UK Stock Returns & the Impact of Domestic Monetary Policy Shocks

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Abstract

We investigate the influence of changes in UK monetary policy on UK stock returns and the possible reasons behind such a response. Firstly, we conduct an event study to assess the impact of unexpected changes in monetary policy on aggregate and sectoral stock returns. The decomposition of unexpected changes in the policy rate is based on futures markets data. Secondly, using a variance decomposition in the spirit of Campbell (1991) we attempt to identity the channels behind the response of stock returns to monetary policy surprises. The variance decomposition results indicate that the monetary policy shock leads to a persistent negative response in terms of future excess returns for a number of sectors.

JEL classification: E4; G1

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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. Not surprisingly, commentators and analysts pay close attention to changes in policy rates in the belief that such changes, particularly unexpected changes, can influence stock market returns. However, neither policymakers nor academics fully understand how monetary policy affects the economy. In this paper we investigate one crucial link in the transmission of monetary policy: Do UK monetary policy rate changes affect the UK stockmarket and if so, how?

A number of channels have been hypothesised regarding how monetary policy can influence stock market returns (see the reviews in Bernanke and Kuttner (2005) and Sellin (2001)). For example, if markets are efficient and the value of equities are determined by the expected discounted present value of future cash flows, a change in monetary policy can influence stock returns in a number of different ways. First, via arbitrage, a change in the monetary authority's policy rate is likely to feed into the risk free rate and other market rates, hence, affecting the opportunity cost of holding such an asset. This will, in turn, have an inverse effect on the present value of future cash flows via its impact on the discount factor. Second, given changes in monetary policy can potentially affect output in the short to medium term, expected future cash flows can also be influenced by changes in economic activity induced by such monetary policy changes.

In the last few 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 Rasche (2000) while Bernanke and Kuttner (2005), Rigobon and Sack (2004), Ehrmann and Fratscher (2004) and Bomfim (2003) have all examined how US policy rate changes affect the US stock market.

In the first part of our study we investigate the impact of UK monetary policy shocks on UK aggregate and sector stock returns in an event type study. An important feature of this 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 in variables problem. While previously mentioned research addresses this issue for the US, there is an absence of such work for the UK.

The second part of this study investigates the likely reasons behind the response of UK stock returns to domestic monetary policy shocks. If stock prices reflect the discounted stream of future dividends, changes in current excess returns could be due to revisions in expectations of future dividends, interest rates or excess returns. Campbell (1991) and Campbell and Ammer (1993) advanced an approach to decompose surprise changes in excess returns into revisions in future dividends, real rates or future excess returns while Cuthbertson, Hayes and Nitzsche (1999) and Engsted and Tanggaard (2003) have applied this approach to explain movements in UK stock returns.

This then begs the question: How does monetary policy changes affect expectations of these variables? Bernanke and Kuttner (2005) use a variant of Campbell's methodology to examine the influence of US monetary policy surprises on current US stock market excess returns and its components. In this paper we adopt the approach followed by Bernanke and Kuttner (2005) in ascertaining the influence of monetary surprises on expectations with respect to future dividends, real rates and future excess returns. Overall, our results are consistent with those of Bernanke & Kuttner (2005) for the US. In terms of the event study, only unanticipated changes in monetary policy have a statistically significant impact on both aggregate and sectoral stock returns. However, there does appear to be a large degree of variation in the reaction of particular sectors to monetary policy changes. The results from the variance decomposition indicate the small impact of monetary policy shocks on both aggregate and sectoral returns. Persistent negative excess returns are found for a number of sectors including autoparts, chemicals, oil and gas and steel.

The outline of the rest of the paper is as follows. In section 2, we discuss the appropriate identification of monetary policy and some methodological issues related to the event study while section 3 presents the results from the event study. In section 4 we discuss the methodology associated with the variance decompostion while section 5 presents the results based on this variance decomposition. 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 stock 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.[1] 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).

