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The Nature and Role of Monetary Policy When Money Is Endogenous

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1. INTRODUCTION

The purpose of this paper is to further consider the nature and role of monetary policy when money is envisaged as credit money endogenously created within the private sector (by the banking system). Macroeconomic analysis has been largely (though never entirely) based on the notion that money can be treated as exogenous and its stock (or "supply") under the control (direct or indirect) of the Central Bank (as an agent of the government). Following the demise of monetarism (firmly based on this exogenous view of money) and the clear difficulties which Central Banks encountered in seeking to target the growth of the stock of money during the 1980s, monetary policy is now (and perhaps has always been) based in many countries on setting (or targeting) of a key interest rate, such as the Central Bank discount rate.[1] The amount of money in existence then arises from the interaction of the private sector and the banks on the basis of the demand to hold money and the willingness of banks to provide loans. Monetary policy (perhaps under the impact of monetarism with the clear link between the growth of the stock of money and inflation which it portrayed) has become closely linked with the targeting of the rate of inflation. In this paper, we consider whether monetary policy is well-equipped to act as a counter-inflation policy and to further discuss the more general role of monetary policy in the context of money being treated as endogenous.

The concept of endogenous (bank) money is a particularly important one for macroeconomic analysis, especially within Keynesian economics. Bank money provides a more realistic approach to money in comparison with the exogenous, controllable money approach (in the sense that most money in an industrialized economy is bank money). Further, the concept of endogenous money fits well with the current approach to monetary policy based on the setting (or targeting) of a key interest rate by the

Central Bank. In endogenous-money models, the causal relationship between the stock of money and prices is reversed as compared with the exogenous money case. Endogenous money plays an important role in the causal relationship between investment and savings: simply the availability of loans permits the expansion of investment, which leads to a corresponding expansion of savings and to an expansion of bank deposits, which may later be extinguished as and when loans are paid off.

There are currently two schools of thought that view money as endogenous. One school is that which has been labeled as the "new consensus" (see, for example, Meyer 2001), and the other is the Keynesian endogenous (bank) money approach. There are significant differences between the two approaches;[2] the most important, for the purposes of this paper, is in the way endogeneity of money is viewed. The "new consensus," which has been particularly applied in the discussion of monetary policy, treats money as endogenously created, though the terminology of endogeneity is seldom used. It views the stock of money as a "residual" based on the demand for money. Indeed, money is treated as endogenous in the sense that the stock of money has no causal significance within the approach (e.g. changes in the stock of money do not cause inflation) and the rate of interest is treated as set by the Central Bank and is not market determined. By contrast, the Keynesian view provides a theory of endogenous, essentially bank, money. The Central Bank sets the rate of discount and provides reserves to commercial banks as required by them. Commercial banks provide loans at a rate of interest that is a mark-up over the Central Bank rate of interest (the mark-up determined by the liquidity preference of banks, their market power, and their attitude to risk). Unlike the "new consensus," the Keynesian view of endogenous money pays a great deal of attention to the process by which loans and deposits are created and destroyed. The causal links between investment expenditure and loan creation and between inflation and the creation of money, feature strongly in the Keynesian endogenous money literature; they are generally overlooked in the "new consensus." Although monetary policy, essentially interest rate policy, appears to be the same in both schools of thought, there are significant differences. It is precisely the role of monetary policy in these two schools of thought that we wish to investigate in this paper.

The rest of the paper is organized as follows. Section 2 explores monetary policy in the "new consensus" macroeconomic model, followed by an examination of interest rate policy and the exchange rate in section 3. Section 4 discusses the Keynesian view of endogenous money and the role of monetary policy within the context of the model. The effectiveness of monetary policy within the Keynesian model is examined in section 5. In section 6 the role for monetary policy in a Keynesian endogenous monetary policy analysis is considered. Finally, section 7 summarizes and concludes the argument.

2. THE "NEW CONSENSUS"

The Model

The "new consensus" has been summarized in terms of a simple model with the following three equations (drawn from Meyer 2001; but see, also, McCallum 2001, and Clarida, Galí, and Gertler 1999):

$$(1) \qquad Y^g_t = a_0 + a_1 Y^g_{t-1} + a_2 E_t (Y^g_{t+1}) - a_3 [R_t - E_t (p_{t+1})] + s_1$$

$$(2) \qquad p_t = b_1 Y^g_t + b_2 p_{t-1} + b_3 E_t (p_{t+1}) + s_2 \text{ , (with } b_2 + b_3 = 1)$$

(3) $R_t = RR^* + E_t (p_{t+1}) + c_1 Y^g_{t-1} + c_2 (p_{t-1} - p^T)$

where Y^g is the output gap, R is nominal rate of interest, p is rate of inflation, p^T is inflation rate target, RR* is the "equilibrium" real rate of interest, that is the rate of interest consistent with zero output gap which implies from equation (2), a constant rate of inflation, and s_i (with i = 1, 2) represents stochastic shocks and E_t refers to expectations held at time t. Equation (1) is the aggregate demand equation with the output gap determined by past and expected future output gap and the real rate of interest. Equation (2) is a Phillips curve with inflation based on current output gap and past and future inflation. Equation (3) is a monetary policy-operating rule (of the Taylor's rule form with sluggish adjustment) with the nominal interest rate based on expected inflation, output gap, deviation of inflation from target, and the "equilibrium" real rate of interest.[3] In some versions of the model a lagged interest rate is included to capture interest rate "smoothing" undertaken by the monetary authorities (see, for example, McCallum 2001).[4] We omit it only for the simple reason that our results and analysis are not affected at all by this omission.

A fourth equation can be added which relates the stock of money to "demand for money variables" such as income, prices and the rate of interest, which would reinforce the endogenous money nature of this approach with the stock of money being demand determined. Clearly, though, such an equation would be superfluous in that the stock of money thereby determined is akin to a residual and does not feed back to affect other variables in the model. We have explored this issue and others related to whether the stock of money retains any causal significance at some length in Arestis and Sawyer (2002c).

From the perspective of this paper equation (3) has considerable importance. It clearly endogenizes the setting of interest rate by the Central Bank along the lines of "Taylor's rule." The significance of "Taylor's rule" for the setting of the rate of interest is twofold. First, it treats the setting of interest rates as a domestic matter without reference to international considerations such as the exchange rate, interest rates elsewhere in the world. This is not just an attribute of using Taylor's rule in the context of the closed economy model used above, but is a more general feature of that rule. Second, the interest rate is adjusted in response to the output gap (and to the rate of inflation which in turn depends on the output gap). A zero output gap is consistent with constant inflation (from equation 2). Equation (3) then implies a nominal rate of interest which translates into a real rate equal to the "equilibrium" rate RR*, which is consistent with zero output gap and constant inflation. From equation (1), the value of RR* would need to be a_0/a_3. Provided that the Central Bank has an accurate estimate of RR* then it appears that the economy can be guided to an equilibrium of the form of a zero output gap, constant inflation (at a rate equal to the pre set target). In this case, equation (1) indicates that aggregate demand is at a level that is consistent with zero output gap. In a private sector economy, this would imply that the real interest rate RR* brings equality between (*ex ante*) savings and investment. The equilibrium rate of interest corresponds to the Wicksellian "natural rate" of interest.

