Learning the rules of the new game? Comparing the reactions in financial markets to announcements before and after the Bank of England's operational independence

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Abstract

The subject of this paper is how the increase in transparency brought about by the Bank of England's operational independence has changed the way in which markets react immediately after economic announcements. Other things being equal, the increase in transparency of the new framework will make monetary policy more predictable once the latest macroeconomic data are known. On this view, the market will be less sensitive to interest rate decisions and more sensitive to macroeconomic data releases. Previous research on the subject showed a more muted reaction to macroeconomic releases in the United Kingdom after 1997, and suggested that markets were still learning the rules of the new monetary framework. With two more years of data and a complementary analysis of trading activity, this study finds that macroeconomic announcements continue to move the markets less in the post-independence period, and interest rate changes the same or more. A separate analysis of the surprise announcements and the surprise component of each announcement reveals a similar pattern. Nor is the possibly greater impact of international announcements — another candidate explanation — borne out by the data. Finally, the paper finds that the reactions to macroeconomic announcements are in fact stronger in the second half than in the first half of the post-independence period. An increase in transparency is not the only change brought about by operational independence. Among other things, the collective nature of the Monetary Policy Committee and a perceived shift towards a more implicit policy rule since operational independence may have made its decisions harder to anticipate, thus decreasing the response to macroeconomic releases and increasing the reaction to monetary policy decisions.

Key words: Central bank transparency, monetary policy, intraday reactions.

JEL classification: E52, E58, E65.

Summary

Increased transparency is a stated aim of the new operational framework for UK monetary policy introduced in 1997. Several features of the new framework are designed to increase the accountability and transparency of the monetary policy process. Four Monetary Policy Committee (MPC) members are external to the Bank, and the individual votes are published in the *Minutes*. The nine members of the MPC give speeches laying down their views on particular economic issues. On top of this, the contents of the *Inflation Report* have changed since Bank independence. The *Inflation Report*—introduced shortly after the change to inflation targeting in 1992—has increased its average number of pages from around 45 to 50, including a new section on 'Monetary policy since the previous *Inflation Report*'. It has occasionally featured a table with alternative scenarios for the inflation forecast. The *Minutes* now include a discussion of alternatives that the MPC considered but did not adopt, plus the reasoning behind its stance. The MPC members have a clear mandate and operational independence without political interference.

This paper uses high frequency data to analyse how the Bank of England's operational independence has changed the way in which markets react immediately after economic releases. Other things being equal, the increase in transparency embedded in the new framework will make monetary policy more predictable once the latest macroeconomic data are known. On this view, the market will be less sensitive to interest rate decisions and more sensitive to macroeconomic data releases.

Previous research on the subject showed a more muted immediate reaction to macroeconomic releases in the United Kingdom after 1997; this suggested that markets were still learning the rules of the new monetary framework. Using two more years of data, this paper finds that that is still the case. Macroeconomic releases continue to move the markets less in the extended post-independence period, and interest rate changes the same or more. The significance of the difference has in fact increased with two years of data in the case of macroeconomic announcements, and it is robust to the measure of central tendency – the mean or the median – used.

This paper complements the study of price variation with an analysis of trading activity (trades and number of contracts). We find that the differences in trading activity between the two periods tend to mirror the differences in price variation. A separate analysis of unexpected announcements and the surprise component of each announcement reveals a similar pattern. Nor is the possible greater impact of international announcements — another candidate explanation — borne out by the data. Finally, a comparison of the two halves of the post-independence period shows that the reactions to macroeconomic announcements are indeed stronger in the second half. There are tentative signs of a more muted reaction to interest changes, but they lack statistical significance.

An increase in transparency was not the only change brought about by operational independence. The decision-making body is now a committee with nine members. This collective nature may make their decisions harder to anticipate, thus decreasing the response to macroeconomic releases and increasing the reaction to monetary policy decisions. If the interest rate process, though transparent, cannot be observed

in real time and is the outcome of a discussion in which new information may result, then the interest rate decision could still be the important price-mover despite the increase in transparency. It is also plausible to argue that the new framework shifted the reaction function of the monetary authority towards a more implicit instrument (or targeting) rule, which involves less reaction to macroeconomic announcements than explicit rules.

1   Introduction

This paper asks whether the Bank of England's operational independence changed the way financial markets react to macroeconomic and monetary policy announcements. The responses of financial asset prices can reveal the degree of 'news' embedded in monetary policy decisions. They can also signal which macroeconomic variables markets believe enter the monetary authorities' reaction function.

Increased transparency is a stated aim of the new operational framework introduced in 1997. The inflation target is defined in a symmetric way, set at the time of writing as 2½% on the RPIX measure.[1] Interest rate decisions are now taken by the Monetary Policy Committee (MPC). Several features of the new framework are designed to increase the accountability and transparency of the monetary policy process. Four out of nine MPC members are external to the Bank, and the individual votes are published in the Minutes. The members of the MPC give speeches laying down their views on particular economic issues. On top of this, the contents of the *Minutes* and the *Inflation Report* have changed since Bank independence. The *Inflation Report*—introduced shortly after the change to inflation targeting in 1992—has increased its average number of pages from around 45 to 65, including a new section on 'Monetary policy since the previous *Inflation Report*'. It has occasionally featured a table with alternative scenarios for the inflation forecast. The delay in publishing the minutes was reduced from five to two weeks in October of 1998. The MPC members have a clear mandate and operational independence with no political interference. Operational independence means that the Bank has complete independence when setting short-term rates to achieve the inflation target, but the target is set by the government. Finally, the Governor has to write an open letter to the Chancellor of the Exchequer on behalf of the Committee if inflation deviates by more than 1 percentage point either side of the 2½% target. Such a letter should explain: the reasons why inflation has moved away from the target by more than 1 percentage point; the policy action that the Bank is taking to deal with it; the period within which the MPC expects inflation to return to target; and how this approach meets the Government's monetary policy objectives. The fact that the letter is open adds a further element of transparency.

Markets may react to macroeconomic and policy announcements differently in this more transparent policy framework. It is possible to argue that market participants may now be better at deducing the reaction function used by policymakers. Macroeconomic announcements such as retail sales or producers' prices should then lead to bigger movements in financial markets. Conversely, monetary policy decisions should have less informational content when taken in the new monetary regime since they can be anticipated by the market. In this sense, monetary policy should be 'boring'. This line of reasoning is exemplified in the remarks by Mervyn King, the Bank's then Deputy Governor, in 1997:

> 'A transparent monetary policy implies that announcements of changes in interest rates by the MPC might
> come as rather little surprise. The news would not be in the outcome of the meetings of the MPC, but in the

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[1] Since January 2004 the target is 2% in the Consumer Prices Index (CPI).

economic statistics published during the month. Markets would be able to anticipate the likely reaction of the MPC, and the decisions by the MPC would follow a predictable policy reaction function.'[2]

But this argument cannot be stretched too far. The reaction of monetary policy to macroeconomic developments is not reducible to a simple rule where we can substitute the values of economic releases and come up with the next monetary policy decisions. Again in the words of the then Deputy Governor:

> 'Mechanical policy rules are not credible – in the literal sense that no-one will believe that a central bank will adhere rigidly to such a rule irrespective of circumstances. No rule could be written down that describes how policy would be set in all possible outcomes. Some discretion is inevitable.' [3]

The explicit aim to make monetary policy more transparent was not the only change introduced in 1997, and some of the features of the new framework may have in fact influenced the way markets react to news in the opposite way to the increase in transparency. First, the setting of interest rates is now a collective process in which nine people discuss their views and come to a conclusion. Their votes are individual, but their initial views can and do change during the discussion process. Experimental evidence shows that when the members of a committee are allowed to discuss a policy decision they may modify their vote (Lombardelli *et al* (2002)). While there is no clear-cut argument why committees should be less predictable than individuals, markets may find it harder to anticipate collective decisions.

Second, now that monetary policy is unconstrained by political considerations, such as the election cycle, it can afford to be more proactive and less reactive. Although forecasts of inflation were already included in the *Inflation Report* before the Bank's operational independence, they became a more integral part of monetary policy in 1997. In the Bank of England's macroeconometric model, official interest rate decisions have their fullest effect on inflation with a lag of around two years.[4] These forecasts are based on the Bank's publicly available macroeconometric model but they also incorporate a degree of judgement. Monetary policy then reacts to macroeconomic announcements only to the extent that they change the forecast. Within Svensson's (2003) distinction between explicit and implicit instrument (or targeting) rules, operational independence moved the United Kingdom's monetary policy towards the implicit end of the explicit-implicit continuum.[5]

Clare and Courtenay (2001) found that markets had not changed their immediate reactions to news as expected with the more transparent framework created by operational independence in 1997. They attributed it to the fact that markets may still be learning the rules of the new game. Given the crucial role

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[2] King (1997a).
[3] King (1999).
[4] See Bank of England (1999 and 2004).
[5] Explicit instrument rules are described by simple reaction functions, or which the Taylor rule is the best-known example. Implicit instrument rules, or targeting rules, by contrast, have the following characteristics. First, the emphasis is on the target to be achieved rather than on the instrument. Second, rules are conditions for target variables or forecasts of target variables, rather than explicit formulas for the interest rate.

played by financial markets in the transmission mechanism of monetary policy, more research is called for on how markets react to both types of announcements. The remainder of the paper is organised as follows. The next section presents a review of the literature on transparency. Section 3 describes the data. Section 4 deals with the methodological framework used in the paper. Section 5 goes on to present the results of the analysis. Finally, Section 6 discusses the results and concludes the paper.

