How well does a limited participation model of the monetary transmission mechanism match UK data?

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Abstract

In this paper we determine how well a 'limited participation' model of the monetary transmission mechanism is able to match important aspects of the UK economy. Such models were developed initially by Lucas (1990), Fuerst (1992) and Christiano and Eichenbaum (1992, 1995), but our version (described in detail in Dhar and Millard (2000)) follows closely that of Christiano and Gust (1998), with the addition of investment adjustment costs. Given that we have not, as yet, attempted to model the endogenous monetary policy rule being followed by the monetary authority, we would not expect the model to match the correlations and variances in the data. However, subject to this caveat, we find that it can reproduce the stylised fact that there is little relationship between monetary aggregates and either output or inflation, even though the underlying cause of inflation is money growth. We also find that the money-income and money-inflation relationships vary substantially depending on what type of shock is hitting the economy. We take this as a strong argument for structural modelling of the monetary transmission mechanism in which shocks are identified. We show that the model is able to capture important features of the monetary transmission mechanism in the United Kingdom as embodied in the responses of variables to monetary policy shocks.

1 Introduction and overview

In this paper we analyse the ability of a state-of-the-art model of the monetary transmission mechanism to match the relationships between nominal and real variables that we see in UK data. We know that all useful models are stylised representations, which inevitably abstract from one or other aspect of reality in order to focus on particular issues of interest; our particular concern is whether these models can allow us to interpret the information contained in monetary aggregates about future prices and activity — both corroborative and incremental — and so we aim to convince ourselves that the model is able to generate the same relationships between real and nominal variables that we see in the UK data.

The model that we examine is an example of a 'limited participation' model (see, for example, Lucas, (1990); Fuerst (1992); Christiano and Eichenbaum (1992, 1995)); it is described in detail in Dhar and Millard (2000). These models have recently become a popular method of representing the monetary transmission mechanism in the United States, and part of our motivation for this paper is to see whether they do as well in terms of UK data.

The paper is structured as follows. Section 2 briefly describes the limited participation model that we are going to use (more detail can be found in Dhar and Millard (2000)). Section 3 assesses the model's ability to reproduce stylised facts about the UK business cycle, including the relationship observed between various money aggregates, output and inflation. Given that we do not specifically model the endogenous monetary policy rule being followed, we do not expect the model to perform well on this criterion. However, the results are still informative. Section 4 examines how these stylised facts might be shock-dependent; specifically, we ask whether the pattern of observed variances and correlations between variables changes according to whether the shock is monetary or real. Section 5 compares impulse responses from the analytical model with those generated by a structural vector autoregressive (VAR) model of the monetary transmission mechanism. We find that the analytical model predictions are broadly consistent with those of our structural VAR. As this comparison does not depend on our modelling the endogenous monetary policy rule, we consider this result to be the strongest empirical support for our model. Finally, we conclude with some observations on future directions that this work could take.

2 The model

The model we use is that of Dhar and Millard (2000); it is similar to those of King and Watson (1996) and Christiano and Gust (1998). There are four types of agents in the model: households, firms, banks and a monetary authority.

The timing and direction of flows of funds in the limited participation set-up are extremely important. At the beginning of the period, the households have all the money, M_{t-1}, and decide how much spending money, S, to hold in order to buy consumption goods, C, in the period and how much to deposit with the banks; they make this decision (and their later decision on labour supply) in order to maximise the present discounted value of their current and expected future streams of utility; in addition, they face a cost of adjusting their financial portfolios relative to the previous period. The banks then lend money out to the firms as working capital, out of which the firms pay wages. Given that they are owned by the households, the firms decide how much labour to employ, output to produce and capital to purchase in order to maximise the utility-weighted present discounted value of their profit streams. As they are borrowing to finance their wage bills (working capital), the firms' demand for labour (and hence loans) will be a decreasing function of the nominal interest rate. The money lent by the banks to the firms will consist of the deposits of the households plus new reserves from the monetary authority, X, which are injected into the economy via open market operations (OMOs). In an interest rate setting environment, the demand for new reserves will be determined by the demand for loans.

During the period, the households purchase goods with their retained money, S, and any wages received, Wh; they have to use cash to purchase goods. Here W is the nominal wage and h represents total hours worked. At the end of the period, the firms pay interest to the banks, $(1+R)(M - S)$, and dividends, *D*, to the households. The banks pay interest on the households' deposits, $(1+R)(M_{t-1} - S)$, and send their profits, $(1+R)X$, to the households (assumed to own them). Hence the households end up holding all the money at the end of the period. Note that the markets for goods, loans and money all clear. These 'flows of funds' are illustrated in Charts 1 and 2.

