# Interest Rates, Exchange Rates and Monetary Policy in Great Britain

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This study analyzes the role of interest rate and exchange rate manipulation in the conduct of monetary policy in Great Britain. Since British gross domestic product is only about fifteen percent as large as that of the United States, a small-open-economy analytical framework is appropriate.[2]

The first task is to develop an appropriate model, which will consist of three equations. The first equation gives the condition of flow equilibrium in the British economy.

$$Y = G_D(\tilde{r} + \rho, Y, \Phi_D) + B_T(Q, Y, \tilde{Y}, \Phi_F) + DSB \tag{1}$$

where $Y$ and $\tilde{Y}$ are the levels of domestic and rest-of-world real income, $\tilde{r}$ is the world real interest rate, $\rho$ is the risk premium on domestic-employed capital, $Q$ is the relative price of domestic in terms of rest-of-world output—that is, the domestic real exchange rate—and $\Phi_D$ and $\Phi_F$ are shift variables. The function $G_D(\quad)$ is domestic private plus public aggregate demand for home-produced goods and services, the function $B_T(\quad)$ is the net foreign demand for domestic output, represented by the trade account balance, and $DSB$ is the debt service balance—that is, domestic residents' earnings on assets held abroad minus foreign residents' earnings on domestic assets they hold. A rise in the domestic real interest rate will reduce aggregate demand by lowering the level of domestic investment and a rise in real income will increase consumption and thereby the the level of aggregate demand. A rise in the real exchange rate makes domestic output relatively more expensive in world markets, reducing the

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[2]In terms of output volume measured in U.S. dollars, Britain is only slightly larger than the obvious small-open-economy Canada, whose GDP is about twelve percent of that of the U.S.

domestic and foereigh demand for it and the level of domestic aggregate demand. An increase in rest-of-world income will increase the demand for domestic output and domestic aggregate demand while and increase in domestic income will increase spending on imports and thereby reduce world demand for domestic output, moderating its effect domestic aggregate demand. The higher the debt-service balance, the higher will be domestic income at each level of aggregate demand for home output.

The second equation is the condition of stock equilibrium

$$M = P\,L(\tilde{r} + \rho + E_p, Y, \Phi_M) \tag{2}$$

where $M$ is the British nominal money stock, $P$ is the domestic price level and $E_p$ is the expected rate of British inflation, making $\tilde{r} + \rho + E_p$ the domestic nominal interest rate. The function $L(\tilde{r}+\rho+E_p, Y, \Phi_M)$ is the demand function for domestic real money balances with $\Phi_M$ being another shift variable. Here, asset equilibrium is represented entirely by equality of the demand and supply of money on the grounds that when domestic residents have their desired level of money holdings they must also have their desired level of aggregate holdings of non-monetary assets. The interest rates on individual non-monetary assets will adjust relative to each other behind the scenes to bring the desired mix of those individual assets into line with the existing mix.

The third equation is the definition of the real exchange rate.

$$Q = \frac{\Pi\,P}{\tilde{P}} \tag{3}$$

where $\tilde{P}$ is the rest-of-world price level and $\Pi$ is the foreign currency price of the domestic currency.

Our model must now be refined to incorporate the possibility that the price level will be fixed in the short-run and flexible in the long-run when there has been sufficient time for it to adjust. And output will be at its full-employment level in the long-run when prices are flexible and will deviate from that level in the short-run when prices are fixed. We can define the full-employment levels of domestic and foreign outputs as $Y_f$ and $\tilde{Y}_f$ and the level of the real exchange rate that will reflect the relative world demand and supply of domestic relative to foreign output under full-employment conditions as $Q_f$ . And under short-run conditions where price levels cannot change and outputs are not at their full-employment levels we can choose the units of output to maintain the price levels constant at values of unity. Letting $\Delta$ represent a deviation from the full-employment level, we can add and subtract the full-employment levels of outputs and the real exchange rate from those variables appearing in the above three equations to generate variables of the form

$$Y = Y + Y_f - Y_f = Y_f + (Y - Y_f) = Y_f + \Delta Y$$

$$\tilde{Y} = \tilde{Y} + \tilde{Y}_f - \tilde{Y}_f = \tilde{Y}_f + (\tilde{Y} - \tilde{Y}_f) = \tilde{Y}_f + \Delta\tilde{Y}$$

and

$$Q = Q + Q_f - Q_f = Q_f + (Q - Q_f) = Q_f + \Delta Q.$$

Under full-employment conditions we impose the assumption that $\Delta = 0$ and under short-run less-than-full-employment conditions we impose the assumption that $P = \tilde{P} = 1$.

