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# Monetary Policy Surprises and International Bond Markets

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## Abstract

We examine the impact and possible spillovers effects of unanticipated monetary policy on international bond returns. First, we decompose international bond returns into news regarding future returns, real interest rates and future inflation in the spirit of Campbell and Ammer (1993) for Germany, the UK and the US. We next assess how excess bond returns in these three countries are affected by surprise changes in monetary policy in each country. Our measure of the unanticipated element of monetary policy is based on futures markets rather than the more traditional vector autoregression. Our results indicate that excess bond returns primarily react to domestic as compared to foreign monetary policy surprises. We also find there is a strong divergence between the effects of domestic monetary on excess bond returns in Germany relative to the UK with a surprise monetary tightening in former(latter) leading to a rise(fall) in the excess holding period return and this appears to be driven by news regarding lower(higher) inflation expectations and could be potentially rationalised by differences in the credibility of the monetary policy authority in each country.

**Keywords:** International bond markets, VAR models, return variance decomposition.

**JEL Classification:** C32, E43, E44.

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# 1 Introduction

The last decade has witnessed the primacy of monetary policy as the main tool used by policymakers in the stabilisation of inflation and output. Concomitantly, commentators and analysts appear to pay close attention to changes in policy rates in the belief that such changes, particularly unexpected changes, can influence asset market returns. However, neither policymakers nor academics fully understand how monetary policy affects the economy. In recent years, an increasing amount of attention has been paid to the qualitative and quantitative impact of monetary policy changes on other asset prices such as interest rates and stock returns. For the US, examples of research that have examined the influence of monetary policy surprises on other interest rates include Kuttner (2001) and Poole and Raasche (2000) while Bernanke and Kuttner (2005), Rigobon and Sack (2004), Ehrmann and Fratscher (2004a) and Bomfim (2003) have all examined how US policy rate changes affect the US stock market.

With increasing globalisation, asset markets appear to move more in tandem with each other in recent years. For example, Kim et al (2005) and Agg et al (2004) find that linkages among European stock markets inside and outside the euro-area have strengthened following currency unification while Solnik, Boucrelle and Le Fur (1996) have found increased correlation between major bond markets. Not surprisingly, recent research has begun to highlight the likely influence of global, regional and local influences on asset returns. For example, Christiansen (2005), Christiansen (2006) investigates the impact of global and regional spillovers in bond and equity markets and uncovers significant spillovers from both global (US) and regional (EU) markets into domestic markets and that the introduction of the Euro has typically strengthened regional effects. While there has also been an increasing number of event studies examining the influence of both domestic and foreign news on domestic and foreign assets, e.g., Andersen et al (2003), Faust et al (2005), Ehrmann and Fratscher (2004b) and Connolly and Wang (2003).

It is within this context that we seek to investigate the international transmission of monetary policy in terms of its impact on international bond markets. The price of a bond is a function of the discounted stream of future coupon payments and the redemption value of the bond. Campbell and Ammer (1993) advanced an approach to decompose news regarding current excess bond returns into revisions in expectations of future excess returns, inflation and real rates.<sup>1</sup> In this study, we focus on the German, UK and US long-term bond

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<sup>1</sup>Engsted and Tanggaard (2006) have recently applied this decomposition to US and German bond

markets and conduct a decomposition of each respective country's bond returns based on the Campbell and Ammer (1993) decomposition while permitting returns in each country to affect one another.

Given the pivotal role of monetary policy in determining bond returns we next seek to characterize the impact of unanticipated domestic and foreign monetary policy changes on each country's bond returns and its components. A natural question is how important are domestic monetary surprises in determining domestic bond returns and are there spillovers from foreign monetary policy to domestic returns? For example, it is frequently argued that US monetary policy drives world bond returns and thus our study seeks to shed light on this view. Related evidence suggests that for example, German bond returns respond more to US macro news than domestic or other Euro area news, see for example Goldberg and Leonard (2003) and Andersson, Hansen and Sebestyen (2006). Greater financial market integration, the importance of the US to global growth and the earlier release (relative to the Euro area) of US macro announcements have been highlighted in the literature.