Monetary Policy

This "new consensus" focuses on the role of monetary policy (in the form of interest rates) to control demand inflation, and not cost inflation, as is evident from equation (2). As Gordon (1997) remarked (though not in the context of this "new consensus"), "in the long run inflation is always and

everywhere an excess nominal GDP phenomenon. Supply shocks will come and go. What remains to sustain long-run inflation is steady growth of nominal GDP in excess of the growth of natural or potential real output" (p. 17). The position taken on cost inflation is that it should either be accommodated, or that supply shocks come and go--and on average are zero and do not affect the rate of inflation (see, for example, Clarida, Galí, and Gertler 1999). The significance of the "new consensus" is that it strongly suggests that inflation can be tamed through interest rate policy (using demand deflation) and that there is an equilibrium rate (or "natural rate") of interest which can balance aggregate demand and aggregate supply and which is feasible, and lead to a zero gap between actual and capacity output.

In the context of the working of monetary policy, this focus on inflation as caused by demand raises three issues. First, how effective is monetary policy at influencing aggregate demand and thereby inflation. The evidence, which we have surveyed in Arestis and Sawyer (2002b), suggests that it is rather ineffectual. Second, if inflation is a "demand phenomenon," and not a cost phenomenon, as reflected in the Phillips curve of equation (2), then the question arises as to whether monetary policy is the most effective (or least ineffective) way of influencing aggregate demand (and in Arestis and Sawyer 2002b, we concluded that it is not), and fiscal policy is a clear alternative policy instrument. Third, there is the question of whether the possibility of sustained cost-push and other non-demand related inflation can be as lightly dismissed as the "new consensus" appears to do. The version of the Phillips curve which appears as equation (2), is a (heavily) reduced form that does not explicitly consider wages, material costs and imported prices. A sustained money wage push makes no appearance in equation (2) and it would appear that there is no explicit representation of such pressures. An increase in, for example, wage aspirations on the part of workers or pressure for higher profit margins are not incorporated, though it could be argued that they would be reflected in the stochastic term. This may be acceptable if pressures for higher wages and profit margins varied in a stochastic fashion over time (and averaged to zero). But even a sequence of time periods in which wage or profit margin pressures were positive, reflected in positive stochastic terms in equation (2), would have long lasting effects as one period's inflation feeds through to subsequent periods inflation (through the lagged inflation term in equation 2). Similarly if expectations on inflation were to rise (for whatever reason), then inflation would rise according to equation (2), and subsequent inflation would also be higher (than otherwise). In the event of a sustained increase in inflation (due to cost pressures, as would seem to have been the case during the 1970s), this could only be met, in this framework, by raising interest rates and grinding down inflation by low demand and unemployment.

In terms of the conduct of the "new consensus" monetary policy, there are serious problems here too. In this context it is worth quoting Blinder's (1998) criticism that it remains "tight for too long, thereby causing recessions, and remaining easy for too long, thereby allowing inflation to take root." Furthermore, "a prominent institutional feature of some central banks (including the Federal Reserve) may also contribute to this problem. Specifically, in many countries monetary policy is made not by a single individual but by a *committee."* Members of the *committee* "laboriously aggregate individual preferences; that they need to be led; that they tend to adopt compromise positions on different questions; and--perhaps because of all of the above--that they tend to be inertial." So much so that "decision-making by committee may contribute to ... systematic policy errors ... by inducing the central bank to maintain its policy stance too long" (p. 20). This raises the issue, however, of the extent the "new consensus" monetary policy, as currently practiced, has contributed to bringing inflation down to low levels, and is now controlled. Our response would be that although the premise of the argument is correct, inflation has come down and does not appear to pose problems to the

policy makers, the argument that this is all due to monetary policy is both theoretically weak and empirically unfounded.

We have argued above, and will argue further below, that endogenous money suggests little role for monetary policy with respect to inflation, and the empirical evidence we have assembled (Arestis and Sawyer 2002b) supports this claim. Furthermore, there has been a worldwide decline in inflation produced, we would argue, by the general fall in commodity prices over the past twenty years or so. Inflation has fallen, not just in inflation-targeting countries, but also in countries that pursue different economic policies. Still, inflation targeting is based to a large extent on "reputation" (Barro and Gordon 1983a, 1983b; Barro 1986), and on the inflationary bias of discretionary monetary policy (Kydland and Prescott 1977). But recent history has not been supportive to this view, if it ever was; and to quote Blinder (1998), "In fact, the history of much of the industrial world since roughly 1980 has been one of disinflation--sometimes sharp disinflation, and sometimes at high social cost. Furthermore, the monetary authorities of many countries, especially in Europe, have displayed a willingness to maintain their tough anti-inflation stances to this very day, despite low inflation and persistently high unemployment. Whether or not you applaud these policies, they hardly look like grabbing for short-term employment gains at the expense of inflation" (pp. 40-41). In any case, the negative correlation between Central Bank Independence (CBI) and actual inflation is not robust at all, and does not imply causation either (Posen 1993, Campillo and Miron 1997). This is particularly the case in large samples that include developing countries; also, in the case where a variety of variables are included in a multivariate analysis, the results thereby obtained cast doubt on the robustness of the correlations between CBI indexes and inflation or inflation variability. Actually, "the only significant correlations developed in the specifications examined here suggest a *negative* correlation between CBI and real growth, and a *positive* correlation between CBI and unemployment" (Fuhrer 1997, p. 34).

Channels of Monetary Policy

This rather bare three-equation model, suggests that monetary policy operates through the effect which the real interest rate has on aggregate demand (equation 1). This equation could be read as real interest rate having a price effect on investment and consumer expenditure. However, writers within this "new consensus" have pointed to many channels by which monetary policy influences aggregate demand. In reviewing this literature we have previously identified six channels, which have been seen to play a role (see Arestis and Sawyer 2002b, for an elaboration of these channels of monetary policy).

Two credit channels, the *narrow credit channel* and the *broad credit channel,* are distinct but complementary ways whereby imperfections in financial markets might affect real magnitudes in the economy. They are concerned with how changes in the financial positions of lenders and borrowers can affect aggregate demand in the economy, on the assumption of credit market frictions.[5] The *narrow credit channel* (also labeled as *bank lending channel;* see Hall 2001) concentrates on the role of banks as lenders (Roosa 1951, Bernanke and Blinder 1988). The *broad credit channel* (also labeled as *balance sheet channel;* see Hall 2001) describes how the financial health of borrowers can affect the supply of finance and ultimately aggregate demand (Bernanke and Gertler 1989, 1999; Bernanke et al, 1999). The next two are labeled the *interest rate channel* and the *monetarist channel* together. These two channels depend heavily on the assumption made about the degree of substitutability between money and other assets. Changes in asset prices are important in the case of the *wealth effect channel* too. The mechanism in this case works via consumer expenditure where the

consumption function is hypothesized to depend on consumer wealth. The sixth channel of the impact of monetary policy is the *exchange rate channel,* operating through import prices and net external demand. Although setting out these various channels for the transmission of monetary policy can be seen as an elaboration of the route from a change in the rate of discount to aggregate demand, nevertheless we would suggest that considering these channels may give a rather different impression of monetary policy and its role. It gives the impression that the transmission of monetary policy depends on the expectations, behavior etc. of a wide variety of agents, and the strength and predictability of the effects of a change in monetary policy may be rather "loose," rather than the precise effect which interest rate has in equation (1). It also indicates that monetary policy may have effects on a range of economic variables, which are of interest in their own right--for example, credit availability (and thereby investment expenditure), asset prices and the exchange rate. This raises the question as to whether and the extent to which, interest rate policy should be concerned with economic variables other than the rate of inflation such as investment, exchange rate or asset prices.

