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**Research Technical Paper**

# *International Policy Rate Changes and Dublin Interbank Offer Rates*

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**Abstract**

We investigate the influence of international interest rate changes on the Dublin inter bank money market rates (Dibor). Specifically, we analyse the impact of (un)expected changes in German(Euro) area and US policy rates on various Dibor rates between 1991 to 2002 in an event type study. Our decomposition of (un)expected changes of policy rates are based on future markets and is akin to Kuttner (2000). Overall, our results suggest that Dibor rates respond positively and significantly to unanticipated Euro and US policy rate changes while expected changes have an insignificant impact.

*JEL classification*: E4; G1
*Keywords*: Monetary policy; interest rates.

# 1 Introduction

The last decade has witnessed the primacy of monetary policy as the main instrument in the stabilisation of inflation and output. The response of market interest rates to changes in monetary policy has been of interest to researchers for a long time. Moreover, with the recent introduction of the single European currency, increased attention has been paid to the relationship between monetary policy and asset prices (see ECB Monthly Bulletin, February 2002).

Given, Ireland is a small open economy, factors outside the country are likely to play a large role in determining economic conditions within the economy.[1] With the advent of EMU, Irish monetary policy is now determined at a european level. In addition, with greater financial integration, it is likely that global monetary conditions will also have an important influence on economies such as Ireland.

There is a large literature that examines the influence of policy rate changes on market interest rates at various maturities. How policy rate changes affect the term structure of interest rates is critical to the effectiveness of monetary policy. In this note we examine the influence of international policy rate changes on the Dublin wholesale money market. In an event type study, we examine the same day impact of changes in German(Euro) and US policy rates on various Dublin interbank offer rates (Dibor rates) ranging in maturity between 1 week and 12 months.[2]

The extent to which market interest rates respond to policy changes will also be influenced by whether such policy changes are perceived to be anticipated or not. Early studies examining this relationship were unable to find a consistent results due to a failure to distinguish between expected and unexpected components of policy changes, see for example, Cook & Hahn (1989) and Roley & Sellon (1995).

The decomposition of policy rate changes into anticipated and unanticipated components is a difficult task. One possibility is to statistically model expectations using either an univariate or multivariate approach. An example of this approach is the use of vector autoregressions (VAR), where the unanticipated exogenous change in the policy instrument is identified and its effects on various asset prices can then be examined via impulse response functions over the short to medium term. Evans

[1] Research, for example, by Gallagher (1995) and Gallagher & Twomey (1998) have investigated linkages between Irish and international stock market.

[2] Lack of data at a daily frequency prohibit looking at longer maturities.

& Marshall (1998) and Wu (2002) use this approach for US data. [3]The difficulty, however, of such an approach is that the modeller may omit information that market participants utilise in forming their expectations. In addition, Rudebusch (1998) and Cochrane & Piazzesi (2002) have questioned the validity of the VAR generated shock on the grounds that it is some what artificial. An alternative approach is to use survey methods to assess market participants expectations of the variable of interest. A difficulty with this approach is that surveys are done on a discrete basis i.e. monthly or weekly. It may be preferable to have a more continous measure of market expectations. A third possibility is to use futures markets to derive market expectations and this the approach used in this note.

We decompose policy rate changes into their (un)expected components based on the approach advocated by Kuttner (2001) and others who argue that one day changes in future interest rates can act as a proxy for the unanticipated change in policy rates. The rest of the paper is structured as follows: section 2 provides a brief literature review while section 3 discusses the methodology used and section 4 reports the results. Finally, section 5 provides a brief conclusion.

## 2 Literature Review

There is a large literature that investigates the impact of US target rate changes on market rates. Early papers failed to distinguish between expected and unexpected policy rate changes. A typical example using the event study approach is that of Cook & Hahn (1989) who ran the following regression

$$\Delta R_t = \alpha_0 + \alpha_1 \Delta \tilde{r}_t + \epsilon_t. \tag{1}$$

They examined the impact of changes in monetary policy on Treasury securities and found that policy rate changes led to increases in treasury rates particularly at the short end of the market. A one percentage point increase in the Fed funds rate resulted in a 55 basis points increase in the 3 month T-bill rate. The impact at the longer end of the maturity spectrum was considerably smaller, with only a 10 basis point increase for the 30 year bond. Roley & Sellon (1995) adopted a similar

[3]Both Wu (2002) and Evans & Marshall (1998) find that the impact of an exogenous monetary policy shock on interest rates falls as we move out the maturity spectrum.

approach to that of Cook & Hahn (1989), for the period 1987 to 1995. Their study found that rates increased by a statistically insignificant four basis points as a result of an increase of 1 per cent in the target rate.

