). Another difficulty is the success, or otherwise, of incorporating speculation.

To complete the financial sector, one needs to examine the explanation of interest rates, representing one channel of the transmission mechanism between the real and financial sectors. The pivotal interest rate in this case is the Treasury Bill rate (RTB), which can be controlled by the monetary authorities through open market operations, and is, therefore, assumed to be exogenous. Other short term rates utilised in the model are determined by simple mark-up relationships. The long run rate, represented by the yield on 2.5% consols, is determined by a simple term structure equation, dependent upon its lagged own rate and the RTB rate.

The exchange rate system

The NIESR model concentrates on the determination of the real effective exchange rate (RER), as opposed to the nominal rate, by utilising forward-looking expectations. The rationale for modelling the real exchange rate is twofold. Firstly, it removes the long term trend caused by the relative movement of world and domestic prices, and secondly,

it may be more realistic if one believes that the monetary authorities have been concerned with movements in the real rate. Note that in the complete model an identity for the bilateral dollar-sterling exchange rate is also incorporated, emphasising the idea that a vast majority of the UK's external trade is undertaken in terms of dollars. However, concentrating on a bilateral rate only, means that trade with the `rest of the world' needs to be derived as well. This is not a problem if the effective exchange rate is utilised, since the relative exchange rate of all major trading partners is taken into consideration.

The real exchange rate equation is predominantly concerned with the high degree of flexibility found in the asset market, as depicted by the open arbitrage condition. This is determined by the real interest rate differential, given an exogenous world interest rate. In this situation, assets flow between international boundaries to maximise the expected value of asset stocks (Hall, 1985). These flows, subject to a high degree of uncertainty, cause short-term movements in the exchange rate, thus theoretically causing large discrete jumps. However, in practice, given that such jumps could prove very costly, the government intervenes to smooth them out. To take account of this intervention, the NIESR has incorporated a cost minimisation equation into their model, taking into account both past levels of the real exchange rate (QER_{-i}) and expected future levels (QER_{+i}). These lags are truncated to examine one period only in each

direction, given that lag adjustment is assumed to be relatively fast and thus agents are unlikely to look far ahead either (Hall and Henry, 1985). In this situation, a restriction is imposed, such that the coefficients of the two lags sum to unity.

Although the asset markets are very important in influencing the exchange rate, their influence is predominantly short term. Long run fluctuations are usually associated with the terms of trade. Thus the NIESR model also includes the log of the ratio of export to imports (CB) as an explanatory variable.

In the NIESR model no explicit capital account equation is estimated, though its effect on the exchange rate is incorporated by the real interest rate differential. Finally, as with the other models, the current account is determined within the income-expenditure framework, by the level of nominal imports and exports.

The transmission mechanism

Given that the NIESR model professes to be predominantly Keynesian in structure, one would expect the traditional `cost of capital' linkage to be the major channel of its transmission mechanism. However, such an effect has been stubbornly difficult to capture econometrically (see Savage, 1978a), which may been seen as verifying the weak nature, given the range of alternative assets, attributed to such a link by the neo-Keynesians. Thus other channels, more

neo-Keynesian in nature, have been incorporated instead. These include the effects of wealth and credit availability, as well as the external effect of the exchange rate.

Although the traditional `cost of capital' mechanism has proven to be insignificant, interest rates are utilised to capture other alternative effects on some components of investment. Firstly, two interest rates, the mortgage rate (RMOR) and the local authority three month rate (RLA), are included in the equation of `investment in private dwellings', helping to determine the cost of house purchases and the relative rate of return respectatively. Secondly, the building society rate (RSHR), determined by a simple mark-up relationship of (RTB), plays an important part, along with (RLA), in determining the portfolio behaviour of the personal sector in terms of `changes in building society shares and deposits' (DKDEP), another component of investment. This effect could be considered to be equivalent to Keynes's `windfall' effect. An alternative wealth effect, captured by the `change in the financial assets' (ΔFAPER)[26], is also included into this equation, to model incremental changes to the total portfolio.

Interest rates, proxied by (RSHR), have an indirect effect upon the level of real disposable income and thereby affect aggregate demand, through the level of consumption. This link, through the determination of `net property income to the private sector', affects the current streams of receipts from outstanding debt (Bladen-Hovell et al, 1982),

and thus resembles the `bond coupon' effect as discussed by Turnovsky (1977).

Previous generations of the model incorporate a liquidity effect on the level of consumption. However, wealth now plays an important part, in terms of the revaluation effect, in determining the level of consumption on non-durables. Furthermore, given that an expansionary monetary policy is likely to affect inflation, consumption is also subject to the `Pigou effect'.

The problems associated with credit availability are less important in the NIESR model, though they are implicitly considered in the `investment in private dwellings' equation. The more usual identification of this effect is found in the consumer durables equation, with the utilisation of a hire-purchase dummy.

Finally, the exchange rate directly effects inflation through the wholesale price of manufacturing goods. Whilst, indirectly, through indices of competitiveness, it affects aggregate demand by influencing the various components of real imports and exports. The exchange rate also has a major role in the construction of the North sea oil sector.

Summary

The NIESR model as a whole professes to be Keynesian in nature, though the monetary sector would perhaps be better defined as neo-Keynesian. This is borne out by the partial utilisation of Tobin's portfolio analysis, directed at the

components of the government's budget constraint and the money supply identity, and by the utilisation of the neo-Keynesian channels of influence. Related to this latter point, although a number of monetary links have been established these are relatively insignificant, in keeping with the unimportance attributed to monetary policy by the Keynesians.

A major divergence from Keynesian methodology may have been seen to occur with the introduction of rational expectations, partly introduced to overcome the Lucas critique of policy invarient coefficients. This procedure results in some behavioural equations being significantly different from those advocated by Savage (1978). However, the methodology employed to model such expectations is not the `Muth-rational' expectations model, which requires information on the complete model, but a much weaker method that utilises an autoregressive scheme instead. Thus, the utilisation of this weaker methodology, coupled with the fact that Keynes explicitly incorporated expectations into his analysis, lays claim to the belief that utilising these expectations falls within the bounds of the Keynesian doctrine.

V) THE POST-KEYNESIAN MODEL[27]

In recent years, with the growing acceptance of the more unorthodox school of post-Keynesian economics, an alternative approach to monetary theory, along with theories from other areas, has begun to emerge (see chapter three). These recent developments have, in turn, led to the construction of various macroeconomic models pertaining to be post-Keynesian in thought. These models, although still based upon the income-expenditure framework, are designed to encapsulate the major elements emerging from post-Keynesian theory by utilising an alternative methodology. Unlike orthodox models, such as the NIESR model, which express variables in terms of first differences, post-Keynesian models utilise growth rates (Eichner, 1979) in an attempt to examine short run deviations from the long run trend.

Any model that professes to explain post-Keynesian monetary theory needs, at the minimum, to incorporate three essential concepts that characterise a monetary capitalist economy, evolving through time. Firstly, one needs to incorporate the idea of the uncertainty associated with the unknown future, such that the majority of peoples expectations of the future will be easily thwarted and thus need to be re-examined. Secondly, the concept of uni-directional historical time is important, acknowledging that both production and consumption take time. People need to make various commitments before the outcome is known with

certainty. This leads on to the final characteristic, whereby in a monetarised economy, economic agents make monetary contracts in both future and spot markets, for example, to pay for inputs into production before sale receipts are received. Thus financial institutions, that provide these services, need to be explicitly modelled.

Two such models attempting to incorporate these characteristics of post-Keynesian monetary theory are, at present, in the process of construction. Firstly Eichner (1979) reports on an economy-wide model for the US economy, and secondly Arestis (1985/86, 1986, 1987/88) attempts to provide a similar model for the UK economy. Both models are based on the theoretical framework propounded by Eichner (1979), and consist of five interlinking blocks[28]. Concern lies here with one block only, namely the monetary-financial sector, block V. The latter model, which is under-review here, incorportes over 100 equations and identities, and has recently begun to expand further.

The construction of the UK post-Keynesian (PK) model has been undertaken for a completely different reason then that advocated for the construction of the other three models under-review. These latter models attempt to forecast the effects on the economy of different economic policies. Yet the PK model, at least at present, primarily aims to capture the major arguments arising from post-Keynesian economics, given the state of the economy.

The monetary sector of the complete model

The monetary block is predominantly concerned with the creation of `credit-money', as opposed to `commodity-money', thus incorporating Keynes' "finance motive". One of the major aims of the block is to show that it is credit availability which is important in determining real expenditure, rather than the cost of credit (i.e. the interest rate). Orthodox Keynesians believe that interest rates, through the level of investment, constitute the major channel of the transmission mechanism that link together the real and financial sectors. Post-Keynesians, however, reject the idea that interest rates are the primary link and relegate them to second place. What is instead emphasised in the PK model is credit this being an integral part of a production money economy.

Post-Keynesians are also concerned with the financial institutions which create `credit-money'. In this model, the only institutions explicitly modelled are those incorporated into the definition of the "banking sector"[29]. Research into the workings of the non-bank financial intermedaries (NBFI) has to be undertaken to establish their contribution to the real economy, as these alternative sources of finance are becoming more and more important, with the distinction between the various institutions becoming blurred. Post-Keynesians also acknowledge that concern should be with liquidity as a whole, rather than the narrow concept of money, whichever aggregate is utilised.

The question about whether or not the money supply is endogeneous is also investigated. This stems from the rejection of the causality implied by the Quantity theory of money and incorporates the idea that banks participate, to a large extent, in `Liability management'. If, as most post-Keynesians believe, the money supply is predominantly endogeneous then any policy aimed at controlling it (eg. MTFS) will inevitably be unsuccessful.

The stylized version of the monetary sector

In keeping with the other three models Table 4.4 reproduces the stylised version of the monetary sector of the PK model.

Table 4.4[30]

THE STYLISED MONETARY SECTOR OF THE PK MODEL

Domestic Financial sector

$$(\Delta TD) = (\Delta BLG) + (\Delta BLP) - (\Delta BLOS) - (\Delta SD) - (\Delta OBD) \qquad (4.5.1)$$

$$(\Delta BLG) = (PSBR) + (\Delta OPB) - (\Delta CUR) - (\Delta B) - (\Delta EF) \qquad (4.5.2)$$

$$(\Delta BLP) = (\Delta BLI) + (\Delta BLC) + (\Delta BLF) \qquad (4.5.3)$$

$$(\Delta BLI)^* = BLI(Y^*1, Y^*2, r^*, RT, D^1, (\Delta BLI/\Delta TBI)^*) \qquad (4.5.4)$$

$$Bi1>0,\ Bi2>0,\ Bi3<0,\ Bi4>0,\ Bi5>0,\ Bi6>0.$$

$$(\Delta BLC)^* = BLC(Y^*3, Y^*4, r^*, Do, D^s, (\Delta BLC/\Delta TBC)^*) \quad (4.5.5)$$

$Bc1>0$, $Bc2>0$, $Bc3<0$, $Bc4\ 0$, $Bc5>0$ $Bc>0$.

$$(\Delta SD)^* = SD(Y^*, r^*) \quad (4.5.6)$$

$S1>0$, $S2<0$

$$(\Delta CUR)^* = CUR(Y^*, P^*, r^*) \quad (4.5.7)$$

$C1>0$, $C2>0$, $C3<0$

$$(\Delta B)^* = B(R^*, \Delta\hat{EF}\ ) \quad (4.5.8)$$

$B1>0$, $B2<0$

$$(\Delta EF) = (CB) + (\Delta KM) - (\Delta OLG) - (\Delta BLGF) \quad (4.5.9)$$

$$(R)^* = R(r^*, \Delta\hat{EF}, BL^*, P^*) \quad (4.5.10)$$

$R1>0$, $R2<0$, $R3>0$, $R4>0$

$$(\Delta M1) = (\Delta CUR) + (\Delta SD) \quad (4.5.11)$$

$$(\Delta SM3) = (\Delta M1) + (\Delta TD) + (\Delta DG) \quad (4.5.12)$$

Exchange Rate System

$$(CB) = (EXP) - (IMP) \quad (4.5.13)$$

$$(\Delta\hat{KM}) = KM\ (\Delta(r/rw), \Delta\hat{CB}, ER^*) \quad (4.5.14)$$

$K1>0$, $K2<0$, $K3>0$.

$$(ER)^* = ER\ (\ \Delta(r/rw)^*,\ \Delta\hat{CB},\ \Delta\hat{KM}) \qquad (4.5.15)$$

$$E1>0,\ E2>0,\ E3>0$$

Glossary[31]