Stock returns and policy rates could also change due to movements in some other variable. In an attempt to control for the influence of other variables, many researchers have turned to an event study methodology. This attempts to control for the effect of other information that may influence asset prices by focussing on a narrow time interval surrounding the policy action or news under consideration. In particular, the day of the event is chosen, *announcement day*, and the impact on the announcement day and/or subsequent days, *event window*, are analysed. Clearly, the smaller the window, the less other factors can influence the results.[2]

A number of theories based on the assumption of efficient markets would suggest that only unanticipated changes in policy should influence asset prices immediately,

[1] See, Sellin (2001) for an overview of such problems.

[2] See Campbell, Lo and MacKinlay (1997) for a detailed discussion of the event study approach.

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 Event Study

We run the following baseline regression,

$$\Delta R_t = \alpha_0 + \alpha_1 \Delta r_t^e + \alpha_2 \Delta r_t^u + \epsilon_t \tag{1}$$

where,

ΔR_t is the one-day percentage change in the stock index of interest between t and $t+1$,

Δr_t^u is the surprise change in the policy rate,

Δr_t^e is expected change in policy rate, i.e., the difference between the actual change in the policy rate and the surprise change, $\Delta r_t^e = \Delta r_t - \Delta r_t^u$.

An important element in the above specification is the need to derive a proxy for the unanticipated component of the policy rate change. In the US, the policy rate target is the federal funds rate (an interbank market rate trading excess reserves between commercial banks) with the target rate set after each FOMC meeting. Moreover, there is a futures market interest rate based on the average monthly federal funds rate, called the federal funds futures rate. Differences between its value and the federal funds rate generally reflect expectations of an interest rate change. Bernanke and Kuttner (2005), Kuttner (2001) and Poole and Rasche (2000) among others have used this measure.

For the UK, there are no equivalent futures market instruments that track the UK 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. The policy rate in the UK is the two week repo rate. Our proxy for the unexpected change in the policy rate is the one-day 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 monetary policy, see Brook, Cooper & Scholtes (2000).

One concern with using futures rates of a longer maturity than the policy 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.[3] Bernanke and Kuttner (2005) find that a surprise change in US monetary policy is statistically significant with a negative sign, i.e., an unanticipated change in the US federal funds rate target has a negative effect on US stock returns. Similar results using an event study methodology have been found for the US by Ehrmann and Fratzscher (2004), Gurkaynak, Sack and Swanson (2004) and Rigobon and Sack (2004).

3.1 Data and Empirical Results

Our sample period runs from the start of January 1993 to the end of May 2004. The starting period was dictated by the UK leaving the ERM in September 1992. The Bank of England base rate is used as the policy rate. The unanticipated change in the UK base rate is proxied by the one-day change in the price of the three-month Sterling LIBOR futures contract as traded on LIFFE.[4] The data are obtained from the Bank of England and Bloomberg respectively.

The stock market data comprise daily stock returns on 16 (level 4) industry-

[3]Rigobon and Sack (2004) use the three-month euro dollar rather than the one-month Fed funds futures contract in their study of the US.

[4]LIFFE stands for London International Financial Futures and Options Exchange.

based portfolios for the UK and these were obtained from Datastream.[5] The summary statistics for the full set of daily returns on each of the sectors and the benchmark index for the UK are reported in table 1. It can be clearly seen that there is considerable variation in sector returns.

In table 2, we report the impact of (un)anticipated changes in the UK policy rate on the FTSE and UK sectoral returns by running a regression similar to equation (1).[6] At an aggregate level, the surprise element in UK policy rate changes gives rise to a negative significant effect on FTSE returns. In addition, anticipated changes are not statistically significant and hence consistent with the efficient markets hypothesis. Quantitatively, the results imply that a surprise 25 basis point increase in the UK policy rate is associated with roughly a 0.2 percent decline in the FTSE return. These results are qualitatively similar to Bernanke and Kuttner (2005), although they find a greater quantitative impact on US stock returns with respect to a surprise change in the Fed funds target rate.[7]

