The Effects of Monetary Policy on the Real Economy

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Abstract: This paper looks for evidence of asymmetric effects of monetary policy on the real economy of the United States, the United Kingdom and Japan. In order to do this, a "new Keynesian" model is used as a basis with the regressions performed in a VAR setting. The results indicate that there is no empirical support for asymmetric effects of monetary policy shocks on the real economy. In fact, there is only vague evidence of any effects on the real economy whatsoever, for all countries under consideration. The estimation outputs reveal that no matter what lag length or sample size is chosen or if asymmetric aspects are taken into account, the effects of a monetary policy shock on the real economy are usually weak.

Keywords: Monetary policy, Asymmetric effects, VAR model, New Keynesianism

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I. Introduction

Throughout the ages, there has been a constant debate among economists, politicians and others alike on how to conduct economic policy. However, there has been more consensus about the goals of economic policy, including low and stable inflation, low unemployment and economic growth. To what extent these goals are mutually compatible is not as clear and the emphasis on different goals varies a lot. In terms of what instruments to employ to achieve these goals the disunity has been even greater and the question of fiscal versus monetary policy is still unanswered (Friedman, 1968). This has resulted in the formation of two different groups of economists. One is a group of monetarists in the spirit of Milton Friedman, believing in the control of the money supply in order to neutralize the economy. The other group follows New Keynesianism and compares demand and supply, using the output gap to control economic variables.

The debate between the advocates of monetarism and Keynesianism has been ongoing since the Great Depression in the 1930s. One field in particular deals with the effects of monetary policy on the economy. More precisely, if there is any significant effect at all, is it symmetric given the state of the economy, the size of the shock or whether the shock is positive or negative? To further elaborate on this notion of symmetric and asymmetric effects, one can imagine what happens when the monetary authorities introduce a policy innovation. Assuming that the monetary policy tool is the short-term interest rate, does a 1% increase of the interest rate in a boom have the same effects on the economy as a 1% decrease of the interest rate in a recession? If the answer is yes, the effects are symmetric and the monetary authorities can use its policy measure in the same manner at any point in the business cycle. On the other hand, a negative answer results in asymmetric effects, forcing the monetary authorities to consider different measures at different stages of the business cycle.

Leading up to the Great Depression this monetary linearity, assuming symmetric interest rate effects, was widely accepted. Some believed that the monetary authorities could dampen an economic boom with tight policy equally well as they could hamper a recession with an easy one. This opinion rose partly because of the success of the monetary policy authorities in dealing with the moderate downturns in 1924 and 1927. However, this belief was questioned following the Great Depression, due to the ineffectiveness of the easy policy employed during that period (Morgan, 1993). Many economists switched sides and the general view completely polarized. Easy monetary policy was now considered impotent in a

recession, or as Milton Friedman described it: "*Monetary policy [is] a string. You [can] pull on it to stop inflation but you [can] not push on it to halt recession"*[1] (1968, pp.1). Following the depression, John Maynard Keynes developed a rigorous and elaborate economic theory published in his seminal work, *The General Theory of Employment, Interest and Money* (1936). In that book he addressed the above-mentioned impotence of easy monetary policy in a recession; a concept later coined the liquidity trap.[2] He also provided an interpretation of the depression in non-monetary terms as well as a new method to fight a recession, the fiscal policy.

This paper employs vector autoregression (VAR) estimation techniques to look for evidence of asymmetric effects of monetary policy on the real economy, using adaptive inflation expectations. Innovations in a short-term interest rate are considered as a policy shock and the research focus is twofold: (1) do monetary policy shocks have any effects on the real economy and (2) do real interest rate innovations have different effects on the real economy at different levels? If so, at what levels do the interest rates become less effective (ineffective) or more effective (super effective) than normal?[3] The countries included in this study are the United States (US), the United Kingdom (UK) and Japan during the period 1975-2009. These three countries are chosen based on their economic importance in a historical sense, the size of their economies, different geographical locations and culture as well as data availability. Furthermore, there is extensive research and empirical literature focusing on the United States and Japan's recent example of a liquidity trap makes it especially interesting for research.

The results of this paper indicate that there is no empirical support for any effects of monetary policy shocks on the real economy, in any country under consideration. Lag length, sample size or asymmetric aspects do not seem to matter; the effects of a monetary policy shock on the real economy are usually weak. This is the case even when inflation expectations are added to the US model. This can be due to various reasons ranging from flaws in the data to shortcomings of the estimation method. Another explanation could simply be that monetary

[1] This is not the personal opinion of Milton Friedman. This was his way of describing how the general view went from extreme monetarism to extreme anti-monetarism.

[2] The liquidity trap appears when the economy is in such a state that the monetary policy authorities are unable to stimulate the economy by expansionary measures, like interest rate cuts or an expansion in the monetary base.

[3] For the purpose of this study, an interest rate interval where the real interest rate is situated approximately 50% of the time is defined as "normal". See chapter IV for a better description of this procedure as well as other intervals tested for comparison.

policy shocks have no significant effects on the real economy. These issues will be addressed and discussed in more detail in the following chapters.

This paper attempts to advance the existing empirical literature in two ways. First, by simultaneously examining and comparing the effects of monetary policy on the real economy in the US, UK and Japan during the period 1975-2009. Second, it looks for evidence of asymmetric effects by analyzing shocks to the real interest rate at different levels or intervals. As previously mentioned, this is done in order to see if the interest rates become more effective or less effective than normal at different levels.

The remainder of the paper is organized as follows. Section II briefly reviews previous literature. Section III describes the methodology and models behind the research. Section IV gives a better picture of the data employed in the study. In section V the empirical results are presented and analyzed. Section VI concludes.

II. Previous Literature

There is a considerable amount of research covering the effects of economic policy on the economy. One strand of this research literature has focused specifically on the asymmetric effects of monetary policy on the real economy. As previously described these asymmetries were generally accepted following the Great Depression but linear models and symmetric effects came back in the 1970s and 1980s (Sensier, et al., 2002). Recently, there has been a revival of this topic, and despite mixed opinions, modern theory suggests that the effects are in fact asymmetric.[4] The following aspects can summarize the main difference between these research papers. First are the afore mentioned types of asymmetry, that is, the effects on the economy based on positive versus negative shocks, the size of the shock and the state of the business cycle when the shock occurs. Second, there has been a rigorous debate over the choice of a monetary policy measure with the most common ones being the money supply, interest rates, the yield spread and a narrative index based on the statements of policy makers. The third aspect is the choice of an estimation model, ranging from an OLS procedure to a VAR-model to some form of a regime-switching model.

James Cover (1992) identified the stance of monetary policy with the money supply (M1) and by using a two-step OLS procedure, he found that positive and negative shocks to

[4] See for example Cover (1992), De Long and Summers (1988), Morgan (1993), Thoma (1994), Karras (1996) and Garcia and Schaller (2002).

the monetary policy variable have asymmetric effects on output in the postwar United States. In more detail, expansionary monetary policy did not have a statistically significant effect on output, while contractionary policy did. This is consistent with the "traditional Keynesian asymmetry" of a convex aggregate supply curve or, in its extreme form, a backward L-shaped curve (Parker and Rotham, 2000). A fair number of articles followed that supported Cover's findings of this type of asymmetry. De Long and Summers (1988)[5] used broader monetary aggregates (M2 and M3) as a policy measure in the US as well as different time horizons, while Karras (1996) adopted Cover's methodology and applied it to 38 different countries.

However, there are also other articles akin to Cover's that reach different conclusions. Thoma (1994), followed Cover by using changes in money supply as a monetary policy measure, but utilized a VAR model to portray the effects of positive and negative shocks based on the state of the business cycle. He found that positive shocks to money supply had no significant effects on output at any state of the economy while negative shocks had a significant impact on output during high-growth periods. Ravn and Sola (1996) examined the effects of small versus big shocks, using a regime-switching model, and their results suggest that big shocks are neutral while small shocks have real effects. However, they also re-examined Cover's article[6] and state that the asymmetry he detected is no longer significant when controlling for the Volcker era regime change in monetary policy starting in 1979. Similarly, Parker and Rothman (2000) built on Cover's method to look for the Keynesian asymmetry in the pre- World War I and the interwar period and they only found evidence of asymmetry in the latter one.

Morgan (1993) employed a similar method but with two additional measures of the US policy stance; a short-term interest rate on the one hand and a narrative index on the other.[7] Both measures led to the same kind of asymmetry as in Cover (1992), that is, of positive and negative shocks on output. Furthermore, Chu and Ratti (1997) found exactly the same asymmetry in Japan with a short-term interest rate as a policy measure.[8] Sensier, et al. (2002) also used a short-term interest rate to examine the effects of monetary policy on output in the UK. In their article they focused on possible asymmetries with regards to the state of the

[5] In 1988, Cover's article was released as a working paper at the University of Alabama. Therefore De Long and Summers cite his article although it was not until four years later that it was published in the Brookings Papers on Economic Activity.

[6] To maintain consistency, Ravn and Sola (1996) did their research using the same methodology as Cover (1992) with the same dataset, provided by Cover himself.

[7] The interest rate Morgan uses is the Federal funds rate and the narrative index is the Boschen-Mill index.

[8] More precisely, they use innovation in the changes in the call money rate.

business cycle employing a so-called smooth transition regime-switching model. Their results suggest that asymmetry is present and the effect of interest rate innovations on output is greater in periods following high-growth than in periods following "normal" or negative growth. An interesting outcome, and an example of how divided the results on this topic are, is an article by Garcia and Schaller (2002). They do find strong evidence of asymmetric effects but in their case the effect is significant during recessions while the effect is insignificant during expansions. This is the opposite of what is addressed in the liquidity trap concept.

Using the yield spread as an indicator of monetary stance has also given similar results of asymmetry. For example, Macklem, et al. (1996) employ the spread in the small open economy of Canada. Despite mixed results, they find substantial empirical support for asymmetry and show that no statistically significant effect of positive monetary shocks is present, while output is reduced by negative shocks. Another article by Galbraith and Tkacz (2000) reaffirms the asymmetry in the case of Canada as well as the United States. However, when applied to the G-7 countries the results indicated that the asymmetric effects of the yield spread on output are not statistically significant.

III. Methodology

There are a number of models available that address the issue of the effects of monetary policy on the real economy. This paper leans upon the so-called "new Keynesian" model that presently is one of the most commonly used. It constitutes of three equations that each formulates different aspects of economic behavior and is therefore frequently referred to as the "3 equation new Keynesian model." Following the traditional theory of Keynes, it assumes nominal price rigidities, but according to Clarida, et al. the reason behind the term "new" is that the analysis is based on "frameworks that incorporate the recent methodological advances in macroeconomic modeling" (1999, pp.1662).

The following exposition of the model borrows from Woodford (2008). The first equation describes the aggregate supply relation:

$$\pi_t - \bar{\pi}_t = \alpha \log(Y_t/Y_t^n) + \beta E_t[\pi_{t+1} - \bar{\pi}_{t+1}] + u_t \quad (1)$$

where π_t is the inflation rate between periods t and $t+1$, $\bar{\pi}_t$ is the perceived rate of "trend inflation" at time t, $\log(Y_t/Y_t^n)$ is the output gap (a function of exogenous factors), u_t is an

exogenous disturbance parameter and α and β are coefficients that satisfy $\alpha > 0$ and $0 < \beta < 1$. Equation 1 is a log-linear estimate of the aggregate inflation dynamics under nominal price rigidities.

The second equation can be termed the "intertemporal IS relation" and is the following:

$$\log(Y_t/Y_t^n) = E_t[\log(Y_{t+1}/Y_{t+1}^n)] - \sigma[i_t - E_t\pi_{t+1} - r_t^n] \quad (2)$$

Here, i_t is a short-term nominal interest rate and r_t^n is the natural rate of interest in the spirit of Knut Wicksell. The equation describes how aggregate expenditure, denoted as the output gap, is affected by monetary policy.

The third and the last equation of the model is a policy rule similar to the one proposed by Taylor (1993):

$$i_t = r_t^* + \overline{\pi}_t + \varphi_\pi(\pi_t - \overline{\pi}_t) + \varphi_y \log(Y_t/Y_t^n) \quad (3)$$

In this equation, $\overline{\pi}_t$ is the monetary authority's inflation target and r_t^* can be seen as their view of the real or natural rate of interest in equilibrium. Both are assumed to be exogenous processes. Furthermore, $\varphi_\pi > 0$ is a coefficient that indicates to what extent the monetary authorities respond to a deviation of observed inflation from the target and $\varphi_y > 0$ is the response to such deviations of observed output from the natural rate. Equation 3 represents the short-term nominal interest rate operation target for monetary authorities (Woodford, 2008). More precisely, it states that the monetary authorities have to adjust the nominal short rate by more than the expected inflation, in order to alter the real rate and aggregate demand (Clarida, et al., 1999).

In order to capture the asymmetric effects of monetary policy shocks on the real economy, dummy variables are constructed[9] and incorporated into equation 2:

$$\log(Y_t/Y_t^n) = \sigma_0[\log(Y_{t+1}/Y_{t+1}^n)] - \sigma_1(r_t) - \sigma_2 d_1(r_t) - \sigma_3 d_2(r_t) \quad (4)$$

Here, d_1 and d_2 are the dummy variables, defined in the following way:

$$d_1 = \begin{cases} 1, & if\ r_t < \overline{r_l} \\ 0, & otherwise \end{cases}$$

[9] This procedure is explained thoroughly in chapter IV.

and

$$d_2 = \begin{cases} 1, & if\ r_t > \bar{r_h} \\ 0, & otherwise \end{cases}$$

In the model derived above, there is a mix of endogenous as well as exogenous variables. However, the estimation method used in the present paper is a vector autoregression (VAR) model, where all variables are considered as endogenous. In order for this to be possible, the study is based on a model proposed by Bernanke and Blinder (1992) that represents the structure of the economy in the following way:

$$\boldsymbol{Y}_t = \boldsymbol{B}_0\boldsymbol{Y}_t + \boldsymbol{B}_1\boldsymbol{Y}_{t-1} + \boldsymbol{C}_0 p_t + \boldsymbol{C}_1 p_{t-1} + \boldsymbol{u}_t \quad (5)$$

$$p_t = \boldsymbol{D}_0\boldsymbol{Y}_t + \boldsymbol{D}_1\boldsymbol{Y}_{t-1} + \boldsymbol{G}p_{t-1} + \boldsymbol{v}_t \quad (6)$$

Here, boldface letters denote vectors of variables or coefficients. More precisely, $\boldsymbol{Y}$ is a vector of macroeconomic variables, containing an output gap, a consumer price index, a real effective exchange rate and oil price. Furthermore, p is the policy variable of a short-term interest rate, $\boldsymbol{u}$ and $\boldsymbol{v}$ are orthogonal error terms and $\boldsymbol{B}$, $\boldsymbol{C}$, $\boldsymbol{D}$, and $\boldsymbol{G}$ are vectors of coefficients. Equation 5 describes the state of the economy based on lagged values of macroeconomic variables as well as lagged values of the policy variable. Equation 6 on the other hand, describes the current policy variable based on lagged values of macroeconomic variables as well as lagged values of the policy variable itself.

It is a well known fact that the system described above is not identified which makes it impossible to obtain estimates for the coefficients in question (Brooks, 2006). To identify the system Bernanke and Blinder propose the assumption that innovations in the policy variable do not have any effects on the macroeconomic variables within the current period. It follows that the contemporaneous policy variable p_0 is excluded from equation 5 by setting $\boldsymbol{C}_0 = 0$. Then, by substituting equation 6 into equation 5, it is possible to obtain a standard VAR system of the form:

$$\boldsymbol{Y}_t = (\boldsymbol{I} - \boldsymbol{B}_0)^{-1}[\boldsymbol{B}_1\boldsymbol{Y}_{t-1} + \boldsymbol{C}_1 p_{t-1} + \boldsymbol{u}_t] \quad (7)$$

$$p_t = [\boldsymbol{D}_1 + \boldsymbol{D}_0(\boldsymbol{I} - \boldsymbol{B}_0)^{-1}\boldsymbol{B}_1]\boldsymbol{Y}_{t-1} + [\boldsymbol{G} + \boldsymbol{D}_0(\boldsymbol{I} - \boldsymbol{B}_0)^{-1}\boldsymbol{C}_1]p_{t-1} + \boldsymbol{v}_t + \boldsymbol{D}_0(\boldsymbol{I} - \boldsymbol{B}_0)^{-1}\boldsymbol{u}_t \quad (8)$$

Here, $\boldsymbol{v}_t$ is still a measure of a shock to the policy variable but in this case, p_t is also affected by shocks to the current macroeconomic variables portrayed in $\boldsymbol{u}_t$. This system may now be

estimated using a Choleski decomposition of the covariance matrix, with the policy variable last in the ordering. It is then possible to calculate impulse response functions to a shock in the policy variable with regards to all the macroeconomic variables within the system. At last, the results may be interpreted as if they are the "true" reactions to a policy shock (Bernanke and Blinder, 1992). As in the new Keynesian model, it is necessary to incorporate the asymmetric effects into the VAR model. Again, this is achieved by including the dummy variables from equation 4.