However, 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 variable problem. In particular, a number of theories based on the assumption of efficient markets would suggest that only unanticipated changes in the policy instrument should influence asset prices while anticipated changes should have no effect as such information should have already been priced into the asset by the market. Studies that examine the influence of policy rate changes and fail to decompose actual changes into these two components are liable to lead to biased results.

The decomposition of policy changes into anticipated and unanticipated components is a difficult problem. Fortunately, with the increasing use of future markets, it is potentially easier to derive market expectations of policy variables. Recent studies that have used federal funds futures to decompose policy changes into anticipated and unanticipated, include Kuttner (2001) and Poole & Rasche (2000).[4]

Kuttner (2001) analyses the impact of unanticipated changes in the fed funds target rate on treasury bill, note and bond yields

$$\Delta R_t = \alpha + \beta_1 \Delta \tilde{r}_t^e + \beta_2 \Delta \tilde{r}_t^u + \epsilon_t \tag{2}$$

where $\Delta \tilde{r}_t^u$ is the one day surprise; and $\Delta \tilde{r}_t^e$ is the expected change in the target rate. The one day surprise is defined as $\Delta \tilde{r}_t^u = \frac{m}{m-t}(f_{s,t}^0 - f_{s,t-1}^0)$ where m is the number of days in the month, t is the day of the announcement, $f_{s,t}^0$ is the spot month federal funds future rate on day t of month s while $f_{s,t-1}^0$ is the previous day's value. Kuttner's (2001) sample runs from June 1989 to February 2000 and he finds a very small insignificant relationship between interest rates and anticipated target rate changes, but a large and highly significant relationship with unanticipated target changes. In addition, he finds the response of interest rates

[4]If on day $t$, the players in the futures market expected a change in Fed policy on day $t+1$ and no further changes were anticipated. Then the federal funds futures rate on day $t$ of month $s$, $f_{s,t}^0$, would encompass the average of realized funds through that date and expectations about rates after that date.

from 1 to 12 month maturities to policy surprises to be of similar magnitude. Poole & Rasche (2000) and Cochrane & Piazzesi (2002) find similar results to Kuttner (2001). [5] Ehrmann & Fratzscher (2002), using survey data, examine the influence of unexpected changes in policy rates for both the US and Germany/Euro area on money market rates in both the US and Germany/Euro area.

# 3 Methodology

Drawing on Kuttner's (2001) approach, we initially run the following baseline regression;

$$\Delta Dibor_t = \alpha_0 + \alpha_1 \Delta R_t^e + \alpha_2 \Delta R_t^u + \epsilon_t \tag{3}$$

where

$\Delta\ Dibor_t$ is the one day change in the relevant Dibor rate between t and t+1

$\Delta R_t^u$ is the one day change in the futures rate on day t of a change in the policy target rate and acts as a proxy for a policy rate surprise

$\Delta R_t^e$ is a proxy of the expected change in the policy rate target at date t

The expected change in the policy rate is calculated as the difference between the actual policy rate target and the change in the futures contract on the day of the change. For the US, we use the one day change in federal funds futures contract as our proxy of the policy rate surprise. One problem in examining Germany or Euro policy rates is that there is no equivalent futures market instrument that tracks German or Euro area policy rates as compared to the federal funds future contract. However, there are interest rate future 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 interest rate between 1991 and 1998 is the one day change in the 3 month Euro mark futures rate. With

[5] Poole & Rasche (2000) use the 1 month ahead futures contract as a proxy for the unanticipated element of policy rate change while Cochrane & Piazzesi (2002) use the euro dollar contract.

the introduction of the Euro in January 1999, we proxy surprise changes in Euro rates by the one day change in the 3 month Euribor futures rate.[6]

# 4 Data and Empirical Results

## 4.1 Data

In table 1 and the appendix, we give a detailed explanation of our data and sources they were drawn from.