2 Central banks' transparency

Central banks' transparency is commonly defined as the release of the information needed to allow a genuine understanding by the public of the monetary policy process and decisions. This section will present some key findings from the considerable body of literature investigating if it is optimal for central banks to behave in a transparent way. It will then review the international comparisons of the relative transparency of central banks. The section concludes with a discussion of the most relevant findings of the empirical research that assesses transparency in UK financial markets.

Before going on to review the literature on transparency, we need to clarify the link between transparency and predictability. This paper makes the assumption that increases in predictability of monetary policy decisions are brought about by enhanced transparency in the decision-making process. In order to conclude from an observed increase in predictability that an increase in transparency has taken place, that needs to be the only way in which predictability can be improved. In theory, however, there is a potential alternative route to increase predictability that does not imply an improvement in transparency. Monetary policy makers could signal their future decisions without spelling out the reasons for them. In the case of the United Kingdom, that would mean that MPC members could signal their vote intentions in speeches in advance of their monthly meeting without explaining the economic developments that had led them to reach that decision. In reality, speeches by MPC members do analyse the economic environment without signalling future vote intentions.

2.1 The desirability of transparency

An array of models in the literature examine the effect of releasing a larger amount of information on the stability of output, inflation and interest rates, and hence on the desirability of transparency. There appears to be a general agreement in the literature about the desirability of *goal transparency* – the monetary authority's openness about its target. Examples of models finding a positive impact of goal transparency are King (1997b), and Cukierman and Meltzer (1986). Jensen (2001) and Faust and Svensson (2001) are two of the few papers finding a negative impact. This happens when the central bank has a high degree of credibility. In models with reputational effects in which the potential loss of reputation – or credibility – motivates the policymaker to abide by the rule, the direct observability of policymakers' preferences implied by goal transparency has a negative impact. More conflicting views exist about the potential benefits of *knowledge transparency* (the public release by the authorities of their information about the state of the economy and forecasts). Some models conclude that this release can raise interest rate volatility or inflation variability. Geraats (2001) finds that an increase in 'economic

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transparency' – defined as the publication of conditional central bank forecasts – reduces the inflationary bias. Comparatively little research has been done on the *operational transparency* of central banks, ie revealing the procedures such as voting by which policy decisions are made. Sibert (1999) uses a model where monetary policy is made by a group of voting members with two types of individuals: opportunistic, who want to expand output by producing unexpected inflation and non-opportunistic. She concludes that publishing the votes makes reputation building more attractive to the members of the groups, which leads to lower inflation and higher social welfare. Gersbach and Hahn (2001) show how the inflation preferences of the members of the committee end up aligned with those of the public when there is re-election and the results of the vote are made public. Gerlach-Kristen (2004) shows that the voting record of the MPC is useful in predicting future policy changes. Geraats (2002) provides a comprehensive review of the literature. She finds that, in general, empirical evidence indicates that central bank transparency is both relevant and beneficial.

2.2   Transparency ratings

International comparisons based on transparency indices assign a high level of transparency to the Bank of England. In Eijffinger and Geraats's paper (2004) it comes second after the Reserve Bank of New Zealand, closely followed by the Swedish Riksbank. Chortareas *et al* (2003) construct an index based on the detail of central banks' forecasts, and again the Bank of England is placed in the top group using a Guttman scale. It also comes top in a recent report evaluating the *Inflation Report* released by 19 inflation-targeting central banks (Fracasso *et al* (2003)). However, survey results are not so favourable. De Haan and Amtenbrink (2002) surveyed professional economists who were asked to rank various central banks in terms of their credibility and transparency. The Bank of England is perceived as less transparent than the Federal Reserve and the European Central Bank, albeit more so than the Bank of Japan. Although the number of central banks with which to compare is much smaller in the survey-based studies, the divergence between the indices and the surveys might indicate that markets perceive the Bank of England as less transparent than it really is.

2.3   Transparency and financial markets in the United Kingdom

One of the most notable empirical papers examining UK financial markets' reactions to monetary policy announcements is Haldane and Read (2000). They first investigate how interest rate changes affect the yield curve. They set up a model where the reaction function of the monetary authorities is assumed to have two sources of uncertainty: indicator uncertainty and target uncertainty. Target uncertainty denotes a lack of credibility. Assuming that the expectation hypothesis holds, policy variable news should affect primarily the short end of the curve and policy preference news the long end because of transmission lags. These predictions are tested by comparing situations with different degrees of transparency, both in the United Kingdom pre and post-1992 and between the United Kingdom and other countries. They expect to (a) find a smaller overall reaction where transparency is greater, and (b) identify the type of uncertainty reduced with transparency by singling out where in the curve this reduction takes place. Using pre-BI daily data for the United Kingdom between 1985 and 1997, they test the effects of transparency by estimating the changes in implied forward rates at nine different maturities as a function of their lags and

of the change in the official interest rate. They also include the change in official interest rate times a dummy for the change of regime after the introduction of inflation targeting in 1992. They find that the increase in transparency clearly decreased the variation in forward rates at short but not at long maturities, and they interpret this result as evidence of lack of target credibility. Similar results are found in the United States from the period after 1994 when the Federal Open Market Committee (FOMC) interest rate target started being disclosed immediately. In the cross-national analysis, they find the largest reaction to interest rate changes in Italy, followed by the United Kingdom and, finally, the United States and Germany. They conclude that these results tally with the perception of different degrees of transparency in these countries.

Joyce and Read (2002), on the other hand, examine the reaction of a range of different UK asset prices to one particular macroeconomic indicator: RPI. Their period spans from the early 1980s to April 1997, therefore pre-BI like Haldane and Read's. They regress the daily changes in asset prices on the surprise element of the RPI announcements and find that gilts are the most responsive assets. They go on to decompose yield movements into shifts in implied inflation expectations and in real rate expectations and find that the pre-independence target was not very credible, although credibility improved from 1992 onwards. An interesting exercise is their separate analysis of reactions to negative and positive surprises of RPI, which suggests that markets assumed the Bank more likely to accommodate lower-than-expected inflation.

Chadha and Nolan (2001) explore whether the increase in transparency since BI has lead to more volatility in three-month LIBOR. Using daily data, they find that there was an increase in volatility in the June 1997-June 1999 period, but it was not related to the new information flows (*Minutes* and *Inflation Report*). Post-BI volatility on interest rate decision days is found to have increased, but remained broadly unchanged on the days leading to the decision. The authors 'call for the use of intra-day financial market data in order to assess the impact of information flows on a wide range of financial market prices'.

Moessner *et al* (2003) ask whether the increase in transparency brought about by the Bank's independence has made interest rate changes less significant. But, unlike this paper, they analyse daily rather than intraday reactions. They follow Joyce and Read's (1999) method for the impact of macroeconomic news and that of Haldane and Read (2000) for the effect of official interest changes. Moessner *et al* (2003) examine the reactions to changes in interest rates in the short sterling futures and gilt markets. Instead of using dummies for the regime change as in Haldane and Read (2000), they divide the sample into pre and post Bank independence (BI) and compare the results from the separate regressions. They find that short sterling futures react slightly less strongly to changes in official interest rates after BI, but the difference is not statistically significant. When analysing the reaction to macroeconomic announcements, they perform a cross-country comparison for a single time period. UK asset prices are found to react to US macroeconomic announcements too, although not to US interest rate change decisions. Another significant finding is that short-term assets are more sensitive to domestic news and long-term assets to US news. Then they go on to compare the size of the effect of macroeconomic news across countries, although they do not rank the countries explicitly. Their results –

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indicative and subject to caveats – suggest that the United States comes across as the most transparent, followed by the United Kingdom. Canada comes in the last place.

Wadhwani (2001) raises the concern that markets seem to believe that the MPC systematically undershoots the inflation target, despite the symmetry in its formulation. It also shows the average surprise on announcement days post-BI has been greater in the United Kingdom than in the euro area or the United States, even when scaled by the respective implied market interest rates. One possible explanation put forward for this finding is that the UK system of collective decision-making and individual accountability is harder for the markets to read. It is also possible that the markets are still learning the new framework.

Finally, this paper builds on the findings of Clare and Courtenay (2001). They used high-frequency data in the United Kingdom. High-frequency data have some crucial advantages over daily data for the purpose of this paper, since daily data may well mask strong immediate announcement reactions that are reversed later in the day. High-frequency data also make it possible to disentangle the impacts of separate announcements within the same day. Using an event study methodological framework, Clare and Courtenay examined the differences in trading around announcements before and after BI. They looked both at futures markets (short sterling, long gilt and FTSE 100 contracts) and at foreign exchange markets (sterling exchange rates with the dollar and the Deutsche mark). They tested the hypothesis of smaller reactions to monetary policy decisions and bigger reactions to macroeconomic announcements in the period after the Bank's independence. The overall conclusion is that the data in general did not bear out the hypothesis. The reaction to macroeconomic announcements in foreign exchange markets seemed to have increased after the Bank's independence, while the reaction in the futures markets had fallen. There was no sign of a more muted reaction to interest rate decisions in the post-BI period.

The authors put forward the short time span covered in the post-independence period (mid-97 to mid-99) as a possible reason for their unexpected results. The lack of statistical significance can stem from the small post-independence sample. But, more importantly, market participants might still be adapting to the new monetary environment in the early post-independence period. For these reasons, this paper starts out by extending Clare and Courtenay's study with more recent data (up to June 2001) and the analysis of trading activity.

3   Data

The data used in this paper cover the period between January 1994 and June 2001. This in facts doubles the size of the post-independence sample used in Clare and Courtenay's paper. The financial markets data used come from two sources. First, three futures contracts traded in LIFFE: short sterling, long gilt and FTSE 100. This LIFFE data set gives the time to the nearest second, the contract maturity, the price and the number of contracts traded in each transaction. Since contracts at different maturities are traded simultaneously, we use the same rule as Clare and Courtenay to select the most heavily traded contract. This means using the nearest to maturity contract in the case of the short sterling, and until the next one

becomes more liquid in the other two. An advantage of this data set is that it includes not only price changes, but also successive trades recorded at the same price.