IV. Data

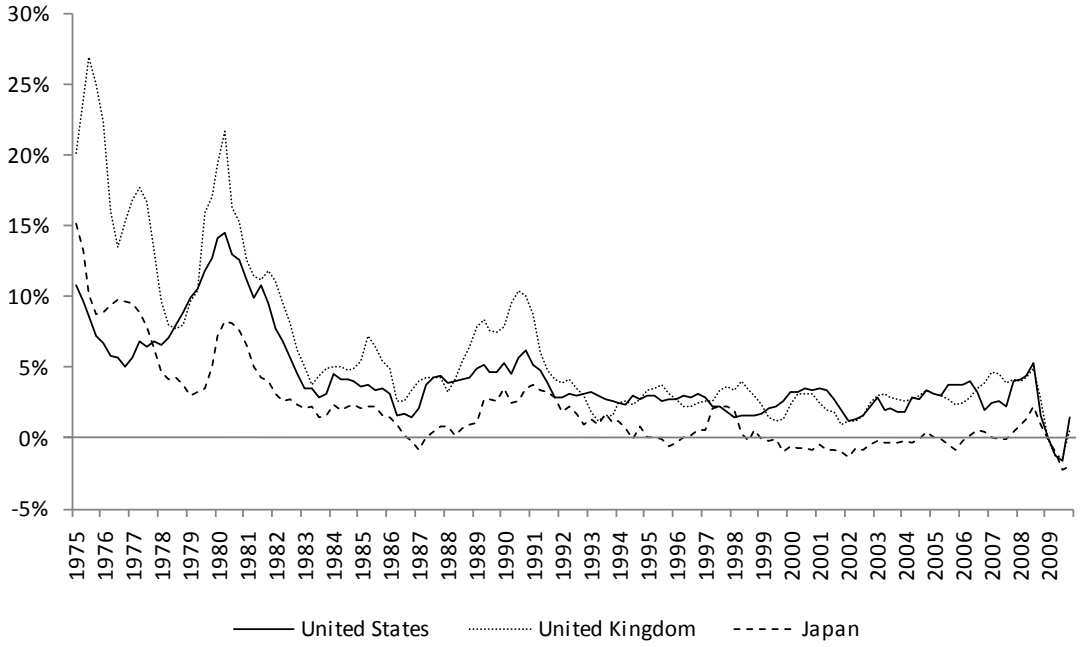
This paper employs quarterly data over the period 1975:1-2009:4, or 140 observations over the last 34 years. Up to 6 lags are tested for all countries, so the sample period runs from 1975:2 to 1976:3. All data is taken from Thomson Reuters Datastream or the OECD statistical database apart from the UK short rate, which is from the Bank of England database and the US inflation expectations, which are from Thomson Reuters/University of Michigan Surveys of Consumers. In order to prevent possible problems related to seasonality, all series are seasonally adjusted, except interest rates, which do not have significant seasonality. In the case of a monthly frequency the data is transformed into quarterly frequency by averaging over the month. The following variables are included in this research and are specific to each country in question – a real interest rate, an output gap, a consumer price index (CPI) and a real effective exchange rate (REER). The only country with adequate inflation expectation series is the US and that is used for comparison purposes. Furthermore, the real average Brent oil price is included and is the same across countries.[10]

The nominal interest rate is the sort-term central bank rate in each country denoted in annual percentages – The Federal funds rate in the United States, the Bank of England bank rate in the United Kingdom and the Bank of Japan basic discount rate in Japan. Normally, the real interest rate is defined as the nominal interest rate minus expected inflation. Due to data unavailability, it is necessary to use observed inflation as a proxy in order to generate adaptive inflation expectations. The inflation rate is calculated using the CPI as the year on year growth rate, that is, the percentage change from one quarter to the corresponding quarter four periods before. The oil price and the REER are also expressed as year on year growth rates using the same method. This is equivalent to taking the log-first difference of the variables but

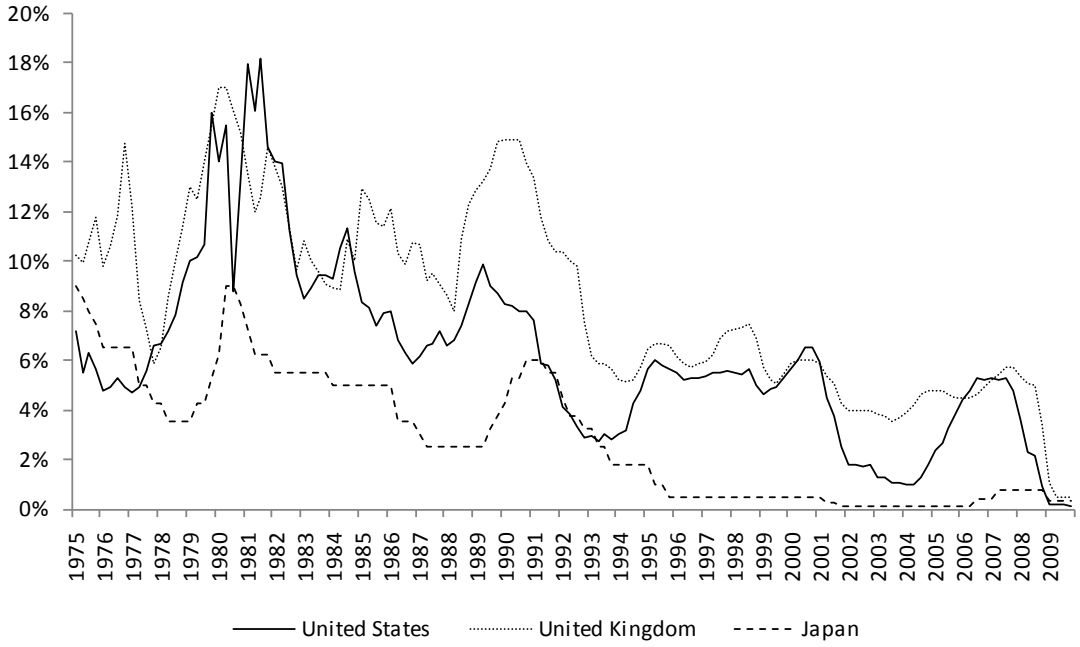
[10] See table 3 in the appendix for more detailed data information.

that approach would instead generate the growth rate from quarter to quarter. Finally, the output gap is constructed by running a Hodrick-Prescott (HP) filter on the log-level of Gross Domestic Product (GDP), with the "smoothing parameter" (lambda) set by a Ravn-Uhlig frequency rule. In order for the output gap to be comparable with the remaining variables, it is transformed into percentages by multiplying with 100. The data is visually presented below in pictures 1-5.

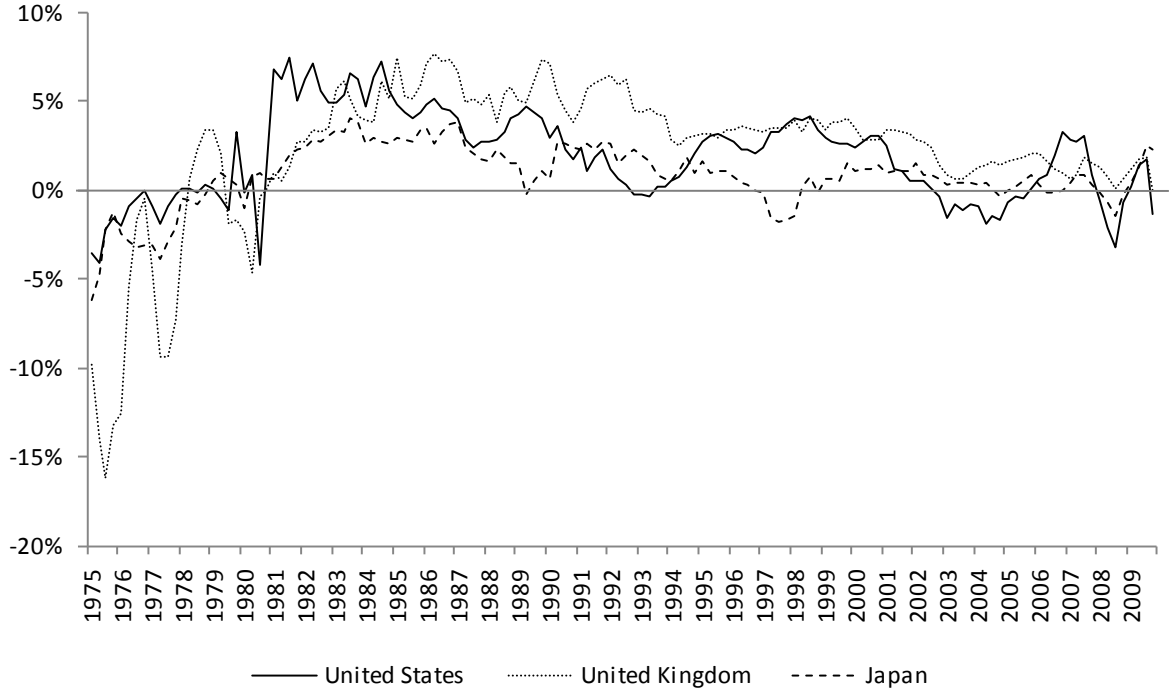
Picture 1: Inflation (Year on Year Growth Rate)



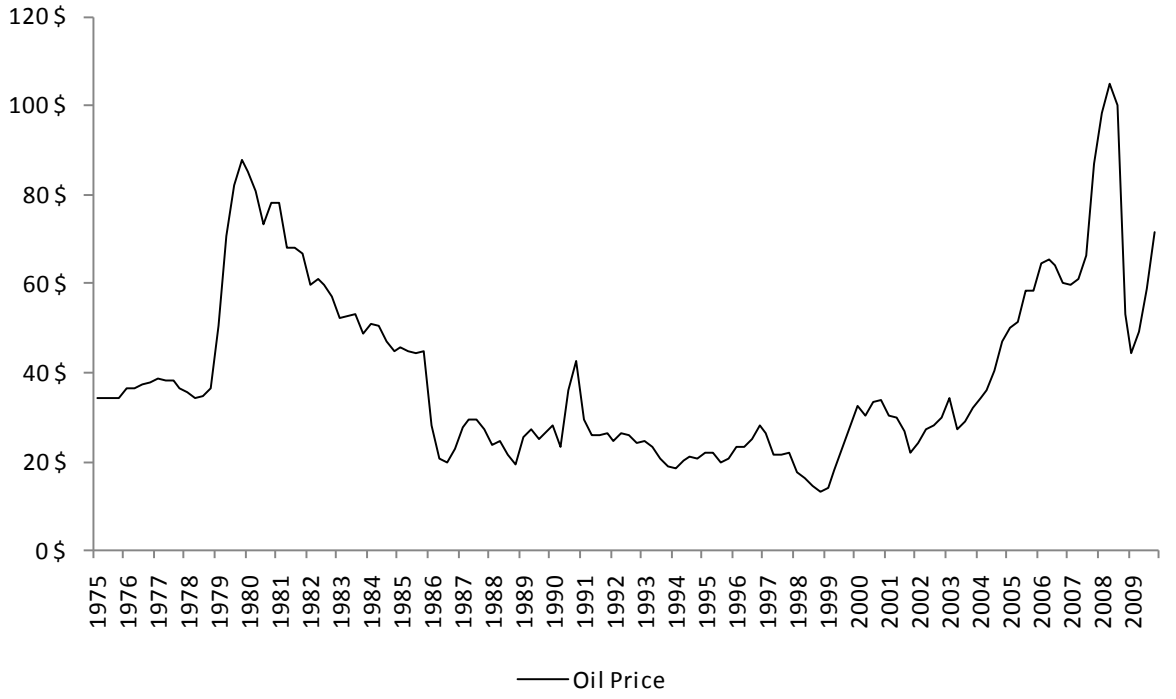
Picture 2: Nominal Short-Term Interest Rate



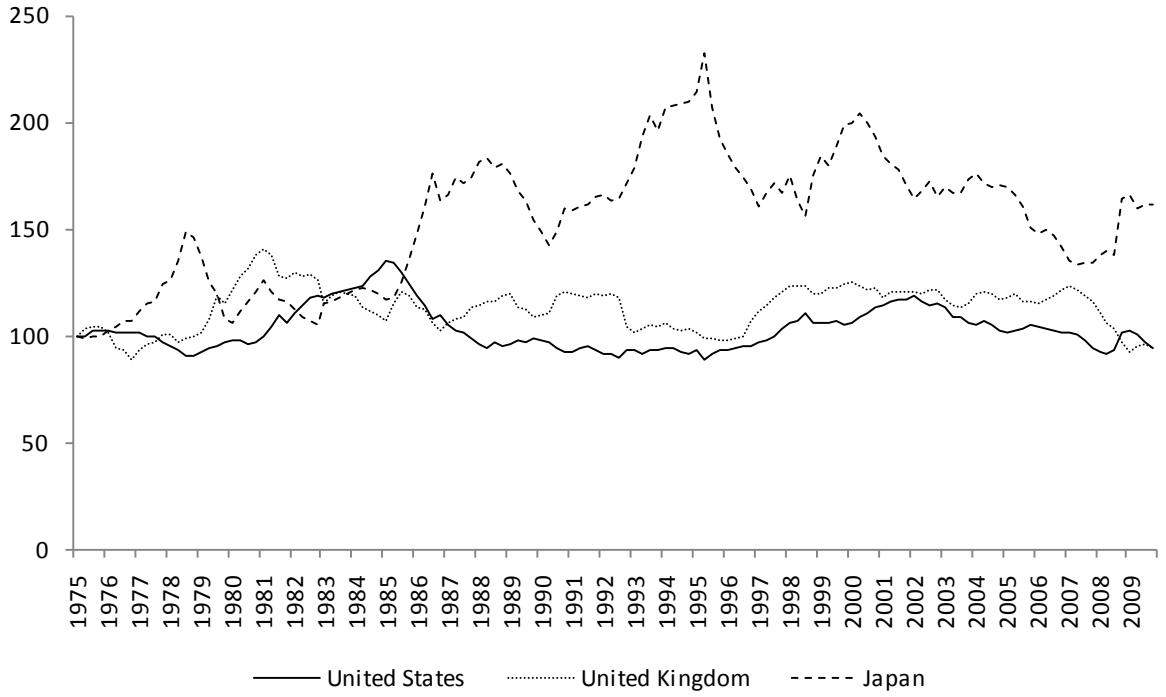
Picture 3: Real Short-Term Interest Rate



Picture 4: Real Average Brent Oil Price



Picture 5: Real Effective Exchange Rate



In order to see if real interest rate innovations have different effects on the real economy at different levels, two dummy variables are constructed for each country. First, a "normal" level of real interest rates is defined for each country, 0-4% for the US and the UK but 0-2% for Japan. The reason for this decision is that the real rate is at these levels for approximately half of the time period under consideration.[11] Since the method of choosing a "normal" level of interest rate is questionable, to say the least, two other intervals are tested and the results compared. For the upper level, the intervals are 0-5% for the US and the UK and 0-3% for Japan, but the rate is at these levels about 65% of the time.[12] For the lower level, the intervals are 0-2.5% in the case of the US, 0-3% for the UK and 0-1% for Japan and the rate is at these levels around 30% of the time.[13] Finally the dummy variables are defined for interest rates outside this level. For all countries, D_1 represents the lower level and takes the value 1 when below 0% and 0 otherwise. Since the upper level is different between countries it is necessary to construct three additional dummies for each country. For the US, D_2, D_3 and D_4 take the value 1 above 2.5%, 4% and 5%, respectively and 0 otherwise. In the case of the UK, D_2, D_3 and D_4 take the value 1 above 3%, 4% and 5%, respectively and 0 otherwise. Finally, with

[11] US: 51.4% - UK: 55.7% - JPN: 50.0%.
[12] US: 63.6% - UK: 65.0% - JPN: 69.3%.
[13] US: 30.0% - UK: 32.9% - JPN: 30.0%.

respect to Japan, D_2, D_3 and D_4 take the value 1 above 1%, 2% and 3%, respectively and 0 otherwise.

Before estimating the final model it is important to identify the lag structure of the equations. The lag length of the VAR models is chosen based on conventional methods, using the Schwarz criterion. The appropriate lag length in the models excluding the dummy variables is two lags for the US and the UK but only one lag for Japan. In all other models, for all countries in question, the Schwarz criterion suggested one lag as the optimal lag length. On this basis the non-dummy models for the US and the UK are estimated as a second-order VAR, while all other estimations are conducted as first-order VARs.

Unit root tests are performed on all series in order to check if they are stationary or not.[14] The tests are conducted using the augmented Dickey-Fuller test with the choice of lag length based on the Schwarz info criterion. Each series is tested three times: with a constant and a trend, only with a constant and finally with no constant and no trend. All series are stationary in at least one of the performed tests. In the case of the US, the inflation series showed some signs of non-stationarity. However, this does not pose a problem since inflation in general is always stationary; otherwise it would spiral out of control. On the other hand, there are no problems with the exchange rate and interest rate series. The data for the UK is a little more problematic, but when tested with no constant and no trend, the exchange rate and the interest rate series are significant at the 5% level. When it comes to Japan, no series showed any evidence of a unit root in any test. All series are statistically significant at the 1% level in all cases apart from one. Finally, the oil price series did not portray a unit root in any test and is statistically significant at the 5-10% levels. In addition, a VAR stability condition check is performed for all countries and models in question. These tests report the inverse roots of the characteristic AR polynomial and revealed that no roots lay outside the unit circle.[15] These results indicate that the estimated VAR models are stationary in all cases (Lütkepohl, 1991).

[14] See table 4 in the appendix for more details.

[15] Pictures of all inverse roots of the characteristic AR polynomial in the unit circle are available in the appendix.

V. Results

The results of this paper are summarized in tables 1 and 2 as well as pictures 6 to 7. Table 1 is an overview of selected estimation coefficients, showing the effect of different macro variables on the output gap for all countries in question. Table 2 is similar to table 1, but shows only the US regression including inflation expectations. Pictures 6a to 6d display the responses of the output gap of all countries to a one standard deviation shock in the real interest rate, while picture 7 shows the impulse response function of the UK inflation to a one standard deviation innovation in the UK short rate.