## 4.2 Empirical Results

We first examine the impact of German and Euro policy rates on market rates in Dublin. We combine together the unanticipated changes in German and Euro policy rate changes based on the one day change in the 3 month mark and euribor futures respectively. The results for the baseline regression are reported in table 2. Overall, our results suggest unanticipated changes in German & Euro policy rates give rise to a significant positive effect on most Dibor rates while anticipated changes have a statistically insignificant effect.

However, given the change in monetary arrangements from a quasi-fixed exchange rate to a monetary union, it is likely that the response of policy rate changes for Germany and the Euro area on Dibor rates is likely to differ. To examine this possibility we separate the influence of German and Euro rates to see whether there has been a change in this relationship with the introduction of the Euro.

In table 3, we find that with the onset of the Euro, an unanticipated change in Euro policy rate leads to a positive significant impact on all Dibor rates. Moreover, a shock to the Euro policy rate appears to give rise to at least a one for one change in all Dibor maturities examined. Hypothesis tests cannot reject a coefficient equal to unity associated with an unexpected change in the ECB policy rate. Thus, wholesale money market rates in Dublin appear to respond one for one to unexpected changes in the Euro area policy rate. On the other hand, expected changes in the ECB policy rate do not give rise to a significant response. The finding of a lack of signficance of expected changes in the policy rate are in accordance with Kuttner's (2001) work

[6]Euribor stands for Euro Interbank Offered Rate.

on the US.

Prior to the onset of EMU, neither (un)anticipated changes in the German policy rate give rise to a significant positive influence on Dibor rates. These diverging results can be rationalised on the basis that in a monetary union, money market rates in Dublin should be in line with Euro policy rate. While under the ERM, there was some scope for different monetary policies given the exchange rate was only quasi fixed and hence Irish money market rates could diverge from German rates.[7]

In table 4, we report results for different Dibor rates for (un)anticipated changes in the US federal funds rate target. Our proxy for the unanticipated change is the one day change in the Fed funds future rate contract.[8] Overall, an unanticipated change in the Fed funds rate target leads to a significant positive response across most Dibor maturities while an expected change is not statistically significant. Not surprising, we find the magnitude of unanticipated component is much lower for US relative to Euro area policy changes.

While the finding that unexpected changes in the US policy rate can influence wholesale money market rates in Dublin may seem surprising, it seems to point to the importance of US monetary policy leading other countries monetary policy. Research by Ehrmann & Fratzscher (2002) also find a positive effect of US monetary surprises on German and Euro Area market rates but find much less evidence of causation running in the opposite direction.[9]

Overall, our results appear to be consistent with the efficient markets hypothesis, which suggests that only unanticipated changes in the policy instrument should influence asset prices while anticipated changes should have no effect as such information should have already been priced into the asset by the market.

## 5 Conclusions

We have investigated the influence of international interest rates on Dublin interbank money market rates (dibor). Consistent with a number of recent studies on

[7] We are unable to examine the impact of (un)anticipated changes in the domestic Irish policy rate prior to EMU due to the lack of a futures market for Ireland.

[8] As in Poole & Rasche (2000), we use the one month ahead federal funds future's contract.

[9] These authors don't report results for expected changes in the policy rate.

US data, we use an event study approach taking into account (un)anticipated policy rate changes. Our main finding is that there is a strong relationship between surprise Euro area policy rate changes and market rates in Ireland while US policy surprises also have a significant influence. On the other hand, expected policy rate changes are not statistically significant. In all cases our results appear to be consistent with the efficient markets hypothesis, which suggests that only unanticipated changes in the policy instrument should influence asset prices while anticipated changes should have no effect as such information should have already been priced into the asset by the market. Further work might explore more closely the link between US policy changes and European interest rates.