Chart 1: Beginning-of-period flows of funds

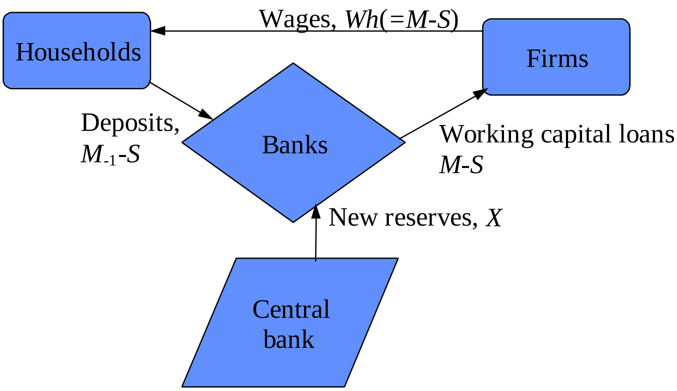
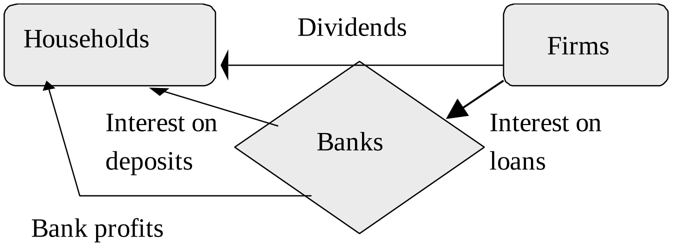


Chart 2: End-of-period flows of funds



Monetary policy in this version of the model is described as a rule for the growth rate of money. We ensure that the money growth rate reacts 'appropriately' to monetary policy shocks, ie in the same way as estimated in Dhar, Pain and Thomas (2000). We use this rule not because we believe the Bank of England targets money — clearly it does not — but because the model is much easier to solve under a monetary rule. However, we can also use the argument of Christiano, Eichenbaum and Evans (1998) to justify our use of a monetary rule *as a modelling strategy*, even though we know that the central bank does not target money in reality. Their argument runs as follows: in order to implement a rule that makes interest rates depend on endogenous variables, the growth rate of money has to respond to the fundamental shocks hitting the economy in a particular way. Provided we ensure that the response of the money supply to particular shocks is correct, then the responses of the other endogenous variables to these shocks will be identical to those obtained from a model in which the central bank was operating the endogenous monetary policy rule which actually applied in the data period. Given that we are able to identify within a VAR the response of variables to a 'monetary policy' shock, we feel happy in using a money growth rule that responds in the correct way to this shock. We stress that the model will not produce the correct responses of endogenous variables to other shocks, nor will it be able to reproduce the variances and correlations of endogenous variables that we see in the data; to address these issues, we would need to use an independent estimate of the policy rule within the model.(1) (For an example of where this approach has been taken, see Ferré and Millard (1998).)

The model is calibrated by ensuring its non-stochastic steady state matches key features of the UK economy (although in future work we aim to use a maximum likelihood technique to estimate these). Details can be found in Dhar and Millard (2000). We then solve the model using techniques developed by King and Watson (1998).(2)

Having solved the model, we can simulate it, assess its qualities by comparing selected moments of the simulated data with UK data, compare its impulse response functions with those implied by an empirical counterpart (eg a VAR), and analyse its forecasting ability. We do this in the following sections of the paper.

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(1) We thank Andrew Scott for drawing this point to our attention in the course of a series of exchanges on these issues.

(2) We are grateful to Professor King for providing us with his software for doing this.

3 Cyclical stylised facts

In this section we assemble a number of stylised facts about the relationship between money aggregates, the real economy and prices, and compare our model's predictions with the data. In particular, we examine a variety of variances and correlations of money, interest rates, output and prices. As we said earlier, the fact that we are using an exogenous monetary policy rule means that we cannot expect to capture these variances and correlations very well; they will clearly be affected by the actual monetary policy rule in force. Rather surprisingly we find that, despite this, our limited participation model generates predictions that are broadly consistent with the pattern of leads and lags between monetary aggregates, real activity and prices evident in the data.

Charts 3 to 6 summarise the cyclical properties of our 'output' and 'price' variables together with M4 and M4 lending. In each case the data is quarterly and we detrend the series using the Hodrick-Prescott (H-P) filter. Chart 7 plots the quarterly growth rate of M4 and the quarterly inflation rate (measured using our price series). Chart 8 plots the base rate and the long (20-year) bond rate (ONS codes: AMIH and AJLX respectively).

From their analysis of similar data, Garratt and Scott (1998) concluded that:

- there is little evidence that aggregate money consistently predicts output. The strongest evidence is that money lags output;
- the relationship between a particular money aggregate and output or inflation varies between business cycles; and
- in any one business cycle the relationship between money and output varies across the monetary aggregates.