In the case of the United States, there is only one occasion where the effect of the interest rate on the output gap is significant. This is the regression that includes dummy variables on an interest rate interval of 0%-2.5% and is shown in the second column of table 1. The first lag of the real interest rate has a negative effect on the output gap while the first lag of the higher dummy variable has a positive effect. Column 2 of table 2 shows that the effects of the same dummy variable are similar when expected inflation is included, but then the real interest rate effect is not significant anymore. There also appears to be a small negative effect of the first lag of the exchange rate on the output gap. These results are portrayed in column 3 of table 1, the regression including dummies on the interest rate interval of 0%-4%. The same effect is present in all models using expected inflation, where the dummy variables are included. This is shown in columns 2-4 in table 2.

The outputs for the United Kingdom show a similar result. Here, it is only in the model excluding the dummy variables where the effect of the real interest rate on the output gap is statistically significant. This is shown in column 5 of table 1. There, it is evident that the effect is positive for the first lag and negative for the second, but the effects are extremely small with coefficients of 0.0016 and -0.0018, respectively. There are some coefficients worth mentioning in connection with the output gap and the inflation on the one hand and the output gap and the oil price on the other. A small significant effect is present in both first and second lags of the inflation on the output gap. However, when you turn this around and look at the effects of the output gap on the inflation the effects are both statistically significant and very large. The effect of the first lag of the output gap on the inflation is positive with a coefficient of 42.67 while the effect of the second lag of the output gap on the inflation is negative with a coefficient of -33.60.[16] There is also a statistically significant effect of both lags of the oil

[16] These coefficients are shown in output 9 in the appendix.

price on the output gap, but the effect is so small that it is technically equal to zero and can therefore be ignored.

In the case of Japan the outcomes are even clearer. Of all the different models tested, there is no sign of an effect of the real interest rate on the output gap whatsoever. In columns 9-12 in table 1, one can see that the estimation coefficients are all very small, on an interval of +/- 0.015-0.099 with t-statistics between +/- 0.156-0.661. In fact, there is no statistically significant effect of any of the included variables on the output gap, in any of the tested models.

Table 1: The effects of different macro variables on the output gap

	United States				**United Kingdom**				**Japan**			
Variable	No Dummies	Dummies (0%-2.5%)	Dummies (0%-4%)	Dummies (0%-5%)	No Dummies	Dummies (0%-3%)	Dummies (0%-4%)	Dummies (0%-5%)	No Dummies	Dummies (0%-1%)	Dummies (0%-2%)	Dummies (0%-3%)
Inflation (-1)	0.04208	-0.04211	-0.00851	-0.03258	0.00174	-0.00017	-0.00023	-0.00021	0.02916	0.02469	0.03488	0.04138
	[0.3667]	[-1.8075]	[-0.2407]	[-1.2876]	[2.4359]	[-0.8531]	[-1.1387]	[-1.0426]	[0.7572]	[0.5077]	[0.7125]	[0.9069]
Inflation (-2)	-0.05488	n/a	n/a	n/a	-0.00199	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	[-0.4848]	n/a	n/a	n/a	[-2.7838]	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Exchange rate (-1)	-0.02790	-0.02000	-0.02413	-0.02175	-0.00008	-4.54E-06	1.64E-05	5.20E-06	-0.01462	-0.01581	-0.01453	-0.01300
	[-1.3523]	[-1.7419]	[-2.0565]	[-1.8561]	[-0.5682]	[-0.0507]	[0.1832]	[0.0584]	[-1.5802]	[-1.6694]	[-1.5561]	[-1.3866]
Exchange rate (-2)	0.01309	n/a	n/a	n/a	0.00015	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	[0.6316]	n/a	n/a	n/a	[1.0411]	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Oil Price (-1)	0.00263	0.00050	-0.00036	-8.25E-05	0.00007	1.95E-05	1.73E-05	1.94E-05	0.00361	0.00401	0.00366	0.00322
	[0.7927]	[0.2585]	[-0.1784]	[-0.0418]	[2.5920]	[0.8969]	[0.8213]	[0.9133]	[1.2214]	[1.3217]	[1.1943]	[1.0824]
Oil Price (-2)	-0.00387	n/a	n/a	n/a	-0.00009	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	[-1.2929]	n/a	n/a	n/a	[-3.1363]	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Interest rate (-1)	0.03534	-0.10137	-0.02300	-0.02319	0.00158	-0.00048	-0.00058	-0.00047	0.01454	-0.09869	-0.02115	0.04309
	[0.6292]	[-2.1980]	[-0.5527]	[-0.6744]	[2.2774]	[-1.0537]	[-1.4288]	[-1.2933]	[0.2138]	[-0.6610]	[-0.1564]	[0.4526]
Interest rate (-2)	-0.05482	n/a	n/a	n/a	-0.00179	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	[-0.9876]	n/a	n/a	n/a	[-2.5914]	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Dummy 1 (-1)	n/a	0.06216	0.07974	0.04571	n/a	0.00059	0.00064	0.00057	n/a	0.13000	0.08494	0.02624
	n/a	[0.6222]	[0.7855]	[0.4486]	n/a	[1.1930]	[1.3531]	[1.2366]	n/a	[0.5939]	[0.3884]	[0.1250]
Dummy 2 (-1)	n/a	0.12022	0.02033	0.03297	n/a	0.00042	0.00055	0.00050	n/a	0.12155	0.02191	-0.13971
	n/a	[2.5529]	[0.4700]	[0.7739]	n/a	[0.9730]	[1.5409]	[1.4918]	n/a	[0.7760]	[0.1648]	[-1.1404]

Note: t-statistics in [ ]

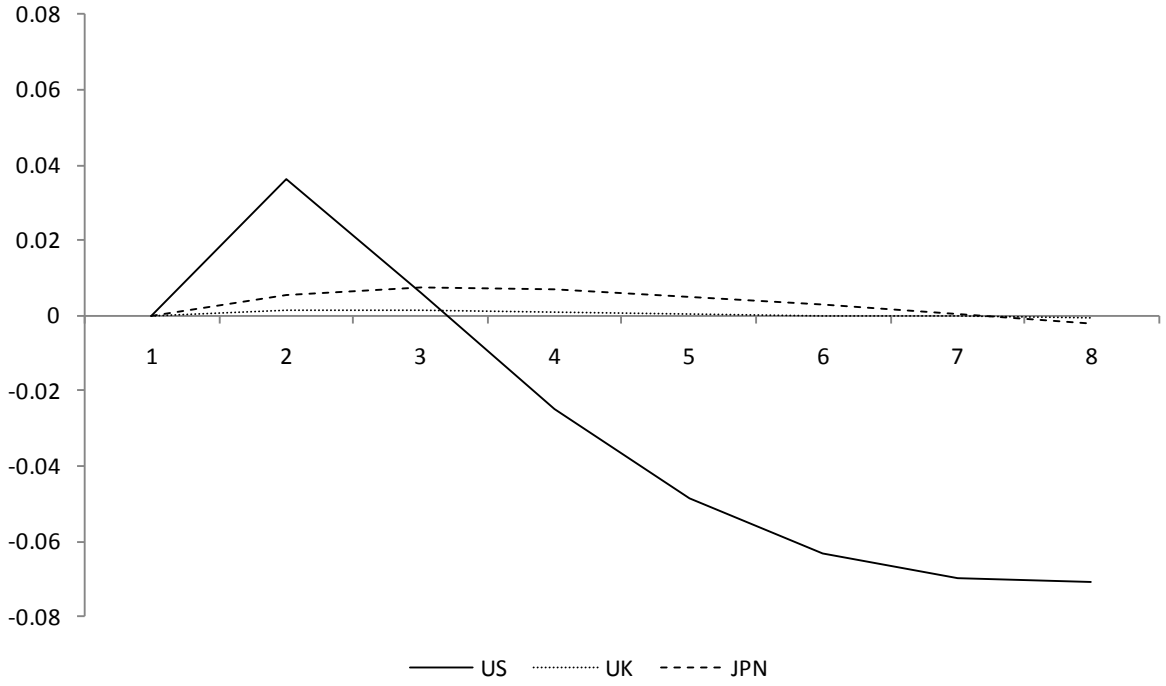
Table 2: The effects of different macro variables on the US output gap (Inflation expectations)

	United States			
Variable	No Dummies	Dummies (0%-2.5%)	Dummies (0%-4%)	Dummies (0%-5%)
Inflation (-1)	0.067695	-0.019412	-0.008518	-0.004988
	[0.91622]	[-0.59464]	[-0.24071]	[-0.14357]
Inflation (-2)	-0.069222	n/a	n/a	n/a
	[-0.93869]	n/a	n/a	n/a
Exchange rate (-1)	-0.029359	-0.023525	-0.024134	-0.024553
	[-1.42741]	[-2.04014]	[-2.05651]	[-2.09319]
Exchange rate (-2)	0.013455	n/a	n/a	n/a
	[0.64988]	n/a	n/a	n/a
Oil Price (-1)	0.002698	-3.51E-05	-0.000361	-0.000543
	[0.91801]	[-0.01799]	[-0.17840]	[-0.27498]
Oil Price (-2)	-0.003931	n/a	n/a	n/a
	[-1.35305]	n/a	n/a	n/a
Interest rate (-1)	0.033045	-0.086829	-0.023008	-0.013839
	[0.61472]	[-1.87711]	[-0.55273]	[-0.40225]
Interest rate (-2)	-0.048978	n/a	n/a	n/a
	[-0.93784]	n/a	n/a	n/a
Dummy 1 (-1)	n/a	0.096251	0.079746	0.074890
	n/a	[0.96848]	[0.78551]	[0.74284]
Dummy 2 (-1)	n/a	0.101208	0.020330	0.010881
	n/a	[2.16003]	[0.47001]	[0.26193]

Note: t-statistics in [ ]

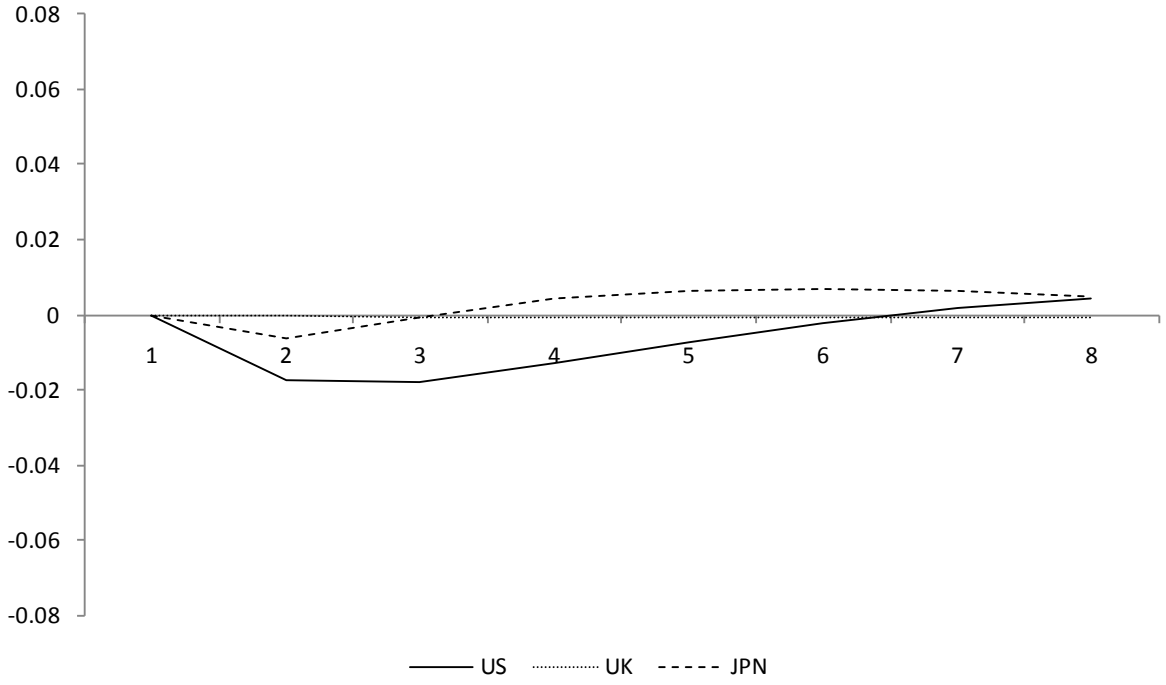
The estimation outputs from a VAR model are hard to interpret individually and give little economic meaning in terms of the effect of the monetary policy variable on other variables in the equation. In order to trace out the effects of an innovation in real interest rates on the output gap it is vital to calculate the implied impulse response functions that should show the "true" reactions to a policy shock (Bernanke and Blinder, 1992). This is done for all three countries in pictures 6a-6d, where the response of the output gap to a one standard deviation shock in the real interest rate is portrayed over eight quarters. From looking at the pictures, it becomes clear how weak the effects really are. The dotted lines representing the UK are almost completely flat in all cases and even though the dashed lines representing Japan show some change, the effects are quite small with the coefficients on the interval of +/-0.01. According to the impulse response functions, the effect is greatest in the case of the US, represented by the solid lines. Picture 6a is generated from the model excluding dummy variables and indicates a positive effect in the first quarter, followed by seven negative ones. The impulses in pictures 6b-6d on the other hand, are generated from the models including dummy variables. They are all very similar, indicating a mild negative effect in the first quarter, followed by seven even milder positive ones. However, as before, the effect is quite small and statistically insignificant.

Pictures 6a: Response of the output gap to a one standard deviation shock in the short rate



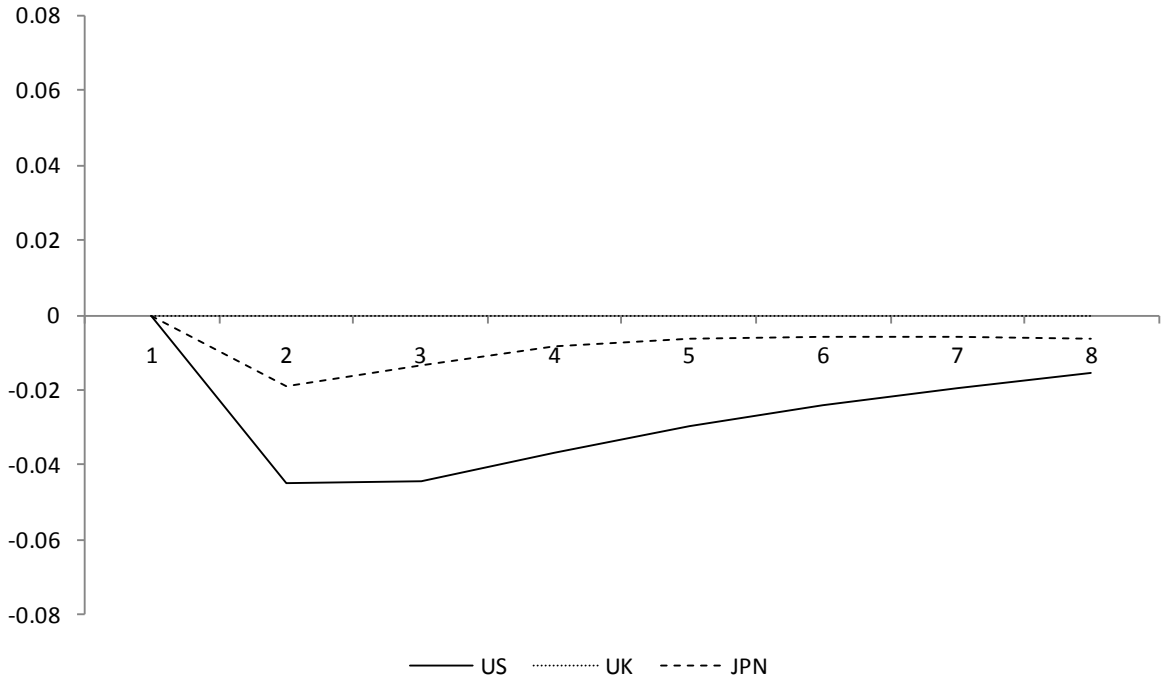
Note: Without Dummy Variables

Pictures 6b: Response of the output gap to a one standard deviation shock in the short rate



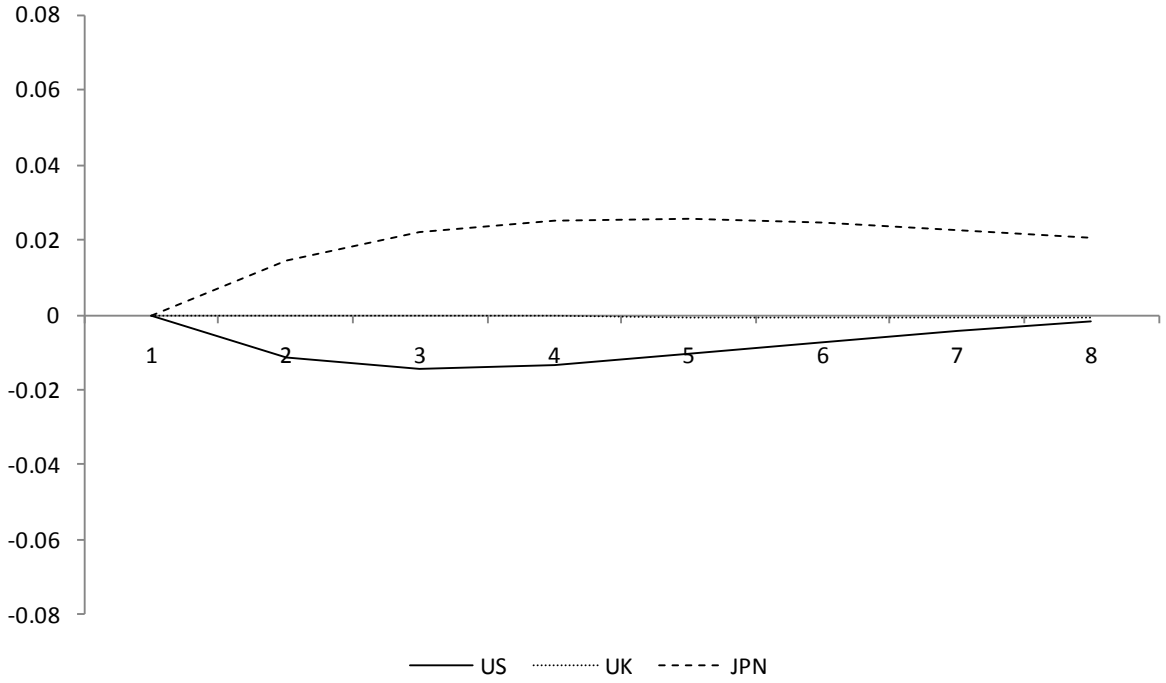
Note: With Dummy Variables: US: 0%-4%, UK: 0%-4%, JPN: 0%-2%