At a sectoral level, we find similar qualitative results as those found at the aggregate level. Nearly all sectors have a significant negative response to a surprise change in monetary policy while expected policy changes give rise to an insignificant response. The exceptions to this are food processing, household, pharmacy and utilities which respond negatively but not significantly to a surprise change in monetary policy. Despite the use of an event study methodology, other variables on the day of a policy change could be driving our results. For example, if say UK stock returns respond significantly to US stock returns, a spike in US returns on day of the monetary announcement could bias our estimate of the response of UK returns due to omitted variable bias. We can control for this by including any variables which may have such an effect.

Thus, our baseline specification in equation (1) is augmented to include any other variable which may affect stock returns on the day;

$$\Delta R_t = \alpha_0 + \alpha_1 \Delta r_t^e + \alpha_2 \Delta r_t^u + \gamma y_t + \epsilon_t \tag{2}$$

[5] All the sectors are classified as Level 4 and the portfolios are constructed by Datastream.

[6] For all regressions, DW refers to the Durbin Watson statistic for serial correlation and the t-statistics reported below coefficient values are based on White (1980) consistent standard errors.

[7] Bernanke & Kuttner (2005) found that a 25 basis point surprise increase in US rates leads to a one per cent decrease in returns on broad US stock returns.

where y_t is any omitted variable which may potentially bias estimates of the reaction of stock returns to monetary policy changes. Variables we have considered include, same day aggregate stock returns of US, German, Italy and France, the sterling bilateral exchange rate with the US and the Eurzone, as well as sectoral indices for the four above mentioned countries.[8] We find the significance of the coefficients associated with the expected and surprise elements of a policy rate change in table 2 are robust to the inclusion of any of these additional variables. Hence, it appears that nearly all UK sectoral returns examined appear to respond negatively and significantly to a surprise in UK policy rates while expected changes do not appear to affect sectoral stock returns.

4 Variance Decomposition & Monetary Policy Shocks

In this section, we attempt to answer a more elusive question, what are the sources underlying the change in stock returns with respect to an unanticipated policy rate change? If stock prices reflect the discounted stream of future dividends, then a surprise change in the policy rate can affect current excess returns by either changing expectations about future dividends, real rates or excess returns. From the event study we saw that surprise changes in monetary policy have a negative impact on both aggregate and sectoral stock returns. However, the analysis from the event study gives us little guidance as to what drives this result.

4.1 Variance Decomposition

Campbell (1991) decomposed surprise changes in excess returns into revisions in expectations (news) with regard to 1) future dividends, 2) current and future real rates and 3) future excess returns. Bernanke and Kuttner (2005) further extended this analysis and asked how do each of these components respond to surprise changes in monetary policy. Below we briefly outline this methodology.[9]

The one-period excess return is defined as the total return on equities (price

[8] For the US we actually used the day before return, since this is most relevant given time lag between markets, although using a two day window does not change our results.

[9] The interested reader is pointed to the original paper by Campbell (1991) and Bernanke & Kuttner (2005) for a more detailed derivation.

plus dividends) minus the risk free rate denoted y_{t+1}. Then, the surprise in current excess returns is simply the difference between the outturn and what one expected the excess return to be. Campbell (1991) and Campbell and Ammer (1993) show that the innovation in current excess returns can be decomposed into the following[10]

$$e^y_{t+1} = \tilde{e}^d_{t+1} - \tilde{e}^r_{t+1} - \tilde{e}^y_{t+1} \tag{3}$$

i.e., the unexpected excess return e^y_{t+1} is equal to the news about future dividends, $\tilde{e}^d_{t+1}$, minus news about future real interest rates, $\tilde{e}^r_{t+1}$, and news about future excess returns, $\tilde{e}^y_{t+1}$. These components are defined as;

$$\begin{aligned} \tilde{e}^d_{t+1} &= (E_{t+1} - E_t) \sum_{j=0}^{\infty} \rho^j \Delta d_{t+j+1}, \\ \tilde{e}^r_{t+1} &= (E_{t+1} - E_t) \sum_{j=0}^{\infty} \rho^j r_{t+j+1}, \\ \tilde{e}^y_{t+1} &= (E_{t+1} - E_t) \sum_{j=1}^{\infty} \rho^j e_{t+j+1}. \end{aligned} \tag{4}$$