The second data source is the intraday quotes on the dollar/sterling and Deutsche mark/sterling exchange rates (euro/sterling since January 1999). It is provided by *Olsen & Associates* and consists of quote data gathered from Reuters, Knight-Ridder and Telerate. Bid and ask quotes are matched for each transaction, and the mid-point is taken as the market price. Andersen *et al* (2001) provide evidence of how using bid/ask averages is a valid approximation to the transaction price, which is usually unavailable.

We use the same set of macroeconomic announcements as Clare and Courtenay, a total of 4,221 in the pre-BI period and 596 in the post-BI one. They are listed in the MMS database and include: RPI/RPIX, PPI input/output, average earnings/unemployment, preliminary, revised and final GDP, industrial production, retail sales, public sector borrowing requirement, M0, M4, consumer credit, current account, global and ex-EU visible trade, CIPM manufacturing survey, CBI distributive trades, CIPS services survey and CBI industrial trends. These macroeconomic indicators are supplemented by the inclusion of monetary policy announcements (interest rate decisions, and publication of the *Inflation Report*). Only nine interest rate changes occurred in the BI period here considered (since 1994), compared to 21 in the post-BI sample. The volatile period immediately after the introduction of inflation targeting in November is excluded from both C&C's paper and this study. The publication of the minutes is not included due to the high overlap with macroeconomic announcements: in the two years of data post-June 1999, only one third of the minutes releases did not coincide with another release. We will also make use of the MMS database to analyse the surprise component of the announcements and the impact of US macroeconomic indicators.

4   Methodology

Markets may move less, more or the same after each type of announcement (macroeconomic or monetary policy) in the post-BI period than in the pre-BI period. The methodology employed in this paper is therefore geared towards a straightforward comparison of the differences between the two periods following the event-study literature. We are not concerned with the sign or the size of the reaction. Equally, we do not attempt to forecast it. There is therefore no need to model the distribution of the abnormal reactions to news explicitly.

The main bulk of event-study papers examining intraday reactions to announcements have concentrated on the US financial markets. This literature analyses the impact of announcements in two different ways. A first set of papers regresses the difference in returns with respect to the mean for each time interval on the announcements, represented by dummy variables. Examples of this approach include Ederington and Lee (1993), Fleming and Remolona (1997) and Furfine (2001). Becker, Finnerty and Kopecky (1996) were the first to focus on the impact of the surprise component of announcements. Clare and Courtenay, however, follow a second branch of the literature in which the sample period is divided into announcements and non-announcement days and differences in trading activity between the two sets are

tested. This method was put forward by Ederington and Lee (1995) and applied to the United Kingdom by Ap Gwilym *et al* (1998) and Clare *et al* (1999).

4.1   Abnormal reactions

Abnormal reactions around announcements are defined by comparison with the average reaction on days when there are no announcements. To calculate them, all the irregularly spaced data are first transformed into calendar time intervals around the announcements (in our case, 5, 15 and 60 minutes after each announcement). Ap Gwilym *et al* (1998) find that, in the United Kingdom, the price adjustment to nine different macroeconomic announcements in the FTSE 100 and short sterling contracts is usually completed within three minutes of the announcement. Examining the reaction across longer intervals, on the other hand, allows for possible reversals of initial overreactions, but intervals of more than 60 minutes are likely to include the release of other pieces of information.

Then we construct a corresponding non-announcement data set around points in time randomly selected from days with no announcements. The observation times in this non-announcement set match those in the announcement sample because the time periods are chosen to reflect the same proportions in both sets. As a result, the percentage of observations at, for instance, 9.30 am is exactly the same in the announcement and non-announcement sample. This matching aims to remove potential distortions due to the time-of-day effect. The data from LIFFE enable us to analyse price changes (returns), number of trades and trade volumes for each time interval. The FX data does not contain information on volume or number of trades, allowing us to examine returns only.

The absolute abnormal log *return (price variation)* for an interval is calculated as the difference between the absolute log return in that interval and the yearly average absolute log return calculated in the non-announcement sample. The log return is defined as the difference in the natural logarithms of the price at two points in time, and assumes continuous compounding. This calculation differs from that used in Clare and Courtenay in two respects. First, for LIFFE contracts, only transactions where contracts are actually traded are used in this paper. Clare and Courtenay also used bids and asks when calculating the returns. Restricting the type of transactions analysed to traded contracts gets round possible distorting effects caused by differences in the bid/ask spread between announcements and non-announcement, or between the pre and post Bank's operational independence period. It also makes the analysis of returns more consistent with that of transactions and volumes traded.[6] An additional departure from Clare and Courtenay's analysis is the use of yearly averages for non-announcement ('normal') reactions.

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[6] We first checked if the differences in returns between all announcements (monetary policy ones included) and non-announcements times were significant when only trades were considered. We observe the same basic pattern as when bids and asks were included: there is no significant abnormal activity prior to announcements, and the big initial reaction becomes much less significant after about 20 minutes. Having established that the abnormal reaction is also significant when bids and asks are excluded, we went on to check if this exclusion alters Clare and Courtenay's findings about the difference between pre and post Bank independence (BI) for all macroeconomic announcements. We found that the negative sign remains and the significance of the difference increases when we consider only traded contracts.

For the short sterling, long gilt and FTSE 100 contracts we can also calculate *relative volumes traded* (number of contracts) and *relative number of transactions*. Despite not being as useful as price movements to gauge the extent of the reaction to announcements, and harder to interpret, they add to the picture of how markets react to announcements. It could be the case that trading activity around economic releases has increased or decreased since BI, even though it has not been reflected in differences in returns. One trade can involve one or many contracts, so the number of trades and the number of contracts (volumes) traded during a given interval are different concepts. To take into account the increase in trading activity that has taken place over the years, *relative* abnormal number of trades and *relative* abnormal number of contracts traded have been used in the calculation of abnormal reaction. This gets round the problem of comparing volumes and transactions in periods of time with different liquidity and trading technology. Abnormal reactions are therefore defined as the difference in number of trades (or contracts traded) between announcements and yearly non-announcement averages divided by the yearly non-announcement average in the corresponding interval.

Once we have calculated the abnormal log returns, volumes and number of contracts traded we take the averages in the pre and post-BI periods. Both means and medians are informative central tendency measures for abnormal returns, but the high number of outliers makes the mean inadequate to analyse volumes and number of trades.

4.2   Statistical significance of the difference

We will check the significance of the difference between before and after BI. The null hypothesis of equal abnormal reactions will be checked with the non-parametric Kruskall-Wallis/Wilcoxon test, also used by Clare and Courtenay (2001), which is given by:

$$H = \frac{12}{N(N+1)}\sum_{j=1}^{J}\frac{S_j^2}{m_j} - 3(N+1) \qquad \textbf{(1)}$$

where $J=2$, since there are only two series the pre and post-BI series; N is the total number of observations from both series combined; m_j is the number of observations from series j; and S_j is the rank sum for series j. This test statistic is distributed $\chi^2(J-1)$ under the null hypothesis of equal populations.

Since we use a non-parametric test, no distributional assumptions about the abnormal reactions are made. High-frequency data are notoriously non-normal. The law of large numbers does not require normality in order to carry out t-tests provided that the distribution is reasonably well behaved (eg symmetric, with not too many outliers). But Andersen *et al* (2001) show how, despite their large sample size, tests derived from asymptotic distribution theory are not robust in a high-frequency context due to the presence of extreme observations. For that reason, non-parametric tests are more suitable for our comparison. It is

worth noting that the Kruskall-Wallis test does not relate to a particular measure of central tendency (mean or median). Rather, its null hypothesis is the equality of the two populations (pre and post-BI).

5 Results

Tables 1 to 7 in the appendix present the results of the comparison of markets' reactions to announcements before and after BI. Each cell displays the result of subtracting the median (or mean) of abnormal reactions in the pre-BI period from that in the post-BI one. The asterisks represent the level at which the null hypothesis that the distributions of abnormal reactions before and after BI are actually the same is rejected. Due to the influence of outliers, only medians are displayed for number of trades and volumes traded. The differences in log returns are multiplied by 10,000.

The focus of this paper is the overall reaction of both financial and foreign exchange markets to both macroeconomic and monetary policy announcements, rather than a comparison of the reaction across different markets. However, it is worth pointing out some differences in the interpretation of the results in the various markets. The short sterling contract is the one embedding expectations of short-term changes to the policy rate in a very straightforward manner. The long gilt contract is linked to a different time horizon, and it can react to both future policy rates and expectations about the future level of inflation. This is what leads Haldane and Read (2000) to take changes in the yields of long-term bonds as a sign of the credibility of the central bank. Within the dividend discount model framework, the FTSE 100 contract reacts to news that change the market's expectations of future interest rates, but also to news that alter its expectation of future earnings growth. Finally, foreign exchange markets change according to anticipations of future interest rates and inflation through the uncovered interest parity.

5.1 All macroeconomic announcements

Table 1 displays the results for the reaction to all macroeconomic announcements, eg those listed in Section 3 and excluding the monetary policy ones. It shows that the difference in *price variations* between the post-BI and pre-BI period for the LIFFE contracts continues to be negative after including two more years of data. It is in fact more significant once the most recent period is included. The difference is negative for both medians and means, and for the three intervals analysed (5, 15 and 60 minutes). Our two new measures of trading activity confirm the pattern found for abnormal price variations. The difference in relative number of trades is also negative when significant (FTSE 100 and long gilt). As for the relative volumes traded, the medians are significantly lower in the post-BI period in the three contracts analysed. We can safely conclude that the reactions that follow macroeconomic announcements are more muted during the post-BI period.