Pictures 6c: Response of the output gap to a one standard deviation shock in the short rate



Note: With Dummy Variables: US: 0%-2.5%, UK: 0%-3%, JPN: 0%-1%

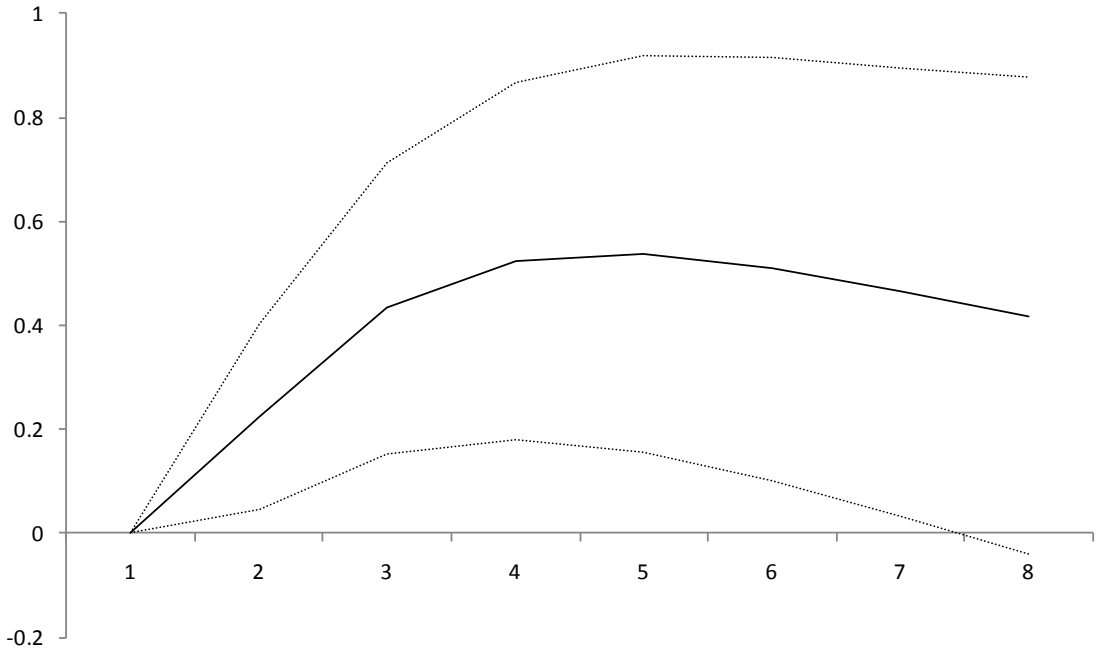
Pictures 6d: Response of the output gap to a one standard deviation shock in the short rate



Note: With Dummy Variables: US: 0%-5%, UK: 0%-5%, JPN: 0%-3%

The "price puzzle" problem, examined by Sims (1992), is also apparent in the study. Basically, the puzzle is that a monetary contraction, in the form of increased interest rates, is followed by a rise in the price level. Since this is the antipode of traditional economic theory, where a monetary contraction leads to a fall in the price level, the interpretation of the VAR output is subject to serious problems. The explanation Sims (1992) suggested is that the monetary policy authorities have better information about future inflation than is possible to acquire form the VAR model itself. This means that the monetary authorities increase the interest rate when they sense an inflationary pressure, but not enough to prevent a rise in the price level. So, even though prices rise subsequent to the rate increase, the monetary contraction dampens the rise in inflation. Sims (1992) suggests that a possible solution to this problem is to include a commodity price index in the regression. However, he points out that this is neither adequate nor logical since this produces various different equations for the estimate of the same variable. In this study, such an index is unavailable for the period and countries under consideration. In order to try to solve this problem, oil prices are included in the estimation, but as Christiano, et al. (1996) show, that does not provide satisfactory results. This is illustrated in picture 7, which shows the impulse response function of the UK inflation to a one standard deviation innovation in the UK short rate over eight quarters. Here, the oil price is included, but we still see a rise in the inflation in the five quarters subsequent to the shock. This is the case for all of the countries in question.[17]

Picture 7: Response of UK inflation to a one standard deviation shock in the UK short rate



[17] All other impulse responses of the inflation to a shock in the real interest rate are available in the appendix.

Two questions are raised in the introduction of this paper. The first one asks if monetary policy shocks have any effects on the real economy. According to the results of the estimation outputs discussed above, the short answer is no. The second question was the following: "do real interest rate innovations have different effects on the real economy at different levels? If so, at what levels do the interest rates become less effective (ineffective) or more effective (super effective) than normal?" Due to the fact that the effects were generally weak and insignificant it is not possible to answer the second question. If interest rate innovations do not have any effects on the real economy, it is fair to say that the effects will not be more or less effective at any level.

VI. Conclusions

This paper searched for evidence of asymmetric effects of monetary policy on the real economy of the United States, the United Kingdom and Japan. In order to do this, a "new Keynesian" model is used as a basis with the regressions performed in a VAR setting. As previously mentioned the results indicate that there is no empirical support for asymmetric effects of monetary policy shocks on the real economy. In fact, there is only vague evidence of any effects on the real economy whatsoever, for all countries under consideration. The estimation outputs reveal that no matter what lag length or sample size is chosen or if asymmetric aspects are taken into account, the effects of a monetary policy shock on the real economy are usually weak. All the models were also estimated excluding the dummy variables, without any obvious changes to the estimation outputs. In addition, the US model was tested with inflation expectations, but again there were no significant changes present in the outcome. Whether this is due to faults in the research or simply that innovations in the real interest rate have no significant effects on the real economy is still up for debate.

As always, there are some limitations to the research and the methodology worth pointing out. For example, explaining the monetary policy stance by a single variable is obviously open for criticism. As Bernanke and Mihov (1998) point out, it could be the case that the operating procedure of a monetary policy authority is not focused only on a single objective, like pure interest rate targeting, but is instead a combination of various targets. Kasa and Popper (1997) found evidence of this in Japan during the period 1975-1994, while Nakashima (2006) found that up to June 1995 the monetary policy stance in Japan is properly identified by the Japanese call rate. Similarly, Bernanke and Blinder (1992) showed that in the

United States, the Federal funds rate is a good measure of a policy shock and is superior to both monetary aggregates and most other interest rates.

Another related criticism of the VAR approach has to do with the endogeneity or exogeneity of monetary policy actions. As endogenous policy responds to developments in the economy, a researcher must evaluate to what extent the response is due to the policy action itself on the one hand and the economic development that led to the policy action on the other (Rudebusch, 1998). In order to avoid this problem this paper follows the method of Bernanke and Blinder (1992) and assumes that an innovation in a short-term interest rate is the instrument of monetary policy, as previously mentioned. This leads to residuals exhibiting an exogenous policy shock (Bernanke and Mihov, 1998).

In future research it might be interesting to try to change the sample length by obtaining more data from years before 1975 and see if the results change. This data is available for the US, including the inflation expectations, but in the case of the UK and Japan this could be more problematic. It might also be the case that other countries than the UK and Japan have longer data series and would be better suited as comparison to the US.

Another possibility to extend the current research would be to experiment by excluding certain years in the sample period. For an example it could possibly improve the results of the United States to exclude the so called Volcker era (1979:4-1982:4). The reason is that in this period the Federal Reserve, under the command of Paul Adolph Volcker, decreased the emphasis on the funds rate (Morgan, 1993).

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B. Appendix

Detailed information on the data series is available in table 3 below. It includes the name of the series, its mnemonic as well as the direct data source. In addition to that the appendix includes the following: All relevant VAR estimations in outputs 1-16, results of unit root tests in table 4, AR root graphs for all estimated models in pictures 8-10, and finally the impulse response functions for all countries showing the response of inflation to a one standard deviation shock in the short rate in pictures 11-13.

Table 3: Data Information

	United States	**United Kingdom**	**Japan**
GDP Deflators			
Name	GDP Deflator	GDP Deflator	n/a
DS Mnemonic	USONA001E	UKONA001E	n/a
Source	Main Economic Indicators, Copyright OECD	Main Economic Indicators, Copyright OECD	n/a
Consumer Price Indicies			
Name	CPI	CPI	CPI
DS Mnemonic	USQ64...F	UKQ64...F	JPQ64...F
Source	IMF International Financial Statistics	IMF International Financial Statistics	IMF International Financial Statistics
Expected inflation			
Name	Expected Change in prices	n/a	n/a
DS Mnemonic	n/a	n/a	n/a
Source	Thomson Reuters / University of Michigan Surveys of Consumers	n/a	n/a
Nominal Short-Rates			
Name	US Federal Funds	Bank of England Bank Rate	Basic Discount & Loan Rate
DS Mnemonic	FRFEDFD	UKABEDRQR	JPDISCR
Source	Federal Reserve Bank	Bank of England	Bank of Japan
Exchange rates			
Name	Real Effective Exchange Rate - CPI Based	Real Effective Exchange Rate - CPI Based	Real Effective Exchange Rate - CPI Based
DS Mnemonic	USOCC011	UKOCC011	JPOCC011
Source	Main Economic Indicators, Copyright OECD	Main Economic Indicators, Copyright OECD	Main Economic Indicators, Copyright OECD
Gross Domestic Product			
Name	Gross Domestic Product - Expenditure Approach	Gross Domestic Product - Expenditure Approach	GDP Volume Index
DS Mnemonic	n/a	n/a	JPI99BVRG
Source	OECD -Quarterly National Accounts	OECD -Quarterly National Accounts	IMF International Financial Statistics
Oil Price			
Name	Average Brent Oil		
DS Mnemonic	UKOILBREN		
Source	Department of Energy, U.K.		

Output 1: VAR Estimate – United States

Date: 11/15/10 Time: 14:07 Sample (adjusted): 1975Q3 2009Q4
Standard errors in ( ) & t-statistics in [ ] Included observations: 138 after adjustments

	Output Gap	Inflation	Exchange rate	Oil Price	Interest rate
Output Gap (-1)	1.033768	0.266662	-0.0271	4.448198	0.335581
	-0.09448	-0.09977	-0.39003	-2.63181	-0.16103
	[10.9416]	[2.67273]	[-0.06948]	[1.69016]	[2.08401]
Output Gap (-2)	-0.217426	-0.146407	0.096613	-1.018116	-0.344297
	-0.09065	-0.09573	-0.37421	-2.52509	-0.1545
	[-2.39853]	[-1.52945]	[0.25818]	[-0.40320]	[-2.22850]
Inflation (-1)	0.042084	0.922025	-0.728969	-5.912116	-0.313612
	-0.11476	-0.12119	-0.47375	-3.19675	-0.19559
	[0.36671]	[7.60821]	[-1.53873]	[-1.84942]	[-1.60340]
Inflation (-2)	-0.054884	0.024161	0.876622	5.557533	0.398906
	-0.11319	-0.11953	-0.46728	-3.1531	-0.19292
	[-0.48486]	[0.20213]	[1.87601]	[1.76256]	[2.06771]
Exchange rate (-1)	-0.027909	-0.018602	1.116571	0.030754	0.03075
	-0.02064	-0.02179	-0.08519	-0.57486	-0.03517
	[-1.35235]	[-0.85357]	[13.1065]	[0.05350]	[0.87426]
Exchange rate (-2)	0.013093	0.006184	-0.350692	-0.166725	-0.027176
	-0.02073	-0.02189	-0.08557	-0.57742	-0.03533
	[0.63161]	[0.28251]	[-4.09825]	[-0.28874]	[-0.76922]
Oil Price (-1)	0.00263	0.010625	0.007543	1.243369	-0.000135
	-0.00332	-0.0035	-0.01369	-0.09241	-0.00565
	[0.79275]	[3.03303]	[0.55080]	[13.4551]	[-0.02395]
Oil Price (-2)	-0.003877	-0.008488	0.009338	-0.585267	-0.000638
	-0.003	-0.00317	-0.01238	-0.08353	-0.00511
	[-1.29297]	[-2.68072]	[0.75438]	[-7.00700]	[-0.12488]
Interest rate (-1)	0.035349	-0.02483	-0.0793	-1.475283	0.687107
	-0.05618	-0.05933	-0.23192	-1.56494	-0.09575
	[0.62920]	[-0.41853]	[-0.34193]	[-0.94271]	[7.17599]
Interest rate (-2)	-0.054828	0.043524	0.224671	0.78349	0.182818
	-0.05552	-0.05862	-0.22917	-1.5464	-0.09462
	[-0.98763]	[0.74243]	[0.98036]	[0.50665]	[1.93220]
Constant	0.11523	0.125121	-1.110812	4.836984	-0.122699
	-0.1271	-0.13422	-0.52469	-3.54052	-0.21663
	[0.90659]	[0.93221]	[-2.11707]	[1.36618]	[-0.56641]
R-squared	0.785003	0.942961	0.783156	0.73483	0.788313
Adj, R-squared	0.768075	0.938469	0.766081	0.71395	0.771645
Sum sq, resids	59.41449	66.25481	1012.494	46101.45	172.5844
S,E, equation	0.683981	0.722282	2.823543	19.05265	1.165733
F-statistic	46.37071	209.9529	45.8674	35.19378	47.29434
Log likelihood	-137.6661	-145.1851	-333.3249	-596.7964	-211.2442
Akaike AIC	2.154582	2.263552	4.990216	8.808643	3.22093
Schwarz SC	2.387914	2.496883	5.223548	9.041975	3.454262
Mean dependent	0.023473	4.245759	0.115568	6.463829	1.926198
S,D, dependent	1.420267	2.911794	5.837974	35.62334	2.439461
Det, resid cov (dof adj,)		443.1374			
Det, resid cov		292.5241			
Log likelihood		-1370.887			
Akaike information criterion		20.66503			
Schwarz criterion		21.83169			

Output 2: VAR Estimate – United States (With Dummy Variables: 0%-2.5%)

Date: 12/28/10 Time: 13:02 Sample (adjusted): 1975Q2 2009Q4
Standard errors in ( ) & t-statistics in [ ] Included observations: 139 after adjustments

	Output Gap	Inflation	Exchange rate	Oil Price	Interest rate
Output Gap (-1)	0.860963	0.132568	0.026894	2.543834	-0.076132
	(0.04951)	(0.05138)	(0.21449)	(1.56556)	(0.03758)
	[17.3895]	[2.58013]	[0.12538]	[1.62487]	[-2.02614]
Inflation (-1)	-0.042119	0.946055	0.140765	-0.782360	0.032023
	(0.02330)	(0.02418)	(0.10095)	(0.73682)	(0.01768)
	[-1.80755]	[39.1227]	[1.39442]	[-1.06181]	[1.81079]
Exchange rate (-1)	-0.020005	-0.018742	0.848301	-0.280103	0.004010
	(0.01148)	(0.01192)	(0.04975)	(0.36314)	(0.00872)
	[-1.74198]	[-1.57265]	[17.0507]	[-0.77135]	[0.46014]
Oil Price (-1)	0.000503	0.003057	0.010741	0.739264	0.000891
	(0.00194)	(0.00202)	(0.00842)	(0.06148)	(0.00148)
	[0.25851]	[1.51533]	[1.27526]	[12.0248]	[0.60363]
Interest rate (-1)	-0.101378	0.158013	-0.273785	2.153649	0.219277
	(0.04612)	(0.04786)	(0.19981)	(1.45842)	(0.03500)
	[-2.19803]	[3.30129]	[-1.37022]	[1.47670]	[6.26444]
Constant	0.173471	0.096861	-0.797096	4.235611	0.511563
	(0.12829)	(0.13313)	(0.55578)	(4.05662)	(0.09736)
	[1.35219]	[0.72754]	[-1.43419]	[1.04412]	[5.25418]
Dummy 1 (-1)	0.062164	-0.135553	0.220391	-5.173861	1.228403
	(0.09991)	(0.10368)	(0.43283)	(3.15924)	(0.07582)
	[0.62220]	[-1.30738]	[0.50918]	[-1.63769]	[16.2005]
Dummy 2 (-1)	0.120229	-0.153714	0.384850	-2.403981	0.648487
	(0.04709)	(0.04887)	(0.20402)	(1.48915)	(0.03574)
	[2.55297]	[-3.14520]	[1.88632]	[-1.61433]	[18.1440]
R-squared	0.776102	0.943346	0.748493	0.641426	0.957665
Adj, R-squared	0.764138	0.940319	0.735054	0.622265	0.955403
Sum sq, resids	62.60373	67.42187	1174.969	62596.34	36.05851
S,E, equation	0.691297	0.717406	2.994867	21.85943	0.524648
F-statistic	64.86968	311.6114	55.69435	33.47652	423.3379
Log likelihood	-141.7958	-146.9489	-345.5818	-621.8766	-103.4539
Akaike AIC	2.155336	2.229480	5.087508	9.062973	1.603654
Schwarz SC	2.324227	2.398371	5.256399	9.231864	1.772544
Mean dependent	0.010441	4.284306	0.104172	6.270909	1.882601
S,D, dependent	1.423428	2.936604	5.818335	35.56684	2.484360
Det, resid cov (dof adj,)		141.5441			
Det, resid cov		105.2384			
Log likelihood		-1309.770			
Akaike information criterion		19.42115			
Schwarz criterion		20.26561			