ΔB	= sale of government debt to the NBPS
ΔBL	= sale of long term government debt to the NBPS
BLC	= £ bank lending to consumers
BLF	= £ bank lending to OFIs
BLG	= £ bank lending to public sector
BLGF	= bank lending to the public sector in foreign currencies
BLI	= £ bank lending to ICCs
BLOS	= £ bank lending to overseas sector
BLP	= £ bank lending to the private sector
CB	= current balance
CUR	= notes and coins in circulation
DG	= deposits of the public sector
D^l	= long run dummy for CCC, unity 1971(Q4) onwards, zero elsewhere.
Do	= dummy for supply constraints
D^s	= short run dummy for CCC, unity from 1971(Q4) to 1973(Q4), zero elsewhere
EF	= external finance
ER	= effective exchange rate
EXP	= nominal exports

IMP = nominal imports

KM = net capital movements

M1 = money stock, M1 definition

OBD = other bank deposits

OLG = overseas lending to the public sector

OPB = other public borrowing

P = price level

PSBR = public sector borrowing requirement

r = short run interest rate

R = long run interest rate

RT = `round tripping'

rw = world interest rate

SD = sight deposits

TBC = total borrowing by consumers

TBI = total borrowing by ICCs

TD = time deposits

Yn = activity variable

In the long run, post-Keynesians are concerned with the steady-state expansion path of the economy (Eichner, 1985). Empirically, observing such an expansion path may be impossible, and therefore the growth rate of an economy, after taking into consideration cyclical fluctuations, may be consided a reasonable approximation instead. Although determining warranted growth rates is important, the PK model is primarily concerned with short run analysis, in terms of the actual deviations from the estimated warranted growth

rate, proxied by a trend. At present, these trends, which are predominantly taken to be exponential[32], are assumed to remain constant over the complete period of estimation. Given that the present revision of the model has resulted in a much longer period of observation, coupled with the fact that the economy is continually evolving, the likelihood of this occurring is remote. Therefore, further research needs to be undertaken, to examine any possible breaks in trends.

Given that post-Keynesian methodology propounds to the utilisation of growth rates, then most short term variables are `detrended'[33], denoted in the model by an asterisk (*). This means that variables are expressed in terms of their actual growth rate from their constant trend growth rate, determined by:

$$X^* = [(X_t - X_{t-1})/ X_{t-1}] - X_T$$

where: X^* = detrended variable.

X = actual variable

X_T = exponential trend of the actual variable.

The complete model is disaggregated into four major sectors: namely, the banking sector, whose importance stems from its major role in the creation of credit-money; the non-bank private sector (NBPS), which can be further disaggregated into persons, industrial and commercial companies (ICCs) and other financial institutions (OFIs), with the latter taken to be exogenous; the government sector, which is also assumed to be exogenous to this block, though

it is endogenised elsewhere; and the external sector discussed below.

The financial sector

Like the NIESR model, the monetary block of the PK model is based upon two identities. Firstly, equation 4.5.1 identifies the behaviour of the banks' balance sheet, by treating time deposits (ΔTD) as the residual asset. This identity is equilivant to identity A in the NIESR model and therefore faces similar criticisms concerning the utilisation of a residual asset (see section IV). In the PK model, this first identity is the focal point of the block, aiming to capture the various components that influence the portfolio behaviour of the NBPS. In this model both sterling bank lending to the overseas sector (ΔBLOS) and other bank deposits (ΔOBD) are treated as exogenous.

The second identity, equation 4.5.2, reflects the government's budget constraint. This identity, like the NIESR model, assumes that bank lending to the public sector (ΔBLG) is the residual form of finance. Both the public sectors' borrowing requirement (PSBR) and other public borrowing (ΔOPB) are also assumed to be exogenous. The other forms of finance, i.e. currency holdings (CUR), bond holdings (ΔB) and external finance (ΔEF), will be explicitly examined in due course.

On the liability side of the banks' balance sheet concern lies predominantly with the flows of nominal bank

lending to the private sector (△BLP), appropriately disaggregated (equation 4.5.3) This is in contrast to the other three models under review, which have utilised real bank lending. Using a real variable as a regressant in this way imposes the strict restriction of unit price homogeneity (Goodhart, 1984). In other words, there is an instantaneous response in the flow of bank lending to any price change. Work related to this proposition has been undertaken within the overall attempt to construct the PK model, however the results obtained were unsupportive. This result, therefore, helps to validate the post-Keynesian idea of non-ergodic uncertainty, coupled with the fact that expectations are easily thwarted, and thus changes do not occur instantaneously.

Each sector will be examined in detail, though at present bank lending to other financial institutions (△BLF) is assumed to be exogeneous[34]. Equation 4.5.4 explores the determinates of the flow of nominal bank lending to industrial and commercial companies (△BLI). Like the other three models, (△BLI) is treated as being predominantly demand determined, dependent positively upon two activity variables (Y*1, Y*2), a `round-tripping' variable (RT), proxied by the difference between the Local Authority three-month rate and the banks' `own' rate, and the ratio of bank lending to total bank lending (△BLI/△TBI). Bank lending to ICCs is also assumed to be negatively associated with various interest rates, both domestic and foreign, incorporating the concept

of opportunity cost, as well as being negatively dependent upon its `own' rate (the rate on bank loans, RBL) proxied by the bank rate plus the maximum mark-up of 2%. The only supply-side variable incorporated into the equation was a long-term CCC dummy, taking the value of unity from 1971(Q4) onwards and zero elsewhere, designed to capture the dramatic effect on the level of bank lending resulting from the lifting of previously implemented restrictions. This dummy proved to be highly insignificant, which is in keeping with other empirical work (eg. NIESR model). This result reflects the proposition that since previously imposed controls were aimed at other sectors, the effect of CCC on ($\triangle$BLI) was minimal.

From a post-Keynesian viewpoint, the variables of particular importance in this equation are the two activity variables (Y*1, Y*2). Their inclusion stems firstly from the proposition that credit-money is essentially created to finance production, and secondly, from the realisation that reality breeds uncertainty. These two propositions lead to anticipated financial needs, governed by entrepreneurs' expectations, and unanticipated needs, when these expectations are unfulfilled.

Expectations are likely to be dependent upon the growth of manufacturing output, thus anticipated needs are taken into consideration by Y*1, proxied by gross domestic product at factor cost, in current prices (GDPFCN)*[35]. However, the unanticipated gap between costs and receipts, leading to the

need for 'credit-money' as a `buffer stock'[36], is captured by Y*2. This is defined as the ratio of discretionary expenditure of ICCs (EI)[37] to discretionary funds of ICCs (FI)[38]. When discretionary expenditure rises relative to available funds one needs to borrow money to finance this extra expenditure. This ratio can be compared with the utilisation, in the NIESR model, of the net borrowing requirement.

Bank lending to consumers (ΔBLC), equation 4.5.5, has recently changed emphasis, now concentrating upon lending for purchases other than houses. With the recent up-date, this further disaggregation has become necessary, due to the distortions of the bank lending figures accompanying the commercial banks attempt to move competitively into the residential mortgage market. To successfully model bank lending to consumers for house purchases (ΔBLCH) the inclusion of the behaviour of the NBFI would be required. Attempts have been made to estimate some plausible regressions for (ΔBLCH), in terms of an activity variable and an appropriate interest rate. However, the restrictions imposed by an appropriate data period, render the results unsatisfactory and therefore (ΔBLCH) is at present treated as exogeneous.

Unlike the (ΔBLI)-equation, the (ΔBLC)-equation cannot be said to be purely demand-determined, since not all demands by consumers for loans are accommodated. Therefore supply constraints need to be taken into consideration. These can

be proxied by two dummies (Do)[39]. These should be negatively signed when controls are imposed and positively signed when controls are lifted. This latter effect is also considered by introducing a seperate short run dummy to take account of the CCC controls. This dummy (D^s) takes the value of unity between 1971(Q4) and 1973(Q4) inclusively, and zero elsewhere. Like the (ΔBLI)-equation, bank lending to consumers is dependent upon various demand-side variables. Those considered in this model are two activity variables (Y*3, Y*4) and the ratio of bank lending to total lending (ΔBLC/ΔTBC), all are expected to have a positive sign. Bank lending is also assumed to be negatively dependent upon various short term interest rates. Note, however, since most consumers are assumed not to participate in the wholesale market, then the variety of interest rates utilised are not as comprehensive as those employed in the (ΔBLI)-equation.

Again, from a post-Keynesian perspective, particular concern lies with the utilisation of the two activity variables, related to the anticipated and unanticipated need for funds. On the anticipated side there is the utilisation of nominal disposable personal income (YDPN)*, emphasising the idea explicit in a consumption function, that consumers increase consumption as their income increases. Thus one way of quickly increasing personal consumption, particularly in terms of consumer durables, is through bank lending. Related to this, is the concept of the time taken to consume durable goods. The temporary need for loans, probably in the form of

an overdraft, can be captured, in a similar way to the (ΔBLI)-equation, by the ratio of discretionary expenditure of the personal sector (EP)[40] to discretionary funds of the personal sector (FP)[41].

Turning now to the asset side of the banks' balance sheet, both the sight deposit (ΔSD) equation and the currency (ΔCUR) equation are purely demand determined, influenced positively by income and negatively by interest rates, with the addition of prices in the currency equation. It is normally assumed that commercial banks will passively accept sight deposits at the going interest rate, whilst actively engaging in the wholesale market. This latter point is not modelled in this block, given that time deposits are assumed to be the residual asset. Similarly, the Central Bank will normally accept any demand for currency by the NBPS. The importance of these two equations stems from the fact that they are a fundamental part of the money supply (equation 4.5.11 and 4.5.12), regardless of the definition employed. Given that their levels are not under the control of the authorities, this then gives weight to the proposition that the money supply is not completely exogenous.

Another asset available to the NBPS is governmental debt (ΔB), which is an important source of funds to finance the PSBR, without incurring an increase in the money supply. Like other models, severe problems have arisen whem attempts have been made to estimate this equation. The major obstacle being that although speculation plays an essential part in

debt determination, it is empirically difficult to estimate. At present, (ΔB) is assumed to be simply dependent upon the long run interest rate (R), proxied by the 2.5% consol rate, and external flows (ΔEF), to take account of any overseas sales, an important element in an open economy such as the UK. The latter variable is determined by an accounting identity (equation 4.5.9).

Research has been undertaken to disaggregate debt into its various components, namely short term debt, comprising Treasury Bills and National Savings, and long term debt, defined as any debt of a maturity of greater than five years. At present, the only explanatory variables employed in each equation are a relevant `own' rate and a variety of alternative rates, thus attempting to model the portfolio behaviour of the NBPS.

To complete the major part of the monetary sector, one needs to examine the term structure of interest rates. Their importance stems not from their part in the transmission mechanism, but from the need to determine the interest-sensitivity of credit.

In this model, as with others, the Treasury Bill rate (RTB) is the pivotal interest rate, with other short term rates determined by mark-up models. One particularly important interest rate, due to its role in the transmission mechanism (see below), is the mortgage rate (RMOR). The monetary authorities are assumed to be able to control RTB through open-market operations and thus is treated as

exogeneous. Some models (eg. NIESR) exogenise all short term interest rates. However, this practice has been criticised as artificial (Easton, 1985) since it poses limitations on simulations, by preventing any possible feedback effect from changes in other variables to interest rates.

The long term interest rate employed is the yield on 2.5% consols (RCL). Like other interest rates, (RCL) is influenced predominantly by short term rates. However, other factors are also important and thus (RCL) is assumed to be positively associated with long term debt Also, since long term assets are made available to the overseas sector, as well as to the domestic sectors, account must be made of the external position, and thus external flows (ΔEF) are utilised.

External Sector

In the PK model the various equations for the components of real exports and real imports are estimated in the real sector, block I and II. These two variables are brought together, in nominal terms, in block VI, the external sector, to calculate the current balance (CB) - equation 4.5.13.

Modelling the external sector is important from a post-Keynesian viewpoint, since it further fuels the proposition that the money supply is not exogenous. If there is room for potential speculation between foreign and

domestic monies then there is no longer a limited range of monetary assets. Therefore, any attempt to control the money supply, or the level of interest rates, may merely lead to disintermediation into overseas money markets and hence the Central Bank loses control. This is likely to have occurred to a large extent after exchange controls were abolished in 1979.