3. MONETARY POLICY IN THE PRESENCE OF A FALL IN AUTONOMOUS DEMAND

The "new consensus" approach views aggregate demand as stable subject to stochastic (and serially uncorrelated) shocks, as indicated in equation (1) above, and monetary policy responds to these variations in aggregate demand through equation (3). But we can ask whether monetary policy would be able to deal with a significant and sustained change in the level of aggregate demand. We examine this question by taking the case of a fall in autonomous demand and examining the extent to which monetary policy can help to restore aggregate demand. In doing so we use the "new consensus" model but modify equation (1), along the lines of Arestis and Sawyer (2002d). We retain the closed economy nature of the model, explicitly include the capacity level of output labeled Y*, and introduce a simple consumption function,

$$C_t = d_1 + d_2\, Y_{t-1} - a\,[R_t - E_t\,(p_{t+1})]$$

where Y represents output. An investment function is also introduced:

$$I_t = d_3 + d_4\, E\,(Y_{t+1}) - b\,[R_t - E_t\,(p_{t+1})]$$

We then have:

$$Y_t = (d_1 + d_3) + d_2\, Y_{t-1} - a\,[R_t - E_t\,(p_{t+1})] + d_4\, E\,(Y_{t+1}) - b\,[R_t - E_t\,(p_{t+1})]$$

and with the output gap incorporated, this can be written as:

$$(1') \qquad (Y_t - Y^*) = (d_1 + d_3) + (d_2 + d_4 - 1)\, Y^* + d_2\,(Y_{t-1} - Y^*) + d_4\,[E\,(Y_{t+1}) - Y^*] - (a + b)\,[R_t - E_t\,(p_{t+1})]$$

It is now evident that the "equilibrium" rate of interest (for a zero output gap) is given by:

$$[R_t - E_t\,(p_{t+1})] = (d_1 + d_3)/(a + b) + [(d_2 + d_4 - 1)/(a + b)]\, Y^*.$$

It is evident from this expression that there is not a unique "natural rate" of interest. The empirical

investigation of the effectiveness of monetary policy is generally undertaken in the context of an econometric model that could be viewed as an elaboration of the "new consensus" model. The econometric model is, of course, much larger and involves many leads and lags which do not appear in the "new consensus" model, but the econometric models generally impose the existence of a supply-side equilibrium (say the NAIRU) which is equivalent to the zero output gap for which inflation is constant. With a policy regime, which pushes the economy towards the supply-side equilibrium (reflected in Taylor's rule), there is little room for output to substantially diverge from the supply-side equilibrium. Consequently, starting from the "new consensus" model (or its equivalent) provides little role for monetary policy. It is assumed that there is a feasible "equilibrium rate" of interest which will secure level of aggregate demand equal to the capacity level of output (which itself is compatible with constant inflation).[6]

It is pertinent to think that the effectiveness of monetary policy would be in the context of a major shift in the coefficients of the model formed by equations (1') and (2). Suppose, for example, there is a change in "animal spirits" or technological opportunities for investment that leads to a reduction in d_3. For monetary policy to be able to offset that reduction (to maintain demand at Y*) would require a change in the real rate of interest of $-Dd_3/(a + b)$. The question then relates to whether there can be a feasible nominal interest rate change that is sufficient to do the job. We think the answer is likely to be no. Let us take some illustrative numbers: consider a reduction in investment expenditure, which is equivalent to 1 percent of GDP (of Y*). If (a + b) = 0.2 (as the semi-elasticity, i.e. percentage change in demand divided by change in interest rate), then this would require a change of 5 percentage points in the real rate of interest. Note that a fall in investment would have multiplier effects on the level of output, and similar a reduction in interest rates would have multiplier effects. In the simulations surveyed in Arestis and Sawyer (2002b), the largest effect of interest rate on investment was that 1 percentage point change in the rate of interest generated a 3 percent change in investment (and generally the numbers were very much lower). Investment is 15 to 20 percent of GDP, and hence a 1-percentage point change in rate of interest was associated with a 0.45 to 0.6 percent change in GDP (at the most). Given the bounds within which interest rates can be changed, falls in the autonomous components of aggregate demand equivalent to say 2 percent would require interest rate reductions of say 6 percentage points. Consequently, the normal rather small interest rate changes would have little impact in offsetting the fall in autonomous demand.

4. INTEREST RATES AND THE EXCHANGE RATE

Much of the recent discussion on the setting of interest rates, and particularly exemplified by "Taylor's rule" (cf. equation 3 above), has focused solely on domestic considerations of inflation and output. This stands in some contrast with interest rate setting in the past, particularly under fixed exchange rate regimes, where interest rate (usually increases) were often used to protect the exchange rate. The interest rate parity theorem indicates that the difference between the domestic interest rate and the foreign interest rate will be equal to the (expected) rate of change of the exchange rate. A relatively high (low) domestic interest rate would then be associated with expectations of a depreciating (appreciating) currency. Although the uncovered interest rate parity result appears often not to hold empirically it could still be expected that there is some relationship between domestic interest rates (relative to international rates) and movements in the exchange rate. "Despite dozens of studies showing that uncovered interest parity is without empirical support, neoclassical authors still rely on it, because, they would say, a more attractive relationship has yet to be found" (Lavoie 2000, p. 175).

The significant question here is not so much whether the interest rate parity theorem holds as whether a change in the rate of interest would have some effect on the exchange rate; and, hence, whether the effect of monetary policy will feed through the exchange rate and whether the setting of monetary policy should consider its exchange rate effects.

A number of points need to be made. The first is that the rate of return that is relevant for foreign exchange dealings (on the capital account) is not the Central Bank discount rate, but the expected rates of return on financial assets. These expected rates of return would include the rate of interest on bank deposits, on bonds, and more generally the overall rate of return on equity, including the expected rate of change of equity prices. The second is that the interest rate parity theorem indicates that a high (domestic) rate of interest is associated with the expectation of depreciation of the value of the currency. Yet an increase in domestic interest rates is often used to raise the exchange rate (or at least to stem the decline in the exchange rate). These views can be reconciled in terms of an overshooting argument, namely that a rise in domestic interest rates initially causes a rise in the exchange rate (as financial capital flows inwards) but a sustained higher rate of interest is combined with a steadily declining exchange rate. The third is whether interest rates can be set for purely domestic reasons to target inflation (and possibly other objectives). This could be seen to have two dimensions. First, in the short-run, there may be a conflict for the setting of interest rates between the domestic requirements and the foreign exchange rate requirements. Second, the domestic "equilibrium" rate of interest (a real rate of RR* in the model above) which is required to balance aggregate demand with "trend output" (and hence with constant rate of inflation), may well differ from the rates of interest in other countries. This would imply (under the interest rate parity theorem) a continuous change in the real value of the exchange rate, depending on the interest rate differential.