As for the FX markets, we see that the abnormal price variations after announcements were bigger in the pre-BI period for the euro/sterling exchange rate. The only positive difference in abnormal reactions in

Table 1 is found in the very immediate reaction (five minute) in returns for the sterling/dollar exchange rate.

5.2   Monetary policy announcements

When analysing the reactions to interest rate decisions before and after BI, Clare and Courtenay compared the interest rate changes before BI with all interest rate decisions (change and no change) in the post-BI period. Moessner *et al*, by contrast, compare the interest rate changes before BI with just the interest rate changes after BI. Given the greater amount of data now at our disposal, this paper follows Moessner *et al*'s approach, which is considered to be more meaningful. The results with all decisions are also displayed in Table 3 for comparison purposes.[7]

The results from the comparison of the reactions to interest rate changes are presented in Table 2. We observe that there is only one difference in price variations that emerges as significant: the immediate reaction (five minutes) in the long gilt contract. It turns out to be bigger in the post-BI period. As for trading activity, it is significantly more intense after BI for the short sterling contract in terms of number of transactions at all intervals and of volumes at the five-minute interval. The timing of the announcements started to be pre-announced with BI. By contrast, it was discretionary in the pre-BI period. This difference could possibly distort the comparison of the *immediate* reaction (five minutes) to the announcement in both periods. When the exact time of an announcement is known, market participants can pre-position and react faster. However, this possible distortion in the speed of the reaction due to pre-positioning does not affect the comparison of 15 or 60-minute intervals. With that caveat in mind, we can conclude that there is no significant difference in the size of the reaction in the two periods. Two extra years of data have not led markets to react less to interest rate decisions in the following 60 minutes.

Finally, there is no overall pattern in the change of reactions to the publication of the *Inflation Report* after and before BI (Table 4). The immediate (five minute) price variations are smaller after BI in the FTSE 100 contract and more in the dollar/sterling exchange rate. The number of short sterling contracts traded has increased since BI.

5.3   Individual macroeconomic announcements

Tables 5 to 7 display the results for five individual announcements. They are the most important releases out of the 17 included in 'all macroeconomic announcements' (Table 1). Table 5 shows that

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[7] Before BI, the time of the announcement of the interest rate decision was usually earlier than the current 12.00. Out of the nine interest rate changes that took place from January 1994 to BI, three overlap with another macroeconomic announcement. We find one macroeconomic announcement at 9:30 followed by an interest rate change at 9:45 in the case of one industrial production, one unemployment/average earnings and one RPI(X) announcement. The differences both in the reactions to interest rate and to the macroeconomic announcements involved were re-calculated to see if that affected the results. They turned out to be unaffected by these cases of overlapping announcements.

the difference in price variations after the RPI(X) announcement is now also clearly smaller after BI for the three LIFFE contracts.

Within Joyce and Read's (2002) framework to interpret reactions to RPI announcements, this can be interpreted as a continuation in the improvement of credibility that started with the inflation target in 1992. It can also be taken as an indication that markets believe that the Bank follows an implicit instrument rule that is forward-looking rather than an explicit one (Svensson (2003)). If the market believes that the MPC is forward-looking in its interest rate decisions and does not respond to temporary movements in RPI(X) following an explicit reaction function, then RPI(X) announcements may well lead to more muted reactions in the post-BI period. Post-BI monetary policy does not need to respond to every blip in the RPI(X) data. It is worth highlighting that it is not the case that the difference in the overall reaction for all macroeconomic announcements is only due to the difference in the reaction to RPI(X). When RPI(X) is removed from the list of announcements, the differences remain significant.

All other significant differences in price variations for individual announcements (most of them in the FTSE 100 contract) are also negative. As for the reaction in FX markets, only industrial production does seem to trigger a significantly different variation in price in the two periods (bigger after BI at the five-minute interval). There is also a general decline in trading activity around individual releases in the post-BI period, as shown in Tables 6 and 7. This is the case both for relative number of trades and for relative volumes traded.

The results presented in Tables 5 to 7 rule out the possibility that the decrease in price variation observed in Table 1 was driven by just one or two macroeconomic releases. Moreover, the decline in trading activity found when all macroeconomic announcements were analysed is also present when we examine individual releases. But this comparison may still be misleading. We know from previous research[8] that UK financial markets are efficient and react only to the unexpected component of the announcements. That is why analysing the reactions to the surprise component may reveal a more accurate picture of the differences between the two periods. Also, markets may indeed react more after BI to some macroeconomic releases that are not included in our announcement set: international ones. Finally, an alternative way to check the explanation put forward for this puzzling result that the markets are still learning the rules of the new game is to compare the first and the second halves of the post-BI period. The next subsections explore each of these alternative explanations.

5.4   Surprises in announcements

This subsection makes use of the expectations data provided by Money Market Services (MMS) to analyse the effect of the surprise element of macroeconomic announcements. We first classify all

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[8] Using daily data, Joyce and Read (2002) find that asset prices in the United Kingdom do not react to the expected component of RPI announcements.

announcements into surprises and not surprises in order to use the same event-study methodology as in the previous section. We then go on to use the information on the size of the news component of each announcement.

In order to classify all announcements into unexpected (surprises) and expected (not surprises), we first calculate the absolute difference between the expected and the actual value and we call it the news component. We then go on to standardise the news component by dividing its yearly standard deviation, as in Balduzzi, Elton and Green (2001). We define an announcement as a surprise if its standardised news component is greater than one.

We have thus to leave out of our analysis the announcements with no forecast in the MMS data set. They include survey announcements (CIPM, CBI distributive trades, CIPS services survey and CBI industrial trends) and monetary policy announcements.[9] Note that using absolute differences assumes symmetric effects of 'bad' and 'good' surprises. Before presenting the result of the analysis, it is worth highlighting a drawback inherent in using published forecast data as a proxy for markets expectations. Forecasts are published several days before the announcements – in the case of MMS the survey is conducted and published on Thursday for data being released the following week. Accordingly, information released between Thursday and the day of the announcement is not incorporated in the forecast. The data set does not include information on the dispersion of the expectation among forecasters.

In several instances, more than one announcement is released at the same time. Examples are PPI input and output, RPI and RPIX, and unemployment and average earnings. In those cases, an announcement was classified as a surprise if at least one of the two indicators had a news component greater than one yearly standard deviation. The proportion of announcements defined as unexpected is 35%.[10]

Table A shows that there does not seem to be any systematic bias in the news component since none of the averages is significantly different from zero.

Table A. Mean and standard deviation of the news component in macroeconomic releases

	RPI	RPIX	PPI input	PPI output	Retail	Industrial production	Unemployment	Average Earnings
Mean	0.0002	0.0001	-0.0005	-0.0003	-0.0006	-0.0017	-6.0943	0.0002
Std dev.	0.0014	0.0015	0.0076	0.0018	0.0054	0.0052	15.5373	0.0023
mean/std dev.	0.1274	0.0678	-0.0664	-0.1708	-0.1129	-0.3343	-0.3922	0.0811

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[9] There are forecasts of MPC decisions in the post-BI period, but not for interest rate decisions pre-BI.
[10] 30% if we include survey announcements (with no expectation data) in our comparison.

Charts 1 to 4 depict the average absolute surprise for four of the main releases. They show that there is no clear trend in the size of the average absolute surprise over the period, with the exception of unemployment. The decline in the size of the surprise is linked to the fall in unemployment figures.

Chart 1

Retail sales: average absolute surprise

Chart 2

RPIX: average absolute surprise

Chart 3

Unemployment: average absolute surprise

Chart 4

PPI output: average absolute surprise
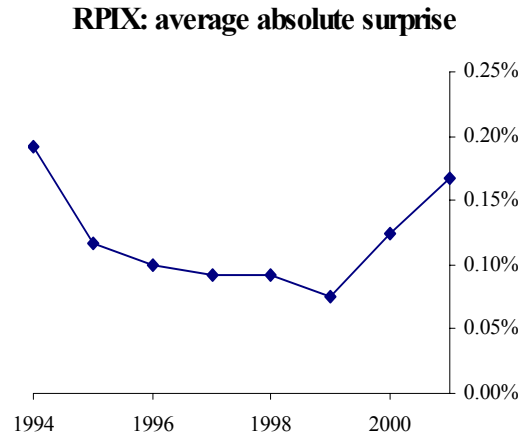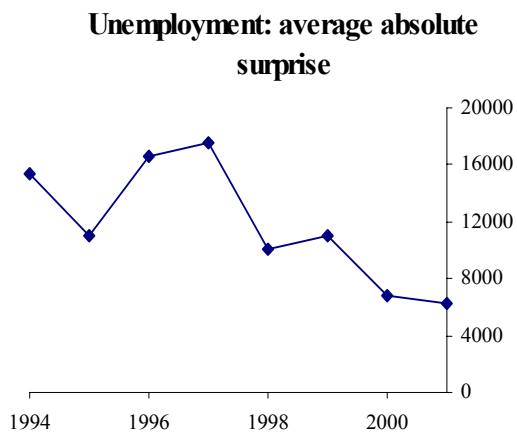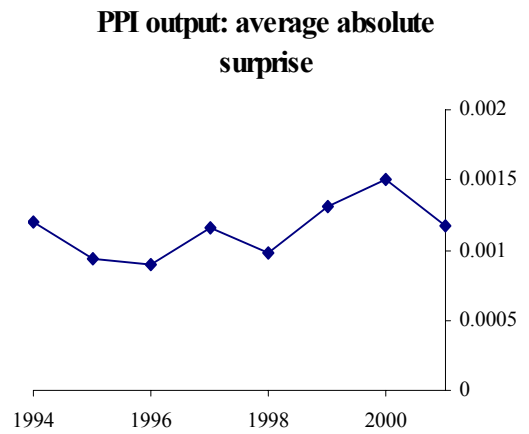
Unsurprisingly, the average abnormal reactions to surprise announcements were larger than those found for all announcements. This was the case for prices, number of trades and volumes traded for all indicators. As an example, Table B shows that the average abnormal reaction after the release of the RPI figure when only surprise announcements are included is about twice the reaction for all releases.