While it is natural to assume that a surprise tightening in monetary policy would lead to higher long-term rates, Ellingsen and Soderstrom (2001) have argued that the response of long rates to a surprise change in the policy rather is ambiguous. In particular, they suggest that long rates will rise when the change in monetary policy reveals information regarding the economy but if the monetary action reveals changes in the central bank's preferences then short rates and long rates may move in opposite directions. Thornton (1998) has also argued that a tightening of monetary policy may lower inflation expectations.

Bearing this in mind a critical feature of our paper in contrast to previous research, that have simply examined how long-term interest rates respond to monetary policy surprises see for example Kuttner (2001), Rigobon and Sack (2004), Ehrmann and Fratscher (2004a), we seek to delve further into what lies behind the response (if any) in bond returns, i.e, is the change in excess bond returns due to changes in expectations regarding future excess returns, real rates or inflation? Bernanke and Kuttner (2005) have conducted a similar exercise in decomposing the impact of monetary policy surprises on US stock returns and we follow their methodology here.

An important feature of our analysis is the decomposition of monetary policy changes into expected and unexpected changes. Failure to decompose monetary policy changes into its expected and unexpected components are likely to lead to biased results due to an errors  

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markets while Barr and Pesaran (1997) have decomposed UK bond returns.

in variables problem. Our measure of the monetary policy surprise is derived from futures market data. Turning to our results we find that excess bond returns react to domestic monetary policy surprises in both Germany and the UK but fail to have a significant impact in the US over the period 1994-2004. Interestingly, we find a strong divergence between the effects of domestic policy on excess bond returns in Germany relative to the UK with a surprise monetary tightening in former(latter) leading to a rise(fall) in the excess holding period return.

The rationale behind such contrasting responses becomes clearer when one breaks down news regarding excess bonds returns into its components, i.e. revisions in news regarding future excess returns, future real interest rates and future inflation, and assess how these components are affected by unanticipated monetary policy. In particular, a surprise tightening of monetary policy in Germany(UK) leads to a statistically significant revision in inflation expectations downwards(upwards) and this appears primarily responsible for the differing response of bond returns in each respective country. Such contrasting responses of inflation expectations to a tightening of monetary policy could be potentially rationalized by differences in the credibility of the monetary policy authority in respective countries(area). In particular, the Bundesbank has traditionally been viewed as a strong fighter of inflation while the Bank of England less so. Finally, we find little role for monetary policy spillovers, i.e., surprise changes in monetary policy in one country(area) doesn't appear to affect news regarding excess bond returns in other countries.

The outline of the rest of the paper is as follows. In section 2, we discuss the Campbell-Ammer methodology associated with the variance decomposition of excess bond returns while in section 3 we outline how we measure monetary policy surprises and how we seek to assess their impact on news regarding current excess bond returns and their respective components. In section 4, we outline the data used and discuss the results from the variance decomposition as well as the impact of monetary policy surprises. Finally section 6 provides a brief conclusion.

## **2 Identification of Monetary Policy**

There are a number of methodological issues that need to be addressed in studying the influence of monetary policy changes on bond market returns. These can be grouped into three main areas 1) endogeneity, 2) omitted variable bias and 3) deriving a measure of the

surprise component of a policy rate change. We will address each of these in turn.

The appropriate identification of policy changes can be most clearly seen in early studies assessing the impact of changes in the money supply on asset prices. Changes in this measure could equally reflect changes in money demand or money supply, e.g., is the announcement of a change in M1 truly exogenous? A failure to properly identify monetary supply changes has led some researchers to find counter intuitive results.<sup>2</sup> The issue of identification becomes somewhat more subtle when one focuses on short term rates as the central bank's main policy variable. In particular, a researcher wishing to isolate the influence of a change in the policy rate on asset prices needs also to be aware that causation may run in the opposite direction, with changes in asset prices leading the monetary authority to change policy rates. Rigobon and Sack (2003) attempt to control for this possibility. However, they find the impact of failing to take account of such endogeneity appears quite small in practice. Moreover, many central bank practitioners argue that central banks have little role in responding to asset prices per se (see for example, Vickers 1999).

