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Asymmetries in Bank of England Monetary Policy

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Abstract

In this paper we estimate limited dependent variable models for Bank of England monetary policy using monthly data over the period June 1997 to March 2003. During this period the Bank has had operational independence to set the interest rate in order to meet the inflation target set by the Government. We find evidence that the Bank has responded to current output growth rather than inflation which is consistent with targeting future inflation when there is a lag in the response of inflation to the output gap. We also find evidence of an asymmetry in the sense that the link between the interest rate and output growth is stronger when an increase in the interest rate is required than when circumstances dictate it should be cut. On the other hand there is considerably more inertia for interest rate cuts in the sense that a cut in the rate in one month significantly increases the probability of a cut in the next month which is not the case for increases.

Keywords: Monetary policy reaction functions, Central Bank independence, binary choice models.

JEL Numbers: E43, E58, C25.

I. INTRODUCTION

In May 1997 the incoming Labour government granted operational independence to the Bank of England. Its objective, as stated on the Bank's website, is "to meet the Government's inflation target – currently 2.5% - by setting short term interest rates". The Bank also defines its objective in the following terms "to deliver price stability (as defined by the Government's inflation target) and, without prejudice to that objective, to support the Government's economic policy, including its objectives for growth and employment" (both quotations from the Bank of England's website). This description of policy can be expressed mathematically in the form of a 'Taylor Rule' linking short term interest rates to deviations of inflation and output from target values and the empirical fit of such equations has been the subject of much recent research. For example, Clarida, Gali and Gertler (1998) estimate monetary policy reaction functions of this type for a variety of economies. Judd and Rudebusch (1998); Clarida, Gali and Gertler (2000) and Rudebusch (2001) use this framework to analyse the monetary policy followed by the US Federal Reserve while Nelson (2000) carries out a similar exercise for the Bank of England.

Decisions on interest rates in the UK are taken by the Bank of England's Monetary Policy Committee (MPC) which meets on a monthly basis to decide on the official repo rate (rate at which the Bank lends to the money markets). Changes in this rate are quickly transmitted to other short term interest rates and then, with lags, to longer term rates, asset prices, real output and inflation (Bank of England 1999). In practice decisions on monetary policy have proved to be less concerned with the ideal level of interest rates and more with the direction in which they should move. Since May 1997, in the 73 months for which we have data, there have been only four different policy decisions taken by the MPC – on 9 occasions the repo rate has been raised by ¼ point, on 11 it has been lowered by ¼ pt, on 4 it has been lowered by ½ pt and on 49 it has been left unchanged.

When the Bank was initially granted operational independence there was considerable concern that this might introduce a deflationary bias into the system. For example, Bean (1998) argues that the lack of a complete contract between the Bank and the Government is a potential source of deflationary bias (although the empirical evidence suggests this might be quite weak). The argument was that the Bank would be less likely to respond by cutting rates in response to a fall in inflation below target than it was to increase rates when inflation rose above target. This problem was seen as arising because of the composition of the MPC which, at least initially, reflected the more conservative views of the banking and finance community rather than manufacturing and industry which were more likely to favour a stimulus in periods of economic downturn cf. Palley (1996).

In this paper we examine an alternative to the continuous Taylor rule for interest rates by estimating an ordered or binary choice model in which the choice is whether to raise or lower the repo rate. We believe this is close to the way in which actual policy has evolved in that changes in the rate are relatively infrequent and, when they do occur, tend to be of a predictable magnitude. This contrasts with much of the literature in which the interest rate is generally treated as continuous – an exception being Dolado *et al* (2000) in which equations for Germany, France, Spain and the US are estimated using an ordered probit approach. Our evidence for the UK is consistent with interest rate movements being more sensitive to output conditions rather than inflation. Although this may seem surprising when inflation is the primary target, we argue that it is consistent with forward looking behaviour when inflation responds to output deviations with a lag. We also show that there is evidence of asymmetry in the sense that an increase in the interest rate in response to positive deviations of inflation and output from target is higher than a cut in the interest rate in response to equivalent negative deviations. On the other hand cuts in rates tend to show more persistence in the sense if the interest rate is cut in one month makes it more likely that there will be a cut in the next month, a pattern which does not hold for increases.

