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Abstract

The Bank of England’s report on its approach to macroeconomic modelling reveals the underlying structure of their macroeconomic model used for policy purposes. A simplified representation of the Bank of England model is presented which is less disaggregated than the original model and focuses on the ‘long run’ relationships. Following current econometric practice, the Bank of England generally estimates long-run steady-state relationships which have embedded short-run dynamics and error correction mechanisms. It is argued that the Bank of England have adopted an essentially endogenous view of money. The model is used to explore the effectiveness of the use of interest rates for the control of inflation and the implications of the macroeconomic model for monetary policy and its channels of influence throughout the economy.

Key Words: Bank of England, Macroeconomic Model, Monetary Policy

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1. Introduction

The Bank of England (1999, 2000) has presented a report on its approach to macroeconometric modelling. The general implication of that document is that a pluralist approach is adopted where the models utilised include small-scale macroeconomic models and vector autoregression models. Here we focus on the macroeconometric model as set out in Bank of England (1999, 2000). We do this as we believe that the model reveals the underlying structural equations and enables us to interpret the general mode of the Bank’s analysis. In doing so, however, we are mindful that the model “should not be viewed as having a fixed specification. Rather, it is a model that can be operated in different ways, and which can be readily adapted to reflect changes in the economic environment” (p. 25). The Monetary Policy Committee (hereafter MPC) in their document on the transmission mechanisms of monetary policy (Monetary Policy Committee, 1999) have drawn upon the model. A particularly important aspect of this paper is to consider the implications of the macroeconometric model for the formulation of monetary policy and its channels of influence throughout the economy.

The purpose of this paper is to draw out the main theoretical ingredients of the Bank’s model and work out their implications in terms of monetary policy. In the next section we have sought to present a simplified though (we trust) an essentially accurate representation of the Bank of England model. It is simplified in (at least) two senses. First, it is less disaggregated than the Bank of England model; for example, investment is considered as a single entity and not disaggregated by sector. Second, we focus on the ‘long run’ relationships. Following current econometric practice, the Bank of England generally estimates long-run steady-state relationships that have embedded in them short-run dynamics and error correction
mechanisms. Our focus is on the long-run properties of the model. However, we diverge from this in respect of inflation. The section that follows concentrates on the main features of the model, leaving the implications of the model and their significance for monetary policy in a subsequent section. The model of the Bank of England is related to what some have termed the ‘current consensus model’ (cf. Meyer, 2001) in the following section. The paper is completed by a short final section which summarises and concludes.


2.1 General features

In this section we provide a verbal outline of the nature of the macroeconometric model of the Bank of England. The equations and definition of variables are given in the appendix to this paper. Before we examine these equations there are certain key features of the macroeconomic model worth emphasising (see, Bank of England, 1999, pp. 25-26, for more details).

The first feature is that a real equilibrium consistent with a simple Cobb-Douglas production function (with constant returns to scale and diminishing marginal returns to each factor) is assumed. There are two important properties of this equilibrium. One property is nominal neutrality, that is the price level does not affect long-run real equilibrium, which is ensured by assuming static homogeneity, implying that the real equilibrium is not affected if, for example, the level of all nominal variables is doubled; the other property is inflation neutrality, that is the Phillips curve is vertical, which is ensured by assuming dynamic homogeneity so that the real equilibrium is not affected by the growth rates of nominal variables; consequently, there is no long-run trade-off between inflation and unemployment or between inflation and output. The long run is viewed as depending on the supply side of the economy. However, in the short run changes in business investment depends on prior changes in investment and changes in GDP,
while in the long run the ratio of the capital stock to output depends on cost of capital. Thus the supply side changes as investment occurs.

The second feature is that a nominal equilibrium, determined by a selected anchor specified in terms of a target for a nominal variable, currently the inflation rate. A feedback rule for nominal interest rates ensures that the nominal anchor achieves its target. Monetary policy (in the form of the setting of the key interest rate) responds to the current rate of inflation relative to the target rate of inflation. A higher (lower) interest rate lowers (raises) aggregate demand which then is viewed to impact on the rate of inflation. In the long run it is assumed that the target for the rate of inflation can be achieved, and this would be reached through high (low) interest rates used to lower (raise) the rate of inflation.