A number of theories based on the assumption of efficient markets would suggest that only unanticipated changes in policy should influence asset prices immediately, i.e., when the policy rate is changed asset prices should respond only to the surprise element of such a change. The anticipated element should have already been priced into the asset's value prior to the announcement. Empirical work that fails to decompose monetary policy changes into its expected and unexpected components are likely to lead to biased results due to an errors in variables problem. The most common method used to distinguish between surprises and anticipated changes in monetary policy is to use futures market data. Its popularity stems from the fact that futures markets have dramatically increased both their liquidity and the range of instruments on offer. Hence, one can derive a measure of the surprise element on a continual basis and this is the approach adopted in this paper.

### **3 Variance Decomposition & Monetary Policy Shocks**

#### **3.1 Variance Decomposition**

Campbell and Ammer (1993) decomposed surprise changes in excess bond returns into revisions in expectations (news) regarding 1) future inflation, 2) future real rates and 3)

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<sup>2</sup>See, Sellin (2001) for an overview of such problems.

future excess returns. The forecasting VAR adopted by Campbell and Ammer (1993) is based on using zero coupon bonds. Engsted and Tanggaard (2001) show how this needs to be modified when working with coupon paying bonds and their approach is adopted here. The excess holding period return on a coupon paying bond is written as;

$$x_{t+1} - E_t x_{t+1} = (E_{t+1} - E_t) \sum_{j=1}^{\infty} \rho^j (-\pi_{t+1+j} - r_{t+1+j} - x_{t+1+j}) \quad (1)$$

$$\tilde{x}_{t+1}^i = -\tilde{x}_{\pi,t+1}^i - \tilde{x}_{r,t+1}^i - \tilde{x}_{x,t+1}^i \quad (2)$$

where  $x_{t+1}$  is the nominal one period log gross bond return from  $t$  to  $t+1$  in excess of the continuously compounded nominal one period interest rate,  $\pi_{t+1}$  and  $r_{t+1}$  is respectively the inflation rate and one period log real interest rate from  $t$  to  $t+1$ .

Equation (2) is a dynamic accounting identity and will hold exactly.<sup>3</sup> A forecasting VAR will be adopted to proxy the components in the above decomposition. However, only three of the four variables in equation (2) are required to be estimated, with the remaining variable being equivalent to the residual. Consistent with previous studies we adopt a linear VAR that includes the excess holding period return and the real interest rate. Other variables can be included that are useful in forecasting the two variables of interest.

Suppose the forecasting vector autoregression (VAR) can be represented as;

$$\mathbf{z}_{t+1} = \mathbf{A}\mathbf{z}_t + \omega_{t+1} \quad (3)$$

where  $\mathbf{A}$  is the coefficient matrix from the VAR,  $\mathbf{z}$  consists of both a measure of the excess holding period return on a long bond and the real short-term interest rate. Consistent with Engsted and Tanggaard (2006) we also include the spread between the long-term bond yield and short-term interest rate as a forecasting variable, while  $\omega_{t+1}$  is the vector of error terms. In our estimation we focus on three countries, Germany, the UK and US and hence include the respective variables for excess returns  $x_t^{us}, x_t^{ge}, x_t^{uk}$ , the real rate  $r_t^{us}, r_t^{ge}, r_t^{uk}$  and spread between the long and short rate  $s_t^{us}, s_t^{ge}, s_t^{uk}$  for each country in our underlying VAR. From this VAR proxies for news regarding current and future excess returns and real interest rates are calculated as follows

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<sup>3</sup>See Cuthbertson and Nitzsche (2005) for a formal derivation.

$$\begin{aligned}
\tilde{x}_{t+1}^i &= f_1^i \omega_{t+1} \\
\tilde{x}_{x,t+1}^i &= \rho_i f_1^i \mathbf{A} (I - \rho_i \mathbf{A})^{-1} \omega_{t+1} \\
\tilde{x}_{r,t+1}^i &= \rho_i f_2^i \mathbf{A} (I - \rho_i \mathbf{A})^{-1} \omega_{t+1}
\end{aligned} \tag{4}$$

where  $i = \text{US, UK and Germany}$ ,  $f_1^i$  and  $f_2^i$  are appropriate selection matrices. A proxy for news regarding future inflation in each country can be calculated as

$$\tilde{x}_{\pi,t+1}^i = -x_{t+1}^i - \tilde{x}_{r,t+1}^i - \tilde{x}_{x,t+1}^i, \tag{5}$$

One can further decompose the variance of news regarding excess returns by taking the variance of both sides of equation (2). Having derived series for the news regarding the excess holding period return and its constituent components we next seek to take account of possible effects of international monetary policy shocks on each of these variables.