II. DATA

The interest rate data used in this paper is taken from the Bank of England's website. For the ordered logit and probit regressions we code the data as follows 0 = ½ pt cut in repo rate, 1 = ¼ pt cut, 2 = no change, 3 = ¼ pt increase. For the binary choice models the variable is coded as 0 for no change and 1 for either an increase or decrease. Inflation is the 12 month rate of increase in the retail price index minus mortgage interest payments (RPIX). Growth is the 12 month rate of increase in Gross Domestic Product (GDP) where the monthly data have been constructed using ONS quarterly data and interpolating using data on Industrial Production by means of the Chow-Lin (1971) procedure. The other variables used are zero-one dummy variables for increases or cuts in the interest rate in the previous month.

III. ESTIMATES

As a first stage we estimated ordered regressions for interest rate changes in which the independent variables are the current rate of inflation and the rate of growth of GDP. Our prior expectation is that both these variables will have a positive sign i.e. will increase the probability of an interest rate increase while reducing that of a cut. Since the sample is somewhat unbalanced (zero change occurs more often than either increases or cuts) we estimated our regressions using both probit and logit functional forms to investigate if any differences emerged. The results are reported in Table 1. Numbers in parentheses are *z* statistics which provide an asymptotically normal test for the null hypothesis that the coefficient in question is equal to zero. Goodness of fit is measured by the Likelihood Ratio Index or the Pseudo R^2. All estimates were obtained using the EViews 4.1 regression package.

[Insert Table 1 here]

In practice the functional form used makes very little difference to the results but we report both sets for the interested reader. In terms of the economic interpretation of the regression equations, we find that the current rate of inflation plays very little role in determining the probability of interest rate changes as can be seen by the low level of significance of this variable and the fact that its sign is opposite to that expected. In contrast the growth rate coefficient both has the correct sign and is statistically significant. It is tempting to interpret this as indicating that the Bank is stabilising output rather than pursuing its designated target of stabilising inflation. However, an alternative explanation (which we believe) is that the Bank is adopting a forward looking strategy to stabilise inflation over the immediate future. Since most estimates of the price adjustment equation indicate that the output gap enters with a lag, it makes sense to respond to the current output gap in order to stabilise future inflation.

One implication of the fact that changes in interest rates have tended to be small in magnitude (typically ¼ pt) is that there are occasions when the total desired change is unlikely to be achieved in a single adjustment. Thus there have been occasions when there have been several months in which successive interest rate changes have been in the same direction. To test for this formally we report regressions in Table 1 in which dummy variables have been included which capture the direction of movement of the interest rate in the previous period. Thus the lagged cut term is zero if the interest rate was not cut in the previous month and one if it was. The lagged increase term is defined in the same way. We note from Table 1 that the lagged cut coefficient is significant in both the probit and logit regressions while the lagged increase coefficient is insignificant in both cases. This indicates a basic asymmetry in monetary policy in the sense that a cut in the interest rate in one month makes it more likely that it will be cut again in the next month. However, no such inertia exists with respect to increases in the interest rate. Note that the inclusion of the lagged adjustment terms makes little difference to the estimated coefficients for inflation and the growth rate.

The estimated limit terms reported below each regression (z-statistics in parentheses) allow us to calculate the probability of each of the events being modelled as well as the marginal effects of the exogenous variables on each event cf. Greene (1993, chapter 20). The actual frequencies observed for the ½ pt cut, ¼ pt cut, zero change and ¼ pt increase are 0.06, 0.14, 0.67 and 0.13. Using the probit model with the inertia terms included we obtain estimates of the probabilities equal to 0.004, 0.09, 0.84 and 0.07 and for the logit model with inertia terms we obtain 0.009, 0.07, 0.84 and 0.08. This is a source of some concern in that our estimated model tends to underpredict changes in the interest rate in either direction in favour of no change. In particular our model assigns virtually zero probability to a ½ pt cut in the interest rate. However, the results may simply reflect the fact that we have a relatively small sample and the addition of more data may lead to the estimated probabilities converging to their true values.