The exchange rate utilised is the effective exchange rate, though some work has been undertaken in terms of the bilateral sterling-dollar rate, thus attempting to capture the trading activities of all major partners. One of the major explanatory variables is the interest rate differential. However, there is a major controversy on the direction of its effect. The resulting relationship is dependent upon the reactions of the government to external circumstances. If, as occurred prior to 1977 (Haache and Townsend, 1981), interest rate policy is determined by external pressure, to ensure competitiveness, then one would expect a positive relationship. This is consistent with most macroeconomic theory. Conversely, post 1977, the monetary authorities have been primarily concerned with monetary targets rather than external objectives. This may have lead to the significant use of `leaning into the wind', whereby authorities attempt to moderate any exchange rate changes, thus leading to a perverse negative correlation. However, it is difficult to empirically estimate the authorities intervention, since explicit intentions were not always

given. Thus biased interest rate parameters, tending towards zero, may occur.

As well as interest rates, the exchange rate is likely to be dependent upon the state of the economy. Therefore, as a measure of confidence, changes in the current account (ΔCB) and the capital account (ΔKM) are incorporated[42].

The modelling of the capital account has become more important in recent years with the introduction of the flexible exchange rate. Like the exchange rate, large movements in the capital account put the feasibility of certain economic policy into jeopardy. Volatile movements may take place due to a number of activities, namely interest rate arbitrage, speculation or trade hedging. These activities are essentially influenced by differences in yields between alternative assets and future expectations of the exchange rate. Thus the rationale for including interest differentials, current balance and changes in the exchange rate.

There is however two important points to note. Firstly, the interest differential is taken as a stock adjustment as opposed to a flow. Thereby, modelling a one-off short stock adjustment, associated with changes in the differential, followed by minor flows until the desired portfolio reallocation is restored (Hodjera, 1972; Branson, 1970). This is opposed to more orthodox flow equations, whereby changes in the interest rate differential lead to a continuous in/outflow of capital.

Secondly, the use of the current balance, as an index of sterling confidence, may lead to a biased coefficient (Hodjera, 1972). This is because of two opposing forces. Growing confidence in the economy leads to a capital inflow. However, such an improvement could also generate a capital outflow because of export finance, thus producing an opposing reaction. These two effects may cancel themselves out, thus a coefficient tending to zero may arise.

The transmission mechanism

The major channel of the transmission mechanism utilised in this model is the availability of credit to consumers for private dwellings and other durables, along with hire purchase controls; interest rates and the exchange rate provide additional channels.

The variable used to reflect credit availablility leads to the major difference between the CEAR model and the PK model. The CEAR model utilises a variable called the "degree of liquidity pressure" (DLP), measured by the ratio of bank loans to bank deposits (Eichner, 1979). Thus when the lending capacity of the commercial banks falls relative to the demand for short term loans problems of liquidity occur. This influences the real sphere of production in two ways. Firstly directly, by making it more difficult to finance any discretionary spending in excess of discretionary income. Secondly indirecly, through the lagged change in long term interest rates. This increases when credit is squeezed,

eventually leading to a fall in discretionary spending, due to the increased cost of funds. However, in the PK model, due to the institutional set-up, as explained above, the use of the "degree of liquidity pressure" is unsuitable. In the UK, this ratio should always be equal to unity and therefore any divergence recorded merely represents errors incorporated in the official data collection. Bank lending to the private sector (BLP), appropriately disaggregated, is the central core variable of this block instead. This variable models the absolute level of credit, rather than the ratio, but can be utilized in a similar way.

In the PK model, bank lending to consumers for purchases other than housing ($\triangle$BLOH) influences consumer expenditure on durables (COND). Thereby emphasising the liquidity constraint on consumer expenditure when discretionary expenditure (EP) is greater than discretionary finance (FP). Another variable, a hire purchase dummy[42], is also incorporated to take account of this constraints on credit availability, thus emphasising the discriminatory nature of such controls.

In the case of consumer expenditure on housing (CONPD), the PK model utilises lending for house purchases from building societies ($\triangle$BSLH), as opposed to lending from banks ($\triangle$BLCH). As touched upon above this brings to the forefront two problems. Firstly, the lack of data available for ($\triangle$BLCH) makes the utilisation of this variable unreliable. Secondly, the model needs to be expanded to incorporate the

activities of the NBFI, especially the building societies.

Bank lending to ICCs (ΔBLI) could potentially influence the level of investment in building and other works (IBOWI). Such an effect would emphasise the dual interaction of entrepreneurial `animal spirits' in the creation of 'credit-money'. Investment by ICCs is dependent upon ICCs receiving sufficient finance, yet the generation of finance is dependent upon expectations of increased productivity, proxied by growth in (GDPFC). These effects, though, are not statistically significant and can thus be ignored for the purposes of this study.

The secondary import of interest rates as a channel of the transmission mechanism is captured by the long run interest rate on various components of investment to ICCs and the effect of the short run interest rate on consumption of consumer durables. Furthermore, the mortgage rate, determined by a simple mark-up model, influences both consumption on private dwellings (CONPD) and the retail price index (RPI).

The external channel of the transmission mechanism, captured by the exchange rate, is important in determining the price of raw materials (PRM), as demonstrated in block IV (Arestis, 1986) - the pricing block. This link emphasises the possibility of imported inflation, seen by some (eg. Beckerman, 1984; Arestis, 1986) as the major cause of controlling inflation. The exchange rate also influences the level of real exports and imports (block II) implicitly,

through indices of competitiveness, calculated by relative prices multiplied by the exchange rate.

Summary

The construction of the PK model has been undertaken to emphasise the major characteristics of the post-Keynesian monetary theory, with particular reference to the UK economy. This has been largely achieved, though more work in certain areas, such as the inclusion of NBFI, needs to be undertaken.

All three major characteristics are explicitly acknowledged. Uncertainty is incorporated into both bank lending equations, with the utilisation of an appropriate ratio for the level of discretionary expenditure to discretionary funds. The evolving process of historical time is analysed with particular reference to the short run, illustrated by deviations from constant long run trends. In terms of contracts, loans are examined, with the only financial institutions explicitly modelled being those included in the definition of the banking sector.

The model further emphasises the demand driven nature of credit and the endogeneous money supply. The demand-determined nature of credit is demonstrated by the utilisation of predominantly demand-side variables in the bank lending equations (especially bank lending to ICCs), proxied by various activity variables. Although the cost constraint of interest rates have been included, these have proved to be generally weak. This is further emphasised by

the insignificant nature of the supply-side constraints, as in keeping with other macroeconomic models. Related to this, the rejection of an exogenous money supply is established, given that bank lending to the private sector (especially to ICCs) is the largest single component of changes in sterling M3. This is further enforced by the demand-determined nature of the currency and sight deposit equations (equations 4.5.7 and 4.5.6 respectively). This leads on to the importance attributed to credit availability, depicted predominantly by bank loans, as the major channel of the transmission mechanism, in keeping with the Radcliffe Report's findings. Thus the two most important equations in this block are the two bank lending equations (4.5.4 and 4.5.5), although the (ΔBLI)-equation should be particularly emphasised. The satisfactory nature of the whole block is dependent upon the ability to model these two variables accurately. This proviso, however, may bring forward problems, as admitted by Cuthbertson (1985a), given that past attemps at adequately modelling (ΔBLI) have proven difficult.

Superficially compared to the other three models, the PK model is more akin to that produced at the NIESR, in that it revolves around the determinants of two identities. However, the PK model is less concerned with producing a partial portfolio model in the Tobin tradition and more concerned with demonstrating the endogeneity of the money supply and the fundamental characteristics of the post-Keynesian doctrine.

VI) CONCLUSION

This overview of the four monetary sectors concentrates on the principal equations that provide direct links with the income-expenditute framework. Although three out of the four models now estimate behavioural equations for, at least, one definition of `money', these sectors are much more exhaustive than any demand-for-money model. The structures of the three orthodox monetary sectors are broadly based upon alternative general formulations of Tobin's (1958) portfolio theory, whereby an economic agent faces a greater choice than merely money V bonds.

Although a detailed evaluation of the similarities and differences between the models will be left until the next chapter, the underlying structures of the HMT model and the LBS model are broadly similar, given that both provide a detailed disaggregation of various assets and sectors in the tradition of Brainard and Tobin (1968). One striking feature of the HMT model is the emphasis placed upon the explicit modelling of the NBFI, whilst the LBS model incorporates the ambitious behavioural assumption of optimisation. Conversely, the NIESR model and the PK model are much more conservative in their available portfolio choice, with the latter being concerned more with highlighting the major characteristics of the post-Keynesian doctrine. These two models concentrating on those assets and liabilities that form the two central identities, the counterparts of sterling M3 and the

government's budget constraint. In both of these models particular attention is levied on the determination of the various components of bank lending. This set of equations are particularly important in the PK model, where they constitute a major channel of the transmission mechanism.

The different theoretical underpinnings utilised by the various modellers provide four alternative representations of the UK monetary sector. At one extreme the `international monetarist' element of the LBS model emphasises the importance attributed to monetary policy, illustrated by the availability of a complete spectrum of alternative monetary policy instruments. At the other extreme, the overtly Keynesian nature of the NIESR model de-emphasises this growing importance, concentrating instead on quantity adjustment. These differences, among others, provide the rationale for stressing alternative channels of the transmission mechanism. Even though all four models incorporate the role of interest rates and the exchange rate, the importance of these roles vary between models.

In the next chapter, all these above similarities and differences will be discussed in detail, to evaluate the contributions that the four models bring to monetary economics. Particular emphasis will be with the role of financial innovation and the theoretical content of all four models.

Endnotes

1) The version of the model under review comes from H.M.Treasury (1987) Macroeconomic Model Documentation.

2) The sheer size of the model stems predominantly from its detailed treatment of the public sector rather than increased disaggregation of key expenditure variables. Its size is also closely related to the vast number of detailed questions the model hopes to assist in answering. Therefore the size of a model has no relevance to its "goodness" or "badness", but merely to its usefulness and relevance for a particular purpose.

3) Most of the equations in the model are estimated using the single equation technique of ordinary least squares (OLS) and are therefore likely to be subject to biased coefficients (see Pindyck and Rubenfeld, 1986). At times, however, two stage procedures have been utilised elsewhere in the research, such as the investigation into the incorporation of expectations.

4) A suffix w denotes a world variable, all of which are treated as exogenous in the domestic model. However, these world variables are estimated in a separate World Economic Prospect Model.

5) A `bank lending to persons for house purchases' equation is also included, whereby lending is dependent upon the base rate and building society liquidity. The latter variable is used as a proxy for any possible constraints on building society lending, given that the banks are assumed to be passive players in a market dominated by the building societies (HMT, 1987, p.598).

6) In the case of (ΔBLI) this is the level of real gross domestic product at factor cost (GDPFCR). Whilst (ΔBLC) is dependent upon real personal disposable income (YDPR).

7) Changes in net financial wealth are determined by the level of the net acquisitions of financial assets.

i.e. FIN = n (NAFPE), where n1>0

8) The behaviour equation used to determine the personal sector's deposits with the building socities is the most important of those included in the building society block.

9) This is merely a technical consideration and in principle the choice of a residual is relatively unimportant, provided that a consistent theoretical approach is maintained (Spencer and Mowl, 1978).

10) Although the PSBR is taken as exogenous in this highly stylised version of the complete model, it can be adequately

explained by a simple identity:

PSBR = G - T

where: G = total government expenditure, including transfers.

T = total tax receipts.

PSBR is important in influencing the demand for gilts, both directly through the expected gains and indirectly through the government's budget constraint.

11) This variable is a measure of "the pre-tax own-product marginal rate of return on physical capital required to cover the cost to the company (in post-tax terms) of the finance needed to acquire the physical capital after providing for the cost of physical depreciation" (H.M.Treasury, 1987, p.24).

12) This is constructed to determine the percentage of the purchase price paid in the first month of an HP contract, derived by:

$$HP = d + (1 - d) / m$$

where: d = minimum initial deposit (% of purchase price)

m = maximum repayment period.

13) The version of the model under review is derived from Budd et al (1984) and Keating (1985).

14) The utilisation of this approach results in a stark distinction between the econometric methodology employed in

constructing the traditional income-expenditure framework and the financial sector, as demonstrated by the alternative procedures utilised.

In the financial sector all equations are estimated jointly as a single system. Given this situation a non-linear system method should have been utilised to ensure fully efficient estimates, but due to the non-availability of adequate software, an iterative instrumental variable (IV) procedure was utilised instead. The rationale behind the use of this methodology, is that it is strongly dictated, given the multitude of parameter restrictions imposed across the different financial asset demand equations. Utilising the iterative (IV) procedure ensures that the cross-equation restrictions are statistically consistent, though the restrictions only become satisfied when the procedure has converged. Convergence is defined by a low percentage change between the iterations in terms of the residual sum of squares.