The interest rate parity theorem has been tested on a short-term basis: the consideration here would relate to a long-standing difference between "equilibrium" rates of interest. It is difficult to believe that over more than a few years a country would be able to experience continuing changes in its real exchange rate. As Keynes (1930) argued, "the dilemma of modern banking is satisfactorily to combine the two functions. As a purveyor of representative money, it is the duty of the banking system to preserve the prescribed objective standard of money. As a purveyor of loans on terms and conditions of a particular type, it is the duty of the system to adjust, to the best of its ability, its supply of this type of lending to the demand for it at the equilibrium rate of interest, i.e. at the natural rate" (p. 192).

It could be noted that these exchange rate considerations come to the fore when monetary policy is based on interest rates. When monetary policy was thought of in terms of growth of the stock of money, in a flexible exchange rate system, what is known as the monetary approach to exchange rate determination (see, for example, Neely and Sarno 2002), then the exchange rate could be seen to take care of itself. In effect, it is argued, growth in the stock of money would determine the rate of inflation, and purchasing power parity considerations would determine the change in the exchange rate (equal to the differential inflation rate). In effect domestic considerations (on inflation) could come first, since it was assumed (through purchasing power parity) that the exchange rate would adjust appropriately, in effect the real value of the exchange rate would remain unchanged as a result of domestic monetary policy.[7] When monetary policy is seen in terms of interest rates, then the real value of the exchange rate (presumed to be relevant for international trade flows) can be influenced by monetary policy. In turn, the real value of the exchange rate can be presumed to have real effects on the economy including long-term effects.

5. THE KEYNESIAN ENDOGENOUS MONEY ANALYSIS

A simple representation of the Keynesian endogenous money approach treats the Central Bank rate of interest as given with the Central Bank providing bank reserves which are required (at a price which it sets). Banks provide loans at a rate of interest that is a mark-up over the Central Bank rate, and meets all credit demanded (subject to credit-standard requirements). The mark-up may vary as banks' liquidity preference and position, market power and attitude to risk vary. The loans are created in response to the demand for loans, and bank deposits are thereby created. The repayment of loans destroys money, and the amount of money that remains in existence depends on the demand to hold money. Money is generated within the inflationary process, and the rate of inflation influences the rate of increase of the stock of money, but money itself does not in any sense *cause* inflation.

The Central Bank rate can be viewed as the key rate on which all other interest rates are based--often explicitly so as in the case of the interest rates charged by banks on loans and paid by banks on deposits. However, while that may be a useful way to proceed in the short run (the period over which the Central Bank holds its interest rate constant), it clearly leaves open the question of the forces that influence or determine the Central Bank interest rate in the longer term. This should be seen as a key issue in the analysis of endogenous money, yet it has been generally neglected in the Keynesian endogenous money literature. The discussion has usually pointed to the discretion possessed by the Central Bank and exchange rate considerations: "A central bank's key decision variable throughout the business cycle, and its central control instrument of monetary policy, is the nominal supply price at which it provides additional reserves. Over a wide range the central bank can determine exogenously the supply price at which it provides liquidity to the financial system. The upper and lower limits of this range are set by the size and openness of the economy and by the exchange rate regime in force" (Moore 1989, p. 27).

However, little has been said about the underlying determinants of the discount rate set by the Central Bank. But, if the Central Bank is able to set its discount rate at some "equilibrium rate" (where savings and investment are equal at the target rate of output, as in the "new consensus" approach, above or at a target level of employment such as full employment), any problem of demand deficiency appears to be effectively dispensed with. We can first consider the relationship between the discount rate set by the Central Bank and other interest rates, and then come to question as to whether the discount rate can be used to overcome demand deficiency.

The Central Bank is perceived to be able to set a discount rate that generates a spectrum of interest rates (on bank deposits, loans, bonds etc.) that is compatible with a balance between savings and investment occurring at a level of employment corresponding to capacity output (at which it is assumed inflation would be constant). The Keynesian endogenous money approach recognizes the significance of the Central Bank rate of interest for the general level of interest rates. Indeed it takes a strong stance of this in the sense that the Central Bank determines the key discount rate and can enforce that rate. This does not mean that there is some one-for-one correspondence between the Central Bank rate and some other specified rate of interest (and in particular the long-term rate of interest on bonds may vary only to a minor extent when the Central Bank rate changes). The relationship between any particular rate of interest and the Central Bank rate is likely to be influenced by a variety of factors including the degree of market power of the banking system and what may be termed liquidity preference.

The causal link that runs from investment expenditure to savings requires the availability of finance to enable the investment to occur, in effect ahead of the generation of savings. Savings are available *ex post* to fund investment, but are not available *ex ante.* The level of income is perceived to adjust following an increase in investment expenditure. The notion of endogenous (bank) money upon which banks are able to make loans for the financing of investment, is key to the explanation of the process whereby investment enhancement leads to expansion in savings and income. Yet, the rate of interest on loans is closely linked with the rate of interest set by the Central Bank. The factors that influence the setting and changing of the interest rate by the Central Bank become crucial to the relationship between savings and investment. To take an extreme view, if the Central Bank could vary the rate of interest to ensure that savings and investment were continuously equated at levels that corresponded to a supply-side equilibrium (perhaps full employment), then there would be no deficient demand problem.

There are (at least) four ways that would upset the conclusion that interest rate policy can guide the economy to equilibrium with demand and supply in balance and inflation on target. The first is that the "equilibrium" rate of interest is either negative or positive but so low as to be unattainable.[8] In some respects this has overtones of the "liquidity trap," but the mechanisms are different. In the case of the "liquidity trap," it is presumed that the rate of interest on bonds is so low (and the price of bonds so high) that no one is willing be buy bonds in light of the possible capital losses in doing so. In the present case, a negative interest rate is ruled out on the basis that a zero rate of interest can also be obtained by holding cash. The real rate of interest given by a_0/a_3 may be negative. This would be equivalent to saying that the savings and investment schedules do not intersect in the positive range of interest rates. The aggregate demand equation (equation 1) above clearly assumes that aggregate demand (and presumably investment) is interest rate sensitive (such that a_3 is greater than zero) and that there is a substantial autonomous component of demand (otherwise a_0 would be non-positive). The emphasis here would be on the failure of the equation $I(r, Y_f) = S(r, Y_f)$ to have an economically meaningful solution, where Y_f is income level for which output gap is zero.

Second, and not unrelated to the previous point, interest rates may have very little effect on the levels of investment and savings and hence variations in the rate of interest would be ineffectual in reconciling savings and investment. The arguments on the ambiguity of the sign of the relationship between savings and the rate of interest are well known. The empirical literature on investment has often cast doubt on the impact of interest rates on investment and stressed the roles of profitability and capacity utilisation. "In the investment literature, despite some recent rehabilitation of a role for neoclassical cost-of-capital effects ... there remains considerable evidence for the view that cash flow, leverage, and other balance-sheet factors also have a major influence on spending [Fazzari, Hubbard, and Peterson (1988); Hoshi, Kashyap, and Scharfstein (1991); Whited (1992); Gross (1994); Gilchrist and Himmelberg (1995); Hubbard, Kashyap, and Whited (1995)]" (Bernanke, Gertler, and Gilchrist 1999, p. 1344). In the same study it is further noted in a footnote, that "contemporary macroeconometric forecasting models, such as the MPS model used by the Federal Reserve, typically do incorporate factors such as borrowing constraints and cash-flow effects" (fn. 2, p. 1344).