Here, ρ, refers to the discount factor and is equal to the steady-state equity price divided by the equity price plus dividend. Implementing this decomposition requires empirical proxies for the expectational terms appearing in the above equation. Campbell (1991) and Campbell and Ammer (1993) model expectations based on a forecasting vector autoregression that includes the variables of interest, excess returns and the real rate and any other variables that may be useful in forecasting these two variables. One can then calculate the discounted sum of revisions in expectations for each of the terms in equation (3).

Suppose we represent the forecasting vector autoregression as;

$$\mathbf{z}_{t+1} = \mathbf{A}\mathbf{z}_t + \omega_{t+1} \tag{5}$$

where $\mathbf{z}$ consists of a measure of excess returns, the real rate and any other variables that are useful in forecasting the variables of interest. Based on the estimates

[10]The expression below is derived in Appendix 1.

from the VAR one can then calculate the following

$$\begin{aligned} e^y_{t+1} &= s_y w_{t+1}, \\ \tilde{e}^y_{t+1} &= \frac{s_y \rho A w_{t+1}}{(1-\rho A)}, \\ \tilde{e}^r_{t+1} &= \frac{s_r w_{t+1}}{(1-\rho A)}, \\ \tilde{e}^d_{t+1} &= e^y_{t+1} + \tilde{e}^y_{t+1} - \tilde{e}^r_{t+1}, \end{aligned} \tag{6}$$

where s_y and s_r are appropriate selection matrices. From this Campbell (1991) decomposes the variance of news about excess returns by taking the variance of both sides of equation (3).

Empirical evidence for the variance decomposition of stock returns using US data find that the variance in expected future excess returns has the largest weight in terms of the current excess returns variance, see Campbell & Ammer (1993) and Bernanke & Kuttner (2005).The latter find that dividends are important, 24.5% compared to 14% in the case of Campbell and Ammer (1993).[11] Although a small share, 1.4%, the real rate is statistically significant in Bernanke and Kuttner (2005), with a t-statistic of 2.40. This result is consistent with Campbell and Ammer (1993). Cuthbertson et al (1999) also find that news about future excess returns is the dominating force behind movements in UK stock returns.

4.2 Monetary Policy Shocks

Bernanke and Kuttner (2005) analyse the impact of monetary surprises on revisions in expected excess returns by including the surprise element in monetary policy as an exogenous variable in the forecasting VAR;

$$\mathbf{z}_{t+1} = \mathbf{A}\mathbf{z}_t + \phi \hat{\Delta} i^u_{t+1} + \bar{\omega}_{t+1} \tag{7}$$

where the coefficients in the vector ϕ captures the contemporanous response of the elements in $\mathbf{z}_{t+1}$ to the unanticipated change in monetary policy. The new disturbance term is orthognal by construction to the surprise in monetary policy. Consistent estimates of both A and ϕ can be obtained by first estimating the VAR in

[11] The difference in results arises from use of different sample periods.

equation (5) and then regressing the one-step ahead forecast errors on the monetary surprise. [12]

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, dividends and real rates. Previously, we saw that news about future excess returns could be written as

$$\tilde{e}^{y}_{t+1} = \frac{s_y \rho A \omega_{t+1}}{(1-\rho A)},$$

and incorporating the surprise element of policy rate changes implies

$$\tilde{e}^{y}_{t+1} = \frac{s_y \rho A (\Delta i^{u}_{t+1} + \bar{\omega}_{t+1})}{(1-\rho A)}.$$