Our data confirm these findings. We regard the first of these conclusions as a statement about the average behaviour of monetary aggregates across business cycles, whereas the second and third describe the dependence of the money-output relationship on the type of disturbance generating the cycle.

Chart 3: Cyclical behaviour of output

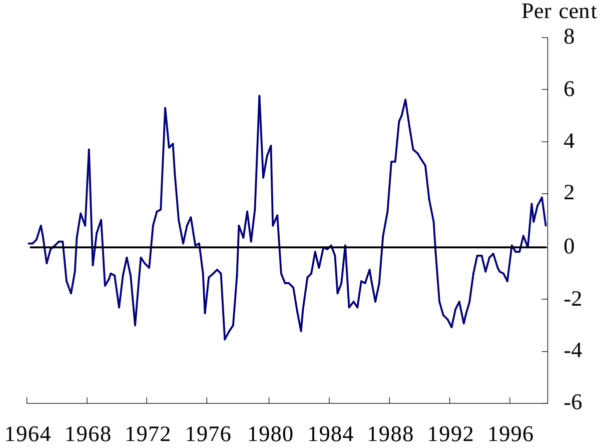


Chart 4: Cyclical behaviour of prices

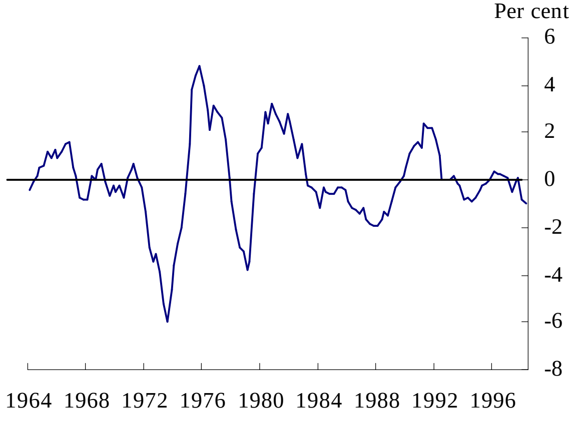


Chart 5: Cyclical behaviour of M4

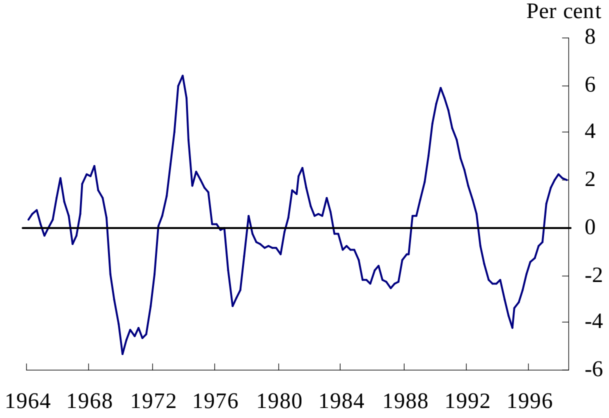


Chart 6: Cyclical behaviour of M4 lending

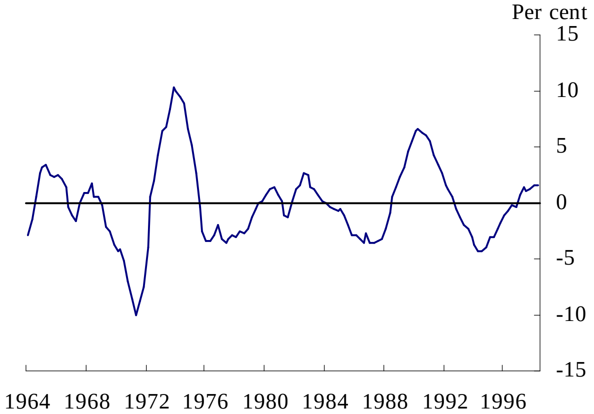


Chart 7: M4 growth and inflation

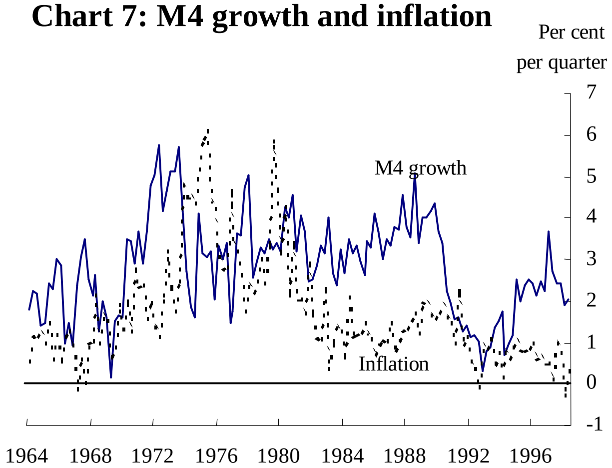
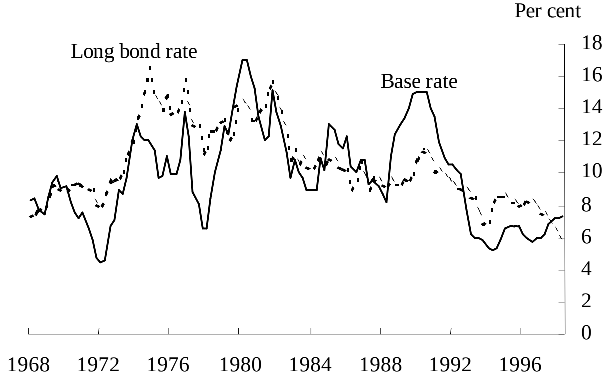


Chart 8: Short and long-run nominal interest rates



The limited participation model we have developed has three shocks, and in order to assess its ability to account for these stylised facts (subject to the caveat that we have not modelled the endogenous response of monetary policy to two of these shocks) we use stochastic simulations of the model. In particular, we take repeated random draws from the joint distribution of all the shocks in the model and compare the variances and cross-correlations of our endogenous variables with those in the data.(3) In each case we run 100 simulations, each 138 periods in length (a length of time corresponding to the 1964 Q1 to 1998 Q2 period over which the model was calibrated). From these experiments we draw conclusions about the data-consistency of our model, about average leading-indicator properties and about shock dependence.

Columns 1 and 2 of table A show the variance of our measures of consumption, investment, output, M4, M4 lending, quarterly inflation, the FTSE All-share index (ONS code: AJMA), and short and long-run nominal interest rates, in absolute terms and also relative to the variance of our output measure (normalised at 1) for the sample period 1964 Q1 to 1998 Q2. Each variable was H-P filtered, all variables other than inflation and the two interest rates having been logged first. Thus the variances are expressed as percentages, except for those of inflation and interest rates where the variances are expressed as percentage points. Columns 3 and 4 report the average values of these same statistics obtained over the stochastic simulations (with standard errors in brackets).

These show that the model does relatively well — though far from perfectly — in replicating the relative variances of real and monetary variables. In a sense this is surprising, as we would have expected the model to do poorly because it is not taking account of the monetary policy rule being followed. As is usual in models in which the real side of the economy is specified in this way, investment is too volatile relative to output (even with investment adjustment costs), whereas consumption is too smooth relative to output. The two disappointing features are that inflation is far too volatile, both absolutely and relative to output, and the