### 3.2 Monetary Policy Surprise

If bond prices reflect the discounted stream of future cash flows, then a surprise change in the policy rate can affect current excess returns by either changing expectations regarding future inflation, real rates or excess bond returns. Using a market derived surprise to domestic and international monetary policy, we seek to identify the impact that the respective surprise has on each of the factors. Bernanke and Kuttner (2005) analyse the impact of monetary surprises on revisions in expected excess stock returns by including the surprise element in monetary policy as an exogenous variable in the forecasting VAR;

$$\mathbf{z}_{t+1} = \mathbf{A} \mathbf{z}_t + \phi \hat{\Delta} i_{t+1}^u + \bar{\omega}_{t+1} \tag{6}$$

where the coefficients represented by the vector  $\phi$  capture the contemporaneous response of the elements in  $\mathbf{z}_{t+1}$  to the unanticipated changes in monetary policy. The new disturbance term is orthogonal by construction to the surprise in monetary policy. Consistent estimates of both  $\mathbf{A}$  and  $\phi$  can be obtained by first estimating the VAR in equation (6) and then regressing the one-step ahead forecast errors on the monetary surprise. The advantage of the two step procedure is that it permits us to estimate the VAR dynamics over a longer period than our measure of the monetary surprise. A similar approach has also been adopted by Faust et al (2004).<sup>4</sup>

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<sup>4</sup>We could alternatively have included the shock in the monetary policy rate in the forecasting VAR.



We are now in a position to calculate the impact of the monetary surprise on each of the discounted sums of expected future excess returns, real rates and inflation. Previously, we saw that news regarding future excess holding period returns for each country could be written as

$$\tilde{x}_{x,t+1}^i = \rho_i f_1^i \mathbf{A} (I - \rho_i \mathbf{A})^{-1} \omega_{t+1}$$

and incorporating the surprise element of policy rate changes implies

$$\tilde{x}_{x,t+1}^i = \rho_i f_1^i \mathbf{A} (I - \rho_i \mathbf{A})^{-1} (\phi \hat{\Delta} i_{t+1}^u + \tilde{\omega}_{t+1})$$

Hence, the response of the present value of expected future excess returns, future real interest rates and future inflation to policy surprises is given as;

$$\tilde{x}_{x,t+1}^i = \rho_i f_1^i \mathbf{A} (I - \rho_i \mathbf{A})^{-1} \tag{7}$$

$$\tilde{x}_{r,t+1}^i = \rho_i f_2^i \mathbf{A} (I - \rho_i \mathbf{A})^{-1} \tag{8}$$

$$\tilde{x}_{\pi,t+1}^i = \rho_i (f_1^i + f_2^i) \mathbf{A} (I - \rho_i \mathbf{A})^{-1} \tag{9}$$

We isolate the impact of domestic and foreign monetary policy shocks on each of these factors with the intention of identifying likely reasons for co-movement between international bond returns.

## 4 Data and Empirical Results

### 4.1 Data

The data is monthly and the sample period for the underlying VAR runs from January 1975 to December 2004 and is taken from both the IFS and Datastream. The variables for the three countries included in the VAR are excess returns on bonds, the real short-term interest rate and the spread between the long-term bond yield and the short rate. Using long term government bond yields for the US, UK and Germany, the respective excess holding period return is calculated as the log of the one-month holding period return,  $b_{t+1}$ , minus the continuously compounded short rate.<sup>5</sup> The holding period return,  $b_{t+1}$ , is defined as  $y_t - \rho y_{t+1} + k$ , where  $y$  is the log yield on a long bond, while  $\rho = \exp(-\bar{Y})$ ,  $\bar{Y}$  is the mean nominal yield over the sample.<sup>6</sup>

The short-term real interest rate is the nominal short rate less the monthly inflation rate while the spread is defined as  $(1 - \rho_i)y_t^i - q_{t-1}^i$ , where  $q_t^i$  is the continuously compounded nominal short-term interest rate in country  $i$ . The variables chosen here are consistent with those used by Engsted and Tanggaard (2006).<sup>7</sup> Our definition of the monetary surprise for the US follows that of Bernanke and Kuttner (2005). More specifically, in the US, the Federal Reserve targets the federal funds rate (an interbank wholesale rate) while the federal funds futures contract is a contract that pays out based on the average level of the federal funds rate and hence can be used to gauge market expectations regarding the expected level of the US policy rate.