Hence, the response of the present value of expected future excess returns to policy surprise is given as,

$$\frac{s_y \rho A \phi}{(1-\rho A)}.$$

Similarly, the response of current and expected future real returns is

$$\frac{s_r \phi}{(1-\rho A)},$$

and the implied response of the present value of current and future dividends is

$$\frac{(s_r + s_y)\phi}{1-\rho A}$$

Bernanke and Kuttner (2005) also identify the avenues as to why interest rate shocks have an influence on US stock returns, using the variance decomposition approach. Over the 1973-2002 sample there is a marginally significant impact on future excess returns and dividends, with real interest rates not statistically significant.[13] Qualitatively there is little change when Bernanke & Kuttner (2005) move to the 1989-2002 sample.[14]

[12] We could alternatively have included the shock in the monetary policy rate in the forecasting VAR.

[13] Patelis (1997) also adopts a VAR to investigate the effect of monetary policy on US stock returns. The author finds that monetary policy changes (rather than shocks) have a consistent effect to those reported in Bernanke & Kuttner (2005).

[14] The impact of the shock on future excess returns has halved, while the impact on the real interest rate is slightly larger and statistically significant at the 90% level when the authors revert to the 1989-2002 sample.

5 Data & Variance Decomposition Results

5.1 Data

Given that the forecasting VAR requires periodic time series data, this section will use monthly data, which is collected from Datastream. The variables included in the VAR are the market excess return, the real interest rate, the log dividend price ratio, the 1 month change in the short rate (treasury bill), the spread between the 20 year government bond rate and the short rate and the effective exchange rate. Besides the excess return and the real interest rate, which are required for the decomposition, we also include variables which have been found to be successful at stock return predictability (see Campbell & Ammer (1993). The only exception is the exchange rate which takes account of the open nature of the UK market. The market excess return is measured using the change in the log total market return index, incorporating prices and dividends, in excess of the short-term interest rate. The real interest rate is calculated using the short-term interest rate minus the CPI inflation rate. The exchange rate is the sterling effective exchange rate.[15] Our definition of the monetary policy shock using monthly data is the following;

$$\Delta r_t^u = i_{uk} - f_{t-3} \quad (8)$$

where i_{uk} is the value of the rate on the settlement day and f_{t-3} is the futures rate on the last day of month $t-3$. There is some difference between our definition of the monetary policy shock and that used by Bernanke & Kuttner (2005). First, the instrument used by Bernanke & Kuttner (2005), the federal funds futures contract, is a one-month contract while the contract used here for the UK is a three-month contract, the three-month LIBOR futures. Second, the settlement price for the federal funds futures contract is based on the average of the federal funds rate that month, in the case of the Libor it is the third Wednesday of each delivery month (December, March, June and September).[16]

[15] We tested the lag length in the VAR using the standard information criteria, Akaike information (AIC) and Schwartz Bayesian (SBC) and found a lag length of one.

[16] The settlement price is based on the British Bankers Association (BBA) libor rate for 3 month deposits on the last trading day.

5.2 Variance Decomposition Results

In table 3, we report the variance decomposition for UK equity returns over the period 1993 to 2004. From equation (3) the variances and the covariances components are reported for news about real interest rates, dividends and expected future excess returns. Both the total contribution and the respective share as a percentage of current excess returns are reported.

Consistent with the findings of Campbell (1991) and Bernanke and Kuttner (2005) for the US and Cuthbertson et al (1999) for the UK, the largest component is the revision in expectations regarding future excess returns.[17] We also find that while news regarding the real rate accounts for just over 1% in the variance decomposition, it is highly statistically significant. The dividend component accounts for 18% and is insignificant. One reason for the lack of statistical significance in our work relative to other papers in the literature is that we calculate t-statistics based on bootstrapped standard errors while other authors use the delta method. Bootstrapped statistics are likely to be more accurate as the delta method is well known to understate true standard errors.