At times, some assets may be rationed for particular sectors. To take account of this, in those specific equations where rationing occured, weighted least squares were utilised, with zero weights during rationing and unit weight elsewhere. These procedures were adopted in estimating the regressions for all sectors, except the overseas sector, where a two-stage least squares (2SLS) estimator was employed. In this context, statistically consistent estimates were still obtained because no

cross-equation parameter restrictions or rationing were imposed.

Conversely the equations estimated in the income-expenditure model are based upon the econometric methodology advocated by Hendry and Mizon (1978) whereby equations are estimated `from the general to the specific', as opposed to the `from the specific to the general' orthodox method.

15) The optimising behaviour of each sector is determined by using a modified version of Parkin's (1970) mean-variance framework.

16) Most of the equations were estimated from 1969, thus giving all tests employed sufficient degrees of freedom to be viable. However, due to data difficulties and the effect of the exchange rate controls, equations for overseas assets and most of those in the overseas sector, were estimated for a much shorter period, i.e. from 1979(Q4) onwards. This lack of available data could lead to problems of interpretation in terms of the results.

17) Subscript 'f' denotes a foreign variable.

18) The coupon, after the effect of tax is taken into consideration, is defined by:

$$(1-t_{Ijt})r_{jt}/P_{jt}$$

where: t_{Ijt} = tax rate on income for the jth asset.

r_{jt} = real coupon

P_{jt} = price index

19) The capital, after tax, is defined by:

$$(1-t_{Gjt})[(P_{jt+1}/P_{jt})-1]$$

where: t_{Gjt} = tax rate on capital gains.

20) The version of the model under review stems from the National Institute Model 9 (NIESR, 1986).

21) All equations estimated in the monetary sector utilise quarterly seasonally adjusted data. This is at odds with the other three models, whom all incorporate, as far as possible, unadjusted data with seasonal dummies. This may lead to additional problems of inconsistency, due to the non-uniformal employment of seasonal filters on alternative sources of data (Wallis, 1974). However, the rationale for this practice stems from the ultimate aim of the model, which in this case is to produce seasonally adjusted forecasts of the UK economy.

Most variables in the monetary sector, apart from the interest rates, are expressed in terms of natural logarithms, whilst dependent variables are predominantly expressed as first differences. The rationale for the use of logarithms stems from the fact that elasticities may be directly calculated. The use of first differences, means that

regressions are expressed in terms of flows, as opposed to stocks. Furthermore, apart from the exchange rate equation which utilises full information maximum likelihood (FIML) estimators, all equations in the monetary sector are estimated using OLS, thus problems of inconsistent coefficients may occur, due to simultaniety bias. However, recent versions of the model have begun to utilise 2SLS, for example in determining the wholesale price of manufacturing goods.

22) Prefix Q indicates that the variable is denominated in real terms.

23) This situation only occurs in the short run, in the long run the banks can alter the size of their retail operations by altering their range of business (Wills, 1982).

24) Here, the representative short run interest rate is the rate on Local Authorities three month debt (RLA).

25) The increased use of various types of 'buffer stock' models has occurred as a response to the breakdown in the more conventional approaches to the demand for money functions. The type of model utilised by the NIESR is derived from the work undertaken by Carr and Darby (1981).

26) This variable, as with others utilised to capture wealth, is determined by a definition, defined as the sum of a sector's income less its expenditure. In the case of the personal sector this is equivalent to income from employment, other personal income, current grants plus net current and capital transfers from abroad, LESS consumers' expenditure, personal sector investment, income taxation and national insurance contributions.

27) The version of the model under review is derived from Arestis (1987/88)

28) Theoretically the British PK model comprises six blocks, with the sixth being the overseas sector.

29) The justification for concentrating on clearing banks only, is that, at present, they are the major source of `credit-money'. However, as explained in Chapter two, this is likely to change in the near future.

30) All equations are estimated using quarterly unadjusted data, from 1963(Q1) to 1985(Q2), except for those equations incorporating the external sector which are estimated from the shorter data period of 1972(Q3) onwards, to take into consideration the floating exchange period only. All real variables are expressed in 1980 prices. Three dummies are utilised to take account of seasonality with the GIVE

(Generalised Instrumental Variable Estimators) package, written by D. Hendry, used to estimate all equations, by utilising OLS estimators throughout. This latter point may lead to problems of inconsistent estimators.

31) An asterisk (*) denotes a variable that has been detrended and a circumflex (^) denotes a variable that has been demeaned.

32) The use of an exponential trend can lead to problems of estimation when negative growth rates occur, because one cannot have a non-positive natural logarithm.

33) When variables exhibit no significant trend they are then expressed in terms of deviations from their mean, denoted by a circumflex (^). i.e.

$$\hat{X}_t = X_t - X_M$$

where:

$\hat{X}$ = demeaned variable.

X = actual variable.

X_M = mean of the actual variable.

34) The PK modellers, like the Treasury, have carried out limited research on the interest-sensitivity of this component, coupled with the effects of official credit restraints. This equation is likely to become more important when the behaviour of the NBFI are explicitly modelled.

35) Moore and Threadgold (1980) have suggested that bank lending is important for financing stock building. This was investigated by disaggregating (GDPFCN) to examine stock building as a seperate component, since including both variables would lead to problems of double counting. The results of this investigation were insignificant.

36) Money may be held to prevent surprises in the market, and if the cost of holding such balances is lower than it would otherwise be, then money becomes a substitute for information (Laidler, 1984).

37) Discretionary expenditure is any expenditure that has the dual characteristics of postponability and external financing (Arestis et al, 1985/86). In this model discretionary expenditure to ICCs (EI) is calculated by:

$$EI = ID + IC + U$$

where:

ID = Gross fixed capital formation for ICCs.

IC = Investment in UK company securities and investment in overseas securities and investment overseas.

U = Unidentified transactions.

38) Discretionary funds are defined as "the difference between the income received (by any sector) and the money claims paid out to purchase any non-discretionary items",

(Eichner, 1980). In this model, internal funds (IF) are taken as equivalent to discretionary funds.

39) Extensive utilisation of dummies for quantitative and qualitative controls on bank lending, such as incorporated into the Bank of England model by Moore and Threadgold (1980), has been criticised by Coghlan (1981). He believes that many studies understate the importance of quantitative controls, such as the `corset', whilst simultaneously overstating the effect of qualitative controls, eg the CCC. His argument stems from the fact that quantitative controls are not merely a weaker form of qualitative control, and should, therefore, be treated as different, rather than inferior. Related to this, Coghlan criticises the lack of attention taken of the pent-up demand resulting from the abandonment of certain controls. In this situation, a pressure release dummy is also required to reflect the increased demand.

40) EP = IA + IS + CAC + OCD

where:

IA = Investment in fixed assets and stocks.

IS = Purchases of government and other securities and debt.

CAC = Consumers' expenditure on cars and motor cycles.

OCD = Expenditure on other consumer durables.

41) FP = CAC + OCD + S + NKT - LASA

where:

S = Savings

NKT = Net capital transfer

LACA = Expenditure on life assurance and superannuation.

42) As with public sector debt (ΔB), the exchange rate may be adversely affected by speculation and expectations. However, problems arise in explicitly modelling such behaviour. One solution, put forward by Dornbusch (1976), is the concept of `news', which distinguishes between actual and anticipated depreciation. Some form of `news' has been tried but the results were not encouraging. Clearly more work is needed on this aspect of the model.

43) This constraint is derived from a series constructed at the NIESR (NIESR, 1986).

CHAPTER FIVE: THE STYLISED MODELS - EVALUATED AND COMPARED

I) INTRODUCTION

The modelling of a monetary sector is dependent upon a large number of factors, both theoretical and empirical, thus diversifying explanations coexist. Previous comparative work (eg. Cuthbertson and Foster, 1982; Easton, 1985; ESRC, 1985; Wallis et al, 1984, 1985, 1986) has predominantly utilised econometric criteria, with a model's forecasting ability taken to be a general guideline to its success. Given, however, the theoretical objective of the PK model (Arestis, 1987), an alternative strategy of evaluating and comparing the theoretical foundations, intrinsic to macroeconomic model building, of the four sectors will be utilised instead. Those theoretical criteria considered will be based upon the major aim of post-Keynesianism, which is to mirror reality as closely as possible. This involves capturing the effects that financial innovation, as discussed in chapter two, has upon the demand for and supply of money, and the ultimate effect it has upon the real sector, as discussed in chapter three.

Financial innovation indirectly affects the money supply, via the evolving role of the financial institutions, and directly, via the imposition of monetary controls, with their subsequent removal affecting money demand. During the 1960's and 1970's, commercial banks were the major source of 'credit-money', constrained in their activities by various

controls, and monetary policy was subordinate to fiscal policy. Models of this era could adequately capture the realities of the monetary sector by examining the activities of the commercial banks, given the imposed controls, only. Whilst the unimportance of monetary policy could be demonstrated by the lack of interaction with the real sector. As can be gleamed from the historical account of all three orthodox models this was how the UK's macroeconomic models were generally constructed. However, the competitive environment of the 1980's, cumulating in the deregulation of various financial services, has meant that the liabilities of the NBFI's, in particular building societies, have become viable alternatives of 'credit-money'. This, coupled with the growing importance attributed to monetary policy, has meant that the monetary sector as a whole needs to be comprehensively modelled. Thus, section two analyses how the four models incorporate the role of financial institutions and the subsequent interaction they have with the real economy. Also the growing importance attributed to modelling a number of alternative monetary aggregates and assets is analysed in keeping with the "Radcliffian" concept of liquidity. Then, section three analyses the incorporation of monetary control, which affects both the demand for and the supply of money.

Financial innovation has promoted an increased utilisation of information technology, which by lowering the settlement costs, has lowered the liquidity preference of

economic agents. Thus the alternative methods of modelling technological advances are analysed in section four.

The importance attributed to financial innovation on the demand for and supply of money is predominantly a post-Keynesian preoccupation, ignored by orthodox economists. Section five, therefore, analyses the other contributions of monetary theory, pinpointed in chapter three, by both post-Keynesians and orthodox economists. Here one pays particular attention to four main areas - the endogeneity of the money supply, the determination of interest rates and the exchange rate, and the role of expectations. The question of endogeneity has important implications for the transmission mechanism, as discussed in chapter three, with the interest rate providing an internal linkage and the exchange rate an external one. Modelling expectations, an area receiving increased attention, given the controversial nature of the REH (Muth, 1961) and the Lucas (1976) critique, has important implications about uncertainty.

Analysing the monetary sector of a macroeconomic model in isolation will not establish its relevancy to reality. An important consideration emphasised by all theories, is the interaction between the real economy and the monetary sector. Although previous sections have examined some of these linkages, section six evaluates all the monetary linkages in terms of the theoretical channels, discussed in chapter three, and then compares them.

Each of these five sections will be handled, where

possible, in a similar way. Firstly, we will evaluate, in alphabetical order, how each model captures the relevant criterion, paying particular attention to any assumptions imposed. Then, the differences and similarities between the models will be discussed and rationalised.

Finally, section seven concludes this chapter by highlighting the major similarities and differences between the four models.

II) THE ROLE OF FINANCIAL INSTITUTIONS

The diversifying nature of financial intermediation has meant that models of the monetary sector have to be more exhaustive in their treatment of financial institutions and monetary aggregates. Even though commercial banks are no longer the only source of finance, they still remain one of the most important. Thus their role in the four sectors and their effect on the real economy, will be analysed first. However, as stated above, modelling their activities only will no longer suffice. Building societies, the most important type of NBFI, now openly compete for customers with the banks. Consequently, their role, examined next, in providing finance, and ultimately effecting the real economy is also important. Similarly, other financial institutions (OFIs), including those in the overseas sector, have their own role to play. Finally, the effect of increased competition between alternative types of financial

institutions is analysed in terms of the effect upon modelling monetary aggregates.

The role of the banking sector

In the HMT model, both the liabilities and assets of the banking sector are fundamental elements in modelling the allocation of the NBPS's wealth. Bank lending to the private sector, appropriately disaggregated, constitutes one component of gross financial wealth (GROSWPR). This latter variable forms the focal point of the monetary sector, whereby the portfolio behaviour of the NBPS is modelled and thus the banking sector is indirectly linked to the demand for money. Bank deposits, not analysed in the stylised version of the HMT model, form part of the personal sector's liquidity (LIQPE), which influences consumer expenditure on non-durables. Other liquidity and wealth effects (discussed below), which are influenced by the availability of alternative assets and liabilities, affect various components of aggregate demand. Conversely, real factors, such as personal disposable income, affect the level of liquidity, as well as the bank lending equations. Consequently financial institutions may indirectly affect the growth in the real economy, whilst the real economy affects the growth in the monetary sector.