A third feature is that the price level is related to the quantity of money so that sustained increases in prices cannot occur without an accompanying increase in the money stock. However, the stock of money adjusts to the level of prices rather than vice versa. The stock of money is endogenous but in the long-run nominal equilibrium moves in line with the price level.

The fourth feature is that a sluggish adjustment of nominal and real variables is assumed. It takes time for the economy to respond to shocks that move it away from equilibrium. Real and nominal inertia, essentially in the wage-price system, are assumed to prevail where the speed of adjustment depends on inflation expectations and the exchange rate amongst other variables. A fifth feature is that the UK economy is an open economy, and as such output and inflation are strongly influenced by developments abroad, and by exchange rate movements.

2.2 Equations of the model

The full set of equations which describe our simplified version of the Bank of England macroeconometric model is given in Table 1. The first ten equations are behavioural ones and
the remaining eight are definitional. We now provide a brief discussion on each of the behavioural equations.

Table 1 near here

Equation 1 is the aggregate demand equation with consumer expenditure taken as a function of income, rate of interest, unemployment rate, taxes and real wealth; investment expenditure is made a function of capacity utilisation and real cost of capital; exports is related to total foreign demand, proxied by world trade, and the real exchange rate; government consumption and investment are treated as exogenous and imports is assumed to be a function of domestic income and the exchange rate. The interest rate utilised here is that set by the Bank of England by some operating rule (see equation 7), and it is implicitly assumed that other interest rates (long rate, deposit rate, mortgage rate and real cost of capital) move in sympathy with that ‘repo’ rate. Other interest rates are introduced into the Bank of England model but the relationship of those interest rates to the ‘repo’ rate does not depend on the variables which enter our formulation of the model, and hence we treat those relationships as constant. The real cost of capital depends on the real rate of interest (see equation 15), with the latter via equation (17) being defined as the difference between the nominal rate of interest and lagged price inflation. Hence aggregate demand is a function of income, nominal and real interest rates, capacity utilisation, real wealth and real exchange rate.

Equation 2 defines capacity utilisation as the difference between actual output and the level of output that would be predicted given employment and capital stock (estimated via the Cobb-Douglas production function referred to above). Presumably the idea here is that if employment is relatively low, the capital stock will be underutilised, and output will be low relative to what would be produced with a fully utilised capital stock; hence capacity utilisation on this measure would be recorded as negative. Consequently, capacity utilisation depends on GDP relative to employment hours and the capital stock. It is estimated by residuals from a production
function, that is (all in logs) GDP minus a constant and a weighted average of employment
hours and the capital stock (presumably this works on the basis that as say employment hours
rises, GDP rises more than indicated by the weighted average as capital stock is used more
effectively, and hence measured capacity utilisation rises). As employment hours rise, the
recorded change in capacity utilisation depends on marginal product of labour minus average
product of labour.

Equation 3 is a real wage equation derived from the wage inflation equation for constant
inflation. In this equilibrium equation, the real wage depends on the rate of unemployment
(negatively), the target real wage and a measure of ‘labour market flexibility’.

Equation 4 is similarly derived from the price setting equation, with prices marked over costs
and the size of the mark-up depends on demand pressures. This provides an equation which
relates the (inverse of the) real wage to the level of capacity utilisation. In effect the
combination of equations 3 and 4 would solve out to give a NAIRU. The combination of
equations 2, 3 and 4 can be seen to provide the supply side equilibrium in terms of constant
inflation rate. With equation 2 providing a mapping between capacity utilisation and
unemployment, a solution could be derived for a (misnamed) non accelerating inflation rate
of unemployment (NAIRU).¹

In equation 5 the nominal exchange rate is taken to depend on the exchange rate expected to
prevail a period ahead (derived in a model consistent manner), the interest rate differential
(between the UK and global interest rates) and a term denoted as the risk premium (even in the
long-run). It is evident from equation 10 below this risk premium brings in the influence of the
current account deficit on the exchange rate. This equation combines an interest rate party view
of exchange rate movements with some pressure from the current account. The significant
feature of this interest rate parity approach is that a divergence of domestic interest rates from
world interest rates has implications for changes in the exchange rate.
Equation 6 determines the real stock of money. The form of the equation is that the real stock of money depends on income, wealth and interest rate differential. This can clearly be read as a demand for money equation, and interpreted as the stock of money (in real terms) being demand determined. It is notable that the stock of money does not enter into any other equations, and is akin to being a residual item.