# 6 Appendix

## 6.1 Data

The data set is taken from various sources, including Datastream, Bloomberg, Federal Reserve Board of Governors, Deutsche Bundesbank and the Central Bank of Ireland. The sample period runs from July 1991 to October 2002. The actual change in the federal funds target rate is obtained from the Federal Reserve Board of Governors. The unanticipated change in the federal funds target rate is proxied by both the 1-day change in the price of the 1-month ahead 30-day Federal Funds futures contract, as traded on the Chicago Board of Trade (CBOT).[10]

Actual changes used for German and Euro policy rate are changes in the Bundesbank base rate (Lombard rate) until December 1998 and the ECB main refinancing rate for the remainder of the sample. These rates are taken from the Deutsche Bundesbank and the ECB respectively. The unanticipated change in the Bundesbank base rate is proxied by the 1-day change in the price of the Short EuroDM futures contract as traded on the London International Financial Futures and Options Exchange (LIFFE). The unanticipated change in the ECB refinancing rate is proxied by the 1-day change in the price of the EUX 3-month euribor futures contract as

[10]The change is $F_t - F_{t-1}$, where $t$ is the day of the policy announcement. The change in the Dibor rates (data taken from Bloomberg) must take account of the time difference between the US and Ireland and hence is calculated as $(P_{t+1} - P_t)/P_t$, where $t$ is the day of the policy announcement.

traded on Eurex, Frankfurt. In both cases the unanticipated change is calculated as $F_t - F_{t-1}$, where $t$ is the date of the policy announcement. The data are taken from Datastream and Bloomberg respectively.

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**Table 1: Data Description**

| Origin of Event | Proxy for Unanticipated Change | Target | Sample |
|---|---|---|---|
| US | 1-month ahead 30-day federal funds futures rate | Federal funds target rate | 1991:10 - 2002:9 |
| German/euro | 3-month euromark & euribor futures rate | Lombard rate & ECB main refinancing rate | 1991:10 - 2002:9 |

**Table 2: Expected & Unexpected Change in German & Euro Policy Rate on Dibor rates**

$$\Delta Dibor_t = \alpha_0 + \alpha_1 \Delta R_t^E + \alpha_2 \Delta R_t^U$$

| | **DIBOR Rates**† | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 week | 1 month | 2 month | 3 month | 6 month | 9 month | 12 month |
| $\alpha_0$ | 0.011 | 0.060 | 0.012 | 0.002 | 0.006 | 0.007 | -0.003 |
| | (0.44) | (1.22) | (0.59) | (0.12) | (0.33) | (0.33) | (-0.12) |
| $\alpha_1$ | 0.74 | 0.147 | 0.028 | 0.031 | 0.028 | 0.029 | 0.038 |
| | (1.50) | (1.47) | (0.69) | (0.74) | (0.77) | (0.74) | (0.88) |
| $\alpha_2$ | 0.952 | 1.015 | 1.016 | 0.86 | 0.786 | 0.761 | 0.654 |
| | (3.78) | (1.99) | (4.97) | (4.05) | (4.26) | (3.76) | (2.97) |
| **Diagnostics**†† | | | | | | | |
| $\bar{R}^2$ | 0.35 | 0.13 | 0.47 | 0.36 | 0.39 | 0.32 | 0.22 |
| D.W. | 2.13 | 1.40 | 1.98 | 2.40 | 2.22 | 2.50 | 2.50 |
| HET | 6.79 | 1.49 | 3.50 | 3.26 | 2.02 | 2.88 | 2.93 |
| | (0.24) | (0.91) | (0.62) | (0.66) | (0.85) | (0.72) | (0.71) |

Note: Using one day change in 3 month mark and euribor future contract as unanticipated change.

† Terms in brackets under coefficients refer to coefficients t-stats.

††In all regressions reported DW stands for the Durbin Watson statistic while HET is White's (1980) test for heteroscedasticity. The associated p value is in brackets.