The role of the banking sector in the LBS model is less crucial to the portfolio behaviour of the NBPS. The liabilities and assets of the commercial banks, although

constituting part of the portfolio of the NBPS, do not receive special attention. Changes in the state of any financial market will alter the present value of assets and thus the wealth of the personal sector (Budd et al, 1984). This subsequently effects the real economy, via the consumption function and thus all financial institutions may indirectly affect the growth of the real economy. The real economy's effect on the monetary sector occurs via the budget constraint, any change in expenditure or income affects the wealth available for allocation.

The NIESR model focuses on those assets and liabilities that constitute the counterparts of the £M3-identity and the government's budget constraint. Particular attention lays with the disaggregated elements of bank lending to the private sector, though bank assets, excluding time deposits, are also explicitly modelled. A `windfall' effect is captured by the interest rates of banks and building societies, which affects the liquid element of investment. Given that increased competition may affect the various interest rates, banks may have some effect on the real economy. The real economy may affect the banks via the bank lending equations.

The PK model analyses a similar set of assets and liabilities as utilised in the NIESR model. However, in the PK model bank lending, appropriately disaggregated, forms the vital link between the monetary sector and the real sector. Any constraint on the level of bank lending affects the

growth of the real economy. Thus the liquidity preference of the banking sector has influence over the rate of real growth. However, given the demand-determined nature of bank lending to ICCs, the real sector can simultaneously influence the growth of the monetary sector. This model, therefore, clearly demonstrates the importance of the interaction with the real and financial sectors.

The lending and borrowing activities of the banks are modelled by the four sectors in a similar way. All emphasise the demand-determined nature of all the bank assets, though the NIESR and PK models assume that time deposits are the residual asset, and the demand-determined nature of bank lending to ICCs. The additional disaggregation of bank lending for house purchases is incorporated into all models, except for the LBS, though only the HMT model produces an estimated equation. The three orthodox models predominantly emphasise the interaction of the banking sector with the real economy in terms of the revaluation effect, though the HMT model does include a liquidity effect, in the Radcliffian tradition. These effects are minor influences on the real economy. Conversely the PK model emphasises the direct effect of the banking sector on the level of aggregate demand as the major linkage between the sectors.

The effect of the real economy on the banking sector in the LBS model is via the wealth constraint. This is also modelled by the HMT, yet like the other two models the HMT captures the direct effect on bank lending.

The important conclusion about the role of banks is that in the orthodox models the activities of the banking sector are primarily analysed to complement the portfolio behaviour of the NBPS. However, in the PK model, the accurate construction of the banking sector's activities are paramount for the interaction with the real sector.

The role of the building societies

As with the banking sector, the complete HMT model incorporates a detailed examination of the building societies behaviour, with the personal sector's deposits at the building societies (SHDEP) constituting the most important equation. This stems from the inclusion of the latter variable in the composition of the personal sector's liquidity and its subsequent interaction with the real sector.

Similarly, the role of the building societies in the LBS model is equivalent to that envisaged by the banks. Thus their assets and liabilities, namely building society shares and mortgages, are assumed to comprise part of the personal sector's portfolio and thus affect the real sector via the revaluation effect.

In the NIESR model the activities of the building societies are not explicitly modelled. The only role attributed to these institutions occurs via the building society share and deposit rate (RSHR) and the mortgage rate (RMOR), determined by simple mark-up relationships over the

Treasury bill rate. These rates then influence the real economy via components of aggregate demand.

Building society lending for house purchases (BSLH) forms another constraint on real activity in the PK model. However, in the present version of the model this variable is exogenously determined. Future research is, therefore, required to construct a monetary block that includes the activities of the NBFIs. But there is another relevant effect here that of the mortgage rate on inflation.

The modelling of the building society sector is less comprehensive than that of the banking sector. Surprisingly, the LBS model pays as much attention to their assets and liabilities as they do the banks, though this is not exhaustive. Conversely, the NIESR model predominantly disregards their activities. Once again the orthodox models emphasise the revaluation effect on the real economy, whilst the PK model emphasises the direct effect of lending. Given that the HMT establishes at least some interaction between the building societies and the real sector, by including a complete section on their activities, it must be credited with providing the best explanation of the role of building societies.

The role of OFIs

Various domestic and foreign assets and liabilities of OFIs, eg commercial bills and foreign currency deposits, are included in the general portfolio models of the HMT and the

LBS. In the LBS model, they are analysed in a similar manner to the liabilities and assets of the banking and building society sectors, whilst the HMT utilises identities. However, in the NIESR and the PK models these assets and liabilities are ignored, with those elements of the bank lending pertaining to these sectors being exogenised.

Compared to the banking sector and the building societies, the behaviour of OFIs is classified as secondary, except by the LBS. This is demonstrated by either simple disregard, as in the case of the NIESR and the PK models, or by the utilisation of identities, as in the HMT model.

The modelling of monetary aggregates

Early versions of the HMT model incorporated no explicit demand-for-money equation, since money was seen as the residual asset in the NBPS's portfolio. However, recent generations of the model, given the preoccupation with monetary targetry, place more emphasis on modelling money demand. In the stylised version, the demand functions for two monetary aggregates, namely the traditional broad aggregate, £M3, and the recently conceived narrow aggregate, M0, are modelled. However, in the complete model, with its general portfolio framework, identities of other aggregates, such as M2 and PSL2, are also included.

In the LBS model, even though a wide selection of assets and liabilities are included in the NBPS's portfolio, no monetary aggregates as such are modelled. However, the

demand for the various components of money can be summed across sectors to determine aggregate money demand. Also the model may be used to examine the effects of monetary targetry, by assuming that high powered money is a governemnt instrument.

The counterparts of £M3 provide the focal point of the NIESR's monetary sector, consequently the portfolio selection of the NBPS is fairly limited. Also the demand for the other traditional monetary aggregate, M1, is estimated.

Even though the post-Keynesians emphasis the importance of liquidity, as opposed to money, the PK model only explicitly examines the supply of broad money, £M3, and the narrower aggregate, M1. Other monetary aggregates can be obtained by aggregation.

Despite the fact that increased financial innovation has meant that the liabilities of the NBFIs have become more acceptable as a means of finance, all four models predominantly examine the demand for and the supply of the traditional aggregates only, namely £M3 and M1. The HMT model, given its eye for detail, does model the determinates of other aggregates, however, apart from M0, their import is only secondary. Also the general portfolio models of the HMT and LBS (see below) means that a wider selection of assets are modelled, as possibly applicable to the Radcliffian concept of liquidity.

Summary

The more general characteristic of the HMT and LBS portfolio models is illustrated by the estimation of a wide range of assets and liabilities, available from a wide range of institutions, thus pertaining to the Radcliffian concept of liquidity. In the LBS model, all these assets and liabilities, independent of their source, receive similar treatment, and the interaction with the real sector is assumed to be uniform among institutions. Thus the model fails to capture the evolving role that financial institutions play on the supply of money and the real sector. In the HMT model, however, concern centres on a detailed examination of the activities of all financial institutions, with the workings of the building societies receiving particular attention. This is further illustrated by the determination of a wide range of monetary aggregates. The interaction with the real economy is predominantly in terms of the wealth constraint, with the banking sector taking precedence.

Both the NIESR and the PK models pay particular attention to the role of the banking sector in the determination of the money supply, £M3, with other monetary aggregates disregarded and in this context are very similar. However, in the NIESR model, this concern is derived from the portfolio behaviour of the NBPS, with a minimal interaction with the real economy. Conversely, the bank lending equations are fundamental in the PK model, acting as a requirement on

real growth whilst real growth simultaneously acts as a constraint on monetary growth. This is in keeping with the post-Keynesian doctrine, which emphasises the importance of setting up monetary contracts. Building societies also provide a similar constraint on growth, though their activities have not yet been modelled. Consequently, one would conclude that the role of financial institutions in the PK model is more akin to that envisaged by the HMT.

III) THE INCLUSION OF MONETARY CONTROLS

Research into the demand for money has focused upon the possibility of a structural break in demand, occurring after the introduction of CCC. In a similar manner, the demand for money, and other liquid assets, may have been affected by the lifting of the exchange controls in 1979 and the reforms of the Green Paper in 1981. Conversely, the imposition of monetary controls may have constrained the supply of money. Consequently, the inclusion of both the imposition and the removal of various monetary controls will be analysed.

The imposition of controls

The hire purchase controls, implemented in the sixties and seventies, have important implications on the level of consumer expenditure on durables in three out of the four models. However, only the LBS model, which omits the availability effect, explicitly models the effect that these

controls have on the portfolio behaviour of the personal sector. The other three models capture the effect on aggregate demand with a dummy variable.

The influences of the `corset' and the qualitative guidelines, intermittenly enforced during the 1970's, are not explicitly examined in any model. However, the LBS model imposes zero weights on the bank loan equations when some form of rationing is in operation. Similarly, the PK model incorporates two conventional dummies to capture the effect on bank lending to consumers of imposing and removing the various controls.

Constraints on the demand for mortgages are explicitly modelled in the LBS model, by the assignment of zero weights. The other three models capture the real effect on expenditure for house purchases by the utilisation of an appropriate interest rate, with the PK model also including an appropriate lending variable.

The preoccupation with monetary targetry does not seem to have penetrated into the workings of the macroeconomic models, though both the HMT and LBS models can be solved with either an endogeneous or exogenous money supply. However, none of the models analyse the effect on the money supply when targets overshoot.

The removal of controls

The effect on the demand for bank lending after CCC was introduced is estimated in the NIESR and the PK models by two

conventional dummies. Firstly, a long run dummy, indicating a structural break, is included in the bank lending to ICCs equation, whilst a short run dummy, applicable to the period preceding the introduction of the `corset', is included in the bank lending to consumers equation.

One major effect of the CCC was the increased utilisation of `liability management', a form of financial innovation, which paved the way, before the introduction of the `corset', for large-scale `round-tripping'. The eventuality of this is examined by all models, except the LBS, with the utilisation of an interest rate differential.

The lifting of the exchange controls in 1979 had an important effect on the demand for overseas assets. Given that these assets are excluded from the portfolio analysis of the NIESR and the PK models, the effects of this reform are disregarded. In the LBS model, this reform is implicitly included by examining the relevant equations from 1979(Q4) onwards, whilst the HMT does not appear to take this reform into consideration.

Finally, the influence of the Green Paper in 1981 and the subsequent deregulation of other financial services has not, at present, been analysed by any of the models.

Summary

The analysis of the influence of monetary control on the demand for and supply of money in the four sectors appears to be very limited. As in keeping with previous

research into the demand for money, concern centres on the influence of the CCC, though this time in terms of the bank lending equations. Other controls receive, at most, passing comment. However, this may be due to the fact that most research finds these effects insignificant.

IV) THE ROLE OF TECHNOLOGY

Increased use of information technology, by lowering the brokerage fee, has particularly influenced the demand for cash. The effect of technology has been completely ignored by the LBS and the PK models, though the latter model does capture the effect of 'liability management' in its bank lending equations However, the HMT has investigated (Johnston, 1984) the effect of various proxies for financial innovation on the demand for M0, the monetary base. In the final specification, the number of bank and building society accounts per capita (PPBA) is utilised.

In the NIESR model, the effect of financial innovation is estimated in two equations. Firstly, the demand for currency equation includes a time trend, whereby as financial innovation evolves uniformally through time, cash holdings fall. Secondly, the recent formulation of a buffer-stock equation for the demand for M1 assumes that the unplanned component of demand depends partly upon the income generation process, proxied by the expectations of future real income and price levels.

Only the NIESR model, therefore, acknowledges the interaction of growth in the real sector and monetary sector in terms of technological advances, though the utilisation of a time trend, by assuming uniformity, has been criticised by Podolski (1986). Even though the HMT also relates demand to innovation, this innovation is assumed to be exogenously determined.

V) THE ROLE OF THEORY

The acceptability of a macroeconomic model is dependent on, among other things, its theoretical foundations. If researchers are allowed to run regressions without any a priori views on the most appropriate variables, then problems of `data mining' (Lovell, 1983) occur[1]. A counter-argument to this is forthcoming by Klein (1982), who emphasises the limitations of theory[2]. However, the importance of theory remains, with or without its limitations, and so this ection analyses the various strands of theory incorporated into the four monetary sectors. Emphasis is placed upon the determination of money, interest rates and the exchange rate, with a special section on the modelling of expectations.

The general framework

All four monetary sectors are based, to some extent (but see below) upon the general portfolio framework in the Tobin (1958) tradition. However, the HMT and LBS models

embrace a much wider choice of assets and liabilities in their portfolio, with the latter basing its choice on the flow-of-funds framework.