Based on this, Bernanke and Kuttner (2005) propose the following measure of the unanticipated element of monetary policy for month  $t$

$$\Delta i_t^u = \frac{1}{D} \sum_{d=1}^D i_t - f_{t-1}^1 \quad (10)$$

where the value of the one-month ahead futures contract on the last day of the previous month  $f_{t-1}^1$  is subtracted from the average level of the fed funds rate for the current month  $\frac{1}{D} \sum_{d=1}^D i_t$ .

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<sup>5</sup>The derivation of the holding period return is based on a log linearization for an underlying coupon paying bond and was initially put forward by Shiller and Beltratti (1993) and has also been used by Engsted and Tanggaard (2006).

<sup>6</sup> $k$  is a constant based on the log linearization and is equal to  $-\rho \ln(\rho) - (1 - \rho) \ln(1 - \rho)$ .

<sup>7</sup>We tested the lag length in the VAR using the standard information criteria, Akaike information (AIC) and Schwartz Bayesian (SBC), and found they suggested a lag length of one.

For both the UK and German(Euro area), there are no equivalent futures market instruments that tracks the UK or the German(Euro area) policy rate. However, there are interest rate futures contracts that can act as close substitutes since they are likely to be strongly influenced by current expectations of future policy rates. Our proxy for the unanticipated change in the German policy rate between 1989 and 1998 is the one-month change in the 3-month Euromark futures rate. With the introduction of the euro in January 1999, we proxy surprise changes in the ECB policy rate by the one-month change in the three-month Euribor futures rate. Bernoth and Von Hagen (2004) find that the three-month Euribor futures rate is an unbiased predictor of Euro area policy rate changes.<sup>8</sup> For the UK, the policy rate is the two-week repo rate. Our proxy for the unexpected change in the policy rate is the one-month change in the 3-month sterling futures contract. This is one of the instruments used by the Bank of England to infer market expectations about the likely course of monetary policy, see (13).

One concern with using futures rates of a longer maturity than the policy rate, i.e., for the UK we use the three-month sterling futures contract when the policy instrument is the two-week repo rate, is that changes in the former may reflect changes that the market anticipates in the future and not in the immediate horizon. However, Rigobon and Sack (2004) argue that a longer maturity forward contract is more likely to catch a genuine surprise element in the policy rate change rather than a change in timing, i.e., markets are more likely to react to a surprise change in the policy rate relative to when markets had factored in a policy rate change but simply got the timing wrong.<sup>9</sup>

Although the forecasting VAR is estimated for a sample period running from 1975 to 2004, our measures for the monetary policy surprise is restricted to a shorter sample, February 1994 to December 2004. In the case of the US, we restrict the sample to a post 1993 period, given that it was only since February 1994 that the Federal Open Market Committee (FOMC) adopted the present procedure of announcing its policy rate decision after each meeting. Prior to this, markets had to infer what decision had been made by the FOMC after each meeting based on the actions of the Open Market Desk in New York. A second reason for focusing on such a sample is to allow for comparison across countries and so avoid changes in monetary policy regimes when measuring the surprise. The latter is the main consideration in restricting our analysis to post 1994 both the UK and Germany.

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<sup>8</sup>Euribor stands for Euro-Interbank Offer Rate.

<sup>9</sup>Rigobon and Sack (2003) use the three-month euro dollar rather than the one-month Fed funds futures contract in their study of the US.