Output 3: VAR Estimate – United States (With Dummy Variables: 0%-4%)

Date: 12/28/10 Time: 12:55 Sample (adjusted): 1975Q2 2009Q4
Standard errors in ( ) & t-statistics in [ ] Included observations: 139 after adjustments

	Output Gap	Inflation	Exchange rate	Oil Price	Interest rate
Output Gap (-1)	0.848266	0.047170	0.118287	2.013726	-0.006980
	(0.05276)	(0.06361)	(0.22220)	(1.64588)	(0.05988)
	[16.0767]	[0.74158]	[0.53234]	[1.22349]	[-0.11656]
Inflation (-1)	-0.008518	0.918291	0.059585	-0.035008	-0.004863
	(0.03539)	(0.04266)	(0.14903)	(1.10391)	(0.04016)
	[-0.24071]	[21.5248]	[0.39981]	[-0.03171]	[-0.12109]
Exchange rate (-1)	-0.024134	-0.015819	0.857791	-0.366074	0.006515
	(0.01174)	(0.01415)	(0.04942)	(0.36608)	(0.01332)
	[-2.05651]	[-1.11817]	[17.3565]	[-0.99999]	[0.48914]
Oil Price (-1)	-0.000361	7.66E-06	0.014127	0.725303	0.002166
	(0.00202)	(0.00244)	(0.00852)	(0.06310)	(0.00230)
	[-0.17840]	[0.00314]	[1.65820]	[11.4939]	[0.94326]
Interest rate (-1)	-0.023008	0.006580	-0.270242	1.321518	0.430803
	(0.04163)	(0.05018)	(0.17530)	(1.29848)	(0.04724)
	[-0.55273]	[0.13111]	[-1.54160]	[1.01774]	[9.11862]
Constant	0.092625	0.432003	-0.313027	0.274861	0.955647
	(0.19395)	(0.23381)	(0.81678)	(6.05004)	(0.22013)
	[0.47757]	[1.84765]	[-0.38324]	[0.04543]	[4.34136]
Dummy 1 (-1)	0.079746	0.074425	0.191428	-4.215949	1.198467
	(0.10152)	(0.12239)	(0.42754)	(3.16683)	(0.11522)
	[0.78551]	[0.60811]	[0.44775]	[-1.33128]	[10.4013]
Dummy 2 (-1)	0.020330	-0.040885	0.433487	-1.487143	0.422865
	(0.04325)	(0.05214)	(0.18215)	(1.34922)	(0.04909)
	[0.47001]	[-0.78410]	[2.37982]	[-1.10222]	[8.61399]
R-squared	0.763383	0.840147	0.748845	0.631231	0.899944
Adj, R-squared	0.750740	0.831605	0.735424	0.611526	0.894598
Sum sq, resids	66.15999	96.14856	1173.327	64375.95	85.22180
S,E, equation	0.710660	0.856714	2.992774	22.16798	0.806566
F-statistic	60.37684	98.35742	55.79848	32.03376	168.3240
Log likelihood	-145.6358	-171.6162	-345.4846	-623.8249	-163.2319
Akaike AIC	2.210587	2.584406	5.086110	9.091006	2.463768
Schwarz SC	2.379478	2.753296	5.255000	9.259897	2.632659
Mean dependent	0.010441	4.835437	0.104172	6.270909	1.882601
S,D, dependent	1.423428	2.087715	5.818335	35.56684	2.484360
Det, resid cov (dof adj,)		802.5948			
Det, resid cov		596.7313			
Log likelihood		-1430.369			
Akaike information criterion		21.15639			
Schwarz criterion		22.00084			

Output 4: VAR Estimate – United States (With Dummy Variables: 0%-5%)

Date: 12/28/10 Time: 13:07 Sample (adjusted): 1975Q2 2009Q4
Standard errors in ( ) & t-statistics in [ ] Included observations: 139 after adjustments

	Output Gap	Inflation	Exchange rate	Oil Price	Interest rate
Output Gap (-1)	0.863075	0.120670	0.078842	2.683625	-0.029935
	(0.05207)	(0.05426)	(0.22193)	(1.62655)	(0.06522)
	[16.5760]	[2.22403]	[0.35525]	[1.64989]	[-0.45897]
Inflation (-1)	-0.032586	0.942068	0.130988	-1.135263	0.052406
	(0.02531)	(0.02637)	(0.10787)	(0.79055)	(0.03170)
	[-1.28764]	[35.7239]	[1.21436]	[-1.43604]	[1.65320]
Exchange rate (-1)	-0.021754	-0.016446	0.842405	-0.246322	-0.005653
	(0.01172)	(0.01221)	(0.04996)	(0.36613)	(0.01468)
	[-1.85611]	[-1.34654]	[16.8628]	[-0.67277]	[-0.38507]
Oil Price (-1)	-8.25E-05	0.003676	0.009505	0.753529	-0.001775
	(0.00197)	(0.00206)	(0.00842)	(0.06168)	(0.00247)
	[-0.04180]	[1.78673]	[1.12952]	[12.2176]	[-0.71766]
Interest rate (-1)	-0.023192	0.070965	-0.086953	0.334806	0.592128
	(0.03439)	(0.03583)	(0.14657)	(1.07423)	(0.04308)
	[-0.67442]	[1.98039]	[-0.59324]	[0.31167]	[13.7464]
Constant	0.184239	0.043000	-0.565657	4.813643	0.721366
	(0.14162)	(0.14757)	(0.60363)	(4.42401)	(0.17740)
	[1.30096]	[0.29138]	[-0.93709]	[1.08807]	[4.06641]
Dummy 1 (-1)	0.045716	-0.116404	0.176975	-4.807817	1.146802
	(0.10190)	(0.10618)	(0.43432)	(3.18316)	(0.12764)
	[0.44865]	[-1.09627]	[0.40747]	[-1.51039]	[8.98463]
Dummy 2 (-1)	0.032979	-0.073255	0.258311	-0.044192	0.295538
	(0.04261)	(0.04440)	(0.18162)	(1.33108)	(0.05337)
	[0.77398]	[-1.64984]	[1.42228]	[-0.03320]	[5.53707]
R-squared	0.766032	0.940308	0.745590	0.634295	0.879482
Adj, R-squared	0.753530	0.937118	0.731996	0.614754	0.873042
Sum sq, resids	65.41931	71.03709	1188.530	63841.07	102.6500
S,E, equation	0.706671	0.736388	3.012100	22.07570	0.885205
F-statistic	61.27232	294.8005	54.84535	32.45894	136.5682
Log likelihood	-144.8533	-150.5791	-346.3794	-623.2451	-176.1636
Akaike AIC	2.199328	2.281713	5.098984	9.082663	2.649836
Schwarz SC	2.368219	2.450604	5.267874	9.251554	2.818726
Mean dependent	0.010441	4.284306	0.104172	6.270909	1.882601
S,D, dependent	1.423428	2.936604	5.818335	35.56684	2.484360
Det, resid cov (dof adj,)		415.0557			
Det, resid cov		308.5950			
Log likelihood		-1384.538			
Akaike information criterion		20.49695			
Schwarz criterion		21.34141			

Output 5: VAR Estimate – United States (Expected inflation)

Date: 01/03/11 Time: 10:59 Sample (adjusted): 1975Q3 2009Q4
Standard errors in ( ) & t-statistics in [ ] Included observations: 138 after adjustments

	Output Gap	Inflation	Exchange rate	Oil Price	Interest rate
Output Gap (-1)	1.035533	0.172160	-0.293363	3.174376	0.203862
	(0.08937)	(0.09726)	(0.37522)	(2.51856)	(0.15614)
	[11.5876]	[1.77003]	[-0.78185]	[1.26039]	[1.30564]
Output Gap (-2)	-0.219480	-0.121976	0.239017	-0.652113	-0.267948
	(0.08945)	(0.09736)	(0.37559)	(2.52106)	(0.15629)
	[-2.45354]	[-1.25282]	[0.63638]	[-0.25867]	[-1.71439]
Inflation (-1)	0.067695	0.589902	0.004156	-1.726179	0.047005
	(0.07389)	(0.08042)	(0.31022)	(2.08228)	(0.12909)
	[0.91622]	[7.33566]	[0.01340]	[-0.82898]	[0.36412]
Inflation (-2)	-0.069222	0.359985	0.174323	1.891876	0.047193
	(0.07374)	(0.08026)	(0.30962)	(2.07829)	(0.12884)
	[-0.93869]	[4.48516]	[0.56301]	[0.91031]	[0.36628]
Exchange rate (-1)	-0.029359	-0.009415	1.128735	0.042406	0.037356
	(0.02057)	(0.02239)	(0.08636)	(0.57967)	(0.03594)
	[-1.42741]	[-0.42057]	[13.0701]	[0.07316]	[1.03948]
Exchange rate (-2)	0.013455	-0.010036	-0.351597	-0.176651	-0.027437
	(0.02070)	(0.02253)	(0.08693)	(0.58348)	(0.03617)
	[0.64988]	[-0.44540]	[-4.04476]	[-0.30276]	[-0.75849]
Oil Price (-1)	0.002698	0.008150	-0.003951	1.173773	-0.005597
	(0.00294)	(0.00320)	(0.01234)	(0.08284)	(0.00514)
	[0.91801]	[2.54741]	[-0.32015]	[14.1687]	[-1.08971]
Oil Price (-2)	-0.003931	-0.010365	0.016159	-0.560682	0.002887
	(0.00291)	(0.00316)	(0.01220)	(0.08189)	(0.00508)
	[-1.35305]	[-3.27770]	[1.32455]	[-6.84705]	[0.56865]
Interest rate (-1)	0.033045	-0.016196	0.043288	-0.830137	0.747033
	(0.05376)	(0.05851)	(0.22570)	(1.51498)	(0.09392)
	[0.61472]	[-0.27682]	[0.19179]	[-0.54795]	[7.95379]
Interest rate (-2)	-0.048978	-0.030879	0.081329	0.072293	0.112776
	(0.05222)	(0.05684)	(0.21927)	(1.47181)	(0.09125)
	[-0.93784]	[-0.54326]	[0.37091]	[0.04912]	[1.23597]
Constant	0.058144	0.337537	-1.204853	3.336505	-0.149922
	(0.17421)	(0.18961)	(0.73147)	(4.90981)	(0.30438)
	[0.33375]	[1.78015]	[-1.64717]	[0.67956]	[-0.49254]
R-squared	0.785583	0.882899	0.776285	0.729298	0.778135
Adj, R-squared	0.768700	0.873678	0.758669	0.707983	0.760665
Sum sq, resids	59.25431	70.19119	1044.578	47063.15	180.8831
S,E, equation	0.683059	0.743429	2.867930	19.25035	1.193430
F-statistic	46.53040	95.75296	44.06854	34.21511	44.54189
Log likelihood	-137.4799	-149.1674	-335.4774	-598.2210	-214.4847
Akaike AIC	2.151882	2.321267	5.021412	8.829289	3.267894
Schwarz SC	2.385214	2.554598	5.254744	9.062621	3.501226
Mean dependent	0.023473	4.845838	0.115568	6.463829	1.926198
S,D, dependent	1.420267	2.091702	5.837974	35.62334	2.439461
Det, resid cov (dof adj,)		849.8843			
Det, resid cov		561.0260			
Log likelihood		-1415.822			
Akaike information criterion		21.31625			
Schwarz criterion		22.48291			

Output 6: VAR Estimate – US (Expected inflation, With Dummy Variables: 0%-2.5%)

Date: 01/03/11 Time: 10:56 Sample (adjusted): 1975Q2 2009Q4
Standard errors in ( ) & t-statistics in [ ] Included observations: 139 after adjustments

	Output Gap	Inflation	Exchange rate	Oil Price	Interest rate
Output Gap (-1)	0.849943	0.052609	0.034535	2.203048	-0.071685
	(0.05080)	(0.06200)	(0.21852)	(1.59557)	(0.03847)
	[16.7318]	[0.84853]	[0.15804]	[1.38073]	[-1.86355]
Inflation (-1)	-0.019412	0.917591	0.133926	-0.038633	0.024059
	(0.03264)	(0.03984)	(0.14043)	(1.02538)	(0.02472)
	[-0.59464]	[23.0297]	[0.95368]	[-0.03768]	[0.97324]
Exchange rate (-1)	-0.023525	-0.015878	0.854951	-0.369322	0.005998
	(0.01153)	(0.01407)	(0.04960)	(0.36219)	(0.00873)
	[-2.04014]	[-1.12817]	[17.2357]	[-1.01970]	[0.68688]
Oil Price (-1)	-3.51E-05	3.78E-05	0.011779	0.725736	0.001197
	(0.00195)	(0.00238)	(0.00840)	(0.06136)	(0.00148)
	[-0.01799]	[0.01584]	[1.40171]	[11.8275]	[0.80934]
Interest rate (-1)	-0.086829	0.036920	-0.301834	2.519809	0.210987
	(0.04626)	(0.05646)	(0.19899)	(1.45293)	(0.03503)
	[-1.87711]	[0.65395]	[-1.51686]	[1.73429]	[6.02333]
Constant	0.106110	0.468182	-0.883968	1.529676	0.520754
	(0.17623)	(0.21509)	(0.75811)	(5.53544)	(0.13345)
	[0.60210]	[2.17664]	[-1.16602]	[0.27634]	[3.90216]
Dummy 1 (-1)	0.096251	0.070830	0.141936	-4.375308	1.207264
	(0.09938)	(0.12130)	(0.42753)	(3.12167)	(0.07526)
	[0.96848]	[0.58392]	[0.33199]	[-1.40159]	[16.0413]
Dummy 2 (-1)	0.101208	-0.075630	0.423280	-2.874531	0.659563
	(0.04685)	(0.05719)	(0.20156)	(1.47171)	(0.03548)
	[2.16003]	[-1.32250]	[2.10005]	[-1.95319]	[18.5891]
R-squared	0.771136	0.841513	0.746520	0.638344	0.956917
Adj, R-squared	0.758906	0.833044	0.732975	0.619018	0.954615
Sum sq, resids	63.99239	95.32707	1184.187	63134.38	36.69573
S,E, equation	0.698922	0.853046	3.006592	21.95317	0.529264
F-statistic	63.05587	99.36629	55.11512	33.03174	415.6616
Log likelihood	-143.3206	-171.0198	-346.1249	-622.4715	-104.6714
Akaike AIC	2.177275	2.575825	5.095323	9.071532	1.621172
Schwarz SC	2.346166	2.744715	5.264214	9.240422	1.790062
Mean dependent	0.010441	4.835437	0.104172	6.270909	1.882601
S,D, dependent	1.423428	2.087715	5.818335	35.56684	2.484360

Det, resid cov (dof adj,)	335.1489
Det, resid cov	249.1841
Log likelihood	-1369.677
Akaike information criterion	20.28312
Schwarz criterion	21.12757

Output 7: VAR Estimate – US (Expected inflation, With Dummy Variables: 0%-4%)

Date: 01/03/11 Time: 10:57 Sample (adjusted): 1975Q2 2009Q4
Standard errors in ( ) & t-statistics in [ ] Included observations: 139 after adjustments

	Output Gap	Inflation	Exchange rate	Oil Price	Interest rate
Output Gap (-1)	0.848266	0.047170	0.118287	2.013726	-0.006980
	(0.05276)	(0.06361)	(0.22220)	(1.64588)	(0.05988)
	[16.0767]	[0.74158]	[0.53234]	[1.22349]	[-0.11656]
Inflation (-1)	-0.008518	0.918291	0.059585	-0.035008	-0.004863
	(0.03539)	(0.04266)	(0.14903)	(1.10391)	(0.04016)
	[-0.24071]	[21.5248]	[0.39981]	[-0.03171]	[-0.12109]
Exchange rate (-1)	-0.024134	-0.015819	0.857791	-0.366074	0.006515
	(0.01174)	(0.01415)	(0.04942)	(0.36608)	(0.01332)
	[-2.05651]	[-1.11817]	[17.3565]	[-0.99999]	[0.48914]
Oil Price (-1)	-0.000361	7.66E-06	0.014127	0.725303	0.002166
	(0.00202)	(0.00244)	(0.00852)	(0.06310)	(0.00230)
	[-0.17840]	[0.00314]	[1.65820]	[11.4939]	[0.94326]
Interest rate (-1)	-0.023008	0.006580	-0.270242	1.321518	0.430803
	(0.04163)	(0.05018)	(0.17530)	(1.29848)	(0.04724)
	[-0.55273]	[0.13111]	[-1.54160]	[1.01774]	[9.11862]
Constant	0.092625	0.432003	-0.313027	0.274861	0.955647
	(0.19395)	(0.23381)	(0.81678)	(6.05004)	(0.22013)
	[0.47757]	[1.84765]	[-0.38324]	[0.04543]	[4.34136]
Dummy 1 (-1)	0.079746	0.074425	0.191428	-4.215949	1.198467
	(0.10152)	(0.12239)	(0.42754)	(3.16683)	(0.11522)
	[0.78551]	[0.60811]	[0.44775]	[-1.33128]	[10.4013]
Dummy 2 (-1)	0.020330	-0.040885	0.433487	-1.487143	0.422865
	(0.04325)	(0.05214)	(0.18215)	(1.34922)	(0.04909)
	[0.47001]	[-0.78410]	[2.37982]	[-1.10222]	[8.61399]
R-squared	0.763383	0.840147	0.748845	0.631231	0.899944
Adj, R-squared	0.750740	0.831605	0.735424	0.611526	0.894598
Sum sq, resids	66.15999	96.14856	1173.327	64375.95	85.22180
S,E, equation	0.710660	0.856714	2.992774	22.16798	0.806566
F-statistic	60.37684	98.35742	55.79848	32.03376	168.3240
Log likelihood	-145.6358	-171.6162	-345.4846	-623.8249	-163.2319
Akaike AIC	2.210587	2.584406	5.086110	9.091006	2.463768
Schwarz SC	2.379478	2.753296	5.255000	9.259897	2.632659
Mean dependent	0.010441	4.835437	0.104172	6.270909	1.882601
S,D, dependent	1.423428	2.087715	5.818335	35.56684	2.484360