(3) Due to lack of a comparable measure in the data, we assumed that the money demand shock had a standard deviation of 1%. The standard deviation of the productivity shock was set at 2.7%, calibrating the model to match the variance of output in the data. The standard deviation of the monetary policy shock was set to match the estimate of Dhar, Pain and Thomas (2000).

model does not generate enough volatility in money and interest rates. The excess inflation (and hence price) volatility is the main recurring failure of our model and one that we aim to address as a priority in order to make this model more usable for policy analysis. Short-run interest rates and money are both less volatile relative to output than their real-world counterparts, but the volatilities of short and long interest rates, M4 and M4 lending are fairly close to the data in terms of how they relate to each other. Equity prices are more volatile than output in both the data and the model, but the model is unable to generate enough volatility.

The lack of volatility of money, interest rates and equity prices relative to output is a function of the variance of the underlying (stationary) monetary policy and money demand shocks, which account for all the low-frequency components of these variables in the simulations. However, Dhar, Pain and Thomas (2000) suggest that monetary regime changes account for a large proportion of money and interest rate variability in recent UK economic history, and these regime changes can be approximated by a change in some underlying inflation target. In the context of our model, simulating this would involve introducing another shock — the implicit inflation target — and for each random draw of this target, recalibrating the model for this new steady-state inflation rate and then simulating. We would also have to take a stand on the process underlying changes in the inflation target — something that, in practice, would have been political — as we would expect agents in the model to understand that the implicit inflation target was changing over time. As we consider this experiment to be outside the scope of the current paper, we have not done this as yet (though we intend to return to it in future work); but, we conjecture that, correctly parameterised, this procedure could replicate the appropriate degree of past variability in money and interest rates. Of course, the performance of the model with respect to the volatility of inflation may well worsen if we took account of this shock, suggesting that a more urgent priority may be to deal with that particular problem.