Third, the domestic interest rate may be incompatible with those rates that are being set internationally or have severe implications for the capital account. Insofar as interest rate parity holds, then the difference between the domestic interest rate and the foreign interest rate will be equal to the

(expected) rate of change of the exchange rate. The relevant domestic interest rate (for international capital movements) may be a rate such as that on bonds, but one assumed to be linked to the discount rate set by the Central Bank. Although the interest rate parity result appears often not to hold, it could still be expected that there is some relationship between domestic interest rates (relative to international rates) and movements in the exchange rate. As noted above, Taylor's rule neglects these exchange rate effects.

Fourth, the Central Bank cannot calculate and attain the "equilibrium rate" of interest through reasons of lack of information, a moving target or incompetence. It can be seen in the equations given above that the "equilibrium rate" depends on a_0/a_3 and these are parameters that can vary over time. The Central Bank has imperfect information on the equilibrium real rate of interest RR* (assuming that such rate exists), and may aim for a real rate of interest which is not equal to a_0/a_3. It can also be noted that it is assumed in equation (3) that there are no stochastic errors in decision making, with accurate knowledge on the lagged output gap and inflation rate. These assumptions need not be sustained in the real world; in fact, it is almost certain that they would not. Furthermore, shifts in the propensity to save (as observed, for example, during the 1990s in the U.K. and the USA), in the propensity to invest, in the demand for exports and in the fiscal stance, could all be expected to lead to a shift in the equivalent of a_0/a_3. Information on the "equilibrium rate" is not exactly readily available. Indeed, the Central Bank (or the government) may not wish to attain the "equilibrium rate" of interest as defined above. In other words, the Central Bank does not pursue a policy rule akin to Taylor's rule. The Central Bank may use its interest rate for objectives other than a target rate of inflation and/or zero output gap; indeed, these objectives may very well include rate of growth of stock of money or a target level of the exchange rate.

6. WHAT ROLE FOR MONETARY POLICY IN AN ENDOGENOUS MONEY ANALYSIS?

The Keynesian endogenous money approach is embedded in a different perception of the macroeconomy as compared with the "new consensus." First, while the "new consensus" views inflation as driven by excess demand and inflationary expectations, the Keynesian endogenous money view is that inflation can arise from a variety of sources including cost push pressures (from wages, imported prices etc.), from struggles over income shares and from inadequate productive capacity. Second, the macroeconomy is viewed as subject to shocks from both the demand side and the supply side with substantial variations in the level of economic activity over the business cycle. Further, variations in the level of demand are often driven by variations in investment expenditure emanating from accelerator type mechanisms as well as shifts in liquidity preference and in the state of expectations. The financial sector itself is intimately involved with the generation of business cycles through its ability to grant loans to finance expenditure, the fluctuations in the liquidity position of the banks and other financial institutions, and, more importantly, changes in their liquidity preference. In our attempt to answer the question of the role of monetary policy in the Keynesian endogenous money analysis, we begin by revisiting liquidity preference.

Liquidity Preference

Liquidity preference can be viewed as influencing the allocation of wealth between different assets (here focusing on financial assets). A shift in liquidity preference, say, towards more liquid assets and away from less liquid assets, changes the demand for those assets, which leads to changes in relative prices (price of more liquid assets rising and of less liquid assets falling) and thereby to changes in the

relative rates of return on those assets. For those financial assets with a fixed nominal price (e.g. bank deposits), clearly the price cannot change but the interest rate on such assets can be adjusted (e.g. the banks faced with an increased demand to hold deposits may lower the rate of interest on deposits).

Liquidity preference considerations can impact on the operation of monetary policy in so far as it influences relative interest rates, and relative interest rates influence aggregate demand. Further, the behavior of banks with regard to their asset portfolio can be viewed in terms of liquidity preference. Since a major element of their asset portfolio is loans, which are relatively illiquid, a shift in the banks' liquidity preference impacts on their willingness to provide loans. The "new consensus" was described above in terms of a relatively simple model with a single rate of interest. However, the elaboration of the channels through which monetary policy is transmitted, points to the role of credit rationing and to changes in the structure of interest rates. Credit rationing could be said to be ever present, and the question is whether a change in the Central Bank discount rate will lead to a change in the extent and form of credit rationing. A higher rate of interest on loans increases the risk of default on the loan. This arises for two reasons. First, the interest payments would be higher increasing the chances that a firm taking out a loan would be unable to meet those interest payments. Second, the structure of the portfolio of loans may shift away from lending to projects with low risk but low expected return, towards those with high risk but high-expected return. As the rate of interest on loans rises, some of the projects with low expected returns would find that those expected returns now fall below the rate of interest on loans. The portfolio of loans shifts from low risk to high risk ones. Banks may then respond to a rise in the discount rate by moving towards more credit rationing rather than raising the loan rate by the full extent of the rise in the discount rate. These arguments suggest that the effects of a change in the Central Bank discount rate will be much less predictable than was suggested by the simple model presented above. There are changes in credit rationing and in relative interest rates to consider.[9]

This analysis suggests a monetary policy which is rather different from that implied by the "new consensus" analysis. Our earlier discussion of the channels of monetary policy (see, also, Arestis and Sawyer 2002b) makes it clear that monetary policy operates through a variety of credit channels. At present, these credit channels are only indirectly affected by monetary policy in that when interest rates rise there may be some impact on the willingness of banks to grant credit; in other words the extent of credit rationing changes. This may be seen to enhance the impact of monetary policy in that changing interest rates not only have a "price effect" on investment and other forms of expenditure, but there is also a credit rationing effect.[10] However, the size of this credit rationing impact depends on the liquidity preference of banks and their willingness to grant credit.

Exchange Rate Considerations

When money is treated as exogenous, it appears that monetary policy (in the form of control over the stock of money) can be operated without regard to exchange rate considerations. The argument is simply that domestic money stock growth would determine the internal rate of inflation and the real exchange rate would be set by purchasing power parity considerations. The nominal exchange rate would change according to the difference between the internal rate of inflation and the general world rate of inflation, leaving the real rate unaffected (by monetary policy). When money is treated is endogenous, with monetary policy focusing on the setting of the key interest rate, matters are somewhat different. Simply, monetary policy in the form of interest rate will affect the capital account and thereby affect the real and nominal exchange rates. Indeed the exchange rate is one of the transmission mechanisms for monetary policy and in some simulations (Church et al, 1997) the effect

of interest rate on the exchange rate is found to be the most important route by which interest rates impact on the rate of inflation. However, as discussed above, it has proved rather difficult to find a precise empirical link between the (domestic) interest rate and the exchange rate. The interest rate parity theorem provides a clear theoretical link between interest rate differentials and the rate of change of the exchange rate, but, as argued earlier, this does not appear to be empirically robust.