Det, resid cov (dof adj,)	802.5948
Det, resid cov	596.7313
Log likelihood	-1430.369
Akaike information criterion	21.15639
Schwarz criterion	22.00084

Output 8: VAR Estimate – US (Expected inflation, With Dummy Variables: 0%-5%)

Date: 01/03/11 Time: 10:58 Sample (adjusted): 1975Q2 2009Q4
Standard errors in ( ) & t-statistics in [ ] Included observations: 139 after adjustments

	Output Gap	Inflation	Exchange rate	Oil Price	Interest rate
Output Gap (-1)	0.846341	0.061573	0.100003	2.167714	-0.019068
	(0.05316)	(0.06418)	(0.22595)	(1.66274)	(0.06665)
	[15.9214]	[0.95936]	[0.44259]	[1.30370]	[-0.28610]
Inflation (-1)	-0.004988	0.900365	0.111463	-0.306800	0.039835
	(0.03474)	(0.04195)	(0.14767)	(1.08672)	(0.04356)
	[-0.14357]	[21.4643]	[0.75479]	[-0.28232]	[0.91449]
Exchange rate (-1)	-0.024553	-0.015303	0.848149	-0.335831	-0.003068
	(0.01173)	(0.01416)	(0.04986)	(0.36691)	(0.01471)
	[-2.09319]	[-1.08055]	[17.0108]	[-0.91529]	[-0.20863]
Oil Price (-1)	-0.000543	0.000481	0.010471	0.738770	-0.001342
	(0.00198)	(0.00238)	(0.00840)	(0.06179)	(0.00248)
	[-0.27498]	[0.20166]	[1.24708]	[11.9568]	[-0.54203]
Interest rate (-1)	-0.013839	-0.026109	-0.105527	0.632962	0.583707
	(0.03440)	(0.04154)	(0.14623)	(1.07613)	(0.04314)
	[-0.40225]	[-0.62855]	[-0.72163]	[0.58818]	[13.5319]
Constant	0.074977	0.526710	-0.561337	1.639888	0.745737
	(0.19190)	(0.23169)	(0.81567)	(6.00247)	(0.24060)
	[0.39071]	[2.27331]	[-0.68819]	[0.27320]	[3.09944]
Dummy 1 (-1)	0.074890	0.090623	0.101782	-3.852668	1.114527
	(0.10082)	(0.12172)	(0.42852)	(3.15346)	(0.12640)
	[0.74284]	[0.74451]	[0.23752]	[-1.22173]	[8.81722]
Dummy 2 (-1)	0.010881	0.012116	0.305524	-0.753497	0.316594
	(0.04154)	(0.05016)	(0.17658)	(1.29943)	(0.05209)
	[0.26193]	[0.24157]	[1.73025]	[-0.57987]	[6.07824]
R-squared	0.763108	0.839468	0.743840	0.628764	0.877748
Adj, R-squared	0.750450	0.830890	0.730153	0.608927	0.871216
Sum sq, resids	66.23687	96.55679	1196.705	64806.62	104.1268
S,E, equation	0.711073	0.858531	3.022442	22.24201	0.891550
F-statistic	60.28504	97.86245	54.34285	31.69651	134.3658
Log likelihood	-145.7165	-171.9106	-346.8558	-624.2884	-177.1564
Akaike AIC	2.211748	2.588642	5.105838	9.097674	2.664121
Schwarz SC	2.380639	2.757533	5.274729	9.266565	2.833011
Mean dependent	0.010441	4.835437	0.104172	6.270909	1.882601
S,D, dependent	1.423428	2.087715	5.818335	35.56684	2.484360

Det, resid cov (dof adj,)	970.2430
Det, resid cov	721.3782
Log likelihood	-1443.553
Akaike information criterion	21.34609
Schwarz criterion	22.19054

Output 9: VAR Estimate – United Kingdom

Date: 11/15/10 Time: 14:03 Sample (adjusted): 1975Q3 2009Q4
Standard errors in ( ) & t-statistics in [ ] Included observations: 138 after adjustments

	Output Gap	Inflation	Exchange rate	Oil Price	Interest rate
Output Gap (-1)	0.815745	42.67271	78.73104	244.0352	-27.49677
	-0.08679	-13.0903	-51.2922	-237.005	-14.3863
	[9.39958]	[3.25987]	[1.53495]	[1.02966]	[-1.91132]
Output Gap (-2)	0.029786	-33.60143	-65.69572	1.826125	31.83009
	-0.08872	-13.3823	-52.4364	-242.291	-14.7072
	[0.33572]	[-2.51089]	[-1.25287]	[0.00754]	[2.16426]
Inflation (-1)	0.001741	1.524418	0.77052	1.873754	-0.386978
	-0.00071	-0.10778	-0.42233	-1.95143	-0.11845
	[2.43598]	[14.1436]	[1.82447]	[0.96020]	[-3.26695]
Inflation (-2)	-0.001995	-0.557097	-0.653277	-2.274713	0.365587
	-0.00072	-0.10809	-0.42352	-1.95694	-0.11879
	[-2.78387]	[-5.15419]	[-1.54250]	[-1.16238]	[3.07768]
Exchange rate (-1)	-0.0000835	0.00206	1.135323	0.244532	-0.015575
	-0.00015	-0.02217	-0.08688	-0.40143	-0.02437
	[-0.56825]	[0.09293]	[13.0681]	[0.60915]	[-0.63917]
Exchange rate (-2)	0.000154	-0.012143	-0.41546	-0.427071	0.05557
	-0.00015	-0.02235	-0.08757	-0.40464	-0.02456
	[1.04117]	[-0.54334]	[-4.74422]	[-1.05543]	[2.26247]
Oil Price (-1)	0.0000779	0.010031	0.002316	1.135201	-0.000648
	-0.00003	-0.00453	-0.01777	-0.08209	-0.00498
	[2.59205]	[2.21243]	[0.13035]	[13.8286]	[-0.13014]
Oil Price (-2)	-0.000092	-0.008653	0.001018	-0.528046	-0.002697
	-0.000029	-0.00443	-0.01734	-0.08014	-0.00486
	[-3.13633]	[-1.95490]	[0.05872]	[-6.58883]	[-0.55440]
Interest rate (-1)	0.001582	0.266391	0.605169	1.006736	0.898413
	-0.00069	-0.10475	-0.41045	-1.89656	-0.11512
	[2.27746]	[2.54307]	[1.47440]	[0.53082]	[7.80401]
Interest rate (-2)	-0.001798	-0.209238	-0.504207	-1.602921	-0.021591
	-0.00069	-0.10468	-0.41016	-1.8952	-0.11504
	[-2.59149]	[-1.99891]	[-1.22931]	[-0.84578]	[-0.18768]
Constant	0.002139	-0.028573	-0.864055	6.862309	0.454395
	-0.00159	-0.23924	-0.93744	-4.33158	-0.26293
	[1.34839]	[-0.11943]	[-0.92172]	[1.58425]	[1.72821]
R-squared	0.788159	0.963148	0.744985	0.732356	0.916152
Adj, R-squared	0.771479	0.960246	0.724906	0.711282	0.90955
Sum sq, resids	0.006239	141.9491	2179.398	46531.46	171.4465
S,E, equation	0.007009	1.057218	4.142537	19.1413	1.161883
F-statistic	47.25069	331.9195	37.10109	34.75118	138.7648
Log likelihood	494.4739	-197.7603	-386.2225	-597.437	-210.7877
Akaike AIC	-7.006868	3.025512	5.756848	8.817928	3.214315
Schwarz SC	-6.773536	3.258844	5.990179	9.051259	3.447647
Mean dependent	0.0000238	5.944483	0.107342	6.463829	2.386096
S,D, dependent	0.014662	5.302419	7.898153	35.62334	3.863297
Det, resid cov (dof adj,)		0.220336			
Det, resid cov		0.145448			
Log likelihood		-846.04			
Akaike information criterion		13.05855			
Schwarz criterion		14.22521			

Output 10: VAR Estimate – United Kingdom (With Dummy Variables: 0%-3%)

Date: 12/28/10 Time: 13:05 Sample (adjusted): 1975Q2 2009Q4
Standard errors in ( ) & t-statistics in [ ] Included observations: 139 after adjustments

	Output Gap	Inflation	Exchange rate	Oil Price	Interest rate
Output Gap (-1)	0.863157	24.97517	29.05440	208.1304	-6.952017
	(0.05152)	(6.41138)	(29.8612)	(153.285)	(3.98818)
	[16.7554]	[3.89544]	[0.97298]	[1.35780]	[-1.74316]
Inflation (-1)	-0.000173	0.964502	0.052543	-0.236925	-0.013049
	(0.00020)	(0.02524)	(0.11753)	(0.60333)	(0.01570)
	[-0.85313]	[38.2203]	[0.44704]	[-0.39269]	[-0.83127]
Exchange rate (-1)	-4.54E-06	0.008484	0.819885	-0.212113	0.001378
	(8.9E-05)	(0.01113)	(0.05185)	(0.26614)	(0.00692)
	[-0.05077]	[0.76214]	[15.8136]	[-0.79699]	[0.19900]
Oil Price (-1)	1.95E-05	0.003243	0.008788	0.736552	-0.001625
	(2.2E-05)	(0.00271)	(0.01263)	(0.06482)	(0.00169)
	[0.89696]	[1.19630]	[0.69601]	[11.3639]	[-0.96367]
Interest rate (-1)	-0.000482	0.563699	0.815697	1.371734	0.179925
	(0.00046)	(0.05696)	(0.26529)	(1.36179)	(0.03543)
	[-1.05374]	[9.89661]	[3.07476]	[1.00730]	[5.07819]
Constant	0.001179	-0.706671	-1.448674	3.875973	1.176906
	(0.00170)	(0.21101)	(0.98279)	(5.04490)	(0.13126)
	[0.69567]	[-3.34898]	[-1.47404]	[0.76829]	[8.96632]
Dummy 1 (-1)	0.000597	-0.677438	-0.968091	-1.629983	0.917585
	(0.00050)	(0.06230)	(0.29017)	(1.48950)	(0.03875)
	[1.19305]	[-10.8737]	[-3.33631]	[-1.09431]	[23.6772]
Dummy 2 (-1)	0.000426	-0.403141	-0.599043	-1.877256	0.602095
	(0.00044)	(0.05445)	(0.25360)	(1.30180)	(0.03387)
	[0.97309]	[-7.40392]	[-2.36215]	[-1.44205]	[17.7765]
R-squared	0.752204	0.972831	0.712449	0.628554	0.981018
Adj, R-squared	0.738963	0.971379	0.697083	0.608706	0.980004
Sum sq, resids	0.007324	113.4405	2460.826	64843.26	43.89489
S,E, equation	0.007477	0.930569	4.334159	22.24830	0.578857
F-statistic	56.80875	670.0988	46.36730	31.66803	967.2052
Log likelihood	487.4191	-183.1104	-396.9601	-624.3276	-117.1215
Akaike AIC	-6.898117	2.749790	5.826764	9.098239	1.800309
Schwarz SC	-6.729226	2.918680	5.995654	9.267130	1.969200
Mean dependent	-4.97E-05	6.074356	0.132039	6.270909	2.267946
S,D, dependent	0.014635	5.500582	7.874870	35.56684	4.093564
Det, resid cov (dof adj,)		0.100641			
Det, resid cov		0.074827			
Log likelihood		-805.9778			
Akaike information criterion		12.17234			
Schwarz criterion		13.01680			

Output 11: VAR Estimate – United Kingdom (With Dummy Variables: 0%-4%)

Date: 12/28/10 Time: 12:58 Sample (adjusted): 1975Q2 2009Q4
Standard errors in ( ) & t-statistics in [ ] Included observations: 139 after adjustments

	Output Gap	Inflation	Exchange rate	Oil Price	Interest rate
Output Gap (-1)	0.871337	22.18316	20.16535	182.0626	-1.696683
	(0.05158)	(7.12580)	(29.6822)	(153.795)	(5.37027)
	[16.8925]	[3.11308]	[0.67938]	[1.18380]	[-0.31594]
Inflation (-1)	-0.000237	0.955422	0.105394	-0.096332	-0.014679
	(0.00021)	(0.02871)	(0.11957)	(0.61956)	(0.02163)
	[-1.13873]	[33.2828]	[0.88141]	[-0.15548]	[-0.67851]
Exchange rate (-1)	1.64E-05	-0.002727	0.794991	-0.287020	0.020008
	(8.9E-05)	(0.01236)	(0.05147)	(0.26671)	(0.00931)
	[0.18321]	[-0.22071]	[15.4445]	[-1.07617]	[2.14841]
Oil Price (-1)	1.73E-05	0.006982	0.012787	0.749670	-0.006853
	(2.1E-05)	(0.00291)	(0.01213)	(0.06283)	(0.00219)
	[0.82134]	[2.39830]	[1.05440]	[11.9309]	[-3.12329]
Interest rate (-1)	-0.000582	0.421613	0.831310	1.335124	0.340212
	(0.00041)	(0.05632)	(0.23459)	(1.21551)	(0.04244)
	[-1.42880]	[7.48625]	[3.54365]	[1.09841]	[8.01563]
Constant	0.001967	-0.899141	-2.263947	1.520771	1.585556
	(0.00180)	(0.24839)	(1.03465)	(5.36092)	(0.18720)
	[1.09395]	[-3.61990]	[-2.18812]	[0.28368]	[8.47007]
Dummy 1 (-1)	0.000646	-0.580708	-0.960875	-1.555868	0.804378
	(0.00048)	(0.06593)	(0.27462)	(1.42293)	(0.04969)
	[1.35311]	[-8.80809]	[-3.49888]	[-1.09343]	[16.1891]
Dummy 2 (-1)	0.000553	-0.229588	-0.622520	-1.844682	0.407319
	(0.00036)	(0.04958)	(0.20652)	(1.07006)	(0.03736)
	[1.54090]	[-4.63073]	[-3.01434]	[-1.72391]	[10.9012]
R-squared	0.754856	0.966883	0.719647	0.631029	0.966038
Adj, R-squared	0.741757	0.965113	0.704666	0.611313	0.964223
Sum sq, resids	0.007245	138.2759	2399.230	64411.35	78.53667
S,E, equation	0.007437	1.027395	4.279571	22.17408	0.774285
F-statistic	57.62580	546.3826	48.03817	32.00587	532.3255
Log likelihood	488.1670	-196.8695	-395.1983	-623.8632	-157.5543
Akaike AIC	-6.908877	2.947762	5.801414	9.091556	2.382077
Schwarz SC	-6.739987	3.116653	5.970305	9.260447	2.550967
Mean dependent	-4.97E-05	6.074356	0.132039	6.270909	2.267946
S,D, dependent	0.014635	5.500582	7.874870	35.56684	4.093564
Det, resid cov (dof adj,)		0.185401			
Det, resid cov		0.137846			
Log likelihood		-848.4400			
Akaike information criterion		12.78331			
Schwarz criterion		13.62776			

Output 12: VAR Estimate – United Kingdom (With Dummy Variables: 0%-5%)

Date: 12/28/10 Time: 13:09 Sample (adjusted): 1975Q2 2009Q4
Standard errors in ( ) & t-statistics in [ ] Included observations: 139 after adjustments