Table B. Short sterling. Average abnormal reaction to unexpected and to all announcements

	Min	Surprises	All announcements
RPI			
Returns	5	2.96	1.58
	15	3.54	2.00
	60	3.98	2.05

Using this binary classification into surprises and non-surprises, the analysis of the differences between the pre and post-BI periods for those macroeconomic announcements defined as surprises is presented in Tables 8 to 11 in the appendix. Table 8 displays the results of the analysis of the reactions for all macroeoconomic announcements defined as surprises (a subset of those examined in Table 1). It is apparent that LIFFE contracts react significantly less to all surprises after BI. The strong result remains when we restrict our sample to unexpected results. Only the very immediate reaction in the US dollar exchange rate is stronger in the post-BI period, while the euro/sterling rate reacts less after BI. Again, the activity indicators mirror this pattern, the difference in the number of transactions and in the volumes traded being negative and significant for all contracts. The differences in individual announcements tend to be negative when significant (Table 9).

The previous analysis used a binary classification for all announcements: either surprises or non-surprises. This distinction has the advantage of allowing us to use the non-parametric event-study method, and the drawback of not using the information about the size of the surprise. It is plausible to assume that the strength of the reaction increases with the magnitude of the news component in the announcement. In order to exploit the information about the size of the news component, two regressions of the abnormal return around the announcement on the absolute news component both before and after BI are run.[11]

$$y_{t,i} = \alpha_i + \beta_i n_{t,i} \qquad (2)$$

Here y is the reaction to the announcement i with absolute news component n. Note that in an efficient market there is no reaction to non-news and α_i is not significantly different from zero.

The coefficient β_i is the correlation between the news component and the reaction times the standard deviation of the reaction over the standard deviation of the news component.

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[11] This exercise would not be valid for number of trades or volumes due to the presence of many outliers.

$$\beta_i = \frac{\rho_{i,n}\sigma_n}{\sigma_n} \qquad\qquad (3)$$

Sharper movements in abnormal price variations following a particular macroeconomic release in the post-BI period would be reflected in a larger correlation coefficient.

There are three releases where more than one indicator is announced. In the case of RPI and RPIX there is a strong correlation between the two (0.62), so only one of the two was used. PPI input and output are not strongly correlated (-0.08), and therefore both are included in the regression. The same applies to average earnings and unemployment.

Table 12 in the appendix shows the result of the regressions for the five individual announcements. In the case of RPI, the coefficients are clearly larger and more significant in the pre-BI period. This confirms the results of the previous binary comparison. Not many of the PPI coefficients are significant. Alternative specifications with only input or output PPI were also attempted, but the significance did not improve. Not one single coefficient in the average earnings and unemployment regression appears as significantly different from zero. This lack of impact may stem from the small sample size (around 40 announcements in each regression), or from the overlap with the MPC minutes after February 1999. Retail sales is the announcement where the post-BI impact of the surprises emerges as clearly stronger than in the pre-BI period for one contract: short sterling. Finally, industrial production displays an opposite pattern: the coefficients are more significant in the pre-BI period for all three contracts. This regression analysis has therefore revealed that the sensitivity of abnormal reactions to the size of the surprise is stronger in the post-BI period for retail sales only (short sterling contract), and smaller for RPI and industrial production.

5.5   US announcements

So far, this paper has only considered UK macroeconomic announcements. But markets may well think that some international economic variables enter the MPC's reaction function. If that were the case, and its perceived importance had increased since BI, we would have a partial explanation of our results. The markets would in fact react more strongly to macroeconomic releases in general after BI, but less strongly to domestic announcements and more strongly to international ones. This is the alternative explanation that this subsection explores.

The analysis of international announcements is confined to US releases, and does not include any euro-area releases. The reason for this exclusion is that there seems to be no consistent and large enough set of euro-area releases moving the markets each month. Market participants remarked that it is extremely hard to know which euro-area announcements will move the UK markets beforehand. Instead, it appears that the markets focus on different indicators and countries – although limited to Germany, France and Italy – every month depending on the issue of concern at the time.

The following US announcements were included in our list: monthly changes in non-farm payrolls, the National Association of Purchasing Managers' index (NAPM, now called ISM), CPI, PPI, the unemployment rate, average hourly earnings, industrial production, current account, gross domestic product (advance, preliminary and final figures), and US retail sales. This set of US indicators is similar to that used by Moessner *et al* (2003), and is in turn based in part on the study by Fleming and Remolona (1999) on the impact of US indicators on US fixed-income markets. Indicators that Moessner *et al* found had little or no impact on UK markets such as housing starts are not included in the list, and there are some additions like advance and preliminary GDP that increase the comparability with the UK macroeconomic announcement set. We do not analyse the impact of individual US announcements due to the large number of overlaps with other releases (included in our announcement list or not). It is not possible to examine the reaction to the US Federal Reserve's interest rate changes with high-frequency data because they are announced when the UK markets are closed.

Table 13 displays the results of the analysis of abnormal price variations following all US macroeconomic announcements. We observe that the reaction in the post-BI period is clearly more muted in the case of the short sterling contract. For the long gilt and FTSE 100 contracts, the differences in means and medians go in opposite directions due to the presence of outliers. Since the median is a more robust central tendency measure, the results indicate that the reaction to US announcements after June 1997 is stronger at all intervals for the long gilt contract, and the immediate reaction is less marked for the FTSE 100 contract. The euro/sterling exchange rate moves more immediately after the publication of US releases in the post-BI period.

These figures rule out a strong increase in the importance of international announcements as a possible explanation for the more muted reaction to UK macroeconomic announcements in the post-BI period found in this paper. The next subsection will explore another alternative explanation: that markets are adapting to the new framework in a gradual fashion.

5.6   Learning in the post-BI period

Here we examine the differences between the two halves of the post-BI period (as opposed to between the pre and post-BI as before). This exercise will allow us to see if familiarity with the new framework has resulted in any change in how markets react to monetary policy and macroeconomic announcements. We divide the post-BI sample into two halves: one from June 1997 to June 1999, and a second one from June 1999 to June 2001, and compare the reactions in these two subperiods.

The results of the comparison are presented in Table 14 of the appendix. It shows the difference in the means and medians of abnormal log price variations in both periods, together with the significance of the difference in populations, means and medians. The reaction to all macroeconomic announcements is significantly smaller in the second half of the post-BI period in the short sterling

contract. The sign varies with the interval in the case of the long gilt. The reaction is more marked in the second half in the case of the FTSE 100 contract. The reaction in the FX markets (both US dollar and euro) is clearly smaller in the second half of the post-BI period. In fact, all significant differences in reactions in FX markets to both monetary policy and macroeconomic announcements are smaller in the second period.

Thus, only the FTSE 100 contract does seem to react more to macroeconomic news in the second half of the post-BI period. However, a closer inspection of the data of price variations around announcements and non-announcements from 1994 to 2001 reveals that in 1998 the FTSE 100 reactions around non-announcements were particularly high, in the wake of the LTCM and Russian crises. In the same year, abnormal reactions (defined as the difference between reactions around announcements and not around announcements) were practically zero or even negative. The volatility in the stock markets was high and independent of any macroeconomic announcements, which did not move the stock markets any further. The abnormal price variations in the second half of the post-BI period are therefore significantly higher.

As for the reactions to monetary policy decisions, the FTSE 100 contract behaves again in a way consistent with the hypothesis that markets may be learning how the new monetary framework functions. It reacts to interest changes more strongly in the second half of the sample for some intervals, despite the high stock market volatility in the first period already mentioned. The short sterling contract seems to react less to interest rate changes in the second half of the post-BI period, but the difference is only significant at the 10% level. Differences in the reaction to all interest rate decisions are distorted by the different number of changes in both the first (12) and the second (9) half of the post-BI period. The short sterling contract reacts less to the publication of the *Inflation Report* in the second period while the FTSE 100 reacts more, although only at some intervals. The reaction to monetary policy news in the FX markets was more muted during the second half of the post-BI period.

We observe that only the FTSE 100 contract reacts more to macroeconomic announcements and less to monetary policy after 1999. The long gilt and short sterling contracts show less price variation after macroeconomic announcements in the second half of the post-BI period. However, the FTSE 100 results are undoubtedly influenced by the very high volatility of stock markets in 1998.

6   Concluding remarks

This paper addressed the question of whether markets had changed the way they react to macroeconomic and monetary policy announcements within the new monetary framework introduced with the Bank of England's operational independence since 1997. Other things equal, the more transparent new framework should have made monetary policy more predictable once the latest

macroeconomic data are known. The market would then react more to macroeconomic announcements and less to monetary policy decisions since 1997.

A previous paper using high-frequency data by Clare and Courtenay (2001) found that the market did not change their reaction after 1997 in this way. They suggested that this might be due to the short post-BI sample analysed and the fact that the markets are still learning the rules of the 'new game'. Using two more years of data, this paper found against such arguments. Macroeconomic releases continue to move the markets less in the extended post-independence period, and interest rate changes the same or more. The significance of the difference has in fact increased with two years of data in the case of macroeconomic announcements, and it is robust to the measure of central tendency used.