More recent empirical work, however, is more optimistic on this issue. Using vector autoregression analysis, Eichenbaum and Evans (1995) find substantial evidence that U.S. monetary policy (in terms of changes in the federal funds rate amongst other forms of monetary policy) leads to significant and persistent impact on U.S. nominal and real exchange rates. As the authors put it "we find that the maximal effect of a contractionary monetary policy shock on U.S. exchange rate is not contemporaneous; instead the dollar continues to appreciate for a substantial period of time" (p. 976). A result, of course, that is inconsistent with the hypothesis of uncovered interest rate parity,[11] but consistent with the covered interest rate parity and the "forward premium bias" literature (for example, Hodrick 1987). Contractionary domestic monetary policy raises the domestic and foreign interest rate differential, which leads to domestic currency appreciation and to a negative forward premium bias. In Rogers (1999), where vector autoregressive analysis is also employed, monetary shocks account for nearly one-half of the forecast error of the real U.S. dollar-pound sterling exchange rate over short horizons. When alternative models are utilized, a 20 percent minimum contribution of monetary policy is identified. One problem with this literature is concerned with the identification restrictions required in the vector autoregression analysis (Sarno and Taylor 2002). Cushman and Zha (1997) propose a structural model to overcome this problem in the case of Canada (see, also, Kim, and Roubini 2000, in the case of non-U.S. G7 countries). The dynamic response to a contractionary monetary policy shock is for the exchange rate to appreciate. In fact, this exchange rate effect is found to be strong, thereby highlighting an exchange rate transmission mechanism.

This more recent evidence would suggest that the exchange rate channel, discussed earlier in this paper, is the most promising in terms of a significant impact of monetary policy on the exchange rate. We may, therefore, conclude that monetary policy (in the form of interest rates) will have effects on the exchange rate.

Fiscal Policies

When money is regarded as endogenous and monetary policy operates via interest rates, then monetary policy has a range of effects, of which we have particularly picked out effects on exchange rate, asset prices and income distribution. On the other hand, the effects of monetary policy on inflation (via aggregate demand) may be rather muted. This observation raises the question of whether other economic policies may be required in view of the finding that monetary policy may be rather ineffectual. Specifically we would argue that fiscal policy has a crucial role to play in terms of aggregate demand (Arestis and Sawyer 2002d). Fiscal policy has an "automatic stabilizer" role which serves to dampen down the swings in aggregate demand (but which does not make an appearance in the "new consensus" model given above). The observation that the government's budget deficit moves counter-cyclically (and according to estimates of Buti et al, 1997, the movement is of the order of 0.5 percent change in the deficit to GDP ratio for a 1 percent change in output relatively to trend) provides some confirmation that fiscal policy operates in this stabilizing fashion. The level of aggregate demand may be judged significant for its impact on the rate of inflation (as in the Phillips curve of equation 2 above) and for its impact on the level of economic activity, employment and output. When monetary policy influences inflation through the level of aggregate demand, then the

use of fiscal policy is an alternative policy instrument, and one that may be more effective. In Arestis and Sawyer (2002b) we have argued, on the basis of model simulations undertaken at a number of Central Banks, that interest rate changes do not have a major impact on aggregate demand and on inflation. A matter of greater concern is the ability of monetary policy to deal with major downturns in aggregate demand, and here we would argue that it is only fiscal policy that can respond to major changes in aggregate demand.

Both monetary policy and fiscal policy have an impact on the level of aggregate demand, and monetary policy is seen to have effects on a range of economic variables other than inflation. This leads to the need for some coordination of fiscal and monetary policies for some consistency in the direction of the policies (in terms of aggregate demand), rather than the separation of those policies which arises when monetary policy is placed in the hands of "independent" Central Banks with an inflation objective.

Objectives of Monetary Policy

The basic rationale for assigning monetary policy the sole objective of inflation targeting is the view that "inflation is always and everywhere a monetary [policy] phenomenon" and that the classical dichotomy holds in the form that monetary policy does not have real effects. These propositions came to the fore with the revival of monetarism based on an exogenous and controllable money stock, but have been carried over to a monetary policy based on interest rates. However, when inflation is viewed as a "demand phenomenon," then (as argued in the previous sub-section) fiscal policy can be viewed as an alternative (or complementary) policy for targeting inflation. When monetary policy has an impact on real variables (which we would argue is the general case, and effects on investment and on the exchange rate are two significant examples), then at a minimum the setting of monetary policy should give consideration to those real side effects.[12]

It is well known that one policy instrument can, at most, achieve one policy objective. Fiscal policy may have some indirect effects on the exchange rate, via effects on trade position and on market sentiment, but fiscal policy does not have direct effects. In contrast, interest rates directly affect international capital flows and can be anticipated to have some effect on the exchange rate (even if that effect is difficult to predict). This would suggest that fiscal policy should be directed to aggregate demand and monetary policy towards the exchange rate.

In the "new consensus" model outlined above, the rate of inflation converges on the target rate of inflation. Expectations that the rate of inflation will be around the target rate, and that the monetary authorities will respond to increases in the rate of inflation by lowering aggregate demand, ensure that the rate of inflation does indeed converge on the target rate. Thus, much of the "work" of monetary policy is accomplished through a belief that the inflation target is credible. But there is nothing unique about monetary policy in that regard: any policy (and specifically fiscal policy), which sets a credible inflation target, would have a similar effect.

We would argue that the objectives of monetary policy should be broaden, or perhaps more accurately that the considerations which bear on interest rate decisions broadened. In particular, the effects which interest rate changes may have on the exchange rate and on investment, and perhaps asset prices, should be fully incorporated into the decision making process. The effects of monetary policy on the exchange rate and on investment may well have long lasting consequences, and hence monetary policy should not be set solely with the immediate impact on inflation in mind, but rather with due

consideration given to potentially long lasting real side effects.

Fine Tuning

In many countries, decisions on the key interest rate are taken frequently (e.g. every two weeks in the case of the ECB, every six weeks for the Federal Reserve, every four weeks in the Bank of England experience; and in all these cases, decisions may often be "no change"). It is also argued that monetary policy is seeking to target the future rate of inflation and a time horizon of two years is often mentioned. Changes in interest rate when they occur are generally relatively small with a change of 25 basis points being common. Thus, monetary policy has the capability of being changed frequently in a way that is not feasible for fiscal policy: the notion of tax rates being considered and potentially changed every few weeks appears rather ridiculous. Monetary policy has been used for what may be seen as ultra fine tuning with policy decisions made every few weeks to target inflation up to two years ahead. Yet, we have argued that those interest rate changes (of 25 or 50 basis points) have relatively little effect on the rate of inflation, but do impose costs of decision-making and of implementation (of a menu cost type). These arguments point in the direction of much less frequent changes in interest rates.

Instruments of Monetary Policy

The effects of monetary policy work through a variety of channels as outlined above. Some of the effects may be described as "price effects" of a change in the interest rate, but others take the form of changes in the extent of credit rationing. But the extent of credit rationing which occurs depends on decisions made by banks (and other financial institutions) and depends on their attitudes towards risk and liquidity. This observation raises the question as to whether interest rate policy should be supplemented by explicit forms of credit control implemented by the Central Bank (or other government agencies). Financial institutions do, for example, vary the conditions under which mortgages are provided in terms of the permissible loan to income ratio etc. A policy, which sought to impose limits on the loan to income ratio, may be possible.