	Output Gap	Inflation	Exchange rate	Oil Price	Interest rate
Output Gap (-1)	0.864819	25.15172	27.57019	202.8898	-6.653932
	(0.05129)	(7.33075)	(29.6009)	(152.609)	(5.79772)
	[16.8619]	[3.43099]	[0.93140]	[1.32948]	[-1.14768]
Inflation (-1)	-0.000211	0.934996	0.074159	-0.147090	0.009963
	(0.00020)	(0.02894)	(0.11687)	(0.60251)	(0.02289)
	[-1.04265]	[32.3057]	[0.63457]	[-0.24413]	[0.43527]
Exchange rate (-1)	5.20E-06	0.002386	0.807706	-0.251332	0.011488
	(8.9E-05)	(0.01271)	(0.05133)	(0.26465)	(0.01005)
	[0.05846]	[0.18771]	[15.7344]	[-0.94966]	[1.14257]
Oil Price (-1)	1.94E-05	0.006586	0.010518	0.740882	-0.005577
	(2.1E-05)	(0.00304)	(0.01228)	(0.06331)	(0.00241)
	[0.91339]	[2.16557]	[0.85653]	[11.7021]	[-2.31850]
Interest rate (-1)	-0.000472	0.344223	0.698578	1.075257	0.440488
	(0.00036)	(0.05213)	(0.21051)	(1.08531)	(0.04123)
	[-1.29336]	[6.60262]	[3.31844]	[0.99073]	[10.6832]
Constant	0.001798	-0.747124	-2.052249	1.801084	1.412125
	(0.00177)	(0.25251)	(1.01959)	(5.25656)	(0.19970)
	[1.01751]	[-2.95885]	[-2.01281]	[0.34264]	[7.07122]
Dummy 1 (-1)	0.000573	-0.532243	-0.874550	-1.378096	0.740043
	(0.00046)	(0.06626)	(0.26754)	(1.37931)	(0.05240)
	[1.23667]	[-8.03301]	[-3.26886]	[-0.99912]	[14.1227]
Dummy 2 (-1)	0.000500	-0.160672	-0.550766	-1.831278	0.340324
	(0.00034)	(0.04790)	(0.19343)	(0.99724)	(0.03789)
	[1.49186]	[-3.35408]	[-2.84736]	[-1.83635]	[8.98290]
R-squared	0.754583	0.964510	0.717674	0.632128	0.959919
Adj, R-squared	0.741469	0.962613	0.702588	0.612471	0.957777
Sum sq, resids	0.007253	148.1850	2416.110	64219.46	92.68757
S,E, equation	0.007441	1.063571	4.294600	22.14102	0.841153
F-statistic	57.54065	508.5950	47.57179	32.15742	448.1965
Log likelihood	488.0894	-201.6796	-395.6856	-623.6558	-169.0683
Akaike AIC	-6.907761	3.016972	5.808425	9.088573	2.547745
Schwarz SC	-6.738871	3.185863	5.977316	9.257463	2.716636
Mean dependent	-4.97E-05	6.074356	0.132039	6.270909	2.267946
S,D, dependent	0.014635	5.500582	7.874870	35.56684	4.093564
Det, resid cov (dof adj,)		0.213604			
Det, resid cov		0,195848			
Log likelihood		-1267,313			
Akaike information criterion		19,04048			
Schwarz criterion		20,22272			

Output 13: VAR Estimate – Japan

Date: 12/09/10 Time: 15:23 Sample (adjusted): 1975Q2 2009Q4
Standard errors in ( ) & t-statistics in [ ] Included observations: 139 after adjustments

	Output Gap	Inflation	Exchange rate	Oil Price	Interest rate
Output Gap (-1)	0.61516	-0.006788	0.015187	0.65849	0.002848
	-0.06744	-0.03294	-0.38503	-1.33067	-0.03642
	[9.12170]	[-0.20610]	[0.03944]	[0.49486]	[0.07821]
Inflation (-1)	0.02916	0.955813	0.418859	-1.055207	0.024355
	-0.03851	-0.01881	-0.21984	-0.75976	-0.02079
	[0.75729]	[50.8254]	[1.90530]	[-1.38887]	[1.17140]
Exchange rate (-1)	-0.014627	-0.017324	0.805639	0.118131	0.004965
	-0.00926	-0.00452	-0.05285	-0.18263	-0.005
	[-1.58027]	[-3.83218]	[15.2452]	[0.64682]	[0.99331]
Oil Price (-1)	0.003612	0.007242	-0.011877	0.778804	-0.003747
	-0.00296	-0.00144	-0.01688	-0.05835	-0.0016
	[1.22144]	[5.01425]	[-0.70349]	[13.3476]	[-2.34672]
Interest rate (-1)	0.014548	0.104667	0.274704	-0.5134	0.887252
	-0.06804	-0.03323	-0.38844	-1.34244	-0.03674
	[0.21383]	[3.14991]	[0.70720]	[-0.38244]	[24.1511]
Constant	-0.062171	-0.121317	-0.634374	4.141385	0.111826
	-0.15764	-0.07699	-0.90001	-3.11041	-0.08512
	[-0.39439]	[-1.57575]	[-0.70485]	[1.33146]	[1.31374]
R-squared	0.474276	0.965584	0.691887	0.618815	0.870186
Adj, R-squared	0.454512	0.96429	0.680304	0.604485	0.865306
Sum sq, resids	170.9195	40.7698	5571.381	66543.44	49.8353
S,E, equation	1.133626	0.55366	6.472255	22.36798	0.612129
F-statistic	23.99687	746.2873	59.73202	43.18242	178.3088
Log likelihood	-211.5994	-111.9885	-453.7517	-626.1264	-125.9428
Akaike AIC	3.130927	1.697676	6.615132	9.095344	1.898458
Schwarz SC	3.257594	1.824344	6.7418	9.222012	2.025125
Mean dependent	0.008431	1.970074	2.04053	6.270909	0.864818
S,D, dependent	1.53489	2.929861	11.44688	35.56684	1.667894

Det, resid cov (dof adj,)	1074.424
Det, resid cov	861.7075
Log likelihood	-1455.907
Akaike information criterion	21.37996
Schwarz criterion	22.0133

Output 14: VAR Estimate – Japan (With Dummy Variables: 0%-1%)

Date: 12/28/10 Time: 13:06 Sample (adjusted): 1975Q2 2009Q4
Standard errors in ( ) & t-statistics in [ ] Included observations: 139 after adjustments

	Output Gap	Inflation	Exchange rate	Oil Price	Interest rate
Output Gap (-1)	0.613261	0.009096	0.037574	0.713490	-0.018639
	(0.06813)	(0.02201)	(0.38725)	(1.34115)	(0.01219)
	[9.00089]	[0.41328]	[0.09703]	[0.53200]	[-1.52955]
Inflation (-1)	0.024699	0.947963	0.438499	-0.952156	0.032494
	(0.04864)	(0.01571)	(0.27648)	(0.95751)	(0.00870)
	[0.50776]	[60.3315]	[1.58602]	[-0.99440]	[3.73489]
Exchange rate (-1)	-0.015814	-0.012780	0.815703	0.149388	-0.001477
	(0.00947)	(0.00306)	(0.05384)	(0.18646)	(0.00169)
	[-1.66942]	[-4.17685]	[15.1504]	[0.80117]	[-0.87180]
Oil Price (-1)	0.004016	0.005731	-0.015274	0.768196	-0.001601
	(0.00304)	(0.00098)	(0.01727)	(0.05980)	(0.00054)
	[1.32173]	[5.84006]	[-0.88454]	[12.8454]	[-2.94678]
Interest rate (-1)	-0.098693	0.644283	1.312176	2.529699	0.134923
	(0.14931)	(0.04823)	(0.84862)	(2.93899)	(0.02670)
	[-0.66101]	[13.3591]	[1.54624]	[0.86074]	[5.05252]
Constant	-0.043876	-0.263791	-0.842309	3.617811	0.305133
	(0.16883)	(0.05453)	(0.95960)	(3.32332)	(0.03020)
	[-0.25988]	[-4.83710]	[-0.87777]	[1.08861]	[10.1050]
Dummy 1 (-1)	0.130007	-0.781623	-1.309290	-3.587270	1.074109
	(0.21889)	(0.07070)	(1.24412)	(4.30871)	(0.03915)
	[0.59393]	[-11.0547]	[-1.05238]	[-0.83256]	[27.4361]
Dummy 2 (-1)	0.121551	-0.517116	-1.068319	-3.230540	0.726944
	(0.15662)	(0.05059)	(0.89019)	(3.08294)	(0.02801)
	[0.77609]	[-10.2217]	[-1.20011]	[-1.04788]	[25.9512]
R-squared	0.477182	0.985029	0.696332	0.622731	0.985837
Adj, R-squared	0.449245	0.984229	0.680106	0.602572	0.985080
Sum sq, resids	169.9745	17.73470	5491.002	65859.78	5.437240
S,E, equation	1.139085	0.367939	6.474260	22.42201	0.203729
F-statistic	17.08076	1231.322	42.91325	30.89040	1302.614
Log likelihood	-211.2141	-54.13538	-452.7417	-625.4087	28.03110
Akaike AIC	3.154160	0.894034	6.629377	9.113794	-0.288217
Schwarz SC	3.323050	1.062925	6.798268	9.282685	-0.119327
Mean dependent	0.008431	1.970074	2.040530	6.270909	0.864818
S,D, dependent	1.534890	2.929861	11.44688	35.56684	1.667894
Det, resid cov (dof adj,)		120.8085			
Det, resid cov		89.82140			
Log likelihood		-1298.761			
Akaike information criterion		19.26275			
Schwarz criterion		20.10720			

Output 15: VAR Estimate – Japan (With Dummy Variables: 0%-2%)

Date: 12/28/10 Time: 13:01 Sample (adjusted): 1975Q2 2009Q4
Standard errors in ( ) & t-statistics in [ ] Included observations: 139 after adjustments

	Output Gap	Inflation	Exchange rate	Oil Price	Interest rate
Output Gap (-1)	0.612352	0.016004	0.040148	0.757923	-0.028901
	(0.06830)	(0.02606)	(0.38940)	(1.34413)	(0.02149)
	[8.96508]	[0.61409]	[0.10310]	[0.56388]	[-1.34470]
Inflation (-1)	0.034880	0.932896	0.298767	-1.034458	0.048570
	(0.04895)	(0.01868)	(0.27907)	(0.96330)	(0.01540)
	[0.71254]	[49.9475]	[1.07057]	[-1.07387]	[3.15332]
Exchange rate (-1)	-0.014539	-0.017469	0.803192	0.120406	0.004981
	(0.00934)	(0.00356)	(0.05327)	(0.18386)	(0.00294)
	[-1.55614]	[-4.90019]	[15.0790]	[0.65487]	[1.69429]
Oil Price (-1)	0.003663	0.006084	-0.010128	0.769922	-0.001890
	(0.00307)	(0.00117)	(0.01748)	(0.06035)	(0.00096)
	[1.19431]	[5.19981]	[-0.57932]	[12.7578]	[-1.95888]
Interest rate (-1)	-0.021155	0.483169	0.330396	1.593843	0.330909
	(0.13520)	(0.05159)	(0.77078)	(2.66056)	(0.04254)
	[-0.15647]	[9.36626]	[0.42865]	[0.59906]	[7.77850]
Constant	-0.034721	-0.369001	-0.804861	2.932791	0.465012
	(0.17405)	(0.06641)	(0.99223)	(3.42497)	(0.05476)
	[-0.19949]	[-5.55662]	[-0.81116]	[0.85630]	[8.49115]
Dummy 1 (-1)	0.084942	-0.705189	-0.708063	-3.158043	0.987499
	(0.21865)	(0.08343)	(1.24651)	(4.30269)	(0.06880)
	[0.38849]	[-8.45290]	[-0.56803]	[-0.73397]	[14.3535]
Dummy 2 (-1)	0.021919	-0.308689	0.190712	-2.018656	0.472885
	(0.13295)	(0.05073)	(0.75796)	(2.61630)	(0.04183)
	[0.16486]	[-6.08519]	[0.25161]	[-0.77157]	[11.3039]
R-squared	0.474887	0.979019	0.693142	0.621290	0.955971
Adj, R-squared	0.446828	0.977898	0.676745	0.601054	0.953618
Sum sq, resids	170.7206	24.85402	5548.691	66111.38	16.90273
S,E, equation	1.141583	0.435575	6.508181	22.46480	0.359205
F-statistic	16.92433	873.2548	42.27252	30.70161	406.3284
Log likelihood	-211.5185	-77.59136	-453.4681	-625.6737	-50.79603
Akaike AIC	3.158539	1.231530	6.639828	9.117607	0.845986
Schwarz SC	3.327430	1.400421	6.808719	9.286498	1.014877
Mean dependent	0.008431	1.970074	2.040530	6.270909	0.864818
S,D, dependent	1.534890	2.929861	11.44688	35.56684	1.667894
Det, resid cov (dof adj,)		385.6243			
Det, resid cov		286.7127			
Log likelihood		-1379.427			
Akaike information criterion		20.42341			
Schwarz criterion		21.26786			

Output 16: VAR Estimate – Japan (With Dummy Variables: 0%-3%)

Date: 12/28/10 Time: 13:10 Sample (adjusted): 1975Q2 2009Q4
Standard errors in ( ) & t-statistics in [ ] Included observations: 139 after adjustments

	Output Gap	Inflation	Exchange rate	Oil Price	Interest rate
Output Gap (-1)	0.610753	0.009909	0.058897	0.699132	-0.018839
	(0.06797)	(0.02886)	(0.38527)	(1.34278)	(0.02771)
	[8.98570]	[0.34331]	[0.15287]	[0.52066]	[-0.67978]
Inflation (-1)	0.041389	0.895737	0.293170	-1.241375	0.104114
	(0.04563)	(0.01938)	(0.25867)	(0.90153)	(0.01861)
	[0.90698]	[46.2233]	[1.13337]	[-1.37696]	[5.59549]
Exchange rate (-1)	-0.013001	-0.017189	0.791524	0.136760	0.003997
	(0.00938)	(0.00398)	(0.05314)	(0.18522)	(0.00382)
	[-1.38667]	[-4.31752]	[14.8941]	[0.73837]	[1.04565]
Oil Price (-1)	0.003228	0.007441	-0.008474	0.775643	-0.003848
	(0.00298)	(0.00127)	(0.01691)	(0.05892)	(0.00122)
	[1.08249]	[5.87544]	[-0.50127]	[13.1647]	[-3.16436]
Interest rate (-1)	0.043096	0.284212	0.083589	0.759958	0.617827
	(0.09522)	(0.04043)	(0.53971)	(1.88105)	(0.03882)
	[0.45261]	[7.02918]	[0.15488]	[0.40401]	[15.9140]
Constant	-0.067721	-0.297953	-0.642552	3.136852	0.366136
	(0.16992)	(0.07216)	(0.96319)	(3.35697)	(0.06928)
	[-0.39853]	[-4.12916]	[-0.66711]	[0.93443]	[5.28453]
Dummy 1 (-1)	0.026246	-0.582741	-0.414892	-2.823341	0.817742
	(0.20983)	(0.08910)	(1.18940)	(4.14537)	(0.08556)
	[0.12508]	[-6.53994]	[-0.34882]	[-0.68108]	[9.55793]
Dummy 2 (-1)	-0.139712	-0.127141	1.175696	-2.217782	0.247789
	(0.12250)	(0.05202)	(0.69439)	(2.42013)	(0.04995)
	[-1.14048]	[-2.44405]	[1.69314]	[-0.91639]	[4.96083]
R-squared	0.479942	0.974262	0.699568	0.621992	0.926780
Adj, R-squared	0.452153	0.972887	0.683515	0.601794	0.922867
Sum sq, resids	169.0773	30.48920	5432.491	65988.80	28.10914
S,E, equation	1.136075	0.482433	6.439674	22.44396	0.463221
F-statistic	17.27072	708.3960	43.57701	30.79341	236.8745
Log likelihood	-210.8463	-91.79391	-451.9972	-625.5447	-86.14511
Akaike AIC	3.148867	1.435884	6.618664	9.115751	1.354606
Schwarz SC	3.317758	1.604774	6.787555	9.284642	1.523496
Mean dependent	0.008431	1.970074	2.040530	6.270909	0.864818
S,D, dependent	1.534890	2.929861	11.44688	35.56684	1.667894
Det, resid cov (dof adj,)		613.2203			
Det, resid cov		455.9309			
Log likelihood		-1411.665			
Akaike information criterion		20.88727			
Schwarz criterion		21.73172			

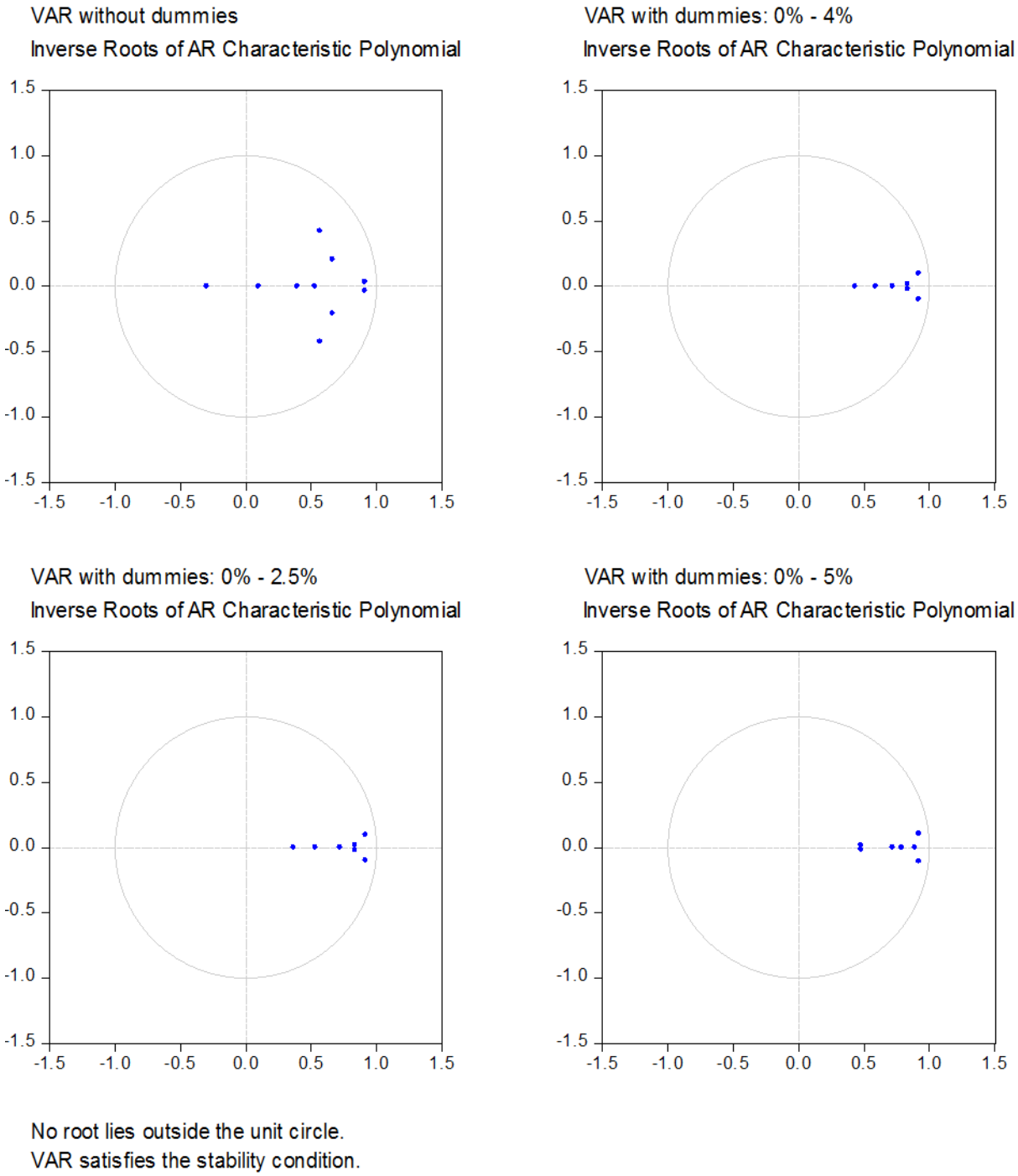
Table 4: Unit Root Tests – Augmented Dickey-Fuller