Equation 7 describes a possible reaction function for the setting of interest rates by the Bank of England. Specifically, the nominal rate depends on the deviation of inflation from its target rate and on capacity utilisation, and hence is akin to Taylor’s rule for the setting of the key interest rate.

Equations 8 and 9 describe the inflation process. Price inflation depends on lagged wage inflation, world prices and capacity utilisation. Wage inflation is related to lagged price inflation, the gap between actual and target real wage, the unemployment rate and degree of flexibility in the labour market. Imposing the condition of constant inflation, and wage inflation equal to price inflation, would generate equations 3 and 4.

Equation 10 indicates that the measure of the risk premium for the exchange rate depends on the current account position, and in effect this means that a current account deficit places downward pressure on the exchange rate through the risk premium effect in equation 5.

The remaining equations are definitional. The model consists of 18 equations and 18 endogenous variables. Through equations 3 and 4, the level of economic activity is set on the supply-side of the economy, at a level corresponding to the NAIRU. The level of aggregate demand (equation 1) adjusts to the supply-side, mainly through interest rate and exchange rate adjustments.
3. Implications

There are five interrelated implications that we derive from this model. The first concerns the relationship between the growth of the stock of money and the pace of inflation. It can be noted that the stock of money is demand-determined and acts essentially as a residual item in this model. It is demand determined in that the only equation with the stock of money as the dependent variable (and then it is for broad money M4) is equation 6, and this is clearly intended to be a demand for money equation. The stock of money is a residual in the sense that it does not enter anywhere else within the model. There is no ‘supply of money’ equation nor is there any equation for loans, credit or similar. Bank of England (1999) is clear on this issue: “Though money does not have a causal role in this framework unless the money supply is targeted by interest rate policy, the money supply will move in line with the price level in the long-run nominal equilibrium, in the absence of persistent shifts in velocity” (p. 26). The Bank of England (1999) concludes that “sustained increases in prices cannot occur without an accompanying increase in the money stock. That does not mean that money causes inflation. When the short-term nominal interest rate is viewed as the policy instrument, both money and inflation are jointly caused by other variables” (p. 13). The crucial implication which follows is that it would indeed be the case that the growth of the stock of money and the rate of inflation will be broadly similar, and that it may appear that ‘inflation is always and everywhere a monetary phenomenon’, but the implied direction of causation is from prices to the stock of money.

The second implication concerns the nature of the supply side equilibrium, which as indicated above corresponds to a form of the NAIRU. An increase in capacity (capital stock) would shift this latter relationship with a given level of employment corresponding to a lower level of capacity utilisation. Hence the NAIRU would be seen to depend on the level of capacity. The NAIRU is generally viewed as a labour market phenomenon, and hence actions to
change the NAIRU should focus on the labour market. However, the NAIRU is based on the interactions of price and wage determination, and the abilities of firms to employ labour and to supply output and their pricing and output decisions are also relevant. Specifically, the productive capacity of firms is relevant for their ability to offer employment and influences the real wages that they offer. In a number of papers (e.g., Sawyer, 1999, 2002) we have argued this more formally.

Two particular questions can be asked on the relevance of the NAIRU. First, whether the NAIRU is a strong attractor for the actual level of unemployment. That is to say are there relatively strong forces at work in the economy which would take the economy relatively quickly to the NAIRU. If there are not, then it is possible that over long periods of time, the economy is not operating at or near to the NAIRU. The theorising on the NAIRU has failed to produce any convincing arguments that the NAIRU will be a strong attractor (for further discussion see Sawyer, 1999). It should first be recalled that the models from which a NAIRU is developed would see the equilibrium as involving an equilibrium real wage along with equilibrium (un)employment. Two adjustment mechanisms from the private sector which push the economy towards the NAIRU could be envisaged: the adjustment of real wages and the adjustment of aggregate demand. The adjustment of real wages faces the difficulty that real wages are influenced by the movements of prices and wages, and when (for example) unemployment is low and capacity utilisation high, then both wages and prices would be expected to be rising, and there is no guarantee that real wages will adjust in the required manner. For aggregate demand, there is no reason to think that there will be a movement of aggregate demand towards the NAIRU level.