This paper complemented the study of price variation with an analysis of trading activity (trades and number of contracts). We found that the differences in trading activity between the two periods tend to mirror the differences in price variation. A separate analysis of unexpected announcements and the surprise component of each announcement revealed a similar pattern. Nor is the possible greater impact of international announcements — another candidate explanation — borne out by the data. Finally, a comparison of the reactions in the two halves of the post-independence period has shown that the reactions to macroeconomic announcements are indeed stronger in the second half. There are tentative signs of a more muted reaction to interest changes but they lack statistical significance. In short, the data show no signs of monetary policy becoming more 'boring' since the Bank of England's independence.

There is a broadly held view that operational independence has increased the degree of transparency at the Bank of England. That is how, for example, Chadha and Nolan (2001) interpret the increase in information flows since 1997. We have also seen that the Bank of England comes in the top group in international comparisons of central banks' transparency (Eijffinger and Geraats (2004) and Chortareas *et al* (2003)). It also comes top in a recent report evaluating the *Inflation Report* released by 19 inflation-targeting central banks (Fracasso *et al* (2003)). Scholtes (2002) shows how market-based inflation measures reveal gradual gains in credibility since the operational independence.

But more transparency was not the only change brought about by operational independence. First, interest rate decisions are now taken by a committee, the MPC. Lombardelli *et al*'s (2002) experimental work shows that collective decision-making by committees leads to better monetary policy outcomes than when those decisions are taken by individuals. The paper's experimental evidence does not extend to whether committees are more or less predictable than individuals. While there is no *a priori* reason why committees should be less predictable than individuals, the decrease in the response to macroeconomic releases and increase in the reaction to monetary policy decisions since BI could indicate that markets find it harder to anticipate collective decisions.

The release of a large amount of information ('openness') is not enough to inform the public of the policymakers' reaction function, as Winkler (2000) points out. There are frictions in the process of transmitting information, so the monetary authority also needs to be clear in the presentation of what they release. Having nine MPC members aims to enhance independence and accountability. However, it also increases the number of signals for markets to read in the form of speeches and interviews. As Chadha and Nolan (2001) point out, if the interest rate process, though transparent, cannot be observed in real time and is the outcome of a discussion in which new information may result, then the interest rate decision could still be the important price mover despite the increase in transparency. The meeting itself is a new non-observable input into the process. This may lead to a decrease in the signalling power of every individual macroeconomic release coupled with an increase in that of the policy decision itself.

Second, with operational independence, the instrument rule of monetary policy shifted towards a more implicit or targeting rule in Svensson's (2003) terminology. When the process of setting the policy rate is independent of political interference, it can afford to be more proactive and less reactive. Although macroeconomic news can change the inflation forecast and affect the interest rate decision, the forecast process includes a degree of judgement by the MPC members about the impact of the latest releases in the forecast. This may decrease the reaction to macroeconomic news and increase the reaction to monetary policy announcements compared to a more reactive monetary policy rule.

So to summarise we have identified three changes brought about by the new monetary framework introduced in 1997: an increase in transparency, collective decision-making and a shift towards a more implicit or targeting rule. Since they all took place at the same time, a comparison of two periods of time cannot disentangle them. The two latter changes may decrease the reaction of the market to macroeconomic releases and increase the reaction to monetary policy announcements in the opposite way that an increase in transparency is likely to cause. If the reason why we observe the results presented in this paper is the complexity introduced by collective decision-making, then it is plausible to assume that the market will learn the rules of the new game with time. By contrast, if the cause is a perceived shift towards a more implicit monetary rule, then the more muted reactions to macroeconomic news compared to policy announcements will last.

More things may have changed between the pre and the post-BI periods. For instance, the decrease in the reactions to macroeconomic releases after 1997 might not be linked to the new monetary policy framework. It could be part of a global trend towards smaller reactions to announcements, perhaps caused by the growing number of indicators and economic information available. A recent paper by Faust *et al* (2003), for example, finds that the effect of macroeconomic surprises in the 1987-2002 period is time varying. Examining if the trend observed in the United Kingdom is also found in the United States and the euro area would be a fruitful avenue for future research.

Appendix: Tables

Table 1. All UK macroeconomic announcements

	Min.	Short Sterling	Long Gilt	FTSE100	USD	EUR
Abnormal price variations						
Difference in medians	5	**-0.9***	**-2.4***	**-2.6***	**+0.6***	+0.2
(post-BI minus pre-BI)	15	**-0.2***	**-2.5***	**-2.8***	-0.1	**-1.1***
	60	**-0.4***	**-2.5***	**-7.9***	+0.02	**-5.0***
Difference in means	5	**-0.1***	**-2.1***	**-2.7***	**+1.3***	+1.4
(post-BI minus pre-BI)	15	**-0.4***	**-3.2***	**-1.8***	+0.2	**-0.5***
	60	**-0.9***	**-4.6***	**-3.7***	+0.4	**-5.0***
Relative number of trades						
Difference in medians	5	+0.4	**-0.7***	**-1.7**		
(post-BI minus pre-BI)	15	+0.2	**-0.4***	-0.4		
	60	-0.1	**-0.2***	-0.2		
Relative volumes traded						
Difference in medians	5	**-0.2**	**-2.8***	**-0.6***		
(post-BI minus pre-BI)	15	**-0.2***	**-1.4***	**-0.7***		
	60	-0.1	**-1.0***	**-0.6***		

: significant at 5% level; *: significant at 1% level

Table 2. Interest rate changes

	Min.	Short Sterling	Long Gilt	FTSE100	USD	EUR
Abnormal price variations						
Difference in medians	5	+1.7	**+5.1**	-0.6	+5.2	-1.5
(post-BI minus pre-BI)	15	-2.2	+8.0	+2.4	+3.4	+12.2
	60	-0.9	+6.9	+7.4	-4.9	+10.0
Difference in means	5	+1.5	**+12.1**	+11.9	+5.0	+4.0
(post-BI minus pre-BI)	15	-4.1	+0.1	+8.3	+6.5	+3.7
	60	-3.7	+17.0	+15.0	-8.6	-8.4
Relative number of trades						
Difference in medians	5	**+10.9***	+1.07	+0.5		
(post-BI minus pre-BI)	15	**+5.0***	+0.7	-0.1		
	60	**+1.1***	+0.8	-0.1		
Relative volumes traded						
Difference in medians	5	**+12.6***	+2.6	+0.8		
(post-BI minus pre-BI)	15	+7.4	+2.5	-1.9		
	60	+2.1	-0.5	-0.7		

: significant at 5% level; *: significant at 1% level

Table 3. Interest rate decisions

	Min.	Short Sterling	Long Gilt	FTSE100	USD	EUR
Abnormal price variations						
Difference in medians	5	+0.2	**+1.5****	-5.0	+3.5	+2.2
(post-BI minus pre-BI)	15	-4.1	+2.5	-1.9	-3.6	+4.4
	60	-2.2	+4.7	-9.2	**-14.4****	**-6.4****
Difference in means	5	-0.01	**+8.7****	+4.1	+2.5	+2.1
(post-BI minus pre-BI)	15	-5.7	-6.9	-0.1	+0.2	-1.4
	60	-5.5	+8.0	+4.6	**-1.8****	**-14.6****
Relative number of trades						
Difference in medians	5	**+9.21****	+0.17	-0.27		
(post-BI minus pre-BI)	15	+5.45	-0.73	**-0.59****		
	60	-0.16	-0.85	-0.56		
Relative volumes traded						
Difference in medians	5	**+8.57*****	-0.15	+0.50		
(post-BI minus pre-BI)	15	**+3.23****	-0.66	**-2.37*****		
	60	+0.13	-1.89	**-1.65*****		

: significant at 5% level; *: significant at 1% level

Table 4. *Inflation Report*

	Min.	Short Sterling	Long Gilt	FTSE100	USD	EUR
Abnormal price variations						
Difference in medians	5	-0.01	-0.5	**-7.2****	**+1.3****	+0.2
(post-BI minus pre-BI)	15	-0.01	-0.5	-3.5	+0.4	-2.6
	60	-0.01	-0.02	+1.1	+2.7	+2.3
Difference in means	5	-0.02	-7.4	**-7.4****	**+4.0****	+2.4
(post-BI minus pre-BI)	15	-0.04	-8.9	-7.3	+4.4	+3.2
	60	-0.1	-11.7	-7.5	+3.1	+4.7
Relative number of trades						
Difference in medians	5	**+3.8*****	-0.1	+0.5		
(post-BI minus pre-BI)	15	**+2.5****	-0.3	-0.1		
	60	+1.0	-0.01	+0.3		
Relative volumes traded						
Difference in medians	5	+2.4	-0.8	-0.6		
(post-BI minus pre-BI)	15	+1.3	-1.8	-1.0		
	60	+1.7	-0.4	+0.1		