However, credit rationing may affect the quality of intermediation thereby having adverse effects on investment. Shaw (1973) attempts to justify this negative aspect of credit rationing as follows: "Rationing is expensive to administer.It is vulnerable to corruption and conspiracy in dividing between borrowers and officers of the intermediary monopoly rent that arises from the difference between low, regulated loan rate and the market-clearing rate. It can be frustrated by borrowers who simply do not repay loans and keep their place in the ration queue by extending maturities.The rationing process discriminates poorly among investment opportunities ... and the social cost of this misallocation is suggested by the high incremental ratios of investment to output that lagging economies report" (p. 86). These arguments are probably more relevant in the case of developing rather than developed countries, especially so in terms of the corruption and conspiracy aspects referred to in the above quote. The reason is the weak institutional arrangements in developing countries.

In the case of developed economies, credit rationing can be ineffective and expensive, in view of the high degree of sophistication of their institutional arrangements. Under these circumstances, the ability of borrowers to get around credit restrictions might be effective. We would, therefore, accept the possibility of credit rationing for the reasons discussed earlier in this section, but an active policy of credit rationing would not be effective--see, also Stiglitz and Weiss (1981). An example of what is meant here is under those situations, like the late 1980s, which arise from rapid growth of credit that

can generate a bubble. The bubble eventually bursts, but the possibility arises of preventing the bubble and thereby prolonging the boom through some form of control over the volume, and direction of credit. There are difficulties with this approach, as argued above, and we are not arguing that credit controls *per se* would stimulate the economy. We are, thus, not arguing for credit controls as a permanent tool of monetary policy. It is only under certain circumstances, as in the example just cited, that such policy might be helpful alongside the other policies for which we have argued in this paper.

7. SUMMARY AND CONCLUSIONS

In the context of endogenous money, the key decision to be made by the Central Bank relates to the discount rate, with the general structure of interest rates resting on the discount rate and the stock of money endogenously determined outside the control of the Central Bank. The use of interest rates as the key element of monetary policy raises the issue of effectiveness of monetary policy. It has to be recognized that there are clear limits on interest rates, notably that nominal interest rates cannot go negative, and the level of international interest rates constrain domestic interest rates.

We have considered the effectiveness of monetary policy in the case of two schools of thought that view money as endogenous. In the case of the "new consensus," we have argued that the effectiveness of monetary policy should be judged along two lines. The first is to ask whether monetary policy is effective in the control of inflation, and in particular in quickly bringing the rate of inflation to its target level. In the simple model used to portray the "new consensus" it is assumed that there is an "equilibrium rate" of interest which would generate a level of aggregate demand compatible with the capacity output, and hence with a constant rate of inflation. The rate of interest is then varied with respect to the "equilibrium rate" to influence aggregate demand and the rate of inflation, and to guide the rate of inflation to its target level. We have argued, based on simulation exercises summarized in Arestis and Sawyer (2002b) that interest rates are relatively ineffective in the control of inflation. The second line along which we think monetary policy should be judged concerns the question of the ability of monetary policy to counter a major shock to the autonomous components of aggregate demand. We have suggested that interest rate changes necessary to combat a major shift in aggregate demand are so large as to be infeasible in practice.

In terms of the Keynesian analysis of endogenous money, we have suggested that in view of the centrality of liquidity preference in this framework, the role and nature of monetary policy is different from that of the "new consensus." Fiscal policy to regulate aggregate demand is paramount, along with monetary policy to control the exchange rate. In addition, credit controls may be used in a supportive manner as necessary, but we are not convinced by their effectiveness. Clearly, the monetary policy implications of this school of thought are rather different from those of the "new consensus."

REFERENCES

Arestis, P. and M. C. Sawyer. 2002a. "The Bank of England Macroeconomic Model: Its Nature and Implications." *Journal of Post Keynesian Economics* 24(4): 529-545.

----. 2002b. "Can Monetary Policy Affect the Real Economy?" Working Paper No. 355. Annandale-on-Hudson, N.Y.: The Levy Economics Institute.

----. 2002c. "Does the Stock of Money Have any Significance?" Working Paper No. 363. Annandale-on-Hudson, N.Y.: The Levy Economics Institute.

----. 2002d "On the Effectiveness of Monetary Policy and Fiscal Policy." Working Paper No. 369. Annandale-on-Hudson, N.Y.: The Levy Economics Institute.

Auerbach, A. 2002. "Is There a Role for Discretionary Fiscal Policy?" Paper prepared for the Federal Reserve Bank of Kansas City conference on *Rethinking Stabilization Policy,* August 29-31.

Barro, R. J. 1986. "Reputation in a Model of Monetary Policy with Incomplete Information." *Journal of Monetary Economics* 17(1): 3-20.

Barro, R. J. and R. Gordon. 1983a "A Positive Theory of Monetary Policy in a Natural Rate Model." *Journal of Political Economy* 91(4): 589-610.

----. 1983b. "Rules, Discretion and Reputation in a Model of Monetary Policy." *Journal of Monetary Economics* 12(1): 101-121.

Bernanke, B. S. and A. S. Blinder. 1988. "Credit, Money and Aggregate Demand." *American Economic Review* 78(2): 435-439.

Bernanke, B. S. and M. Gertler. 1989. "Agency Costs, Net Worth, and Business Fluctuations." *American Economic Review* 79(1): 14-31.

----. 1999."Monetary Policy and Asset Price Volatility." In *New Challenges for Monetary Policy,* proceedings of the Symposium Sponsored by the Federal Reserve Bank of Kansas City, Jackson Hole, Wyoming. 77-128.

Bernanke, B. S., M. Gertler, and S. Gilchrist. 1999. "The Financial Accelerator in a Quantitative Business Cycle Framework." In J. Taylor and M. Woodford, eds. *Handbook of Macroeconomics* Volume 1. Amsterdam: North Holland.

Blinder, A. S. 1998. *Central Banking in Theory and Practice.* Cambridge, Mass. and London: The MIT Press.

Buti, M., D. Franco, and H. Ongena. 1997. *Budgetary Policies During Recessions: Retrospective Application of the 'Stability and Growth Pact' to the Post-War Period.* Brussels: European Commission.

Campillo, M. and A. Miron. 1997. "Why Does Inflation Differ Across Countries?" In C. Romer and D. Romer, eds. *Reducing Inflation: Motivation and Strategy,* 335-357. Chicago: University of Chicago Press

Clarida, R., J. Galí, and M. Gertler. 1999. "The Science of Monetary Policy: A New Keynesian

Perspective." *Journal of Economic Literature* 37(4): 1661-1707.

Church, K. B., P. R. Mitchel, J. E. Sault, and K. F. Wallis. 1997. "Comparative Properties of Models of the UK Economy." *National Institute Economic Review* 161: 91-100.

Cushman, D.O. and T. Zha. 1997. "Identifying Monetary Policy in a Small Open Economy Under Flexible Exchange Rates." *Journal of Monetary Economics* 39(1): 433-448.

Eichenbaum, M. and C. L. Evans. 1995. "Some Empirical Evidence on the Effects of Shocks to Monetary Policy on Exchange Rates." *Quarterly Journal of Economics* 110(4): 975-1009.

Engel, C. 1996. "The Forward Discount Anomaly and the Risk Premium: A Summary of Recent Evidence." *Journal of Empirical Finance* 3(2): 123-192.

Fair, R. 2001. "Estimates of the Effectiveness of Monetary Policy." *Memo,* Yale University: Cowles Foundation and International Center for Finance.

Feldstein, M. 2002. "The Role for Discretionary Fiscal Policy in a Low Interest Rate Environment." *NBER Working Papers Series,* No. 9203 (September).