The second question is whether the NAIRU is aggregate demand sustainable. In other words, are there reasons to think that the appropriate level of aggregate demand will arise to underpin the NAIRU, and if it did whether it would be sustained in the sense that the incomes
(wages, profits etc.) generated at the level of output corresponding to the NAIRU would lead to expenditure which would be equal to output (and also to income). If Say’s Law (that supply creates its own demand) can be held to apply to all levels of supply, then the problem would be solved. But this would require the assertion of a substantial extension to Say’s Law. Say’s Law is taken to mean that the intention of people to supply is also an intention to demand: an individual wishes to supply labour in order to buy goods and services. The sum of the intentions to supply are then taken to be equal to the sum of intentions to demand: full employment (in the sense of all those willing to work doing so) results if the intentions to supply labour come to fruition, and if they do, then the full employment income will all be spent. It is generally recognised that the NAIRU does not (generally) correspond to a position of full employment. Hence the assertion here is not just that full employment income would all be spent, but that the level of income corresponding to the NAIRU would all be spent. In the Bank of England’s model (and more generally) the rate of interest is varied to cause changes in the level of aggregate demand. The issue of the aggregate demand sustainability of the NAIRU can then be seen as the question as to whether there is an achievable interest rate at which aggregate demand equals the NAIRU supply level.

The third implication is derived from the view that the influence of interest rates on inflation runs through the impact on the level of aggregate demand, and then the impact of aggregate demand on the pace of inflation. This stands out clearly in the diagram in Monetary Policy Committee (1999) which is reproduced as Figure 1. Accepting for the moment the second of those links, we focus on the first one. There are two related questions here: first, how does the impact of interest rates on the level of aggregate demand compare with the alternative, that is fiscal policy; and second how does the range within which fiscal policy can be varied compare with the range within which monetary policy (interest rates) can be varied.
The simulations reported in Bank of England (1999, p. 36) for a 1 percentage point shock to nominal interest rates, maintained for one year, reaches a maximum change in GDP (of opposite sign to the change in the interest rate) of around 0.3 per cent after five to six quarters: “temporarily raising rates relative to a base case by 1 percentage point for one year might be expected to lower output by something of the order of 0.2% to 0.35% after about a year, and to reduce inflation by around 0.2 percentage points to 0.4 percentage points a year or so after that, all relative to the base case” (Monetary Policy Committee, 1999, p. 3). The cumulative reduction in GDP being around 1.5 per cent over a four year period. Inflation responds little for the first four quarters (in one simulation inflation rises but falls in the other over that period). In years 2 and 3 inflation is 0.2 to 0.4 percentage points lower (the simulation is not reported past year 3). It should be also noted here that the simulation which is used varies the interest rates for one year: in the nature of the model, there are limits to how far interest rates can be manipulated, and this has some reflection in reality. In the models reviewed by Church et al. (1997), a stimulus of £2 billions (in 1990 prices) in public expenditure (roughly 0.3 per cent of GDP) raised GDP in the first year by between 0.16 per cent and 0.44 per cent and between 0.11 per cent and 0.75 per cent in year 3.\(^5\) Bank of England (1999) are forced to conclude that “even for a given set of assumptions, the effects of a change in interest rates are highly uncertain, because of uncertainty about the true value of the parameters underlying the model” (p.36).

The fourth implication is related to the previous two. It can be noted that we have treated ‘the’ interest rate as endogenous. We have simplified matters to talk in terms of a single nominal interest rate, in effect making the assumption that the spectrum of interest rates rests upon the Central Bank discount rate, but unless there are significant effects (on aggregate demand) from changes in the spectrum of interest rates, this simplifying assumption is
innocuous. In the Bank of England model both the nominal rate and the real rate of interest influence aggregate demand. There is then a rate of interest which generates a level of aggregate demand consistent with the supply-side determined level of economic activity. However, the expected exchange rate has been treated as an exogenous variable in equation (5), and there is an implied rate of change of the exchange rate in that equation. We would expect that a constant exchange rate would require equality between domestic interest rate and world interest rates (apart from any risk premium). There is then a conflict between the (domestic) interest rate required to balance aggregate demand and aggregate supply and that required to maintain the exchange rate (whether in nominal or in real terms).