[Insert Table 2 here]

One of the problems of limited dependent variable models is that the coefficient estimates do not measure the marginal effects of changes in the exogenous variables in the same way as they do with the standard linear model with a continuous dependent variable. However, we can calculate the marginal probability effects as shown in Table 2. These results show that inflation and the lagged increase terms have almost no effect on the marginal probabilities. In contrast the output growth and the lagged cut terms both affect the marginal probability terms in meaningful ways. An increase in output growth increases the probability of an increase in the interest rate and reduces that of a cut. Similarly an interest rate cut in one period increases the probability of a cut in the next period and reduces the probability of an increase.

Since our regressions in Table 1 indicate some *prima facie* evidence of an asymmetry in monetary policy, we decided to investigate this further by estimating simple binary models for increases and cuts in interest rates respectively. In Table 3 we present the results of a regression in which the dependent variable is a zero-one dummy variable in which zero corresponds to no change or a cut while one corresponds to an increase. We report three models – the linear probability model, probit and logit estimates. Numbers in parentheses below coefficients are *z* statistics while numbers in bold type are the marginal probabilities. In the case of the linear probability model, the estimates of the marginal probabilities are equal to the coefficients. The estimates again indicate that both inflation and output growth have the correct sign but the inflation term is only marginally significant while the output growth term is strongly significant. The lagged increase term is not significant in any of the regressions. The marginal probabilities are very similar for the probit and logit models but in each case these are lower than those estimated using the linear probability model.

[Insert Table 3 here]

Table 4 presents results for a binary regression for interest rate cuts. In this case the inflation coefficient has the wrong sign although growth has the correct sign. However, in both cases these variables are insignificant. The lagged cut term proves to be highly significant in this case indicating that inertia is much more important for interest rate cuts than it is for increases.

[Insert Table 4 here]

IV. CONCLUSIONS

In this paper we have investigated Bank of England monetary policy during its period of operation independence using a limited dependent variable approach. Estimation using an ordered dependent variable indicates that output growth is the most important determinant of the probability of interest rate changes. There is also some evidence of inertia in that a cut in the interest rate in one month increases the probability that it will be cut again in the subsequent month while reducing the probability that it will be increased. We investigated this asymmetry further by estimating simple binary choice models for increases and cuts in the interest rate. These indicate a significant asymmetry in policy in that the interest rate responds strongly in a positive direction to an increase in growth with very little evidence of inertia. In contrast the evidence for a systematic effect of low growth on the probability of a cut in the interest rate is much weaker and there is considerably more inertia when the direction of movement is downwards.

REFERENCES

Bank of England, Monetary Policy Committee (1999) 'The Transmission Mechanism of Monetary Policy' www.bankofengland.co.uk.

Bean, C. (1998) 'The New UK Monetary Arrangements: A View from the Literature', *Economic Journal*, Vol 108, No 451 pp. 1795-1809.

Chow, G.C. and Lin, A.L. (1971) 'Best Linear Unbiased Interpolation, Distribution, and Extrapolation of Time Series by Related Series', *Review of Economics and Statistics*, Vol 53, No 4, pp. 372-375.

Clarida, R., Gali, J. and Gertler M. (1998) 'Monetary Policy Rules in Practice: Some International Evidence', *European Economic Review*, Vol 42, Issue 6, pp. 1033-1067.

Clarida, R., Gali, J. and Gertler M. (2000) ' Monetary Policy Rules and Macroeconomic Stability: Evidence and Some Theory', *Quarterly Journal of Economics*, Vol 115, Issue 1, pp. 147-180.

Dolado, J., Maria-Dolores, R. and Navier, M. (2000) 'Asymmetries in Monetary Policy Rules: Evidence for Four Central Banks' *CEPR Discussion Paper No 2441*.

Greene, W.H. (1993) *Econometric Analysis: 2nd Edition*, New York: Macmillan.