Null Hypothesis: Series has a Unit root
Lag Lenght based on the Schwarz Info Criterion

Series	Constant or Trend Included	T-stat	p-value	Significance	Schwarz Criterion	Lag length
United States						
Inflation	Constant+Trend	-1.856	0.352	-	2.112	8
	Constant	-3.239	0.081	*	2.118	9
	None	-1.427	0.142	-	2.089	8
Exchange Rate	Constant+Trend	-2.999	0.037	**	4.927	9
	Constant	-3.021	0.130	-	4.962	9
	None	-3.014	0.002	***	4.889	9
Interest Rate	Constant+Trend	-3.253	0.019	**	3.243	0
	Constant	-3.456	0.048	**	3.260	0
	None	-2.483	0.013	**	3.238	0
United Kingdom						
Inflation	Constant+Trend	-2.213	0.202	-	2.839	13
	Constant	-1.396	0.857	-	2.878	13
	None	-2.598	0.009	***	2.807	13
Exchange Rate	Constant+Trend	-2.355	0.156	-	5.562	8
	Constant	-2.611	0.276	-	5.585	8
	None	-2.377	0.017	**	5.524	8
Interest Rate	Constant+Trend	-3.088	0.029	**	3.562	0
	Constant	-2.758	0.215	-	3.595	0
	None	-2.434	0.014	**	3.554	0
Japan						
Inflation	Constant+Trend	-3.863	0.003	***	1.828	8
	Constant	-4.253	0.005	***	1.819	8
	None	-4.129	0.000	***	1.796	8
Exchange Rate	Constant+Trend	-3.662	0.005	***	6.348	4
	Constant	-3.832	0.017	**	6.374	4
	None	-3.570	0.000	***	6.317	4
Interest Rate	Constant+Trend	-4.129	0.001	***	1.968	0
	Constant	-4.042	0.009	***	1.997	0
	None	-3.208	0.001	***	1.986	0
All Countries						
Oil Price	Constant+Trend	-3.927	0.002	***	8.795	4
	Constant	-4.001	0.010	**	8.827	4
	None	-3.702	0.000	***	8.772	4

- Not significant / * Significant at 10% level / ** Significant at 5% level / *** Significant at 1% level

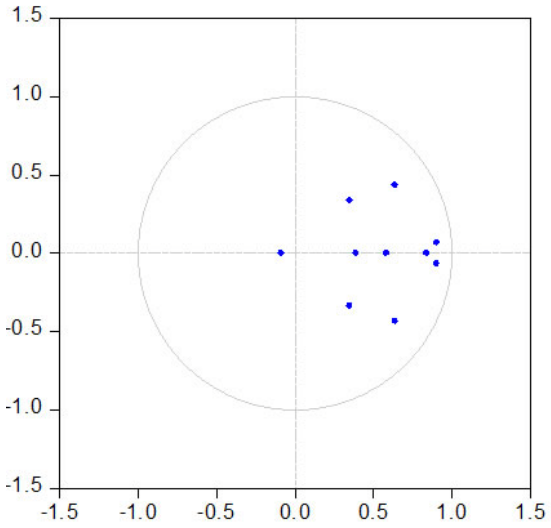
Picture 8: AR Roots Graphs – United States



Picture 9: AR Roots Graphs – United Kingdom

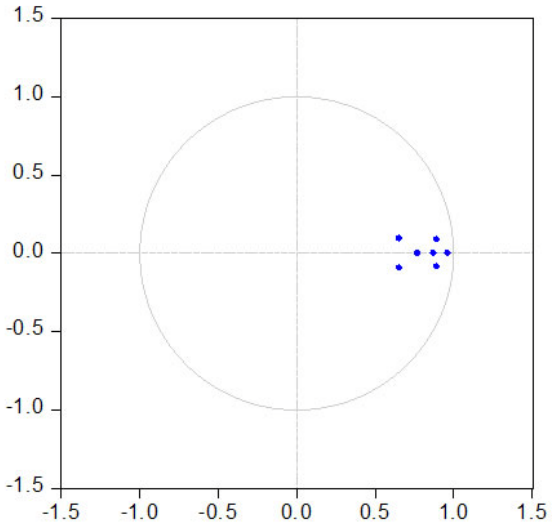
VAR without dummies

Inverse Roots of AR Characteristic Polynomial



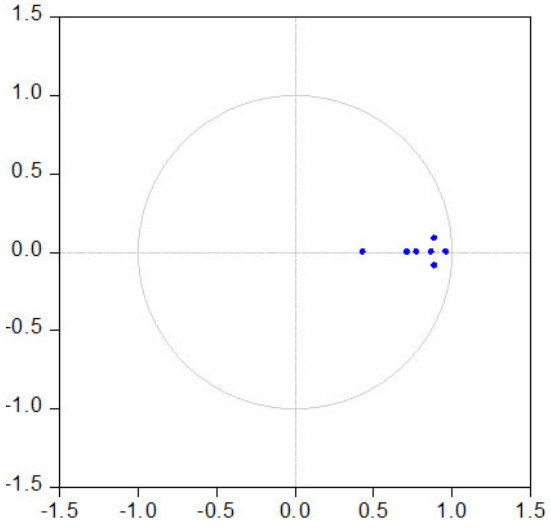
VAR with dummies: 0% - 4%

Inverse Roots of AR Characteristic Polynomial



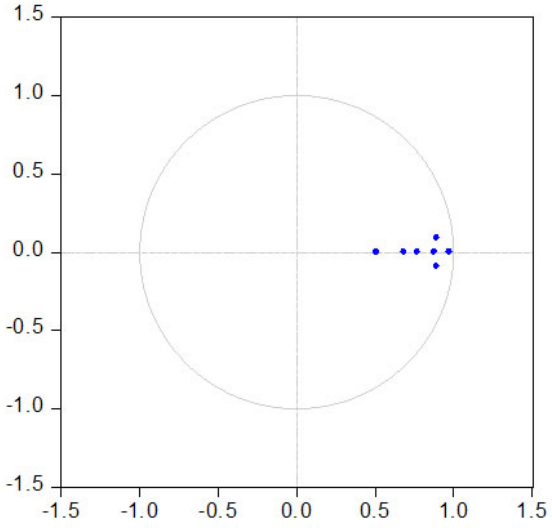
VAR with dummies: 0% - 3%

Inverse Roots of AR Characteristic Polynomial



VAR with dummies: 0% - 5%

Inverse Roots of AR Characteristic Polynomial

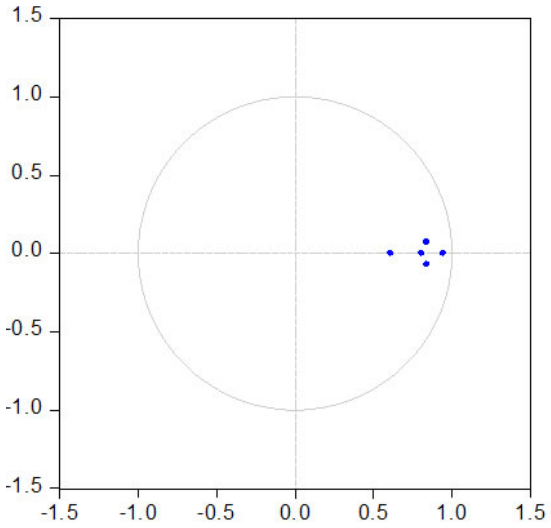


No root lies outside the unit circle.

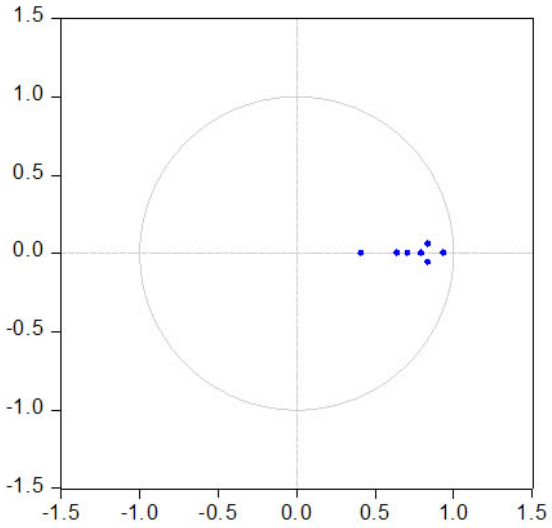
VAR satisfies the stability condition.

Picture 10: AR Roots Graphs – Japan

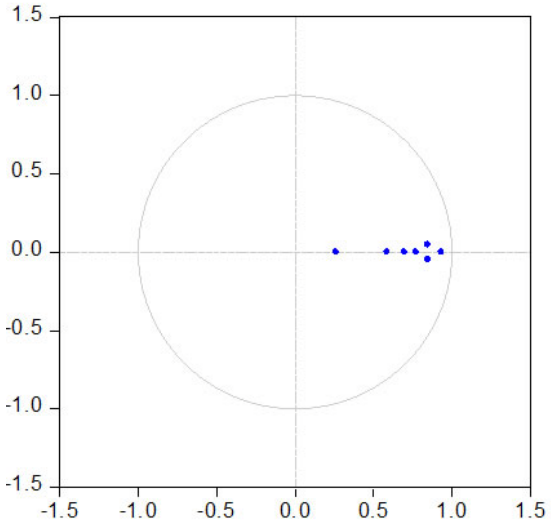
VAR without dummies
Inverse Roots of AR Characteristic Polynomial



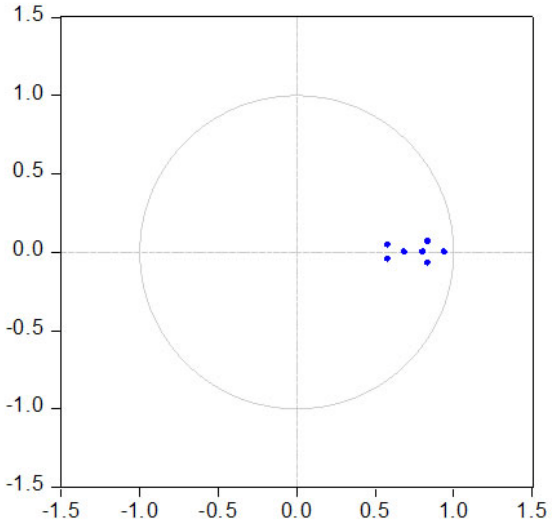
VAR with dummies: 0% - 2%
Inverse Roots of AR Characteristic Polynomial



VAR with dummies: 0% - 1%
Inverse Roots of AR Characteristic Polynomial

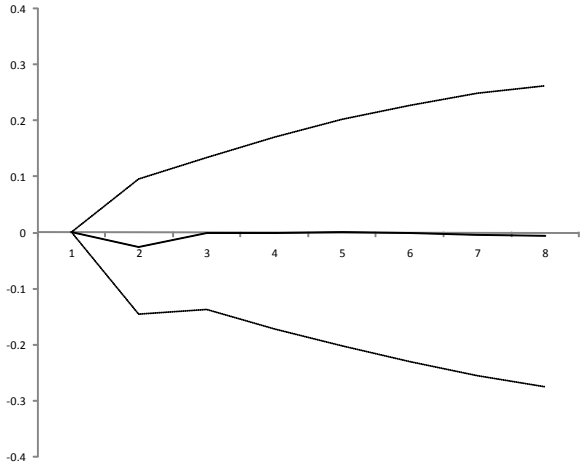


VAR with dummies: 0% - 3%
Inverse Roots of AR Characteristic Polynomial

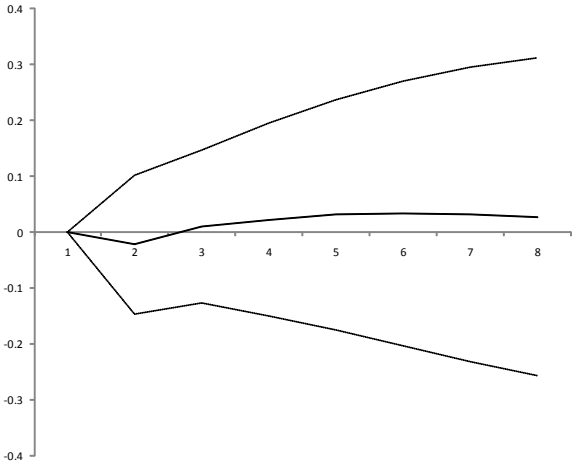


No root lies outside the unit circle.
VAR satisfies the stability condition.

Picture 11: Response of US inflation to a one standard deviation shock in the US short rate

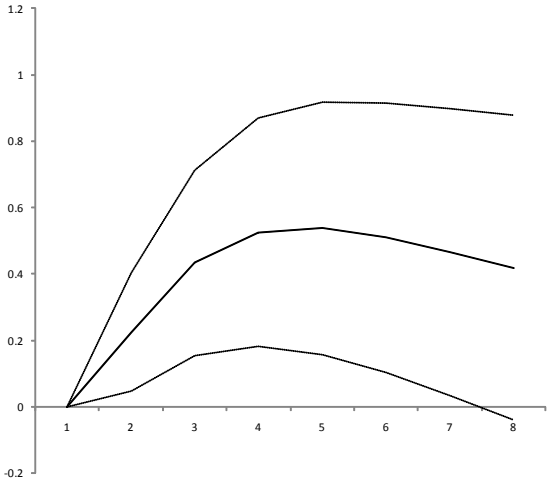


Note: Including Oil Prices

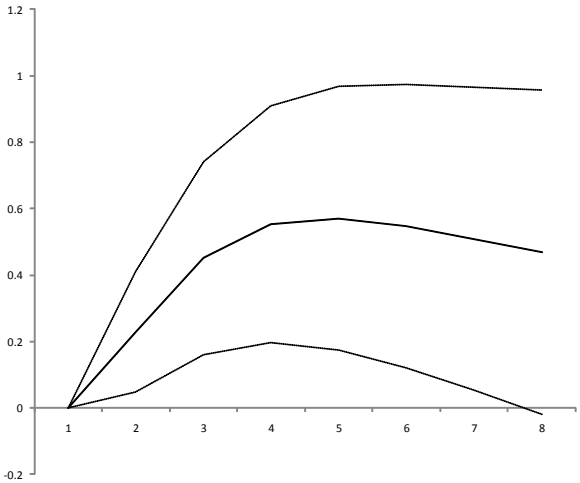


Note: Excluding Oil Prices

Picture 12: Response of UK inflation to a one standard deviation shock in the UK short rate

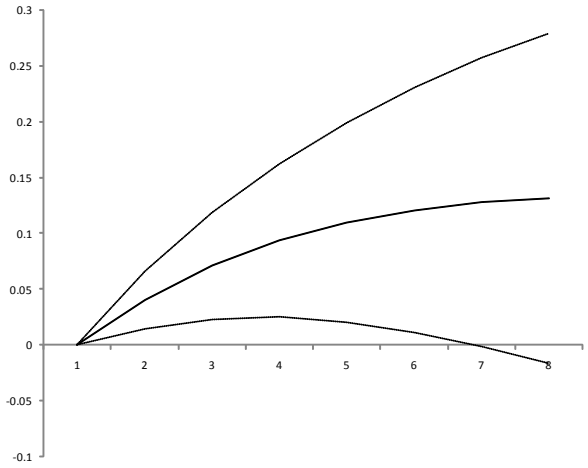


Note: Including Oil Prices

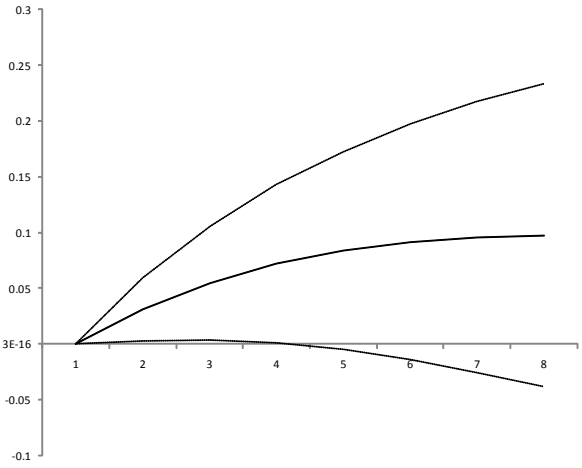


Note: Excluding Oil Prices

Picture 13: Response of JPN inflation to a one standard deviation shock in the JPN short rate



Note: Including Oil Prices



Note: Excluding Oil Prices