The fifth implication relates to monetary policy. The Monetary Policy Committee (MPC) has been charged with setting the Central Bank interest rate on a monthly basis with the objective of achieving an inflation target, which is currently set at 2.5 per cent +/- 1 per cent. Treasury (1999) puts this way: “It is important to recognise that the goal of monetary policy should be price stability” (p.12). It is notable that in Treasury (1999) and Monetary Policy Committee (1999) there is no mention of the supply of money (in the sense of the amount of money supplied by the Central Bank or by the banking system) and little mention of the demand for money. The Bank of England's model incorporates a demand for money equation, which can be presumed sufficiently stable and reliable for inclusion in their model. But since the demand for money is a residual with no feedback into the rest of the model, it would be of little consequence if it were not stable. The Treasury appear to take a different view. For example, “The development of global capital markets, financial deregulation, and changing technology led to significant and unanticipated changes in the velocity of circulation of money. As a result, there was no clear and stable relationship between money demand and inflation over this period, making it impossible to rely on fixed monetary rules to deliver price stability’ (Treasury, 1999, p.12). Gordon Brown (1999) makes a similar point and then
remarks that “fixed intermediate monetary targets assume a stable demand for money and therefore a predictable relationship between money and inflation” (p.6) but argues that the demand for money is not stable and hence argues that intermediate monetary targets should not be used.

It could be said that monetary policy (in the form of the setting of a key interest rate) now has little to do with money. The supply of money is not mentioned, and the demand for money is either viewed as unstable (Treasury) or is treated residually (Bank of England). As noted above, in Bank of England (1999) there is an equation for M4 (but not for other monetary aggregates) which is a demand equation in real terms, and hence the stock of money relative to nominal income depends on wealth and interest rate differential (deposit minus base). Hence the stock of money (which some may call the money supply) is seen as determined by nominal income, wealth and interest rate differential. But the direction of causation runs from income and the other variables in the relationship to demand for money (and hence the stock of money, for as the Monetary Policy Committee (1999) remark “monetary and credit aggregates must be willingly held by agents in the economy” (p.11). Thus, the stock of money is determined by nominal income and interest rates rather than the rate of change of money determining the rate of inflation.

Monetary Policy Committee (1999) argue that “monetary policy works largely via its influence on aggregate demand in the economy. It has little direct effect on the trend path of supply capacity. Rather, in the long run, monetary policy determines the nominal or money values of goods and services—that is, the general price level” (p.3). There is a sense in which there is no longer a monetary policy in the sense of concern over either the demand for or supply of money. It is rather that interest rate policy has become aggregate demand policy. It used to be that fiscal policy was associated with aggregate demand policy, now it is monetary policy. The view on inflation that is implicit in this appears to be as follows.
Domestic inflation depends on a range of factors such as unemployment relative to the NAIRU, and in so far as those factors depend on the level of aggregate demand, they can be influenced by variations in the interest rate. It is necessary to take a broader view of the inflationary pressures than just unemployment (relative to NAIRU) or output (relative to trend), and variations in interest rates response to the perception of those inflationary pressures. Nevertheless, the rate of interest influences aggregate demand and the exchange rate (which in turn influences aggregate demand but also the price of imports), and it is only through those routes that interest rate can impact on the rate of inflation.

The sixth implication relates to what may be termed a form of the classical dichotomy. In one sense it could be said that the Bank of England's model is close to being a 'real side' model of the economy. The equation for the demand for money could be removed from the model without any consequence for the properties of the model. But monetary policy in the form of interest rate policy does have an effect. A change in the rate of interest has an impact on the real cost of capital. It also has a more general impact of the level of aggregate demand and thereby on capacity utilisation. The real cost of capital and capacity utilisation influence investment, and thereby the evolution of the capital stock. The implications of aggregate demand for capacity utilisation and thereby inflation are in turn changed.

These effects may be in some relevant sense small. But that may arise because the impact of monetary policy on aggregate demand is small: it could then be said that monetary policy is ineffectual. Even if the effect is small, it does not change the theoretical point that monetary policy can have long lasting real effects. Monetary policy is not neutral.