Judd, J. and Rudebusch, G.D. (1998) 'Taylor's Rule and the Fed, 1970-1997', *Federal Reserve Bank of San Francisco Economic Review*', Vol 3, pp. 3-16.

Nelson, E. (2000) 'UK Monetary Policy 1972-1997: A Guide using Taylor Rules', *Bank of England Working Paper No 120*.

Palley, T.I. (1996) ' The Institutionalization of Deflationary Monetary Policy', *Economies et Societies*, Vol 30, Nos 2-3, pp. 247-268.

Rudebusch, G.D. (2001) ' Is the Fed too Timid: Monetary Policy in an Uncertain World' *Review of Economics and Statistics*, Vol 83, No 2, pp. 203-217.

Table 1: Ordered Dependent Variable Estimates. Monthly Data June 1997 to March 2003 (70 Observations)

	Ordered Probit		Ordered Logit	
Inflation	-0.1991	-0.0170	-0.3294	-0.1279
	(0.47)	(0.04)	(0.44)	(0.16)
Growth	0.9733	0.8232	1.6679	1.4563
	(3.79)	(2.85)	(3.61)	(2.79)
Lagged Cut		-1.6500		-2.8998
		(3.77)		(3.63)
Lagged Increase		-0.0410		0.0794
		(0.08)		(0.09)
Limit 1	-1.77 (6.18)	-2.62 (5.88)	-3.21 (5.23)	-4.61 (5.49)
Limit 2	-0.88 (4.38)	-1.37 (4.90)	-1.51 (4.22)	-2.40 (4.51)
Limit 3	1.62 (5.79)	1.44 (4.89)	2.74 (5.33)	2.50 (4.56)
Log Likelihood	-56.78	-49.11	-57.36	-49.79
Pseudo R^2	0.13	0.25	0.12	0.24

Table 2: Marginal Probability Effects for the Ordered Regression Model

Probit Model				
	Inflation	Output	Lagged Cut	Lagged Increase
½ pt cut	-2.333×10^{-4}	-0.011	0.124	3.519×10^{-4}
¼ pt cut	2.538×10^{-3}	-0.123	0.360	1.818×10^{-3}
No change	-4.866×10^{-4}	0.024	-0.385	4.856×10^{-3}
¼ pt increase	-2.285×10^{-3}	0.111	-0.099	-7.026×10^{-3}
Logit Model				
	Inflation	Output	Lagged Cut	Lagged Increase
½ pt cut	2.333×10^{-4}	-0.014	0.1110	-5.524×10^{-4}
¼ pt cut	7.595×10^{-3}	-0.098	0.376	-3.963×10^{-3}
No change	-8.383×10^{-4}	0.011	-0.392	-2.918×10^{-3}
¼ pt increase	-7.872×10^{-3}	0.102	-0.095	7.433×10^{-3}

Table 3: Interest Rate Increase Model. Monthly Data June 1997 to March 2003 (70 Observations)

	Linear Probability Model	Probit	Logit
Inflation	0.2001	1.3238	2.3158
	(1.91)	(1.81)	(1.78)
		0.118	**0.098**
Growth	0.1544	1.1619	2.0826
	(2.87)	(2.55)	(2.43)
		0.103	**0.088**
Lagged Increase	-0.0257	-0.3372	-0.5011
	(0.21)	(0.50)	(0.44)
		-0.030	**-0.021**
Log Likelihood	-11.49	-17.03	-17.26
R^2 - McFadden R^2	0.20	0.32	0.31

Table 4: Interest Rate Cut Model. Monthly Data June 1997 to March 2003 (70 Observations)

	Linear Probability Model	Probit	Logit
Inflation	0.1476	0.7116	1.5205
	(1.30)	(1.20)	(1.32)
		0.153	**0.162**
Growth	-0.0669	-0.4222	-0.7792
	(1.11)	(1.18)	(1.18)
		-0.091	**-0.083**
Lagged Cut	0.5442	1.6541	2.8548
	(5.02)	(3.52)	(3.46)
		0.356	**0.304**
Log Likelihood	-18.68	-23.47	-23.60
R^2 - McFadden R^2	0.34	0.30	0.30