Fazzari, S., R. G. Hubbard, and B. C. Peterson. 1988. "Financing Constraints and Corporate Investment." *Brookings Papers on Economic Activity* 1: 141-95.

Fuhrer, J. C. 1997. "Central Bank Independence and Inflation Targeting: Monetary Policy Paradigms for the Next Millennium." *New England Economic Review.* January/February: 19-36.

Gilchrist, S. and C. P. Himmelberg. 1995. "Evidence on the Role of Cash Flow for Investment." *Journal of Monetary Economics* 36(3): 541-572.

Gordon, R. J. 1997. "The Time-Varying NAIRU and its Implications for Economic Policy." *Journal of Economic Perspectives* 11(1): 11-32.

Gross, D. 1994. "The Investment and Financing Decisions of Liquidity-Constrained Firms." unpublished paper (MIT).

Hall, S. 2001. "Credit Channel Effects in the Monetary Transmission Mechanism." *Bank of England Quarterly Bulletin* (Winter): 442-448.

Hodrick, R. 1987. *The Empirical Evidence on the Efficiency of Forward and Futures Exchange Markets.* Chur, Switzerland: Harcourt Academic Publishers.

Hoshi, T., A. K. Kashyap, and D. Scharfstein. 1991. "Corporate Structure, Liquidity and Investment: Evidence from Japanese Industrial Groups." *Quarterly Journal of Economics* 106(1): 33-60.

Hubbard, R. G., A. K. Kashyap, and T. Whited. 1995. "Internal Finance and Firm Investment." *Journal of Money, Credit and Banking* 27(3): 683-701.

Keynes, J. M. 1930. *Treatise on Money,* London: Macmillan (page references refer to *The Collected Writings of John Maynard Keynes,* Vol. V. London: Macmillan).

Kim, S. and N. Roubini. 2000. "Exchange Rate Anomalies in the Industrial Countries: A Solution with a Structural VAR Approach." Journal of Monetary Economics 45(3): 561-586.

Kydland, F. E. and E. C. Prescott. 1977. "Rules Rather Than Discretion: The Inconsistency of Optimal Plans." *Journal of Political Economy* 85(3): 473-492.

Lavoie, M. 2000. "A Post Keynesian View of Interest Rate Parity Theorems." *Journal of Post Keynesian Economics* 23(1): 163-179.

Meyer, L. H. 2001. "Does Money Matter?" *Federal Reserve Bank of St. Louis Review* 83(5): 1-15.

McCallum, B. T. 1994. "A Reconsideration of the Uncovered Interest Rate Parity Relationship." *Journal of Monetary Economics* 33(1): 105-132.

----. 2001. "Monetary Policy Analysis in Models without Money." *Federal Reserve Bank of St. Louis Review* 83(4): 145-160.

Moore, B. J. 1989. "A Model of Bank Intermediation." *Journal of Post Keynesian Economics* 12(1): 10-29.

Neely, C. J. and L. Sarno. 2002. "How Well Do Monetary Fundamentals Forecast Exchange Rates?" *Federal Reserve Bank of St. Louis Review* 84(5): 51-74.

Posen, A. S. 1993. "Why Central Bank Independence Does Not Cause Low Inflation: There Is No Institutional Fix for Politics." In R. O'Brien, ed. *Finance and the International Economy* 40-65. Oxford: Oxford University Press.

Rogers, J. H. 1999. Monetary Shocks and Real Exchange Rates." *Journal of International Economics* 49(2): 269-288.

Roosa, R. V. 1951. "Interest Rates and the Central Bank." In R. V. Roosa, ed. *Money, Trade and Economic Growth: Essays in Honour of John Henry Williams.* New York: Macmillan, 270-295.

Sarno, L. and M. Taylor. 2002. "Purchasing Power Parity and the Real Exchange Rate." *IMF Staff Papers* 49(1): 285-314.

Shaw, E. 1973. *Financial Deepening in Economic Development.* New York: Oxford University Press.

Stiglitz, J. and A. Weiss. 1981. "Credit Rationing in Markets with Imperfect Information." *American Economic Review* 71(3): 393-410.

Whited, T. 1992. "Debt, Liquidity Constraints, and Corporate Investment: Evidence from Panel Data." *Journal of Finance* 47(4): 1425-1460.

NOTES

1. The generic term Central Bank discount rate is used to cover rates such as "repo" rate (European Central Bank), Federal Funds rate (USA) etc. It is the rate of interest at which the Central Bank is willing to supply reserves to the financial system.
2. There are also, of course, differences within each of the approaches.
3. An interesting feature of equation (3) is that for the model to be stable, the coefficient on inflation should be greater than one (Fair 2001, who elaborates on this point in the same publication).
4. Variations on this theme could be used; for example, interest rate "smoothing" in equation (3) is included or ignored (as in our case), as is the lagged output gap variable in equation (1) so that the focus is on the influence of expected future output gap in this equation.
5. The assumption of credit market frictions is important in that it is normally hypothesized that lending and borrowing are indifferent among internal funds, bank borrowing and equity finance. This assumption relies on a frictionless world, where lenders and borrowers have the same information about risks and returns, costlessly monitor the use and repayment of borrowed funds in the case of lenders, and are not faced with search and transaction costs. In addition to these agency costs, lenders and borrowers have no concerns about corporate controls, and there is no tax discrimination of sources of finance. In the real world of credit markets, frictions are abundant so that the heroic assumptions of frictionless credit markets do not generally hold.
6. We use the expression "Feasible 'equilibrium rate' of interest" in the sense of involving a positive nominal rate of interest that is also compatible with the prevailing level of the exchange rate.
7. In terms of the empirical evidence of the monetary approach to exchange rate determination, a recent survey of the empirical evidence observes that "One of the most widely studied and still unanswered questions in this literature involves why monetary models of exchange rate determination cannot forecast much of the variation in exchange rates" (Neely and Sarno 2002, p. 51).
8. This discussion is in terms of the Central Bank rate. It is assumed that the rate of interest on loans is above that Central Bank rate, and that it is the rate of interest on loans that is relevant for investment decisions. Given the risks for banks involved in extending loans, it can be assumed that there is a minimum level below which banks would not go in terms of the loan rate.
9. There is, of course, the case of credit rationing that emanates from incomplete information as in Stiglitz and Weiss (1981).
10. The empirical evidence on the effects of monetary policy to which reference was made above (and detailed in Arestis and Sawyer 2002b) should include both the price effect of an interest rate change and the credit rationing effects.
11. It would be interesting to note in this context the argument of McCallum (1994) on the proposition of the uncovered interest rate parity that contractionary monetary policy causes the exchange rate to depreciate, in that it "is inconsistent not only with existing models but also with views that have been held by actual policy makers for many decades--indeed over a century" (p. 121). Even so, Kim and Roubini (2000) provide evidence, which is consistent with significant effects that suggest that the exchange rate appreciates initially in response to a monetary contraction, but find little evidence of a "forward discount bias." But then, the uncovered interest

rate parity is thought not to work very well empirically in any case, which may very well be due to expectations not being rational (Engle 1996)

12. It may well be that those real side effects are (in some relevant size) rather small: but if that is so, then the effects on inflation are also likely to be rather small. If the effects of monetary policy on inflation are indeed rather small (as we would argue) then little regard should be paid to the use of monetary policy.