4. The Macroeconomic Nature of the Model

We can comment on the Bank of England model in terms of its position in the discussion of current mainstream macroeconomic theory and practice. We may utilise the following model
which has the characteristics of such a current ‘consensus’ model (see, for example, Meyer, 2001):

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

(ii) \[ p_t = b_1 Y^g_t + b_2 p_{t-1} + b_3 E_t (p_{t+1}) + s_2 \] (with \( b_2 + b_3 = 1 \))

(iii) \[ R_t = RR^* + E_t (p_{t+1}) + c_1 Y^g_{t-1} + c_2 (p_{t-1} - p^T) \]

Where \( Y^g \) is the output gap, \( R \) is nominal rate of interest, \( p \) is inflation, and \( p^T \) is inflation 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.

Equation (i) is the aggregate demand equation; equation (ii) is a Phillips curve and equation (iii) is a monetary policy operating rule which replaces the old LM-curve. There are three equations and three unknowns: output, interest rate and inflation. Such a model has a number of intriguing characteristic: money has no role in the model; the operating rule implies that ‘policy’ becomes a systematic adjustment to economic developments rather than an exogenous process; there are both lagged adjustment and forward-looking elements; the model allows for sticky prices (the lagged price level in the Phillips-curve relationship) and full price flexibility in the long run; it contains the neutrality of money property, that equilibrium values of real variables are independent of the money supply and that inflation is determined by monetary policy (that is the rate of interest).

McCallum (2001) presents a similar model. The output equation is formulated slightly differently with output depending on expected future output, difference between real government expenditure and expected future expenditure as well as the real rate of interest. But the equilibrium outcome from that equation is the same as from the Meyer model.
In the long run when inflation is constant and expectations fulfilled, equation (ii) clearly indicates that $Y^g = 0$. Equation (i) then would yield $R - p = a_0/a_3$, which gives the real rate of interest. Equation (iii) would be $R - p = RR^* + c_2 (p - p^T)$. Hence $a_0/a_3 = RR^* + c_2 (p - p^T)$ and the long-run rate of inflation differs from the target rate unless $RR^* = a_0/a_3$.

In this model money has no role to play though monetary policy (interest rate policy) does. The operating rule for monetary policy implies that policy becomes a systematic adjustment to economic developments rather than being treated as an exogenous process. There are both lagged adjustment and forward-looking elements in the model. The model allows for sticky prices in the short run but with the rate of inflation presumed to hit the target rate in the long run.

In this approach, changes in the rate of inflation depend on the output gap (cf. equation 2). The rate of inflation at any particular time is the initial rate of inflation plus subsequent cumulated changes in the rate of inflation. Equation 3 indicates an operating rule which will keep the rate of interest above the equilibrium level until the rate of inflation is brought down to its target rate. The mechanism by which inflation is reduced in this model is through interest rates lowering aggregate demand (equation 1), and then aggregate demand impacting on the rate of inflation (equation 2). But fiscal policy would be used in an analogous manner: substitute a rule for monetary policy by a rule for fiscal policy that says lower (raise) government expenditure when inflation is above (below) the target rate.

These characteristics appear also in the Bank of England model, and to that extent the Bank of England model lies within the 'new' mainstream macroeconomics, with the absence of any significant role for money and an operating rule that makes policy responsive to economic events. However, the Bank of England model adds three features. First, in an open economy, the domestic rate of interest cannot persistently diverge from the world rate of interest without a persistent change in the exchange rate. There are significant constraints on
domestic interest rates. Second, interest rates directly and indirectly influence investment, and thereby monetary policy has real effects. Third, fiscal policy influences the level of aggregate demand in that government expenditure and taxation enter equation 1. Fiscal policy and monetary policy then influence aggregate demand and thereby in this model changes in the pace of inflation. Any target rate of inflation can be achieved in this model provided that there is sufficient deflationary policies to cumulatively reduce the rate of inflation. However, deflationary policies have effects on investment, which can influence the supply-side equilibrium of the economy.