: significant at 5% level; *: significant at 1% level

Table 5. Individual announcements, abnormal price variations

	Min.	Short Sterling	Long Gilt	FTSE100	USD	EUR
RPI						
Difference in medians	5	**-0.1*****	**-2.4*****	**-8.6*****	-0.5	+0.7
(post-BI minus pre-BI)	15	**-1.9*****	**-2.5*****	**-8.2****	-0.6	-3.1
	60	**-1.7*****	**-2.5****	**-17.2****	+0.2	+2.8
Difference in means	5	**-1.8*****	**-11.6*****	**-11.0*****	+1.6	+2.2
(post-BI minus pre-BI)	15	**-2.5*****	**-18.5*****	**-9.1****	+0.3	-0.2
	60	**-2.8*****	**-12.7****	**-11.4****	+1.9	+2.3
PPI						
Difference in medians	5	-0.1	-0.1	**-3.9*****	+1.0	-0.9
(post-BI minus pre-BI)	15	**-0.1*****	+1.2	-3.8	-1.1	-0.9
	60	-0.1	+0.1	-5.9	+2.4	+1.7
Difference in means	5	-0.1	-2.6	**-3.1*****	+0.5	-0.3
(post-BI minus pre-BI)	15	**-0.1*****	-0.1	-2.8	-0.9	+0.6
	60	-1.3	-3.7	-0.1	+0.01	+1.7
Retail sales						
Difference in medians	5	-0.01	+2.0	**-4.8*****	+2.0	+0.5
(post-BI minus pre-BI)	15	-0.03	+1.5	-3.8	+1.0	+2.5
	60	-1.1	+2.2	-10.2	+1.1	+1.4
Difference in means	5	+0.02	-2.3	**-1.9*****	+3.1	+2.9
(post-BI minus pre-BI)	15	-0.02	-11.8	+3.4	+1.7	+3.2
	60	-1.1	-8.8	-2.4	+1.5	+0.7
Industrial production						
Difference in medians	5	+0.01	+1.1	-2.9	**+2.4****	+1.3
(post-BI minus pre-BI)	15	-0.01	**+1.5****	-3.2	+1.2	+1.5
	60	-0.01	-1.0	**-9.6****	+4.0	-0.4
Difference in means	5	-0.1	-1.0	-1.2	**+2.1****	+2.8
(post-BI minus pre-BI)	15	-1.0	**-0.7****	-4.4	+0.7	+1.1
	60	-1.4	-9.6	**-7.8****	+2.1	-2.6
Unemployment						
Difference in medians	5	-0.1	-0.5	**-6.9*****	+0.4	+0.4
(post-BI minus pre-BI)	15	-1.1	-0.6	-6.7	+0.5	-0.4
	60	-0.01	-1.0	-8.8	+2.1	-0.6
Difference in means	5	-1.4	+0.1	**-7.6*****	+1.0	+0.9
(post-BI minus pre-BI)	15	-1.7	+0.0	-8.1	+0.1	-1.6
	60	-1.7	-0.1	-10.6	+3.7	-0.8

: significant at 5% level; *: significant at 1% level

Table 6. Individual announcements, relative number of trades

	Min.	Short Sterling	Long Gilt	FTSE100
RPI				
Difference in medians	5	**-1.50*****	-0.82	**-1.10*****
(post-BI minus pre-BI)	15	**-1.62*****	+1.33	**-0.80*****
	60	**-0.86*****	**+0.05****	**-0.35*****
PPI				
Difference in medians	5	**-1.45*****	-0.31	**-0.66*****
(post-BI minus pre-BI)	15	**-0.80*****	-0.97	**-0.30*****
	60	**-0.20*****	**-0.64*****	-0.11
Retail sales				
Difference in medians	5	**-1.08****	**+1.72**	**+0.59*****
(post-BI minus pre-BI)	15	**-0.30****	+1.77	**+0.62*****
	60	**-0.38****	-0.51	**+0.93*****
Industrial production				
Difference in medians	5	**-1.40*****	+1.16	-0.24
(post-BI minus pre-BI)	15	**-1.00*****	+0.08	-0.31
	60	**-0.59*****	-0.12	-0.29
Unemployment				
Difference in medians	5	-2.01	**-1.45****	-0.49
(post-BI minus pre-BI)	15	**-4.82****	-0.60	-0.27
	60	-7.13	-0.26	-0.26

: significant at 5% level; *: significant at 1% level

Table 7. Individual announcements, relative volumes traded

	Min.	Short Sterling	Long Gilt	FTSE100
RPI				
Difference in medians	5	**-5.81**	+0.62	**-3.07*****
(post-BI minus pre-BI)	15	**-4.47**	-0.82	**-2.62*****
	60	**-3.46**	-1.40	**-0.90*****
PPI				
Difference in medians	5	**-4.73*****	-2.07	**-1.69*****
(post-BI minus pre-BI)	15	**-3.35*****	-0.76	**-1.11*****
	60	**-1.74*****	-0.39	**-0.60*****
Retail sales				
Difference in medians	5	**-4.60*****	+1.28	**-1.75*****
(post-BI minus pre-BI)	15	**-3.74*****	**-8.48****	**-1.67*****
	60	**-3.06*****	**-17.93*****	**-0.76*****
Unemployment				
Difference in medians	5	-0.44	**-5.06*****	**-1.44****
(post-BI minus pre-BI)	15	-0.85	**-4.26*****	**-1.66*****
	60	-0.58	**-3.04*****	**-1.09*****
Industrial production				
Difference in medians	5	**-5.60*****	+2.97	**-1.10*****
(post-BI minus pre-BI)	15	**-4.04*****	+0.66	**-0.65*****
	60	**-2.44*****	-0.23	**-0.97*****

: significant at 5% level; *: significant at 1% level

Table 8. All UK macroeconomic announcements classified as surprises

	Min.	Short Sterling	Long Gilt	FTSE100	USD	EUR
Abnormal price variations						
Difference in medians (post-BI minus pre-BI) (medians test)	5	**-0.9*****	**-2.4*****	**-2.6*****	**+0.6*****	+0.2
	15	**-0.2*****	**-2.5*****	**-2.8*****	-0.1	**-1.1*****
	60	**-0.4*****	**-2.5*****	**-7.9*****	+0.02	**-5.0*****
Difference in means (post-BI minus pre-BI) (means test)	5	**-0.1*****	**-2.1*****	**-2.7*****	**+1.3*****	+1.4
	15	**-0.4*****	**-3.2*****	**-1.8*****	+0.2	**-0.5*****
	60	**-0.9*****	**-4.6*****	**-3.7*****	+0.4	**-5.0*****
Relative number of trades						
Difference in medians (post-BI minus pre-BI)	5	+0.35	**-0.73*****	**-1.7****		
	15	+0.16	**-0.44*****	-0.4		
	60	-0.14	**-0.15*****	-0.2		
Relative volumes traded						
Difference in medians (post-BI minus pre-BI)	5	**-1.4****	**-3.9*****	**-0.8*****		
	15	-0.4	**-2.7*****	**-1.0*****		
	60	**-0.5*****	**-1.7*****	**-0.8*****		

: significant at 5% level; *: significant at 1% level

Table 9. Individual announcements classified as surprises, abnormal price variations

	Min.	Short Sterling	Long Gilt	FTSE100	USD	EUR
RPI						
Difference in medians (post-BI minus pre-BI)	5	-2.1	-3.5	**-14.1****	+2.8	+4.0
	15	-4.3	-2.3	-12.1	+1.8	+1.5
	60	**-4.4****	-2.4	-20.2	+1.2	+2.3
Difference in means (post-BI minus pre-BI)	5	-1.9	-15.1	**-12.9****	+5.0	+7.0
	15	-2.9	-19.2	-10.2	+7.3	+7.2
	60	**-4.3****	-22.5	-13.1	+5.5	+7.1
PPI						
Difference in medians (post-BI minus pre-BI)	5	-0.6	+0.5	**-4.9****	-0.6	-1.0
	15	**+1.1*****	**+1.0****	-4.6	-19.6	+1.9
	60	-0.1*	+1.0	-3.9	-0.2	+0.6
Difference in means (post-BI minus pre-BI)	5	-7.1	+0.8	**-4.7****	+0.4	-1.2
	15	**-0.8*****	**+1.6****	-3.2	-1.3	-0.5
	60	-0.5*	+1.0	-0.6	-0.6	+1.1
Retail sales						
Difference in medians (post-BI minus pre-BI)	5	-0.9	-0.6	**-9.3*****	**+6.8****	-2.4
	15	+0.4	-2.8	-8.1	+3.7	-7.5
	60	-1.1	-1.0	**-13.6****	-1.0	-3.1
Difference in means (post-BI minus pre-BI)	5	+0.6	-11.1	**-4.8*****	**+6.5****	+4.2
	15	-0.6	-24.9	-4.2	+2.4	+4.2
	60	-1.2	-14.8	**-18.4****	+1.8	+1.6
Unemployment						
Difference in means (post-BI minus pre-BI)	5	-0.9	-0.2	**-10.0*****	+1.2	-2.2
	15	-1.9	-1.3	**-9.4****	+0.9	-3.4
	60	-0.6	-3.1	**-28.8****	+3.2	-4.0
Difference in medians (post-BI minus pre-BI)	5	-0.7	-8.9	**-8.2*****	+1.1	+1.4
	15	-1.7	-24.8	**-13.4****	+1.2	-2.5
	60	-1.4	-20.6	**-22.7****	+3.3	-2.6
Industrial production						
Difference in medians (post-BI minus pre-BI)	5	-1.6	+0.6	-0.7	+3.4	+4.2
	15	-1.0*	-0.5	-3.3	+7.0	-2.3
	60	-1.5*	-5.1	-12.4	+0.2	-6.0
Difference in means (post-BI minus pre-BI)	5	-2.5	-0.6	-0.2	+2.8	+3.1
	15	-2.2	-9.5	-4.8	+2.0	-0.5
	60	-2.7	-26.2	-15.9	-0.6	-7.3

: significant at 5% level; *: significant at 1% level

Table 10. Individual announcements classified as surprises, relative number of trades

	Min.	Short Sterling	Long Gilt	FTSE100
RPI				
Difference in medians	5	-0.2	-0.8	**-1.3*****
(post-BI minus pre-BI)	15	-1.4	-0.4	**-0.9*****
	60	-2.1	-0.4	**-0.7*****
PPI				
Difference in medians	5	**-2.1****	**-1.8*****	**-0.8****
(post-BI minus pre-BI)	15	+1.3	**-0.7*****	-0.4
	60	**-0.03*****	**-0.3*****	-0.10
Retail sales				
Difference in medians	5	+0.1	**-1.2*****	+1.0
(post-BI minus pre-BI)	15	-0.3	**-0.5*****	**+0.5*****
	60	-1.1	**-1.3*****	**+0.7*****
Unemployment				
Difference in medians	5	+3.0	+0.1	-0.3
(post-BI minus pre-BI)	15	-3.1	+0.3	-0.1
	60	-6.7	+0.3	-0.1
Industrial production				
Difference in medians	5	+1.9	**-2.3*****	-0.7
(post-BI minus pre-BI)	15	+1.2	**-0.9****	-0.7
	60	-0.3	**-0.8****	**-0.4****