In the stylised version of the HMT model, only two assets, namely £M3 and gilt-edged securities, are modelled. These asset are assumed to be imperfect substitutes only, with the latter now taken to be the residual. A wealth constraint, determined by the net acquisitions of financial assets, bank lending and the capital gains in gilts, is the hub of the sector, linking together real and financial assets.

The LBS model incorporates the ambitious behavioural assumption of optimising the NBPS's portfolio, subject to a budget constraint, given that the economic agents are assumed to be risk averse utility maximisers. Thus the determination of any equation in the monetary sector is dependent upon the relative rate of return, the relative holdings and a wealth constraint, subject to any rationing. All equations in this sector are solved simultaneously.

The portfolio choice available to the NBPS in both the NIESR and the PK models is limited, based upon two central identities - the £M3 identity and the government's budget constraint. Both models emphasise the predominantly demand-driven nature of all assets and liabilities, with possible supply constraints applicable to bank lending to consumers. Time deposits are then assumed to be the residual asset, thus making any wealth constraint redundant.

The theoretical foundations of the LBS's portfolio framework are much stronger than the other three, given the assumption of optimisation. The HMT model examines a wide range of assets and liabilities as well, but no such behaviour is assumed. In the PK model, concern falls less with providing a portfolio framework, and more with demonstrating the major characteristics of post-Keynesianism.

The determination of money

The demand for money in the HMT model is captured by two separate equations, both of which are based upon neo-Keynesian theories of money demand. The narrow aggregate, M0, is a general version of the inventory-theoretical approach (Baumol, 1952; Tobin, 1956), whilst the broad aggregate, £M3, is broadly based upon the portfolio theory (Tobin, 1958). In terms of the supply of money, the HMT model can be solved with either an endogeneous or exogenous money supply. However, the former is the norm, whereby demand is accommodated and thus monetary targetry is futile.

In the LBS model, as discussed above, money demand is determined by the neo-Keynesian portfolio theory. Like the HMT model, the supply of money may be assumed to be either endogeneous or exogenous, dependent upon governmental policy.

The demand-for-money equation, M1, in the NIESR model is based upon the 'buffer-stock' notion, whereby money is dependent upon both a planned and unplanned component.

Changes in money stock, £M3, are dependent upon changes in its counterparts, with bank lending to the private sector and the NBPS's currency holdings taken to be predominantly demand-driven. Consequently, at least partial, endogeneity of the money supply is implied.

The PK model does not explicitly model the demand-for-money. Instead the counterparts of the money stock, namely £M3 and M1, are analysed to establish its endogeneity, a proposition put forward by the post-Keynesians, given their preoccupation with credit-money. Although total endogeneity is not established, given the possibility of supply constraints on the level of bank lending, partial endogeneity is substantiated by the predominantly demand-driven nature of the bank lending, currency and sight deposit equations, with the former being particularly relevant given their relative importance in determining the supply of money.

Three alternative explanations of the demand-for-money are utilised by the three orthodox models, with the PK model examining no explicit function. The theory utilised by the NIESR is probably the most controversial, given the newness of the 'buffer-stock' notion and the inclusion of rational expectations (discussed below). Increased use of this type of model stems from the breakdown of the more conventional demand-for-money equations, as utilised in the other two models, though no one theory seems to reign supreme. This is further illustrated by the controversial results pertaining

from demand-for-money studies.

In complete contrast, all four models, at times, contend the orthodox assumption of a completely exogenous money supply. In the HMT and LBS models, where exogeneity may be assumed, the norm appears to be the more controversial accommodation of demand by the monetary authorities. This is verified by the other two models, in particular the PK model, where the demand-driven nature of the various components of £M3 establishes, at least, partial endogeneity of the money stock. This belief in an endogeneous money supply is fundamental to the post-Keynesian doctrine, whereby money is created to meet the 'needs of trade', and has important implications for the transmission mechanism (see chapter 3).

The determination of interest rates

All four sectors utilise mark-up models to determine their various short- and long- run interest rates, with any foreign rates taken to be exogenously determined. The pivotal rates utilised are the three-month interbank rate (HMT) and the Treasury bill rate (LBS, NIESR and PK). The utilisation of mark-up models is more in keeping with the post-Keynesian determination of cost, as opposed to the orthodox assumption of profit maximising. However, the LBS attempts to rationalise the utilisation of mark-ups, given that such behaviour is equivalent to profit maximising when determination is subject to the bill's market rate.

The determination of the exchange rate

The HMT model, by utilising a set of three equations, analyses the effect of both the capital and current account on the exchange rate. The long run rate is closely related to the PPP, in accordance with the monetary approach, though an interest rate differential is also included. The determination of the current rate is based upon the capital account, whilst the expected rate incorporates an error correction term.

The LBS model utilises a general portfolio framework, given the additional assumption of rational expectations (Muth, 1961), to determine the exchange rate (Branson, 1977). This implies that, unlike the other models, no explicit exchange rate equation is modelled.

The exchange rate equation in the NIESR model has recently changed direction with the utilisation of rational expectations. The short term effects of the capital account are predominantly modelled, though long term effects are captured by the current account.

In the PK model, the influence of both the capital and current accounts are explictly examined, with the former enhanced by the utilisation of an interest rate differential. At present, however, no role for expectations is included, though the utilisation of Dornbusch's (1976) `news' has been considered (but produced no sensible results).

Apart from the LBS, which utilises a general portfolio framework for both its internal and external monetary sector,

the other three models examine a portmanteau of variables, related to both the capital and current account. However, there appears to be a consensus that the former affects the short term, whilst the latter affects the long run. Expectations also have a role to play - though not so much in the PK model.

The role of expectations

Traditionally, the HMT model has utilised backward-looking expectations in the exchange rate[3], such that expected movements, determined by both current and past values, affect the actual rate. However, given the increased importance attributed to the REH of the New Classical school, the model may now also be solved by assuming consistent expectations, thus the actual rate equals the last periods equilibrium rate.

The recent utilisation of rational expectations[4] in the financial sector of the LBS model goes some way towards responding to the Lucas (1976) critique of policy variant coefficients. These expectations determine the price of gilt-edged stock, equities and the exchange rate.

The last two versions of the NIESR model incorporate forward-looking expectations in the equations for, among others, the exchange rate and narrow money (M1). However, these expectations are only weakly rational, generated by autoregressive schemes.

The PK model does not incorporate any explicit model

for expectations, in keeping with the post-Keynesian theoretical belief in the formulation of non-ergodic expectations. Instead the effect of entrepreneurial 'animal spirits', proxied by various activity variables, are incorporated into the bank lending equations.

Increased interest in the theoretical modelling of expectations, initiated from the controversial New Classical's REH (Muth, 1961) and the Lucas critique, has been coupled with the increased utilisation of forward-looking expectations in the three orthodox models[5]. All three models emphasise the importance of expectations in determining the exchange rate, whilst only the LBS model incorporates the speculative element of gilts and equities. The utilisation of rational expectations in the M1 equation is related to the evolution of financial innovation. However, only the LBS includes the Muth-rational expectations, whilst the other two utilise weakly rational, based upon vector autoregressive schemes, expectations. This utilisation of ergodic formulations of expectations is in complete contrast to the non-ergodic formulation of expectations, propounded by the post-Keynesians, and utilised, via the bank lending equation, in the PK model.

Summary

The monetary sector of the LBS model is the most cohesive in terms of its economic foundations, with the utilisation, given the assumption of rational expectations,

of a general portfolio model in both the internal and external monetary sector, a divergence from the strong 'international monetarist' tradition of the seventies. This is empirically upheld by the simultaneous estimation of all relevent equations. The only possible inconsistency occurs with the utilisation of the more post-Keynesian mark-up model of interest rate determination. However, this has been rationalised as attaining to profit maximisation, given the problem of a possible constraint.

The other three models utilise a portmanteau of theories to construct their monetary sectors. The HMT and the NIESR models utilise various theories originating from the neo-Keynesian school. However, the construction of both exchange rate equations appears to be derived from a variety of views. On the other hand, the PK model attempts to pinpoint the various conclusions of the post-Keynesian doctrine. This includes establishing the endogeneity of the money supply, utilising the non-ergodic formulation of expectations and the mark-up models of cost determination.

VI) THE ROLE OF MONETARY VARIABLES IN THE REAL SECTOR

The analysis, in chapter three, of the various transmission mechanisms established four major monetary channels. Firstly, the orthodox Keynesians emphasised the importance of interest rates, in terms of the `cost of capital' channel. Then the neo-Keynesians extended the

analysis to incorporate both a wealth and an availability effect. This latter effect is emphasised further by the post-Keynesians, who postulate that this is the major monetary requirement, on real growth, with the real economy, via the production process, having important implications for the growth in the monetary sector. Finally, given the overt nature of the UK economy, all theories emphasise the importance of the exchange rate. Therefore, in this section, we will evaluate and compare how the four models incorporate these four influences.

The role of interest rates

Recent generations of the HMT model have seen a move towards the utilisation of real, as opposed to nominal, interest rates. The traditional Keynesian `cost of capital' effect on `investment in manufacturing' has been superceded by a more sophisticated composite variable, which proves to be more encompassing than even the neo-Keynesians envisaged. However, the equations for the various components of stock-building utilise a more traditional explanation of this channel. Consumer expenditure on housing is assumed to be dependent upon nominal interest rates, whilst expenditure on durables and non-durables is dependent upon real rates.

Interest rates affect both investment and consumption in the LBS model. The traditional `cost of capital' effect is captured in the total investment equation, as well as various disaggregated components, including stock building.

In the consumption function, the interest rate captures the substitution effect of cost, whilst other variables capture the opposing income effect.

The traditional `cost of capital' linkage is not captured in the NIESR model, though interest rates do have a role to play. Interest rates directly effect investment in housing, whilst indirectly affecting consumption via the 'bond coupon' effect on net property income.

Interest rates are of secondary importance in the PK model, though various equations incorporate their influence. The traditional `cost of capital' effect is captured in various components of investment by ICCs. The demand side effect of interest rates is captured in the consumers' expenditure on housing and durables equations.

All four models incorporate the influence of interest rates, though only the LBS includes the traditional Keynesian `cost of capital' influence on total investment. The HMT model has widened its definition of the `cost of capital', whilst the NIESR, even though it pertains to be Keynesian, has repeatedly found such a linkage impossible to capture[6]. However, in the HMT and LBS models, other disaggregated components of investment, in particular stock building[7], exhibit some interest rate effect. In the former model, this is captured by a real variable, in keeping with real expenditure. The PK model also includes interest rate effects on various components of investment by ICCs, though these influences are of secondary import as compared to the

availability effect (see below).

There is a general consensus that monetary policy effects the housing sector, however, there is disagreement on the precise mechanism (Savage, 1978a). Many of the empirical equations estimated are hybrids of demand and supply considerations. Interest rates are the proxy for cost in the `investment in housing' equations in three models, whilst the LBS model includes the ratio of house prices to other prices. On the demand side, the NIESR and the PK models incorporate the mortgage rate, whilst on the supply side, the HMT and the NIESR models incorporate a short run rate to reflect builders costs. In the HMT model, the latter rate may also be taken to include the effect on the housebuyer's cost.

Apart from the NIESR model, which examines an indirect `bond coupon' effect, the other three models incorporate a direct interest rate effect on various components of consumer expenditure[8]. These effects, via sales and output, may ultimately affect the level of investment. However, interest rate effects on consumption are usually overshadowed by wealth and availability effects (see below).

The role of wealth

The HMT model incorporates two seperate wealth effects on various components of consumption. Firstly, the `consumer expenditure on non-durables' equation explicitly models the `Pigou effect', by disaggregating the real interest rate into its nominal component and price deflator. Then, the

`consumer expenditure on durables' equation includes a revaluation effect, modelled by the `net financial wealth' variable, which includes the personal sector's share and bond holdings.

Similarly, total consumer expenditure in the LBS model is dependent on the same two effects. The revaluation effect is captured by a composite variable, consisting of real financial wealth and the real value of housing stock, whilst the `Pigou effect' is captured by the price of private consumption.

The NIESR model also captures these two effects in their `consumption of non-durables' equation. The real wealth variable is proxied by the stock of financial assets of the personal sector, whilst the `Pigou effect' occurs via the consumers price index. However, two revaluation effects are also captured in the `changes in building society shares and deposits' equation, a disaggregated element of investment, by relevant interest rates and changes in financial wealth.

In the PK model there is no role for wealth.