Table A: Variances of money, output and prices

	Standard error in data		Standard error in simulation	
	Absolute (%)	Relative to Y	Absolute (%)	Relative to Y
Output	2.03	1.00	2.03 (0.13)	1.00
Inflation	0.71	0.35	1.51 (0.10)	0.74 (0.06)
Consumption	1.82	0.90	1.16 (0.07)	0.57 (0.03)
Investment	4.04	1.99	5.04 (0.32)	2.48 (0.07)
M4	2.46	1.21	0.56 (0.15)	0.28 (0.08)
M4L	3.67	1.81	0.95 (0.51)	0.47 (0.26)
Stock market	12.96	6.38	3.66 (0.23)	1.80 (0.16)
Base rate	1.86	0.92	0.34 (0.02)	0.17 (0.02)
20-year rate	0.95	0.47	0.05 (0.00)	0.02 (0.00)

Table B shows the correlation between H-P filtered measures of money/credit and our measure of output at various leads and lags over the sample 1964 Q1 to 1998 Q2, and compares these with correlations taken from our first type of stochastic simulation. Table C shows a similar comparison of correlations between money/credit and our measure of prices. M4, M4 lending and short and long-run interest rates clearly lag output in the data (by about one to two years). The last result may be seen as evidence for the Bank of England following an endogenous monetary policy rule. In our model, given exogenous money growth, output is uncorrelated on average with money or interest rates; when an economy is subject to real (technology, money demand) and nominal (monetary policy) shocks, on average real and nominal magnitudes are unlikely to co-vary.

Table B: Correlation of output with variable x at time:

X	t-16	t-8	t-4	t-1	t	t+1	t+4	t+8	t+16
M4 - data	-0.24	-0.51	-0.14	0.28	0.42	0.51	0.59	0.43	-0.26
Simulation	-0.01	0.03	0.03	-0.03	-0.07	-0.05	-0.01	0.01	-0.00
M4L - data	-0.17	-0.56	-0.12	0.31	0.44	0.53	0.60	0.34	-0.23
Simulation	-0.02	0.04	0.06	-0.03	-0.11	-0.09	-0.03	0.01	0.00
Short rate - data	0.14	-0.48	-0.39	0.00	0.20	0.41	0.68	0.46	-0.46
Simulation	-0.01	0.01	-0.01	-0.08	-0.14	0.02	0.03	0.01	-0.01
Long rate - data	0.20	-0.27	-0.41	-0.29	-0.16	0.00	0.42	0.60	-0.38
Simulation	-0.01	0.01	-0.01	-0.08	-0.13	0.02	0.03	0.01	-0.01

The relationship with inflation is interesting. The data suggest that high M4 and M4 lending predict high inflation but low output two years ahead. In the model simulations, the lag from M4/M4L to inflation is just a quarter. So, even though the model successfully generates some endogenous nominal persistence, the feed-through from money to inflation is quicker than is apparent in the data. Again the model produces too much movement in prices relative to the data.

Table C: Correlation of prices with variable x at time:

X	t-16	t-8	t-4	t-1	t	t+1	t+4	t+8	t+16
M4 – data	-0.13	0.56	0.33	0.07	-0.01	-0.07	-0.15	-0.25	-0.21
Simulation	-0.02	-0.13	-0.00	0.37	0.17	0.23	0.09	-0.08	-0.04
M4L - data	-0.28	0.63	0.36	-0.01	-0.14	-0.25	-0.36	-0.23	-0.10
Simulation	-0.01	-0.07	0.03	0.38	0.04	0.03	-0.03	-0.05	-0.00
Short rate - data	-0.39	0.31	0.63	0.35	0.20	0.02	-0.36	-0.47	0.29
Simulation	0.03	-0.01	0.02	0.08	-0.56	-0.00	0.08	0.03	0.00
Long rate - data	-0.43	0.12	0.64	0.54	0.41	0.25	-0.15	-0.52	0.15
Simulation	0.03	-0.01	0.02	0.08	-0.56	-0.00	0.08	0.03	0.00

4 Business cycle correlations: sub-samples and shock dependence

One of Garratt and Scott's (1998) primary conclusions is that the relationship between money and activity is unstable across business cycles and between different money aggregates; they suggest that this is because the economy is affected by different shocks and that these also have differential effects on the monetary aggregates. In this section we try to establish this claim — whether shock dependence might account for these idiosyncrasies — by looking at the same set of descriptive statistics as above, taken from stochastic simulations in which only one, rather than all, of the forcing processes is shocked.

The intuition is that the sample period that we looked at (1964 Q1-1998 Q2) includes relatively few business cycles and may be dominated by a few well-documented real shocks (two oil shocks, financial deregulation), the monetary policy response to which differed in each case. Garratt and Scott (1998) investigate the non-constancy of the money-output relationship in a sophisticated episodic analysis, and conclude that the time variation in the behaviour of money aggregates across business cycles is very large, while different aggregates prove to be better predictors at different times.