Under long-run full-employment conditions, our three-equation model now becomes

$$Y_f = G_D(\tilde{r} + \rho, Y_f, \Phi_D) + B_T(Q_f, Y_f, \tilde{Y}_f, \Phi_F) + DSB \tag{4}$$

$$M = P\,L(\tilde{r} + \rho + E_p, Y_f, \Phi_M) \tag{5}$$

$$Q_f = \frac{\Pi\,P}{\tilde{P}} \tag{6}$$

and under less-than-full-employment conditions it becomes

$$Y_f + \Delta Y = G_D(\tilde{r} + \rho, Y_f + \Delta Y, \Phi_D) + B_T(Q_f + \Delta Q, Y_f + \Delta Y, \tilde{Y}_f$$

$$+\Delta\tilde{Y}, \Phi_F) + DSB \tag{7}$$

$$M = L(\tilde{r} + \rho + E_p, Y_f + \Delta Y, \Phi_M) \tag{8}$$

$$\Pi = Q_f + \Delta Q \tag{9}$$

In the full-employment case, the levels of $Y_f$ and $Q_f$ determined by the existing levels of technology and past real savings will be consistent with the output flow equation (4) and that full-employment output level will result in an equilibrium level of $P$ associated with each level of the nominal money stock in the asset equation (5). The equilibrium nominal exchange rate will move inversely with respect to the domestic price level in equation (6). If the British authorities fix the nominal exchange rate, the equilibrium domestic price level will be established in equation (6) and will vary through time in proportion to the full-employment equilibrium real echange rate. The level of the nominal money supply consistent with asset equlibrium will thereby be endogenously determined in equation (5) and the authorities will be unable to vary the price level by changing the money supply. Any excess of existing money holdings over the equilibrium level will induce domestic residents to buy foreign assets with domestic money. To prevent the nominal exchange rate from deviating from its designated fixed level, the authorities must sell foreign exchange reserves in return for domesitic money until the excess of actual over desired money holdings has been eliminated. Monetary policy will therefore not work under a domestically imposed fixed exchange rate regime although it will work under flexible exchange rates.

Under less-than-full-employment there will be a negative relationship between $\Delta Q$ and $\Delta Y$ in equation (7)—a fall in the real exchange rate will make domestic output cheaper in world markets and increase the demand for it. The resulting increase in $\Delta Y$ will increase the demand for money and be consistent with a higher nominal money stock. When the exchange rate is flexible, an expansion of the nominal money supply by the authorities will cause domestic residents to purchase assets in the world market with these excess money holdings, leading to a devaluation of the domestic currency—that is, a fall in $\Pi$—with the result that $\Delta Q$ will decline, leading to an increase in $\Delta Y$ sufficient to support the rise in $M$ in equation (8). Monetary policy thus works under flexible exchange rates. When, alternatively, the authorities fix the exchange rate, a change in $\Delta Q$ is not possible in equation (9), so no change in output can occur in response to a change in the nominal money supply. An increase in the money supply leads domestic residents to purchase assets in the world market, requiring the authorities to sell foreign exchange reserves to keep the nominal exchange rate from depreciating. This selling will occur until all the excess money holdings have been removed. Monetary policy is therefore not possible under fixed exchange rates.

Consider now the effect of a fiscal expansion, represented by an increase in $\Phi_D$ in equation (7). Given the level of $Q$ under a fixed exchange rate, the effect of this fiscal expansion will be to increase $\Delta Y$. And to maintain the fixed exchange rate the authorities must increase foreign exchange reserve holdings, thereby expanding the nominal money supply as required by equation (8). Fiscal policy thus works under fixed exchange rates. When the exchange rate is flexible, fiscal expansion of output increases the demand for money in equation (8). If in the absence of monetary policy the authorities maintain the nominal money supply constant, this excess demand for money will lead to a sale of assets in the international market in order to maintain portfolio equilibrium. The result will be an excess demand for the domestic currency on the international market and an appreciation of both the nominal and real exchange rates. The rise in the real exchange rate will reduce the demand for domestic output and thereby offset the direct output expansion resulting from the fiscal policy. In equilibrium, the level of output will remain unchanged and the fiscal policy will be unsuccessful. Fiscal policy will thus not work under a flexible exchange rate.