All three orthodox models now incorporate the "wealth" theory of consumption and thus both the neo-Keynesian revaluation effect and the `Pigou effect' are considered. Various proxies for wealth are utilised, with the widest encapsulating variable incorporated into the general portfolio model of the LBS. This diversification of variables illustrates the problems associated with measuring

wealth. Only the NIESR model incorporates wealth into a non-consumption equation, though such an equation could equally be taken to be a savings function.

The role of credit availability

Credit availability has a minor role to play in the HMT model. A long term "Radcliffian" liquidity effect, designed to capture any rationing on loans, is included in the `investment in manufacturing' equation and the stock builing equations. This latter set of equations also incorporate a short term effect, which models the cost of illiquidity. Investment in housing incorporates the possibilty of a supply constraint, via the short run interest rate and the ratio of house prices to investment prices. The consumption on non-durables equation incorporates a liquidity-income ratio, whereby consumption is curtailed when the level of liquidity falls, whilst the `consumption on durables' equation utilises a hire purchase dummy.

In the LBS model no explicit credit availability effects are included. However, the `investment in housing' equation examines the effect of availability via cost.

Credit availability effects are implicitly considered in the NIESR model in the `investment in housing' equation, via the mortgage rate. An explicit effect, by utilising a hire purchase dummy, is included in the consumer durables equation.

In the PK model, the availability effects are

fundamental to the post-Keynesian doctrine. Bank lending to ICCs and bank lending to consumers are integral parts of investment and consumption on durables. These monetary variables are simultaneously affected by the growth in the real economy. Consumption on durables is found to be constrained by a hire purchase dummy, while in the `investment in housing' equation the availability constraints are captured by `lending for house purchases by building societies' and by the mortgage rate.

Only the HMT incorporate the possibilty of a supply constraint on the level of finance for investment projects; for the PK model finance for investment projects is viewed as a requirement, which is expected to be forthcoming - although the possibility of some `rationing' is considered. The other two models, in keeping with orthodox theories, implicitly assume that the supply of such finance is perfectly elastic. In the PK model, this constraint is very important in terms of the "finance motive". However, it is less encapsulating then that envisaged by the Radcliffe Report and subsequently utilised by the HMT model.

The more orthodox availability effect, emphasised by the neo-Keynesian and incorporated, at least partially, in all four models influences the level of consumer expenditure on both housing and other durables. The constraint on housing may be modelled on the demand side in terms of the availability of finance. This is captured by the mortgage rate in the NIESR and the PK model. The latter model also

explicitly incorporates the problem of obtaining funds with the utilisation of a variable for building societies' activities. Alternatively the constraint on housing expenditure may originate from the supply side and is thus dependent upon the cost of building. This is modelled in the HMT by a short-run interest rate, which may also be taken to capture the demand side constraint, and the price of houses. The LBS incorporates the cost of houses only, whilst the NIESR includes a relative rate of return. Consumer expenditure on durables is dependent upon the availability of hire-purchase credit in three of the models, excluding the LBS, and is modelled by the utilisation of a dummy variable. More importantly, the PK model further emphasises the role of the monetary sector in the growth of the real sector, by the utilisation of an appropriate lending variable. Once again, this constraint is not as embracing as the Radcliffian liquidity term, utilised by the HMT model in their `non-durables' equation.

The role of the exchange rate

In the HMT model, the importance of the exchange rate, when an expansionary monetary policy is undertaken, is immediately obvious, given that the exchange rate is partially determined by the money supply. The influence of the real exchange rate on the real sector is captured via the competitive indices in the import and export equations, with the former set exhibiting the greater effect. Domestic

prices, eg. the producer price index, are also implicitly affected by the exchange rate via import prices.

Similarly, the LBS model includes the implicit effect of the exchange rate on foreign trade and domestic prices. However, in addition, and in keeping with the general portfolio framework, changes in the exchange rate have a revaluation effect, via wealth, on the consumption function.

The NIESR and the PK models also incorporate the role of the exchange rate in determining foreign trade and domestic prices, with the latter model explicitly examining the effect on prices. In the former model, the exchange rate is an important element in the construction of the North Sea oil sector.

In the four models, the exchange rate never appears in the different expenditure functions as a direct determinant of demand. However, all four models capture an indirect real effect, via competitiveness, on the level of demand in keeping with Keynesian school of thought. The LBS model also captures a revaluation effect, in keeping with the neo-Keynesian tradition, which ultimately affects aggregate demand via the consumption function. All four models also consider the possible monetarist-type effect that the exchange rate has on the domestic price level, which could ultimately affect consumption in the orthodox models, via the 'Pigou effect'. However, only the HMT model incorporates the direct effect of the money supply on the exchange rate.

Summary

The othodox Keynesian `cost of capital' effect on gross investment is only portrayed by the more `international monetarist' LBS model. However, the HMT and the PK models do incorporate this effect on some disaggregated components of investment, though in the latter model such effects are secondary to the availability influence. Surprisingly, though in keeping with the de-emphasis of monetary influences, the more Keynesian-based NIESR model is the only one that fails to capture any such effect.

The orthodox monetary theories, by emphasising the cost element of investment finance, implicitly assume that the supply of finance is perfectly elastic and thus availability constraints are disregarded. At complete odds with this, the more controversial post-Keynesians pinpoint the availability effect as being of major importance. Such an effect, on the various components of investment, is captured by both the HMT and the PK models, with the former utilising a more wider encapsulating variable in keeping with the Radcliffe Report (1959).

Monetary effects have important implications for investment in housing. Interest rates are utilised in the HMT and NIESR models to take into consideration both demand and supply influences, whilst the LBS incorporates a more general cost element. The PK model concentrates on the demand side only, by including the availability of loans, as well as the more conventional utilisation of interest rates.

This emphasis on availability is derived from both the neo-Keynesians and the post-Keynesians monetary theories.

The determination of the various orthodox consumption functions concentrate on the importance of wealth. Wealth, proxied by various variables, affects consumption in two distinct ways. Firstly, price changes possibly caused by changes in the exchange rate, induce a `Pigou effect' and secondly, changes in the interest rate or, in the case of the LBS, changes in the exchange rate produce a revaluation effect. Interest rates may also have a direct substitution effect on consumption, captured by all models except the NIESR, which incorporates an indirect `bond coupon' effect instead. The post-Keynesians and the neo-Keynesians also emphasis the importance of credit availability on consumer expenditure. Conventionally, this is represented by a hire-purchase constraint, though the PK model also incorporates a bank lending constraint. The HMT model includes a constraint on liquidity, which is more akin to the type of variable envisaged by the Radcliffe committee.

The various components of imports and exports in all four models are indirectly affected by the exchange rate, via competitiveness indices. Whilst domestic prices may be affected by world events via the exchange rate.

VI) CONCLUSIONS

This chapter has evaluated and compared how the four models under-review, in an attempt to capture reality, incorporate financial innovation, monetary theories and the various channels of the transmission mechanism.

The role of the banking sector, in terms of the creation of monetary assets and laibilities, is modelled in a similar way by all four models. The demand-determined nature of the various assets and liabilities is emphasised, though supply constraints are imposed, where applicable, on the bank lending equations. The orthodox models capture the banking sector's effect on growth in the real economy indirectly via the revaluation effect, whilst the real sector's effect on the growth of banks occurs indirectly via wealth in the HMT and LBS models and directly, via bank lending, in the HMT and NIESR models. The PK model, in keeping with the post-Keynesian doctrine, encapsulates the direct influence that banking activities have on the growth in the real economy, via appropriate bank lending variables, and vice versa. This availability effect on real growth is also captured in the HMT model by utilising a much wider embracing "Radcliffian" liquidity effect.

The modelling of OFIs, including building societies, ranges from near total disregard by the NIESR to a full structural model by the HMT. The LBS model, in complete contrast to the others, treats all financial institutions in

a similar manner, given their importance as possible sources for the assets and liabilities of the NBPS's portfolio. In the PK model, OFIs, as additional sources of finance, should have a greater role to play. However, at present, even though a link with the real sector exists, their activities are exogenously determined.

In keeping with the lack of concern for the activities of the NBFI's, the monetary aggregates considered by the four models are the traditional broad and narrow aggregates, £M3 and M1. Only the complete HMT includes identities for other less established aggregates, such as PSL2 and M2.

The inclusion of monetary controls and technological advances is, at best, sketchy. The effect on the demand for bank lending after the introduction of CCC is captured in three models, excluding the LBS, by utilising conventional dummies and a `round-tripping' variable. Conversely, the availability constraint on the level of bank lending, caused by the imposition of various qualitative and quantitative controls, is included in the LBS and PK models only. The former model also captures the availability effect of lending controls on the demand for hire-purchase credit and mortgages. The effect of the various availability constraints on the real economy are conventionally captured by a hire-purchase dummy in the HMT, NIESR and PK models, with the latter model also utilising an appropriate lending variable. Finally, the effect of technological advances on the monetary sector is explicitly captured in the HMT and

NIESR models, with the latter providing a linkage with the real sector.

The evaluation and comparison of the utilisation of monetary theories in the four models considers five areas of interest. Firstly, analysis of the general portfolio framework of the models indicates the strong theoretical foundations of the LBS monetary sector, given the behavioural assumption of optimisation. Although the complete HMT model estimates an equally encompassing portfolio, with the NIESR and PK models only estimating the demand for assets and liabilities of two central identities, no such behaviour is assumed.

Secondly, analysing the determination of money demand in the orthodox models throws up three competing theories, two of which are considered by the HMT. The only similarity here is that the HMT and LBS consider Tobin's (1958) portfolio model, though for the former this is in terms of broad money only, whilst the latter utilises the model throughout. In the PK model, in an attempt to validate the endogeneity element of the money supply, an issue fundamental to the post-Keynesian doctrine, the counterparts of M1 and £M3 are considered and thus no explicit demand-for-money function is estimated. An important consideration for the orthodox theories, and their corresponding transmission mechanisms, in the acceptance of, at least, partial endogeneity of the money supply by all four models.

Thirdly, evaluating and comparing exchange rate

determination produces a portmanteau of possible variables, procured from various theories. Only the LBS model utilises a cohesive theoretical foundation, based upon an external portfolio model (Branson, 1977), in keeping with the determination of its internal monetary sector.

Leading on from the determination of the exchange rate, one finally analysed the role of expectations. The orthodox models, in keeping with the trend in theoretical macroeconomics, include, at times, rational expectations in some equations of the model, in particular the exchange rate equation. However, only the LBS utilises the Muth-rational expectations (1961), whilst the other two incorporate weakly `rational expectations', based upon autoregressive schemes. In complete contrast to these ergodic formulations of expectations, the PK model utilise a non-ergodic formulation, as postulated by the post-Keynesian doctrine, of entrepreneurs' `animal spirits'.

Finally, the evaluation and comparison of the four possible monetary linkages - the interest rate, wealth, availability and the exchange rate - were analysed. Despite the overtly Keynesian nature of the NIESR model, no traditional `cost of capital' channel is modelled. Ironically, in the `international monetarist' LBS model, the only model that captures the traditional link with gross investment, this is one of the major financial linkages. The HMT and PK models also include the effect of interest rates on some components of investment, though in the latter model

these are only secondary to the availability effect. Only the HMT and PK model consider the possiblity of an availability constraint on the level of investment finance. In the former model, this constraint is more akin to the liquidity constraint envisaged by the Radcliffe Report and is empirically acceptable. The PK model does not produce an empirically acceptable availability constraint in terms of investment finance.

The cost element of interest rates is also important in determining consumer expenditure on housing and other durables, though the LBS incorporates a more general cost variable in its housing equation. The orthodox models emphasise the effect of wealth in consumption, whilst the PK model captures the availability effect with an appropriate lending variable and a hire-purchase dummy. In a similar manner, the HMT and NIESR models utilise a dummy variable, with the former also utilising a "Radcliffian" liquidity constraint.

The exchange rate in all four models does not directly enter into any of the aggregate demand relationships, though the level of imports and exports are indirectly influenced, via the competitive indices. All models also capture the effect of the exchange rate on domestic prices, whilst only the LBS models the revaluation effect of changes in the exchange rate.

This evaluation and comparison has indicated the various similarities and differences between the four models.