Much of this sounds very negative: the money-output and money-inflation relationships appear to be highly unstable and of limited use to the professional forecaster. However, together with Garratt and Scott (1998), we choose to interpret the results slightly differently: that the money aggregates appear to behave very differently in the data because of the variety of shocks hitting the economy. We take this as a strong argument for structural modelling of the monetary transmission mechanism in which shocks are identified, and we also conclude that our structural models should incorporate an important role for sectoral money balances.

Tables D to F reproduce Tables A to C above, but here they report variances and lead/lag correlations when the model is subjected to individual shocks alone. The experiment demonstrates that variances and lead/lag correlations change substantially when we condition on the shock process. Specifically, when the model is subjected to technology shocks alone — as in the real business cycle (RBC) literature — it appears to reproduce the relative variances of real variables pretty well, though as with much of the RBC literature there appears to be too much consumption-smoothing. Technology shocks also have no significant effect on nominal variables other than inflation and equity prices. This is because the variations in loan demand caused by technology shocks are relatively small and can be satisfied by relatively small injections of new reserves into the banking system; consequently, interest rates do not have to change by much, and prices move to clear the money market. In effect, technology shocks appear to impact on all sectors roughly equally: firms' labour demand changes, but wages move to ensure that labour supply by households moves by the same amount; firms' investment demand changes, but so does the supply of savings from the household. This is not the case for monetary policy shocks, which impact disproportionately on the firms in the first instance, as we shall see below.

The table does not report absolute variances; in the case of money demand shocks these are very small: money demand shocks primarily affect the money market. The relativities show that investment becomes much more volatile (relative to output), and this is because greater demand for working capital loans (wages) means fewer funds available for investment (and *vice versa*). With both prices and investment becoming more volatile relative to output, equity prices become extremely volatile. Nominal interest rates become more volatile relative to output as well, and this is because we are operating a money rule. However, we stress again that the absolute volatility of interest rates is small even in this case (0.25%). (When we come to forecasting later in the paper, we actually 'switch this shock off'.)

Monetary policy, or money supply, shocks also induce a substantial degree of volatility, and in this case the absolute volatility increase is significant as well. Short-term nominal interest rate variation is similar to that observed in the data, as are the volatilities of money, credit and equity prices. Inflation is notably far too volatile when only monetary policy shocks are in operation. As was pointed out above, because of the limited participation feature of the model, monetary policy shocks initially hit firms disproportionately, since they have to absorb the bulk of any short-term changes in liquidity. Overall, it appears that monetary policy captures the behaviour of nominal variables (except for prices) reasonably well, whereas technology shocks do the same for real variables. When all these shocks are hitting the economy at the same time, the observable correlation between nominal and real variables deteriorates.

In addition, the lead-lag relationships suggest that shocks to money demand or monetary policy make the monetary data a better, more timely predictor of inflation than in the case of a productivity shock (in which case the correlation of money and prices is almost perfectly negative). Notice that, in the case of a monetary policy shock, M4 also lags prices. This is a result of the nominal persistence induced by inter-period portfolio frictions. Prices react immediately — by too much, as we have already mentioned and shall see again later — but it takes time for the whole shock to come through in the money data.

Table D: Relative variances of money, output and prices — different shocks

	Data	Tech. Shock	Md Shocks	Policy Shocks
Output	1.00	1.00	1.00	1.00
Inflation	0.35	0.48 (0.02)	3.55 (0.38)	2.47 (0.22)
Consumption	0.90	0.44 (0.02)	2.31 (0.19)	1.34 (0.11)
Investment	1.99	2.26 (0.03)	6.82 (0.45)	4.90 (0.22)
M4	1.21	0.00 (0.00)	1.21 (0.42)	2.70 (0.32)
M4L	1.81	0.00 (0.00)	2.60 (0.98)	1.49 (0.42)
Stock market	6.38	2.80 (0.06)	11.47 (0.71)	8.08 (0.29)
Three-month rate	0.92	0.00 (0.00)	1.05 (0.08)	0.71 (0.04)
Ten-year rate	0.47	0.00 (0.00)	0.14 (0.01)	0.10 (0.01)

Table E: Correlation between M4 and output — different shocks

	t-16	t-8	t-4	t-1	t	t+1	t+4	t+8	t+16
Data	-0.24	-0.51	-0.14	0.28	0.42	0.51	0.59	0.43	-0.26
Tech. shocks	-0.01	-0.09	-0.13	0.07	0.90	0.48	-0.05	-0.12	-0.02
Md shocks	-0.05	0.27	0.36	-0.27	-0.79	-0.62	-0.24	0.03	0.10
Policy shocks	0.11	-0.35	-0.60	0.03	0.43	0.71	0.51	0.07	-0.13