The above result that monetary policy works only under flexible exchange rates and fiscal policy only under fixed exchange rates goes back to the path-breaking work of Fleming and Mundell.[3]

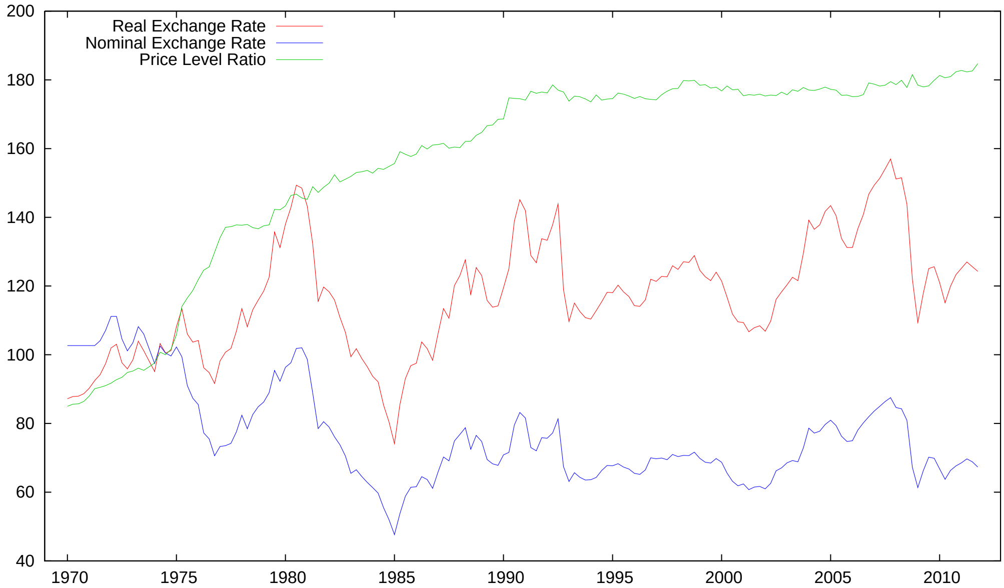
The fact that monetary policy in a country like the United Kingdom operates via its effect on real and nominal exchange rates rather than through changes in the level of domestic interest rates poses a problem for the monetary authority. Upon using monetary policy to move the exchange rate in the desired direction, the authorities lose sight of its underlying equilibrium level. The real and nominal exchange rates are affected by a number of non-monetary factors. Obvious ones in this case are the world prices of British export and import goods and the corresponding world prices of goods exported and imported by the United States. Another obvious factor is the equilibrium net inflows of capital into the U.K. and U.S.—a net real capital inflow increases the demand for the non-traded components of domestic output, leading to an increase in real wages and a rise in the prices of the non-traded components of domestic output and hence in the world price of that output—that is, in the real exchange rate.

The historical movements in the British real and nominal exchange rates with respect to the United States. and in the ratio of British to U.S. nominal price levels are plotted in Figure 1 below. All series are indexed at 1974 = 100. Both the real and nominal exchange rates show substantial variability, showing changes of up to 50 percent in periods as short as 5 years. The price level ratio moves rather smoothly and the real and nominal exchange rates therefore vary in a similar fashion. The effects of U.K. and U.S. terms of trade changes and real net capital inflows on the real exchange rate are shown empirically in regressions that use logarithms of the real exchange rate and terms of trade variables and express the net capital inflow as a percentage of GDP. These regressions are presented in Table 1 further below.

The regression reported in the left-most columm of Table 1 includes the logarithms of U.K. and U.S. real GDP as well as the two countries' unemployment rates for the short sample period extending from 1983 through 2010. The two real GDP variables and the U.K. employment rate variables are not statistically significant and are dropped in the regression reported in the middle column. That regression can now cover the longer period 1974 through 2010. A third regression using only the net capital inflow and terms of trade variables is reported in the right-most column. The regression that includes the U.S. employment rate variable has an R-square close to 0.6 while the exclusively net capital inflow and terms of trade regression has an R-square slightly below 0.5. The actual and fitted values of the middle regression are shown in Figure 2 below Figure

[3] J. M. Fleming, Domestic Policies under Fixed and Flexible Exchange Rates, *International Monetary Fund Staff Papers* 9, 1962, 369-379 and R. A. Mundell, Capital Mobility and Stabilization Under Fixed and Flexible Exchange Rates, *Canadian Journal of Economics and Political Science*, 29, 1963, 475-485.