In terms of the activities of the financial institutions, those choosen to be modelled by the HMT and LBS are similar. However, the treatment of their activities is completely different, with the LBS treating all institutions in a similar manner and the HMT emphasising the importance of the banking sector and the building societies. The NIESR and PK predominantly model the activities of the banking sector and consequently concentrate on the endogeneity of the traditional monetary aggregates. The imposition of the CCC is treated in a similar way by the HMT, NIESR and PK model, though only the latter, like the LBS, examines the imposition of other controls. The effect of technological advances on the monetary sector are disregarded by the LBS and PK models, whilst the HMT and NIESR models examine the effect on narrow money. The monetary theories utilised varies between the models, with only the LBS incorporating a cohesive external and internal framework. All models utilise mark-up models of interest rate determination, whilst the orthodox models emphasise the importance of ergodic formulations for expectations. In terms of the channels of influence, all models emphasise the importance of the exchange rate on the domestic prices and foreign trade, whilst the orthodox models emphasise the wealth effect on the level of consumption. The cost element on investment in housing is captured by all four models, whilst some capture this element on other forms of investment and consumption.

Endnotes

1) Hendry (1980) demonstrates the ease of obtaining spurious regressions when he "establishes" the 'significant' effect of cumulative rainfall in the UK on inflation.

2) These limitations include:

i) the fact that given economic theory is predominately concerned with the long run steady-state, little information on dynamics is available.

ii) auxiliary assumptions lead to the portrayal of a perfect economy.

iii) no one theory can be classed as unique, such that the data can absolutely exclude one or more theoretical hypothesis.

3) The other major channel through which expectations enter the model is via planned output, determined by a vector auto-regressive model, in the employment equation.

4) Backward looking (adaptive) expectations are also included in the model to determine price expectations in the wage equation.

5) The Liverpool University model (Minford et al, 1984) is the only macroeconomic model that utilises rational expectations throughout.

6) Thompson (1984, pp.129-130) suggests some reasons why the `cost of capital' effect has proven notoriously difficult to capture. These include:

i) the relationship between the level of investment and the interest rate may be nonlinear.

ii) interest rate effects may be more significant if investment is analysed in a more disaggregated manner, i.e. in terms of the different types of assets as well as sectors.

iii) supply constraints, predominately ignored by orthodox macroeconomic models, may mask the demand effect.

7) Savage (1978a) pinpoints some reasons why interest rates may not exhibit a significant effect on stock-building. These include:

i) interest rates are only one of a number of cost considerations.

ii) actual stock-building is not always equivalent to planned stock-building, thus the interest rate role in determining planned behaviour may be swamped by unanticipated changes.

iii) speculative and expectational motives are much more important.

8) According to Keynes (1936, pp.92-93) "... the total effect of changes in the rate of interest on present consumption is complex and uncertain, being dependent on conflicting tendencies... and is not likely... to have much <u>direct</u> influence on spending either way".

CHAPTER SIX: SUMMARY AND CONCLUSIONS

This study has investigated how four teams of researchers have incorporated various monetary aspects into their macroeconomic models. These aspects are ascribed different weights by the various researchers, thus producing four diversifying views of the UK's monetary sector.

In chapter two, analysis of the historical development of the UK's monetary sector highlights the growing importance of the liabilities of the NBFIs as a means of 'credit-money'. This has occurred on to the backdrop of a change in attitude away from credit control towards monetary control, cumulating in the adoption of monetary targets in the mid-seventies. The rapid evolution of financial innovation, encouraged by, and causing, growth in the real sector, needs to be portrayed in macroeconomic models to ensure reality is adequately captured. Consequently present day monetary sectors should incorporate certain important elements in the monetary sector. These aspects are: modelling the activities of all financial institutions and subsequently analysing the determinants of all monetary aggregates; capturing the effect of financial innovation on both the monetary sector and the real economy; and analysing the interaction between the real and monetary sectors.

Chapter three discusses the evolution of monetary theory, in terms of both an open and closed economy, with particular reference to the channels of influence. The

distinction between the overt nature of the various strands of the Keynesian transmission mechanism, portrayed in the four structural models under-review, is compared with the 'black-box' solution of the monetarists, as applicable to the 'reduced form' models. The more controvesial post-Keynesian doctrine, a possible critique of the various orthodox theories, is subsequently analysed. Emphasis is placed upon the endogeneous nature of the money supply and the importance of 'credit-money' in the production process. Given these propositions, the viability of orthodox theories are in jeopardy. The orthodox theories emphasise the link from money to nominal income, with the orthodox Keynesians de-emphasising the importance of monetary policy. Conversely, the post-Keynesians emphasise the important role that production plays in the creation of credit-money, which ultimately affects growth in the real economy, and the problem of credit availability. The post-Keynesians also utilise the non-ergodic formulation of expectations, at odds with the increased utilisation of ergodic expectations in the orthodox theories.

Extending the analysis to examine the openness of the economy, in accordance with the UK, the various recent explanations of exchange rate determination concentrate upon the monetarist aspect of no real long term effect given an expansionary monetary policy. Opening up the post-Keynesian doctrine, to analyse the effect of a possible external sector further fuels the acceptance of an endogeneous money supply.

Chapters four and five analyse the contributions that the four models make in terms of financial innovation and monetary theory. Theoretically, only the post-Keynesian doctrine emphasises the importance of various types of institutions in setting up contracts, though the importance of liquidity, as derived from the Radcliffe Report (1959), is also acknowledged by the neo-Keynesians. Consequently, one would expect the PK model to determine the activities of all relevant financial institutions and a variety of monetary aggregates. However, like the NIESR model, the PK model concentrates on the activities of the banking sector and the traditional monetary aggregates, M1 and £M3. These banking activities, at odds with the treatment undertaken at the NIESR yet in accordance with the post-Keynesian doctrine, are central to the whole sector. The PK model emphasises the importance of the banking sector in terms of being the engine to growth in the real sector, whilst the real sector, given the endogeneity of the money supply, may simultaneously constrain growth in the banking sector. NBFIs also provide a constraint on aggregate expenditure, via housing, yet at present their activities are not endogeneously determined.

The HMT and LBS models are more comprehensive in their inclusion of financial institutions and the varitey of monetary assets and liabilities available, with the former expressing identities for a variety of monetary aggregates. However, the LBS model, in accordance with the portfolio approach, treats all assets and liabilities, and consequently

institutions, in a similar manner. No account is taken of the historical evolution of the various institutions and no monetary aggregates as such are determined. On the other hand, the HMT model concentrates on the importance of the banking sector and building societies in constituting a major element of the financial sector. This interaction with the real sector, in terms of a liquidity constraint, more akin to that envisaged by the Radcliffe Report, is one important element of the transmission mechanism.

Despite the growing importance ascribed to the activities of the NBFIs, this has not in general been transmitted to the macroeconomic models. Even after a decade of including a fully-fledged monetary sector, concern still lies with the activities of the banking sector and the traditional monetary aggregates. Only the HMT model adequately captures the building societies activities and include identities for other monetary aggregates, though these shortfalls have been acknowledged by the PK model and will subsequently be amended. Given, therefore, the simultaneous interaction that the HMT and PK capture in their models, one must attribute these two models as pertaining to the reality of the role of financial institutions. However, only the HMT model incorporates, to a limited extent, the Radcliffian concept of liquidity, illustrated by the utilisation of various monetary aggregates.

Secondly, previously imposed controls have levied, at times, availability contraints on a variety of monetary

assets. The effect on the demand for and supply of money by such constraints is anticipated by both the post-Keynesians and the neo-Keynesians and consequently one would expect all four models to include credit controls. Apart from the LBS monetary sector, where availability constraints on hire-purchase credit and mortgages are considered, the monetary sectors concentrate on the effect of the CCC on the demand for bank lending and consequently the traditional monetary aggregates. Only the LBS and the PK models consider other supply constraints on the level of bank lending.

The availability effect on the real economy of these controls centres on consumer expenditure in the HMT, NIESR and PK models with the utilisation of a hire purchase dummy in the durables equation and an appropriate interest rate in the house-buyers equation. The HMT and PK models also consider the imposition of controls indirectly via the utilisation of an appropriate liquidity and bank lending variable respectively.

Inclusion of a role for monetary controls is limited, with concern centring on the effects, where applicable, on traditional aggregates. The importance of the availability aspect of the post-Keynesian doctrine implies that the PK model should comprehensively establish the effect of monetary control on both the monetary and real sectors. However, although the PK model examines a variety of effects, as with the other three models, these are not exhaustive. No one model adequately captures the realities of monetary control,

though this may be related to the problem of significantly estimating their effect.

Thirdly, financial innovation has been facilitated by technological advances. The major effect of increased utilisation of information technology has been to lower the brokerage fee and thus lower the transactionary demand for cash, as postulated in the neo-Keynesian inventory-theoretical approach. Ceteris paribus, this implies that the demand for interest bearing assets has increased. The effect on the demand for cash balances has been estimated in the HMT and NIESR models, with only the latter incorporating the effect on the real economy.

Like monetary controls, technological advances have a minimal role, based upon the demand for traditional narrow aggregates, in macroeconomic models. The effect on the demand for interest bearing assets is disregarded, whilst the interaction with the real economy is only included in the NIESR model. This latter model provides the best analysis of the role of technology, however, it falls along way short of reality.

Fourthly, strong theoretical foundations are intrinsic to the successful modelling of any sector. Modelling an external monetary sector requires the determination of money, interest rates and the exchange rate, with the latter variable bringing to the forefront the role of expectations. The theoretical basis, utilising a general portfolio framework given the assumption of optimisation and rational

expectations, is very strong and coherent in the LBS monetary sector. The only possible inconsistency occurs with the utilisation of a mark-up model to determine interest rates, which may be rationalised as pertaining to profit-maximising models, given the pivotal interest rate constraint. This theoretical consistency is further enhanced by simultaneously estimating all the relevant equations.

The other three models utilise a plethora of theories. The sheer size of the HMT model makes the utilisation of one single theory impossible. Thus various strains of, predominately, Keynesian theories are utilised, with the determination of the exchange rate providing a portmanteau of possible variables from the various theories. This is equally true for the NIESR model, except for the recent utilisation of rational expectations. Theoretical considerations are important for the PK model, given its objective of empirically verifying the post-keynesian doctrine.

Theoretical considerations are particularly strong in the LBS, as demonstrated by the utilisation of one theory throughout, apart from the utilisation of a mark-up model for interest rates, incorporated in the other three models as well. This universal utilisation of mark-up models has important implications for the post-keynesian doctrine, as it gives weight to the critique of the orthodox theories. This critique is further substantiated by the, at least, partly endogeneous nature of the money supply in all four models.

Only the PK model disputes the acceptability of an ergodic formulation for expectations. Whilst the orthodox models, in keeping with the trend in theoretical macroeconomics, begin to utilise rational expectations.

Finally, the interaction with the real and financial sectors is an important element of the macroeconomic models. Four possible linkages are advocated - interest rates, wealth, availability and the exchange rate. The HMT and NIESR models incorporate all four possible linkages, though in the latter model these are all minor effects, as in keeping with the orthodox Keynesian doctrine. The HMT model establishes many possible linkages, with the additional feature of utilising a liquidity variable in line with the Radcliffe Report. The PK model, as postulated by the post-Keynesian doctrine, emphasises the importance of the availability effect, though the channels of the interest rate and exchange rate are also considered. The LBS emphasises the importance of monetary policy and incorporates a variety of monetary effects, except the availability effect. However, in keeping with its general portfolio framework, the influence of the revaluation effect is particularly emphasised.

Without performing some kind of econometric test or examining the simulation results of the models one cannot establish which model follows the criterion best. Each model utilises a range of channels in accordance with its beliefs. The PK model emphasises the availibility effect, whilst the

NIESR de-emphasises all financial linkages. Consequently, no conclusions can be drawn.

Each criterion is best satisfied by different models. the role of financial institutions is probably best captured by the HMT model, though more research by the PK model should provide an equally good analysis. The modelling of monetary aggregates is also best achieved by the HMT, which is the only model that considers the Radcliffian concept of liquidity. Monetary controls, important constraints on liquidity, are best captured in the PK model, whilst the NIESR best captures the role of technology. The theoretical foundations, apart from the determination of interest rates, are the most coherent in the LBS model. The channels of influence are different in each model and consequently, without empirical validation, no conclusion on the best explanation is forthcoming.

Even though for each criterion, apart from the transmission mechanism, a model has been acclaimed with providing the best explanation, such explanations are not necessarily exhaustive. The role of financial innovation in macroeconomic models falls along way short of reality. More research needs to be undertaken to capture the effects of monetary controls and technological advances. Also models need to be more comprehensive in terms of the financial institutions and monetary aggregates modelled. Utilising a coherent theory does not necessarily mean that the model captures reality. The acceptability of a theory must be

empirically justified.

Macroeconomic models by definition can never be perfect representations of reality. However, in terms of the monetary sectors, all four models have a long way to go before pertaining to acceptable representations. Recent vintages of these models have altered from the original versions, with the utilisation of 'rational expectations', market-clearing prices, etc.. However, concern still lies with the determination of the traditional definitions of money.

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