In the case of the UK we concentrate on a post exchange rate mechanism (ERM) currency crisis, while for Germany the analysis is carried out for a post unification sample.<sup>10</sup>

## 4.2 Empirical Results

### 4.2.1 Variance Decomposition

The VAR estimates are reported for the complete sample (1975-2004) in table 1. The VAR includes the excess return on bonds, the real short-term interest rate and the spread between the long-term bond yield and the short rate for the US, Germany and the UK. Our results are consistent with the anecdotal evidence and the limited empirical evidence that unidirectional spillovers are evident from the US to both the UK and the German bond market. As well as the domestic market, US excess returns has a large influence on German returns in particular. The influence of the US is considerably greater for the German bond market, than is the case for the UK.<sup>11</sup> This result is consistent with recent work by Engsted and Tanggaard (2006), although the authors focus solely on the US and German bond markets. As can be seen a somewhat unexpected result is that German excess returns has a small yet statistically significant (negative) effect on US returns. However, consistent with the previous work, US excess returns are dominated by domestic influences. Finally, US variables represent consistently good predictors for both German and UK yield spreads, while the German spread has a small negative influence internationally.<sup>12</sup>

In table 2, we report the result for the case the US, German and the UK variance decomposition using the news components from equation 2. From equation 2 the variances and the covariances components are reported for news about real interest rates, inflation and expected future bond excess returns. Both the total contribution and the respective share as a percentage of current bond excess returns are reported. Consistent with the finding of both Campbell and Ammer (1993) and Engsted and Tanggaard (2006), the news component associated with future inflation,  $\tilde{x}_\pi$ , plays the largest role. The dominant influence is news about inflation with the variance of this news term being considerably larger than the other news variance terms. This is consistent with the results from Engsted and Tanggaard (2006)

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<sup>10</sup>A number of sensitivity tests have been carried out in relation to the sample specifically and these are discussed later in the paper.

<sup>11</sup>US real rates have particularly high influence on UK real rates, even taking into account the impact of lagged UK real rates.

<sup>12</sup>The German yield spread is significant at 5% for the case of the UK and 10% for the US.

who consider US and German bond returns. As can be seen from table 2, the dominant influence of the inflation factor is also driving its respective covariance term's, although none are statistically significant. We further find theoretically appealing results in relation to the sign of the covariance between real rates and news about inflation, although not statistically significant. Our variance decomposition for the three country bond market case is consistent with previous studies that have adopted a bilateral perspective, namely Campbell and Ammer (1993) and Engsted and Tanggaard (2006).

### 4.3 Monetary Policy Surprises

Next we seek to assess the impact of surprise changes in monetary policy on revisions in expectations regarding excess bond returns and their constituent components for each country based on equations (7) to (9) and these results are reported in table 3. As previously mentioned, we restrict our attention to the sample period 1994:2 to 2004:12. In the first panel of table 3 we report the effect of unanticipated US monetary policy on news regarding domestic and foreign current excess bond returns and their respective constituent components. US monetary policy does not have a statistically significant impact on any of the three countries excess bond returns or their individual components. This result is potentially surprising given the belief that US monetary policy has a strong influence on global bond returns.

In the second panel of table 3 the impact of surprise German(Euro area) monetary policy changes on news regarding both German and foreign excess bond returns as well as their respective components are reported. There is a significant rise in German excess bond returns in response to a surprise domestic monetary tightening. In addition, future inflation expectations are revised significantly downwards. This could potentially point to the credibility of German(Euro area) monetary policy with a surprise tightening in the policy rate leading to lower inflation expectations. Surprise changes in German(Euro area) monetary policy do not significantly impact on news regarding excess bond returns in either the US or UK.

Finally, in third panel of table 3 we report the impact of UK monetary policy on news regarding domestic and foreign excess bond returns. Here we observe that a surprise tightening by the Bank of England has a significant negative effect on news regarding current excess bond returns. When we focus on the driving force behind this, we see that an unanticipated monetary tightening appears to lead to higher inflation expectations and

hence declining excess returns. There is also some evidence that UK monetary policy appears also to have some impact on German excess returns.