**Figure 1. United Kingdom Real and Nominal Exchange Rates and Price Level Ratio With Respect to the United States**

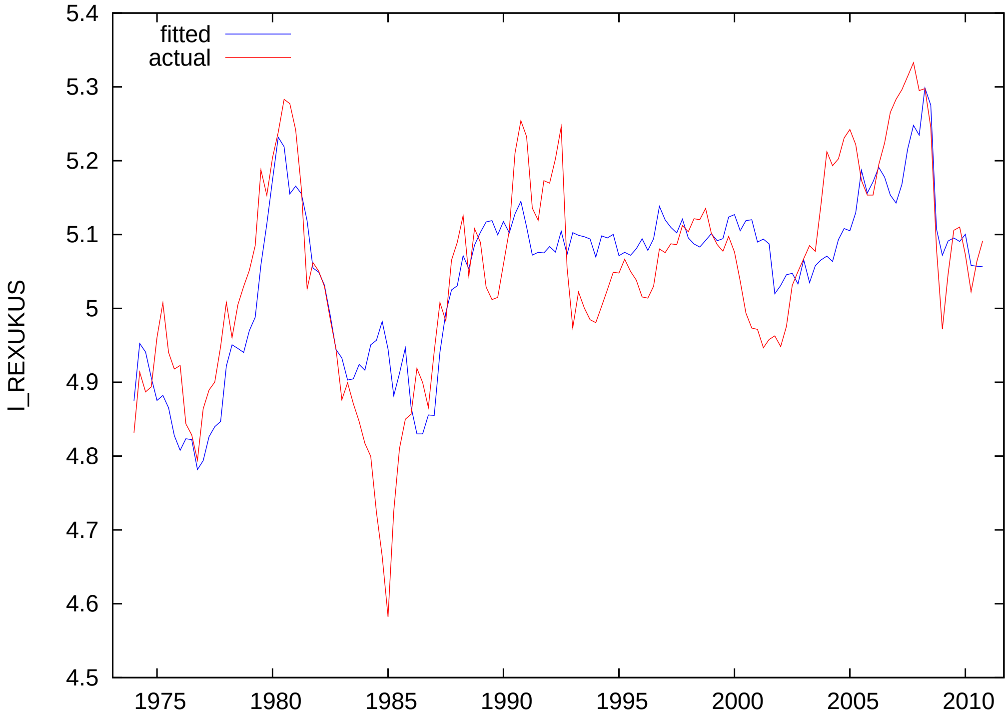



1. Clearly a substantial fraction of the variability of the real exchange rate is explained by the independent variables in the regression, indicating that the underlying real shocks produced major movements in that real exchange rate.

These real exchange rate movements make it difficult for the Bank of England to conduct monetary policy in that the Bank can never know whether a movement in the exchange rate is the result of its policy efforts or a consequence of ongoing changes in technology and other international forces. One alternative is for it to focus on the changes that it has made to the stock of money to determine how tight or easy its monetary policy has been. This raises a further difficulty arising from exchange-rate overshooting.

As noted above, monetary shocks affect the level of output and employment through a process by which domestic residents' attempts to maintain monetary (and portfolio) equilibrium lead them to purchase or sell assets to foreigners. This creates an excess supply or demand of domestic currency in the foreign exchange market leading to a change in the nominal and, given fixed prices in the short-run, real exchange rate that shifts world aggregate demand between foreign and domestic real output. The result will be an increase in the level of output and employment resulting from monetary expansion or a decline resulting from monetary contraction. It turns out, however, that it will take time for the change in the exchange rate to lead to a change in output and employment sufficient to offset the effect of the initial monetary shock.

**Figure 2. Actual and Fitted Valuees for the Regression that includes Real Net Capital Inflows, the Terms if Trade and the U.S. Unemployment Rate**




In the very short-run—say, within a day or two of the monetary expansions—the exchange rate change required to equilbrate asset markets will have no effect on output and, hence, no equilibrating effect on asset markets. The resulting movement in the real and nominal exchange rates could be infinite in magnitude! This is the problem of exchange rate overshooting—a central banker's nightmare! To explore this, consider the demand function for nominal money balances.

$$M = P\ L(\tilde{r} + \rho + E_p, Y_f + \Delta Y, \Phi_M) \tag{10}$$

and rearrange it to put the price level P on the left-hand side to obtain

$$P = \frac{M}{L(\tilde{r} + \rho + E_p, Y_f + \Delta Y, \Phi_M)} = \frac{M}{L} \tag{11}$$

## Table 1. Basic Regression Results

| Dependent Variable | Log Real Exchange Rate | | |
|---|---|---|---|
| Time Period | 1983–2010 | 1974–2010 | 1974–2010 |
| Constant | 7.14796<br>(0.2225) | 3.66<br>(0.1110) | 2.467<br>(0.3372)*** |
| U.K. Capital Inflow as Percent of GDP | 0.0250365<br>(0.0089)*** | 0.0276<br>(0.008)*** | 0.0332<br>(0.0006)*** |
| U.S. Net Capital Inflow as Percent of GDP | -0.0389558<br>(0.0056)*** | -0.0307<br>(0.0048)*** | -0.0192<br>(0.0584)* |
| Log U.K. Terms of Trade | 1.10608<br>(0.2128 | 1.6127<br>(0.0000)*** | 1.601<br>(0.0000)*** |
| Log U.S. Terms of Trade | -1.16787<br>(0.0070)*** | -1.25552<br>(0.0000)*** | -1.041<br>(0.0009)*** |
| Log U.K. Real GDP | 1.15785<br>(0.2427) | | |
| Log U.S. Real GDP | -0.860945<br>(0.3283) | | |
| U.K. Unemployment Rate | 0.00517<br>(0.8004) | | |
| U.S. Unemployment Rate | -0.0318<br>(0.0030)*** | -0.03499<br>(0.0000)*** | |
| NOBS | 112 | 148 | 148 |
| DF | 103 | 142 | 143 |
| RSQ | 0.634 | 0.591 | 0.472 |
| Regression P-Value | 0.000*** | 0.000*** | 0.000*** |