It is notable that in a model such as that as Meyer (and in our view that of the Bank of England) there is no market-based mechanism by which the economy moves to the long run supply side equilibrium. The assumed mechanism is the operation of monetary policy according to some rule which is close to Taylor’s rule, that is the real interest rate set is based on a ‘natural’ real rate of interest, deviations of output from trend and difference of actual inflation with target rate of inflation. If the ‘natural’ rate of interest is set incorrectly (e.g. in the model of Meyer above if RR* is not set equal to a0/a3), then the inflation target would not be attained. It is also, of course, the case that the (implicit) use of other policy rules for monetary policy (e.g. setting the interest rate to achieve an exchange rate target) would not in general lead to the achievement of the inflation target.

5. Summary and Conclusions

This paper has sought to analyse the basic nature of the Bank of England’s macroeconometric model. It has argued that the Bank of England’s model is essentially an endogenous money supply view in that the stock of money is demand determined and the stock of money itself has no causal effect on the rate of inflation or the level of economic activity. Monetary policy operates through the setting of the key interest rate, and the effects of such policy (which are
seen as uncertain in magnitude) operate through channels such as effects on investment and
the exchange rate. In other respects, though, the model belongs to that category of
macroeconomic models that have the characteristics of the 'new' consensus in
macroeconomics as argued in the text.

Can it be said that “central banks ultimately determine the inflation rate” (Meyer, 2001)? In
the model of Meyer reported above and that of the Bank of England, the inflation rate is
determined in the long run by the target rate of inflation. The Central Bank is often given the
objective of achieving that rate of inflation, and seeks to achieve that objective through
interest rate policies. In the long term, the Central Bank would have to set an interest rate that
is consistent with that rate of inflation. It can be seen that the real rate of interest in the model
of Meyer is equal to $a_3/a_0$, and hence depends on the effect of interest rates on output ($a_3$) and
on $a_0$. Treating $a_0$ as including the effects of fiscal stance, overseas demand etc., would
indicate that the equilibrium interest rate depends on those other factors. Further, the Central
Bank may not be able to achieve that equilibrium real rate of interest in so far as it diverges
from overseas interest rates, and any difference between domestic interest rate and foreign
interest rate would have implications for changes in the exchange rate.
References


Table 1: Simplified Version of the Bank of England’s Macroeconometric Model

(1) C[Y, R, UR, T, (WTH/P)] + I(CU, RCC) + X(WTR, RER) + G - Q(Y, RER) = Y
(2) CU = Y - Y(L, K)
(3) W/P = N(UR, (W/P)T, F)
(4) P/W = CU(CU)
(5) ER = [ERt-1, (R - Rw), RPRE]
(6) (M/P) = (M/P)[Y, (RD - R), WTH/P]
(7) R = R[((PR) - (PR)T], CU) + PR
(8) PR = PR[WR(-1), (PR)w, CU]
(9) WR = WR[PR(-1), (W/P) - (W/P)T, UR, F]
(10) RPRE = RPRE(BAL)
(11) W = Wx(1 + WR)
(12) P = Px(1 + PR)
(13) UR = U/(L + U)
(14) U = (PARR)x(POP) - L
(15) RCC = RCC(RR)
(16) RER = [(ER)x(P)]/(Pw)
(17) RR = R - (PR)T
(18) BAL = [Xx(Px) - Qx(PQ)] + BIDP + BTRF

where the variables have the following meaning:

**ENDOGENOUS VARIABLES**

BAL = balance of payments
CU = capacity utilisation
ER = nominal exchange rate
L = employment
M = stock of money
P = price level
PR = rate of price inflation
R = nominal rate of interest
RCC = real cost of capital
RER = real exchange rate
RR = real rate of interest
U = unemployment
UR = unemployment rate
W = nominal wage
W/P = real wage
WR = rate of wage inflation
Y = income

EXOGENOUS VARIABLES

WTR = world trade
(W/P)^T = target real wage
BIDP = balance of interest, dividends and profits
BTRF = balance of transfers
F = labour market flexibility
G = government consumption plus investment
K = capital
PARR = participation rate
POP = population.
PR_{w} = rate of world price inflation
P_{w} = world prices
RD = interest rate on deposits
RPRE = risk premium
R_{w} = world interest rate
T = tax revenue
WTH = nominal wealth