Table F: Correlation between M4 and prices — different shocks

	t-16	t-8	t-4	t-1	t	t+1	t+4	t+8	t+16
Data	-0.13	0.56	0.33	0.07	-0.01	-0.07	-0.15	-0.25	-0.21
Tech. shocks	0.02	0.14	0.12	-0.39	-0.99	-0.50	0.10	0.15	0.02
Md shocks	-0.04	-0.05	0.09	0.59	-0.13	-0.12	-0.10	-0.06	0.01
Policy shocks	-0.13	-0.29	-0.01	0.51	0.79	0.97	0.40	-0.23	-0.20

We do not want to claim too much for these moment-matching exercises. Clearly our model does not match every feature of the data, either in absolute or relative volatility terms. However, we would not expect it to, as we have not modelled the endogenous monetary policy rule actually being followed. On a positive note, the experiment has shown us that shock identification matters if we are to make sense of the money-income and money-inflation relationships in the United Kingdom over the past three decades.

5 Impulse responses

In this section, we examine the ability of the model to match the impulse response functions estimated from the small identified structural vector autoregression (VAR) model of Dhar, Pain and Thomas (2000). In particular, we look at the effects of an exogenous monetary policy 'shock' on various real and nominal variables within our model and compare them with those in Dhar, Pain and Thomas (2000).[4] We note that this is the one test that we should expect the model to support despite the fact that we are using an exogenous rule for monetary growth. The result of Christiano, Eichenbaum and Evans (1998) tells us that these responses should be unaffected by this.

Charts 9 to 11 describe the response of nominal variables to a monetary policy shock as defined above. In each case we plot the responses of the variables in the data, using the SVECM of Dhar, Pain and Thomas (2000) to identify the 'policy shock') and the equivalent responses of the variables in the model.

A surprise monetary tightening is associated with a fall in money supply growth and a rise in nominal interest rates (the liquidity effect) in both the data and the model. This rise in nominal interest rates is small: 4 basis points in the model compared with 14 basis points after one quarter in the data. The effect is persistent in the limited participation model, whereas in the data it lasts only one quarter. We note that this impulse response function is also a first-order approximation of what should happen to the yield curve when the shock is observed. A number of studies (eg Evans and Marshall (1998); Millard (1998)) have documented a tendency for the yield curve to pivot around a short maturity in response to a monetary tightening: a feature matched by the model. Finally, we note that the peak

(4) Dhar, Pain and Thomas (2000) used a structural vector error correction model (SVECM) of the data which contained eight variables: the base rate, real broad money balances, real GDP, a long bond yield, the weighted own rate of interest on M4 deposits, real asset prices, inflation and the real exchange rate. They identified four common trends (as opposed to two in our model) and a temporary monetary policy shock by assuming it had no contemporaneous effect on output and inflation. Details can be found in their paper, or in Dhar and Millard (2000).

response in prices is reached after four quarters in the model, whereas in the data prices are still falling relative to trend three years after the shock.