Notes: The variables are defined in the text and the numbers within brackets are coefficient standard errors, all of which are Newey-West HAC-adjusted with bandwidth equal to 3 (Bartlett kernel) to compensate for significant serial correlation in the residuals. The superscripts ***, ** and * denote significance at the 1%, 5% and 10% levels respectively.

which can be written in logarithmic form of as follows

$$logP = logM - logL \tag{12}$$

Clearly an increase in M or decline in L will produce a rise in P in the same proportion. But the domestic price level can be expressed as a geometrically weighted average of the prices of the traded and non-traded components of domestic output with $\theta$ being the share of the non-traded output component in total output.

$$P = P_N^{\theta} P_T^{1-\theta} \tag{13}$$

which, in logarithmic form becomes

$$logP = \theta\, logP_N \, + \, (1-\theta)\, logP_T \tag{14}$$

When substituted into (12) this produces

$$\theta\, logP_N \, + \, (1-\theta)\, logP_T = logM - logL \tag{15}$$

The domestic currency price of the the traded component of output can be expressed as the product of the foreign-currency price, denoted here by $\tilde{P}_T$, and the nominal exchange rate, which in logarithmic form becomes

$$logP_T = log\,\pi + log\tilde{P}_T \tag{16}$$

In the short-run, the domestic price of the non-traded component of output is fixed and the foreign currency price of the traded component can be regarded as independent of movements in the nominal exchange rate. Accordingly, upon substitution of (16) the differential of (15) becomes

$$(1-\theta)\, dlog\,\pi = dlogM - dlogL \tag{17}$$

which upon rearrangement yields the following expression for the short-run effects of domestic money shocks on the exchange rate

$$dlog\,\pi = \frac{1}{1-\theta}\,(dlogM - dlogL) \tag{18}$$

When the share of output that is non-traded is zero, an increase in the money supply or decline in the demand for real money balances leads to an equiproportional increase in the nominal exchange rate—that is, reduction in the value of the domestic currency on the foreign exchange market—while, as the share of output that is non-traded approaches unity, the increase in the nominal exchange rate becomes infinite. When the share equals one-half, a given excess supply of money leads to a devaluation of the currency equal to two times that excess supply of money as a proportion of the money stock. This is an overshooting exchange rate movement because in the long-run when the prices of the non-traded components of output have adjusted the equilibrium exchange rate movement will be in the same porportion as the excess supply of money.

A further potential equilibrating mechanism would arise if it became widely believed that the observed exchange rate movement was an overshooting one. The expectation would be that an overshooting devaluation would correct itself with the result that the expected future appreciation would generate a capital gain on holdings of domestic as opposed to foreign assets. This would cause domestic asset prices to be bid up, resulting in a decline in the domestic interest rate and increasing the demand for domestic money holdings, thereby eliminating the excess supply of domestic money holdings that caused the exchange rate to devalue.

The above analysis suggests that we should add domestic and foreign unanticipated money supply changes to the real exchange rate regressions in the table above. This is done in Table 2 below.

We would expect an unanticipated money supply shock in in the U.K. to have a negative effect on that country's real exchange rate with respect to the U.S. and an unanticipated shock to the U.S. money supply to have a positive effect. In all but one case the effects of the unanticipated monetary shocks on the real exchange rate are statistically insignificant. The significant case is that of the U.S. base money shock in the case where the two base money shocks are added to the basic regression that includes the U.S. unemployment rate as well as the two countries' log terms of trade variables and their net capital inflows as percentages of their GDPs. That case is also the only one in which the unantifipated money shock variable has the wrong sign.

The fact that the U.K. base money and M2 shock variables are statistically insignificant suggests an absence of exchange-rate-overshooting effects of that country's unanticipated money supply shocks. However, the fact that it must be excess demand and supply shocks to the money supply that cause overshooting suggests an alternative interpretation of the evidence when one takes into consideration the fact that central banks must regard overshooting exchange rate changes as undesirable. If the Bank of England were to adopt an orderly-markets approach to monetary policy, it would not create excess money supply shocks and would offset demand for money shocks by corresponding money supply changes to the extent possible. While this would not rule out smooth and gradual ongoing changes in the money supply through time, the observed unanticipated money supply changes in the data could be attribuable to changes in the demand for money through time so that the observed unanticipated shocks are really demand-for-money shocks that were accommodated by equivalent responsive money supply adjustments. The monetary authority will have accomplished this by using base-money-supply adjustments to eliminate