5.3 Impact of Monetary Policy

Next we attempt to identify the possible avenues as to why interest rate shocks have an influence on aggregate stock and sector returns. The impact of the monetary surprise on future excess returns, real interest rates and dividends is reported in table 4. The first row represents the aggregate market return, while the sector returns are shown in the remainder of the the table. In terms of the aggregate market, the signs for the variance decomposition as a result of the shock to monetary policy are consistent with the results in Bernanke & Kuttner (2005) for the US. However, the components are not statistically significant. This is not a surprising result, given that the size of the impact is so small.

However, when we turn to the sectoral response we find evidence of a significant negative response in terms of future excess returns. The sectors where persistent negative future excess returns are found include, autoparts, chemicals, engineering,

[17]However, it is not significant here. A similar finding was reported in Bernanke & Kuttner (2005) for a post 1989 VAR sample.

oil and gas, retail and steel, represent what may be considered traditional sectors of the economy. Two points should be highlighted here. Firstly, given the size of the persistence is so small, the discounting approach does not yield a statistically significant current excess return component. Secondly, it may well be the nature of these particular sectors that leads to the persistence in negative returns.

6 Conclusions

In this study, we have examined the impact of UK monetary policy shocks on aggregate and industrial level stock returns. A central part of the study is the decomposition of policy rate changes into their expected and unexpected components using interest rate futures contract. UK monetary policy shocks have a statistically significant impact on UK industrial level stock returns. The sensitivity to the shock is dependent on the particular industry, e.g. autoparts and oil and gas are extremely sensitive to the shock. The finding of heterogenous results are also evident from the variance decomposition approach. The impact on the aggregate index to the monetary policy shock is considerably smaller than that found using US data. The results for sector returns indicate clear evidence of persistence negative future excess returns in response to a monetary policy shock. This is particularly the case for sectors in traditional industries, including autoparts, chemicals, oil and gas and steel.

7 Appendix

The log-linear representation of the present value model or rational valuation formula (RVF) formulated by Campbell & Shiller (1988) approximates the one-period log holding return as:[18] [19]

$$h_{t+1} \approx k + \rho p_{t+1} + (1-\rho) d_{t+1} - p_t \tag{9}$$

where h_t is the expected log real return in period t, p_t is the log real price at the end of period t and d_t is the log real dividend paid during period t, $\rho = 1/(1+exp(\delta))$ where δ is the mean log dividend price ratio and k is a constant associated with the linearization.[20][21] Imposing the terminal condition that $\lim_{j\to\infty} E_t \rho^j p_{t+j} = 0$,[22] equation (9) can be solved forward to give:

$$p_t = \frac{k}{1-\rho} + (1-\rho)\, E_t \sum_{j=0}^{\infty} \rho^j d_{t+j+1} - E_t \sum_{j=0}^{\infty} \rho^j h_{t+j+1} \tag{10}$$

Campbell (1991) shows that it is possible to obtain a decomposition of the unexpected stock return as:

$$\begin{aligned} \tilde{h}_{t+1} &\equiv h_{t+1} - E_t h_{t+1} \\ &= (E_{t+1} - E_t) \left\{ \sum_{j=0}^{\infty} \rho^j \Delta d_{t+j+1} - \sum_{j=1}^{\infty} \rho^j h_{t+j+1} \right\} \end{aligned} \tag{11}$$

by substituting p_t and p_{t+1} out of equation (9). Although equation (11) is written in terms of real log stock returns, it is possible to define the excess stock return over a short term interest rate as $e^y_{t+1} \equiv h_{t+1} - r_{t+1}$ where h_{t+1} is the expected return and r_{t+1} is the real interest rate, such that the innovation in the excess return is given by:

[18] See, Cuthbertson & Nitzsche (2005) for a detailed account of the variance decomposition approach.

[19] Campbell & Shiller (1988) define the one-period log holding return as $h_{t+1} \equiv \log(P_{t+1}+D_{t+1}) - \log P_t$, where P_t is the real stock price measured at the end of period t and D_t is the real dividend paid during period t.