#### 4.3.1 Discussion and Further Results

Overall, our results suggest that revisions in expectations regarding current domestic excess returns on long-term bonds is influenced by surprise changes in domestic monetary policy with the exception of the US. We find contrasting results for the impact of surprise changes in domestic monetary policy on news of excess returns for German and UK bonds with excess returns responding positively in Germany and declining in the UK. This difference appears to be driven by the contrasting effects of tightening in monetary policy in the two countries. In particular, while a surprise tightening in the UK suggests rising inflation expectations, the converse appears to be true in Germany with a contractionary policy leading to declining inflation expectations. One possible explanation for these diverging results is the credibility of the two monetary authorities. It is generally perceived that the Bundesbank had strong inflation fighting credentials. Thus, with enhanced credibility, a surprise tightening of policy would lower inflation expectations. On the other hand, the UK has had mixed history in terms of fighting inflation and may have yet to gain such credibility. Thus, a surprising tightening could suggest to market participants that higher inflation is expected in the future.

Of course during the period we are examining, the UK monetary policy regime changed somewhat with the granting of independence to the Bank of England by the Chancellor of the Exchequer in May 1997. One potential criticism of our results and subsequent interpretation is that it was only under the new regime that the Bank of England gained a reputation as an inflation fighter and could yet develop the aura of credibility that the Bundesbank had. We have examined a shorter sample period 1997:5 to 2004:4 for a UK monetary surprise and find little difference in our results, see table 4. One potential reason for this is that inflation fighting credibility has to be earned and isn't simply gained by granting central bank independence. Thus, it is only over time that markets may change perceptions regarding the effectiveness of a monetary authority in fighting inflation.

## 5 Conclusions

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Table 1: VAR Results: US, UK and Germany

	$EX_t^{US}$	$R_t^{US}$	$S_t^{US}$	$EX_t^{GE}$	$R_t^{GE}$	$S_t^{GE}$	$EX_t^{UK}$	$R_t^{UK}$	$S_t^{UK}$
Constant	0.12 (1.28)	-0.01 (-0.98)	-0.00 (-3.55)	0.11 (1.40)	-0.01 (-1.04)	0.00 (0.15)	0.07 (0.82)	-0.01 (-0.56)	-0.01 (-2.15)
$EX_{t-1}^{US}$	0.33 (5.12)	0.00 (0.94)	0.01 (2.35)	0.15 (2.94)	0.01 (2.45)	-0.01 (-2.52)	0.03 (0.56)	-0.00 (-0.15)	-0.01 (-2.49)
$R_{t-1}^{US}$	1.90 (2.48)	0.53 (11.56)	0.00 (0.36)	1.24 (2.04)	0.06 (1.08)	0.00 (1.13)	0.48 (0.75)	0.47 (4.94)	-0.01 (-0.98)
$S_{t-1}^{US}$	3.92 (1.93)	-0.22 (-1.78)	0.93 (40.59)	2.81 (1.74)	0.24 (1.55)	0.04 (3.45)	1.33 (0.79)	0.90 (3.55)	0.04 (2.05)
$EX_{t-1}^{GE}$	-0.17 (-2.11)	-0.00 (-0.65)	-0.00 (-0.41)	0.20 (3.06)	-0.01 (-2.02)	0.01 (2.17)	-0.01 (-0.22)	0.00 (0.11)	0.00 (1.63)
$R_{t-1}^{GE}$	0.42 (0.58)	0.15 (3.46)	0.01 (0.73)	1.82 (3.17)	0.18 (3.17)	-0.00 (-1.31)	0.69 (1.15)	-0.00 (-0.02)	-0.00 (-0.41)
$S_{t-1}^{GE}$	1.26 (0.44)	0.02 (0.10)	-0.06 (-1.75)	-0.87 (-0.39)	-0.53 (-2.43)	0.965 (64.10)	0.12 (0.05)	-0.72 (-2.02)	-0.07 (-2.41)
$EX_{t-1}^{UK}$	0.04 (0.55)	-0.00 (-0.76)	-0.00 (-1.35)	0.03 (0.56)	0.00 (0.14)	0.00 (0.13)	0.23 (3.83)	0.00 (0.47)	0.01 (2.52)
$R_{t-1}^{UK}$	0.04 (0.10)	0.05 (1.98)	0.00 (0.16)	-0.41 (-1.21)	0.01 (0.31)	0.00 (1.00)	0.38 (1.08)	0.13 (2.49)	-0.00 (-0.45)
$S_{t-1}^{UK}$	-0.84 (-0.64)	0.04 (0.56)	0.02 (1.38)	1.08 (1.03)	-0.03 (-0.28)	0.01 (1.49)	0.99 (0.91)	-0.43 (-2.62)	0.97 (76.30)
$R^2$	0.13	0.41	0.86	0.21	0.10	0.94	0.10	0.18	0.96