## Table 2. Addition of Unanticipated Money Shocks

| Dependent Variable | Log Real Exchange Rate | | |
|---|---|---|---|
| Time Period | 1983–2010 | 1974–2010 | 1974–2010 |
| Constant | 4.12226<br>(0.0708)* | 4.40744<br>(0.0591)* | 3.41197<br>(0.1399) |
| U.K. Capital Inflow as Percent of GDP | 0.0264636<br>(0.0012)*** | 0.0276<br>(0.0011)*** | 0.02747<br>(0.0008)*** |
| U.S. Net Capital Inflow as Percent of GDP | -0.0309027<br>(0.0041)*** | -0.0301514<br>(0.0054)*** | -0.0296<br>(0.0067)*** |
| Log U.K. Terms of Trade | 1.53946<br>(0.0000)*** | 1.50807<br>(0.0000)*** | 1.6484<br>(0.0000)*** |
| Log U.S. Terms of Trade | -1.27783<br>(0.0000)*** | -1.31181<br>(0.0000)*** | -1.23774<br>(0.0009)*** |
| U.S. Unemployment Rate | -0.0379491<br>(0.0000)*** | -0.035640<br>(0.0000)*** | |
| Unanticipated U.K. Base Money Shock | -0.0004782<br>(0.2436) | -0.0005104<br>(0.1827) | |
| Unanticipated U.S. Base Money Shock | -0.0003947<br>(0.0285)** | | |
| Unanticipated U.S. M1 Monery Shock | | 0.0021938<br>(0.3333) | |
| Unanticipated U.K. M2 Shock | | | -0.000902<br>(0.5675) |
| Unanticipated U.S. M2 Shock | | | 0.001032<br>(0.8648) |
| NOBS | 148 | 148 | 148 |
| DF | 140 | 140 | 140 |
| RSQ | 0.598 | 0.596 | 0.593 |
| Regression P-Value | 0.000*** | 0.000*** | 0.000*** |

Notes: The unanticipated money shocks avariables are the percentage deviations of actual from predicted from running regressions using as independent variables several years of lags of the nominal money variable in question and the country's nominal GDP. The other variables are as defined in Table 1 and the numbers within brackets are coefficient standard errors, all of which are Newey-West HAC-adjusted with bandwidth equal to 3 (Bartlett kernel) to compensate for significant serial correlation in the residuals. The superscripts ***, ** and * denote significance at the 1%, 5% and 10% levels respectively.

changes in the exchange rate beyond established limits.

While the U.K. authorities neutralize major shocks to the exchange rate, modest day-to-day movements are allowed, reflecting on-going changes through time in the underlying equiibrium real exchange rate as well as the public's expected domestic inflation rate. In allowing these movements, the authorities thereby finance all on-going changes in domestic-residents' demand for money. This makes it necessary to ensure that the inflationary expectations are appropriate—if the public thinks there is going to be a greater inflation rate, it will reduce desired money holdings to a lower level and then increase them thereafter at a more rapid rate through time, with the central bank ending up financing these expectations by providing the desired time path of money holdings so that sharp short-run overshooting exchange rate movements do not occur. One of the ways the Bank of England can keep inflationary expectations at an appropriate level is to announce an appropriate desired inflation rate that it will maintain, and also to set an appropriate bank-rate—that is, an interest rate at which it will borrow and lend funds to the commercial banks.

Also, controlling the overnight rates at which the British commercial banks borrow from each other enables the Bank of England to automatically finance changes in U.K. residents' demand for money and thereby minimize overshooting shocks to the country's exchange rates with respect to the U.S. dollar and other currencies, making the previously-noted direct stabilizing interventions in the foreign exchange market unnecessary.

The question arises as to why unanticipated changes in the U.S. money supply generally have no statistically significant observable effect on the exchange rate with respect to the pound. Given the process by which U.S. monetary policy is conducted, the U.S. Fed. would seem to have no interest in what is happening to exchange rates, given that its focus on the manipulation of domestic interest rates and thereby investment. This policy view suggests that substantial effects of U.S. monetary policy on the country's exchange rates should be observed. To the extent that other countries care about their exchange rate with respect to the U.S. dollar, they might be expected to offset U.S. monetary effects on those exchange rates by implementing similar domestic money supply changes, thereby reproducting U.S. policy in the domestic economy. However, it turns out here that the correlation between the U.K. and U.S. unanticpated base money shocks is less than .05 and the correlation between their unanticipated M2 shocks is in the neighborhood of -0.2, although the correlation beween U.S. unanticipated M1 shocks and U.K. unanticipated M2 shocks is positive and slightly above one-third.