**Table 3: Expected & Unexpected Change in German & Euro Policy Rate on Dibor rates allowing for Structural Change**

$$\Delta Dibor_t = \alpha_0 + \alpha_1 \Delta R^E_{GER,t} + \alpha_1 \Delta R^U_{GER,t} + \alpha_3 \Delta R^E_{ECB,t} + \alpha_4 \Delta R^U_{ECB,t} + \epsilon_t$$

| | **DIBOR Rates**† | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 week | 1 month | 2 month | 3 month | 6 month | 9 month | 12 month |
| $\alpha_0$ | 0.008 | 0.081 | 0.008 | 0.001 | 0.005 | 0.008 | 0.080 |
| | (0.34) | (1.50) | (0.39) | (0.07) | (0.28) | (0.39) | (0.93) |
| $\alpha_1$ | 0.010 | 0.241 | -0.017 | -0.003 | -0.001 | 0.013 | 0.030 |
| | (0.14) | (1.44) | (-0.26) | (-0.05) | (-0.01) | (0.20) | (0.46) |
| $\alpha_2$ | -0.196 | 0.363 | 0.421 | 0.142 | 0.178 | 0.143 | -0.160 |
| | (-0.47) | (0.37) | (1.10) | (0.36) | (0.53) | (0.38) | (-0.42) |
| $\alpha_3$ | 0.072 | 0.064 | 0.033 | 0.026 | 0.023 | 0.017 | 0.013 |
| | (0.71) | (0.51) | (0.68) | (0.51) | (0.54) | (0.36) | (0.27) |
| $\alpha_4$ | 1.366 | 1.465 | 1.21 | 1.132 | 1.014 | 1.012 | 1.009 |
| | (3.21) | (2.35) | (5.00) | (4.62) | (4.75) | (4.28) | (4.14) |
| **Diagnostics**†† | | | | | | | |
| $\bar{R}^2$ | 0.52 | 0.12 | 0.50 | 0.43 | 0.45 | 0.38 | 0.36 |
| D.W. | 0.88 | 1.44 | 1.82 | 2.23 | 2.36 | 2.70 | 2.32 |
| HET | 6.30 | 6.02 | 4.46 | 4.13 | 3.02 | 4.35 | 6.18 |
| | (0.96) | (0.97) | (0.99) | (0.99) | (0.99) | (0.99) | (0.96) |

Using one day change in 3 month mark and euribor futures contract as unanticipated change.

† Terms in brackets under coefficients refer to coefficients t-stats.

††In all regressions reported DW stands for the Durbin Watson statistic while HET is White's (1980) test for heteroscedasticity. The associated p value is in brackets.

**Table 4: Expected & Unexpected Change in Federal Funds Rate on Dibor rates using US Fed Funds Futures**

$$\Delta Dibor_{t+1} = \alpha_0 + \alpha_1 \Delta R^E_{US,t} + \alpha_1 \Delta R^U_{US,t} + \epsilon_t$$

| | **DIBOR Rates**[†] | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 week | 1 month | 2 month | 3 month | 6 month | 9 month | 12 month |
| $\alpha_0$ | -0.006 | -0.008 | -0.007 | -0.013 | -0.008 | -0.004 | -0.007 |
| | (-0.34) | (-0.59) | (-0.59) | (-1.06) | (-0.67) | (-0.39) | (-0.71) |
| $\alpha_1$ | 0.017 | 0.031 | 0.047 | 0.041 | 0.035 | 0.041 | 0.025 |
| | (0.31) | (0.69) | (1.15) | (1.03) | (0.87) | (1.16) | (0.72) |
| $\alpha_2$ | 0.281 | 0.214 | 0.144 | 0.184 | 0.260 | 0.258 | 0.256 |
| | (2.16) | (1.99) | (1.46) | (1.93) | (2.65) | (3.06) | (3.13) |
| **Diagnostics**[††] | | | | | | | |
| $\bar{R}^2$ | 0.09 | 0.10 | 0.08 | 0.12 | 0.19 | 0.26 | 2.32 |
| D.W. | 1.91 | 1.76 | 1.92 | 1.99 | 2.03 | 2.03 | 1.91 |
| HET | 5.20 | 5.58 | 5.55 | 5.72 | 5.07 | 2.90 | 2.82 |
| | (0.39) | (0.35) | (0.35) | (0.33) | (0.41) | (0.71) | (0.73) |

Using one day change in 1 month ahead federal funds future contract as unanticipated change. [†] Terms in brackets under coefficients refer to coefficients t-stats. [††]In all regressions reported DW stands for the Durbin Watson statistic while HET is White's (1980) test for heteroscedasticity. The associated p value is in brackets.