*Note:*

The table reports the coefficient estimates and their standard errors (in parenthesis) for a three country (US, UK and Germany) VAR which includes the following variables; excess returns, the real short rate and the spread between the long-term bond yield and the short rate.

Table 2: Variance Decomposition US, German and UK Excess Bond Returns.

	US		Germany		UK	
	Total	%	Total	%	Total	%
Variance of Expected Returns	0.002	100	0.001	100	0.001	100
Variance of Expected Future Returns	0.000	73.95 (1.08)	0.001	115.26 (1.05)	0.000	37.50 (0.70)
Variance of Real Rate	0.000	1.20 (1.82)	0.000	0.71 (0.74)	0.000	4.87 (0.97)
Variance of Inflation	0.004	263.11 (3.24)	0.003	328.60 (2.66)	0.002	216.04 (3.32)
2Cov(future returns & real rate)	0.000	7.53 (0.81)	0.000	4.49 (0.28)	0.000	1.04 (0.04)
2Cov(future returns & inflation)	-0.003	-232.81 (-1.58)	-0.003	-343.78 (-1.48)	-0.002	-149.54 (-1.35)
2Cov(inflation & real rate)	-0.000	-12.98 (-1.23)	-0.000	-5.28 (-0.31)	-0.000	-9.91 (-0.35)
Startdate	1975:07	Enddate	2004:12			

*Note:*

The table reports results from the variance decomposition of revision in expectations about current bond return  $e^y$ , future bond returns  $\tilde{e}^y$ , real interest rates  $\tilde{e}^r$ , and future inflation  $\tilde{e}^y$ . The numbers in parenthesis contain t-statistics which use the bootstrap simulation (10,000 runs).

Table 3: Impact of Monetary Policy on Excess Bond Returns: Factoring in Announcement overlap. Sample 1994:2 to 2004:12.

<b>US Policy Surprise</b>			
	US	Germany	UK
Excess Return	0.04 (0.97)	0.00 (0.01)	-0.01 (-0.37)
Excess Future Return	0.04 (1.44)	0.02 (0.83)	-0.01 (-0.49)
Real Rate	0.01 (1.52)	0.00 (1.45)	0.01 (1.37)
Inflation	-0.08 (-1.41)	-0.03 (-0.51)	0.01 (0.23)
<b>German/EMU Policy Surprise</b>			
	US	Germany	UK
Excess Return	0.03 (1.57)	0.05 (2.51)	0.01 (0.20)
Excess Future Return	0.00 (0.12)	0.01 (1.20)	-0.00 (-0.22)
Real Rate	0.00 (0.74)	-0.00 (-0.78)	-0.00 (-0.27)
Inflation	-0.04 (-1.26)	-0.06 (-2.17)	-0.00 (-0.05)
<b>UK Policy Surprise</b>			
	US	Germany	UK
Excess Return	-0.02 (-1.22)	-0.02 (-1.68)	-0.02 (-2.18)
Excess Future Return	0.01 (1.35)	-0.01 (-1.27)	-0.01 (-2.00)
Real Rate	0.01 (1.42)	0.00 (0.52)	0.01 (1.20)
Inflation	0.01 (0.31)	0.03 (1.58)	0.03 (1.86)

*Note:*

US monetary surprise defined as in Bernanke and Kuttner (2005).  
 German/Euro area and UK surprise defined as one month change in 3 month sterling Libor and Euribor contracts.

Table 4: **Impact of UK Monetary Policy Surprise:** *Sample 1997:6 to 2004:12*

Excess Return	-0.038 (-2.38)
Excess Future Return	-0.015 (-0.77)
Real Rate	0.002 (0.50)
Inflation	0.052 (1.74)

*Note:*

UK surprise defined as one month change in 3 month sterling Libor contract.