It turns out that the Federal Reserve Bank's policy of maintaining a desired level of the federal funds rate may well be responsible for neutralizing any exchange rate effects of unanticipated demand for money shocks. An increase in commercial bank deposits increases those banks' desired reserve holdings, putting positive pressure on the federal funds rate. To keep that rate from rising, the authorities will have to lend reserves to the banks, thereby validating the increase in the money supply associated with the increase in bank deposits. The opposite will occur if the demand for money falls and commercial bank deposits decline. A downward adjustment of the federal funds rate will represent an expansionary monetary policy in that it will involve lending of additional reserves to the commercial banking system by the Fed.

To the extent that U.S. monetary policy has effects on the level of U.S. and world interest rates, and world-wide output and employment changes occur as a result of these and other forces, the U.K. authorities will end up financing the resulting changes in the British demand for money, thereby validating the effects on British output and employment and prices. That is, Britain will end up following a monetary policy very similar to that of the United States. Similar arguments can be made with respect to the monetary policies of other countries.[4]

The monthly year-over-year inflation rates of the United Kingdom and the United States are presented below in Figure 3. The correlation between the two series is .83880584 for the period 1974Q1 through 2010Q4 and .62410024 for the period 1995:Q1 through 2010Q4.

[4]As an example, see my working paper "Canadian Monetary Policy and Real and Nominal Exchange Rates", University of Toronto, 2011.

## Table 3a. Equivalence of U.K. and U.S. Monetary Policy: 1974 Through 2010

| Dependent Variable | U.K. Year-Over-Year Inflation Rate | | |
|---|---|---|---|
| Time Period | 1974:1–2010:4 | 1974:1–2010:4 | 1974:1–2010:4 |
| Constant | -0.378092<br>(0.523385) | -0.311881<br>(0.490403) | -0.446453<br>(0.446854) |
| U.S. Year-Over-Year Inflation Rate | 1.53455<br>(0.0843)*** | 1.53657<br>(0.0828)*** | 1.53157<br>(0.0824)*** |
| U.K. Year-Over-Year Broad Money (M2) Growth | 0.002188<br>(0.028517) | -0.011309<br>(0.0168) | |
| U.K. Broad Money Growth Lagged 1 Quarter | -0.0151516<br>(0.034947) | | |
| U.K. Broad Money Growth Lagged 2 Quarters | -0.0053188<br>(0.034677) | | |
| U.K. Broad Money Growth Lagged 3 Quarters | -0.0035870<br>(0.034919) | | |
| U.K. Broad Money Growth Lagged 4 Quart3ers | 0.015750)<br>(0.028478) | | |
| NOBS | 148 | 148 | 148 |
| DF | 141 | 145 | 146 |
| RSQ | 0.705 | 0.704 | 0.703 |
| Regression P-Value | 0.0000*** | 0.000*** | 0.000*** |

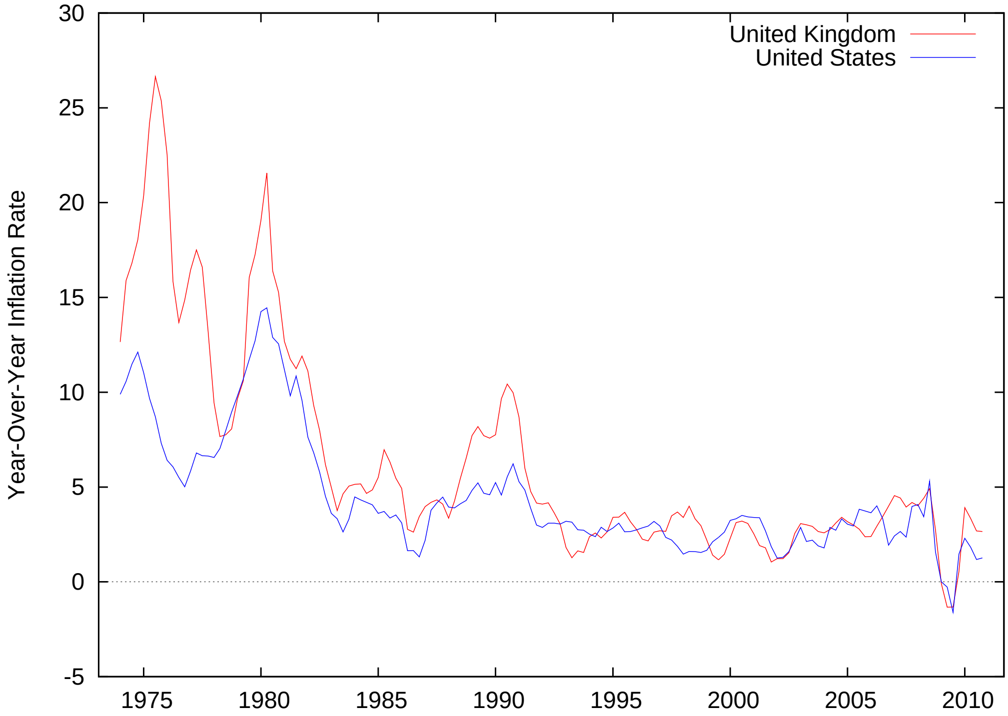
Notes: The quarterly year-over-year money growth variables are in percentages with the underlying levels of the variables as defined previously. The numbers within brackets are coefficient standard errors. The superscripts ***, ** and * denote significance at the 1%, 5% and 10% levels respectively.