[20] $k - log(\rho) - (1-\rho) log(\frac{1}{\rho} - 1)$.

[21] Following Cuthbertson, Hayes & Nitzsche (1997) $\rho = 0.99$ is adopted for all the countries.

[22] This condition prevents explosive behaviour and rules out “rational bubbles”.

$$
\begin{aligned}
e^y_{t+1} &= (E_{t+1} - E_t)\left\{\sum_{j=0}^{\infty}\rho^j \Delta d_{t+j+1} - \sum_{j=0}^{\infty}\rho^j r_{t+j+1} - \sum_{j=1}^{\infty}\rho^j e_{t+j+1}\right\} \\
&= \tilde{e}^d_{t+1} - \tilde{e}^r_{t+1} - \tilde{e}^y_{t+1}
\end{aligned}
\qquad (12)
$$

This states that the unexpected excess return, e^y_{t+1} is equal to the news about future dividends, $\tilde{e}^d_{t+1}$, minus the news about future real interest rates, $\tilde{e}^r_{t+1}$, and the news about future excess returns, $\tilde{e}^y_{t+1}$.

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Table 1: Summary Statistics for UK Industry Returns

	Mean	Standard Error	Minimum	Maximum
FTSE	0.03	0.98	-5.36	5.10
Autoparts	0.05	1.54	-9.92	12.93
Banks	0.06	1.54	-10.15	7.33
Chemicals	0.02	1.13	-7.78	5.32
Cons & build	0.03	0.94	-4.72	5.75
Elec Equip	0.01	1.89	-23.50	16.85
Engineering	0.02	1.13	-7.39	8.55
Foodproc	0.03	1.10	-7.21	6.10
Household	0.01	1.39	-8.93	17.79
Insurance	0.01	1.62	-13.63	9.79
Media	0.03	1.42	-6.97	9.33
Oil & Gas	0.05	1.50	-8.34	9.28
Pharmacy	0.03	1.57	-10.51	13.15
Retail	0.03	1.11	-6.71	6.24
Steel	0.01	3.86	-102.97	37.46
Transport	0.01	0.93	-7.88	4.34
Other Utilities	0.04	1.07	-5.32	4.75

The sectors in full are the following; auto and parts, banks, chemicals, construction and building materials, electricity, engineering and machinery, food production and producers, household goods and textiles, insurance, media and entertainment, oil and gas, pharmacy and biotechnology, retail, steel and other metals, transport and utilities.

Table 2: Influence of UK monetary policy change on UK aggregate and sectoral stock returns. Unanticipated change in policy rate proxied by 1-day change in 3-month sterling futures contract.

	Expected	Surprise	R^2	S.E.
FTSE	0.166	-0.752	0.127	0.093
	(0.879)	(-1.965)		
Autoparts	0.101	-1.222	0.184	0.140
	(0.417)	(-3.024)		
Banks	0.272	-1.132	0.112	0.252
	(0.875)	(-1.694)		
Chemicals	-0.073	-0.608	0.350	0.016
	(-0.973)	(-5.344)		
Cons & build	-0.015	-0.433	0.075	0.050
	(-0.142)	(-2.113)		
Elec Equip	0.161	-0.678	0.072	0.145
	(0.792)	(-2.234)		
Engineering	-0.064	-0.726	0.342	0.023
	(-0.635)	(-5.694)		
Foodproc	0.181	-0.478	0.114	0.057
	(1.336)	(-1.587)		
Household	-0.247	0.056	0.047	0.122
	(-1.444)	(0.156)		
Insurance	0.374	-0.723	0.215	0.082
	(2.374)	(-2.165)		
Media	0.064	-0.898	0.137	0.107
	(0.320)	(-2.582)		
Oil & Gas	0.133	-1.069	0.142	0.149
	(0.563)	(-2.071)		
Pharmacy	0.435	-0.912	0.125	0.230
	(1.497)	(-1.531)		
Retail	0.074	-0.640	0.212	0.033
	(0.626)	(-3.318)		
Steel	-0.229	-1.063	0.140	0.192
	(-1.364)	(-3.719)		
Transport	0.085	-0.515	0.113	0.046
	(0.747)	(-2.163)		
Other Utilities	0.279	-0.494	0.075	0.144
	(1.410)	(-0.967)		

White consistent t-statistics reported below coefficient values in parenthesis.
R^2 and S.E. refer to R squared and standard error.