Chart 9: Response of money growth to a monetary policy shock

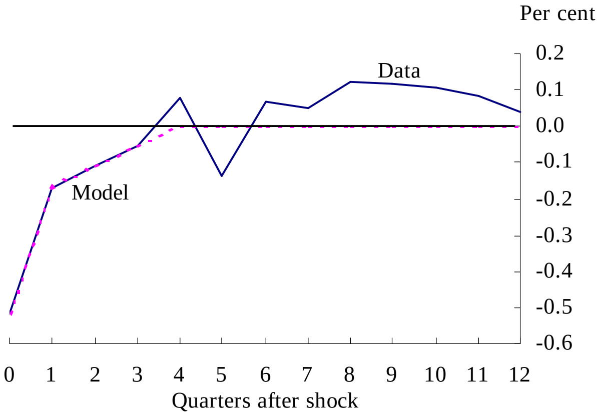


Chart 10: Response of nominal interest rate to a monetary policy shock

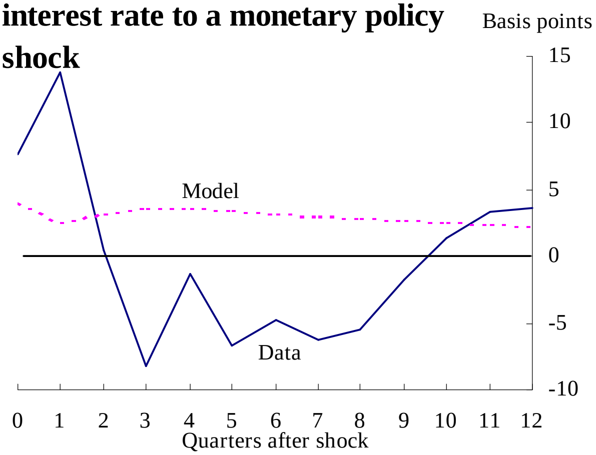


Chart 11: Response of prices to a monetary policy shock

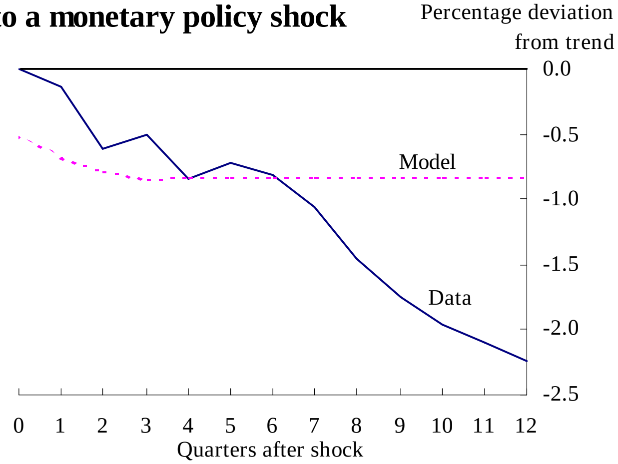
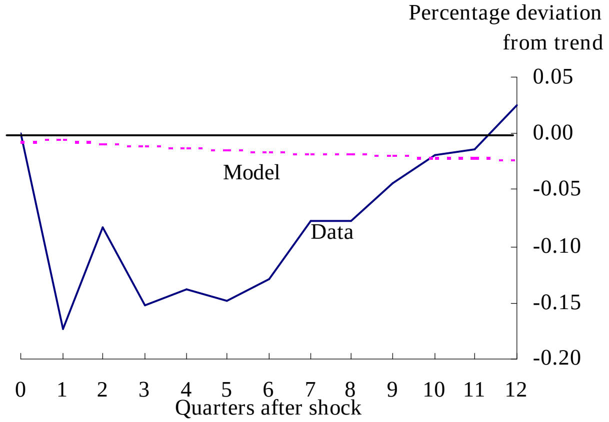


Chart 12 plots the response of output to a monetary policy shock in the data and in the model. The effect of the shock is small in the data and negligible in the model, reflecting the small effect on interest rates of the monetary shock. This analysis suggests that other shocks are likely to be the major determinants of output volatility in the United Kingdom. To the extent that we believe this, it is not so worrying that monetary shocks in our model have such a small effect on output.

Chart 12: Response of output to a monetary policy shock



6 Conclusions

In this paper, we analysed the ability of a ‘limited participation’ model to match some features of UK data. We found that, despite this being a model in which inflation is a purely monetary phenomenon, it still implied that there would be no observable business cycle relationship between money, output and inflation. However, by perturbing the model one shock at a time, we showed the importance of being able to understand which shocks are affecting the economy at any point in time if one is to draw conclusions from the data on monetary aggregates about future output and inflation. The model is potentially one tool that can be used to infer what shocks are affecting the economy; it gives strong predictions as to the expected correlations we might observe in the data, conditional on the economy being hit by a productivity or money demand shock (although these will be affected by the monetary policy rule in force).

We also showed that the responses of money growth, interest rates, prices and output to a monetary shock were fairly similar in the model to what we observe in the data. Unfortunately, the model’s key failing is that it still predicts too large a short-run response in prices to a monetary policy (or, indeed, any other) shock. This suggests that we need to consider adding some kind of nominal rigidity to the model if we are to trust its conditional forecasts for short-term inflation. The answer may well lie in the addition of ‘sticky wages’ to the model: something that would also allow the model to better match the responses of employment and real wages to a monetary policy shock. (For an example of a paper that takes this approach see Hendry and Zhang (1998).)

Another area of the model as it currently stands that requires some work is the monetary policy rule. Although, the Christiano, Eichenbaum and Evans (1998) result enables us to run the model with a ‘money’ rule in place, solving the model while assuming that the monetary authority is operating an endogenous interest rate rule would enable us to do more. In particular, we would then be in a position to examine more thoroughly the effects of the different shocks on variances and correlations; we could also then examine the model’s ability to match these data. In addition, we would be able to make forecasts conditional on assumptions about all of our shocks, ie not just the monetary policy shock. Finally, we could also examine alternative policy rules and their effects on the volatility of output and inflation as well as aggregate welfare. This can be done provided we assume that the resulting dynamic equation for monetary growth has a minimum state variable representation. This approach is pursued in Ferré and Millard (1998).

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