## Table 3b. Equivalence of U.K. and U.S. Monetary Policy: 1995 Through 2010

| Dependent Variable | U.K. Year-Over-Year Inflation Rate | | |
|---|---|---|---|
| Time Period | 1995:1–2010:4 | 1995:1–2010:4 | 1995:1–2010:4 |
| Constant | 0.646391<br>(0.438379) | 0.779994<br>(0.333261) | 0.998895<br>(0.2954)*** |
| U.S. Year-Over-Year Inflation Rate | 0.648005<br>(0.1215)*** | 0.644124<br>(0.1151)*** | 0.693507<br>(0.1103)*** |
| U.K. Year-Over-Year Broad Money (M2) Growth | 0.0206548<br>(0.028222) | 0.0274135<br>(0.0198) | |
| U.K. Broad Money Growth Lagged 1 Quarter | 0.0096048<br>(0.030057) | | |
| U.K. Broad Money Growth Lagged 2 Quarters | 0.0021416<br>(0.027029) | | |
| U.K. Broad Money Growth Lagged 3 Quarters | -0.0005437<br>(0.030381) | | |
| U.K. Broad Money Growth Lagged 4 Quarters | 0.0054127<br>(0.027428) | | |
| NOBS | 64 | 64 | 64 |
| DF | 57 | 61 | 62 |
| RSQ | 0.412 | 0.408 | 0.389 |
| Regression P-Value | 0.00002*** | 0.000*** | 0.000*** |

Notes: The quarterly year-over-year money growth variables are in percentages with the underlying levels of the variables as defined previously. The numbers within brackets are coefficient standard errors. The superscripts ***, ** and * denote significance at the 1%, 5% and 10% levels respectively.

**Figure 3. Year-Over-Year Inflation Rates of the United Kingdom and the United States**




As is evident from Figure 3 above, there is no basis for concluding that the U.K. monetary policy was identical to that in the U.S., although there is clearly a positive relationship between them. Between 1974 and 1993 the U.K. got its monetary policy under control and thereby reduced the domestic inflation rate very substantially relative to the U.S. The average inflation rates of the two countries were roughly the same thereafter, But there were short periods in which the two inflation rates went in opposite directions—for example, in the late 1990s and around 2006. The two countries' monetary policies were clearly positively related, however, for most of the post-1990s period during which their inflation rates averaged roughly the same.

As a further test of the conformity of monetary policy in the United Kingdom with that in the United States we can examine the extent to which the U.K. inflation rate is correlated with the U.S. inflation rate and the extent to which current and past British money growth had further effects on that country's inflation rate. The evidence is presented in Tables 3a and 3b above. The first of these tables presents regressions covering the entire period from 1974 through

2010 and the second one presents regressions covering that period after 1995. There is evidence in Figure 3 above that during the period before 1995 inflation was much greater in the U.K. than in the U.S. All three regressions in Table 3a indicate that a rise in the inflation rate in the U.S. was accompanied by an increase in the U.K. that was more than 1.5 times greater while during the period after 1995 a change in the U.S. inflation rate was accompanied by a change in the U.K. inflation rate less than 0.65 times as large. The two-countries'‘inflation rates were highly correlated with the British one exhibiting much greater variability before 1995. It turns out, however, that an F-test of the effects on the British inflation rate, given that in the U.S., of current and lagged broad money growth in the U.K. indicates no effect of significance. For the entire period, the F-statistic for the differences between the the standard errors of the second regression from the left in Table 3a and the left-most regression that includes the U.K. M2 growth variables is $F(4, 141) = 0.13969$ and has a P-Value of 0.967234, indicating that dropping these variables does not increase the regression standard error by a significant amount. And for the period after 1995 the corresponding test statistic is $F(4, 57) = 0.09686$ and its P-Value is 0.983059. In both cases the null-hypothesis that changes in current and lagged British M2 growth had no effects on the U.K. inflation rate beyond that predicted by the the U.S. inflation rate cannot be rejected.

We have to conclude that the Bank of England has followed a monetary policy equivalent to that in the United States, albeit with greater variability in the years before the corrective influence of Prime Minister Margaret Thatcher.