Table 3: Variance Decomposition of Aggregate UK Excess Equity Returns

	Total	Share (%)
$Var(e^y)$	16.33	100
$Var(\tilde{e}^d)$	2.95	18.09
		(0.18)
$Var(\tilde{e}^r)$	0.22	1.37
		(4.26)
$Var(\tilde{e}^y)$	19.89	121.81
		(0.86)
$-2Cov(\tilde{e}^d, \tilde{e}^r)$	-0.14	-0.87
		(-0.08)
$-2Cov(\tilde{e}^d, \tilde{e}^y)$	-5.78	-35.42
		(-0.15)
$2Cov(\tilde{e}^y, \tilde{e}^r)$	-0.81	-4.98
		(-0.43)
$\bar{R}^2$ from excess return equation	0.044	

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

Table 4: The Impact of UK Monetary Policy on News regarding current excess returns, future dividends, future real interest rates and future excess returns.

	e^y	$\tilde{e}^d$	$\tilde{e}^r$	$\tilde{e}^y$
FTSE	-0.06	-0.42	0.02	-0.38
	(-0.07)	(-0.43)	(0.26)	(-1.65)
Autoparts	0.38	-1.10	0.03	-1.51
	(0.25)	(-0.75)	(0.34)	(-4.39)
Banks	-0.03	-1.04	0.02	-1.03
	(-0.02)	(-0.45)	(0.23)	(-0.93)
Chemicals	0.54	-0.57	0.03	-1.14
	(0.44)	(-0.42)	(0.43)	(-3.66)
Cons & build	0.89	0.90	0.02	-0.01
	(0.77)	(0.47)	(0.22)	(-0.01)
Elec Equip	1.18	0.96	0.02	-0.23
	(1.22)	(1.21)	(0.20)	(-0.49)
Engineering	1.22	-0.19	0.03	-1.44
	(0.90)	(-0.14)	(0.39)	(-4.05)
Foodproc	-0.04	-0.11	0.03	-0.10
	(-0.04)	(-0.10)	(0.31)	(-0.45)
Household	0.53	0.31	0.02	-0.25
	(0.37)	(0.17)	(0.28)	(-0.41)
Insurance	0.53	0.72	0.03	0.16
	(0.34)	(0.49)	(0.32)	(0.38)
Media	-0.53	-0.87	0.04	-0.38
	(-0.38)	(-0.66)	(0.52)	(-0.87)
Oil & Gas	0.31	-0.67	0.02	-1.00
	(0.28)	(-0.70)	(0.29)	(-3.38)
Pharmacy	-1.06	-0.40	0.02	0.64
	(-0.88)	(-0.39)	(0.22)	(1.86)
Retail	1.21	0.59	0.02	-0.63
	(1.24)	(0.62)	(0.24)	(-2.65)
Steel	-0.84	-4.06	0.02	-3.23
	(-0.25)	(-1.23)	(0.18)	(-3.77)
Transport	1.03	0.64	0.03	-0.42
	(0.99)	(0.52)	(0.34)	(-1.37)
Other Utilities	-0.31	0.35	0.02	0.65
	(-0.37)	(0.54)	(0.23)	(1.14)

e^y reflects news about current excess return, $\tilde{e}^d$ is news about future dividends, $\tilde{e}^r$ is news about real interest rates and $\tilde{e}^y$ is news about future excess returns. The numbers in parenthesis contain t-statistics which use the bootstrap simulation (10,000 runs).