: significant at 5% level; *: significant at 1% level

Table 11. Individual announcements classified as surprises, relative volumes traded

	Min.	Short Sterling	Long Gilt	FTSE100
RPI				
Difference in medians	5	+0.6	**-3.5*****	**-3.0*****
(post-BI minus pre-BI)	15	-0.8	**-3.7****	**-1.5*****
	60	**-1.4****	**-1.7****	-0.4
PPI				
Difference in medians	5	-3.4	**-8.8*****	**-1.5*****
(post-BI minus pre-BI)	15	-0.5	**-4.5*****	**-1.7*****
	60	**-1.0****	**-2.5*****	**-0.8****
Retail sales				
Difference in medians	5	-0.8	-1.7	**-1.7****
(post-BI minus pre-BI)	15	**-9.5****	-1.5	**-2.7*****
	60	**-22.5*****	**-2.2****	**-1.7****
Unemployment				
Difference in medians	5	+2.1	**-3.6*****	**-1.3****
(post-BI minus pre-BI)	15	-0.4	**-3.5*****	**-1.8*****
	60	+0.4	**-2.8*****	**-1.4*****
Industrial production				
Ho: Equality of populations	5	Yes	No***	No**
(Kruskal-Wallis test)	15	Yes	No***	No**
	60	Yes	No***	No**
Difference in medians	5	+5.2	**-5.0*****	**-1.8****
(post-BI minus pre-BI)	15	+2.2	**-3.9*****	**-2.1****
	60	+1.0	**-1.9*****	**-1.1****

: significant at 5% level; *: significant at 1% level

Table 12. Coefficients and p-values of regressions of surprise component of announcements on absolute surprises

	Period	Indicator	Short Sterling	Long Gilt	FTSE100	USD	Euro
RPI							
5 minutes	Pre-BI	RPI	**0.13** **(0.001)**	0.077 (0.10)	**0.811** **(0.000)**	0.081 (0.26)	0.006 (0.94)
	Post-BI	RPI	**0.07** **(0.008)**	**0.589** **(0.006)**	**0.509** **(0.019)**	**0.320** **(0.013)**	**0.384** **(0.012)**
15 minutes	Pre-BI	RPI	**0.16** **(0.005)**	0.178 (0.76)	**0.853** **(0.019)**	-0.007 (0.95)	0.037 (0.79)
	Post-BI	RPI	**0.09** **(0.003)**	0.354 (0.21)	0.660 (0.167)	**0.363** **(0.038)**	0.202 (0.29)
60 minutes	Pre-BI	RPI	**0.18** **(0.009)**	1.146 (0.07)	**0.842** **(0.034)**	-0.070 (0.60)	-0.162 (0.37)
	Post-BI	RPI	**0.10** **(0.003)**	0.3114 (0.40)	0.622 (0.343)	+0.164 (0.44)	0.078 (0.75)
PPI							
5 minutes	Pre-BI	Input	**0.001** **(0.008)**	0.004 (0.95)	0.027 (0.216)	0.008 (0.50)	0.004 (0.75)
		Output	0.005 (0.577)	-0.272 (0.27)	0.125 (0.161)	0.049 (0.33)	0.067 (0.21)
	Post-BI	Input	0.001 (0.664)	-0.014 (0.52)	0.008 (0.688)	-0.01 (0.34)	-0.002 (0.83)
		Output	0.006 (0.484)	-0.180 (0.108)	-0.182 (0.086)	0.014 (0.80)	0.023 (0.53)
15 minutes	Pre-BI	Input	0.005 (0.066)	-0.023 (0.58)	0.016 (0.675)	0.017 (0.27)	0.030 (0.05)
		Output	-0.002 (0.871)	-0.220 (0.19)	0.302 (0.051)	0.107 (0.08)	0.027 (0.66)
	Post-BI	Input	-0.001 (0.429)	-0.013 (0.549)	**0.063** **(0.040)**	0.001 (0.99)	-0.011 (0.34)
		Output	-0.001 (0.922)	-0.156 (0.173)	0.110 (0.468)	0.064 (0.41)	0.060 (0.33)
60 minutes	Pre-BI	Input Output	-0.01 (0.648) 0.03 (0.693)	-0.012 (0.86) -0.544 (0.057)	0.008 (0.901) 0.161 (0.542)	-0.011 (0.78) 0.141 (0.39)	0.014 (0.74) 0.114 (0.49)
	Post-BI	Input Output	-0.001 (0.694) **0.016** **(0.068)**	-0.02111 (0.390) -0.12491 (0.319)	0.016 (0.832) -0.239 (0.530)	0.023 (0.48) 0.005 (0.98)	-0.007 (0.74) -0.064 (0.53)

Table 12. Coefficients and p-values of regressions of surprise component of announcements on absolute surprises (continued)

	Period	Indicator	Short Sterling	Long Gilt	FTSE100	USD	Euro
Retail sales							
5 minutes	Pre-BI		0.02 (0.07)	-0.004 (0.99)	0.04 (0.34)	-0.09 (0.78)	0.047 (0.106)
	Post-BI		**0.04 (0.00)**	**0.16 (0.01)**	0.06 (0.37)	**0.09 (0.006)**	**0.102 (0.01)**
15 minutes	Pre-BI		0.03 (0.12)	0.18 (0.31)	0.02 (0.81)	0.086 (0.06)	0.037 (0.45)
	Post-BI		**0.03 (0.00)**	0.11 (0.10)	-0.01 (0.95)	0.**120 (0.005)**	0.089 (0.07)
60 minutes	Pre-BI		0.03 (0.09)	0.10 (0.55)	0.09 (0.38)	-0.03 (0.51)	0.015 (0.82)
	Post-BI		**0.02 (0.03)**	0.05 (0.49)	-0.05 (0.70)	0.102 **(0.06)**	0.093 (0.10)
Unemployment/ av. earnings							
5 minutes	Pre-BI	Unemploy.	$4.0*10^{-5}$ (0.15)	$-8.0*10^{-6}$ (0.23)	$1.6*10^{-5}$ (0.94)	**$1.1*10^{-5}$ (0.07)**	$5.6*10^{-6}$ (0.39)
		Aver. earnings	-0.331 (1.65)	-0.022 (0.08)	-0.1348 (1.01)	$1.4*10^{-4}$ (0.39)	-0.02 (0.67)
	Post-BI	Unemploy.	$2.7*10^{-6}$ (0.61)	$-8.0*10^{-6}$ (0.23)	$-2.0*10^{-5}$ (0.62)	$-6.9*10^{-6}$ (0.70)	$-6.6*10^{-6}$ (0.32)
		Aver. earnings	-0.009 (0.39)	-0.086 (0.46)	-0.147 (1.00)	-0.04 (0.64)	**-0.18 (0.09)**
15 minutes	Pre-BI	Unemploy.	$-1.3*10^{-6}$ (0.24)	$-4.0*10^{-6}$ (0.10)	$-2.0*10^{-5}$ (0.68)	**$2.5*10^{-5}$ (0.07)**	**$3.4*10^{-5}$ (0.01)**
		Aver. Earnings	+0.011 (0.41)	-0.006 (0.18)	-0.110 (0.49)	-0.04 (0.56)	-0.03 (0.74)
	Post-BI	Unemploy.	$-8.0*10^{-6}$ (0.23)	$-2.0*10^{-5}$ (0.51)	$-2.0*10^{-5}$ (0.40)	$-2.2*10^{-5}$ (0.36)	**$1.1*10^{-6}$ (0.04)**
		Aver. Earnings	-0.086 (0.46)	-0.113 (0.59)	+0.127 (0.63)	-0.205 (0.11)	-0.35 (0.02)
60 minutes	Pre-BI	Unemploy.	$-1.3*10^{-6}$ (0.27)	$1.0*10^{-6}$ (0.31)	$-4.0*10^{-6}$ (0.14)	**$2.8*10^{-5}$ (0.03)**	**$4.8*10^{-5}$ (0.00)**
		Aver.Earnings	-0.050 (1.32)	-0.230 (0.69)	-0.330 (1.65)	-0.06 (0.84)	0.05 (0.58)
	Post-BI	Unemploy.	$-4.0*10^{-6}$ (0.40)	$-9.0*10^{-6}$ (0.20)	$-9*10^{-5}$ (1.62)	$7.5*10^{-6}$ (0.15)	$-2.6*10^{-9}$ (1.00)
		Aver. earnings	-0.010 (0.43)	-0.092 (0.38)	-0.087 (0.29)	-0.249 (0.21)	**-0.32 (0.05)**

Table 12. Coefficients and p-values of regressions of surprise component of announcements on absolute surprises (continued)

Industrial production								
5 minutes	Pre-BI			**0.02**	0.02	0.04	-0.003	-0.004
				(0.04)	(0.82)	(0.21)	(0.88)	(0.83)
	Post-BI			0.03	0.08	0.01	+0.044	**+0.108**
				(0.63)	(0.07)	(0.83)	(0.12)	**(0.006)**
15 minutes	Pre-BI			**0.03**	**0.24**	**0.13**	-0.013	+0.018
				(0.04)	**(0.00)**	**(0.02)**	(0.79)	(0.59)
	Post-BI			0.004	0.05	-0.03	+0.04	+0.042
				(0.51)	(0.28)	(0.97)	(0.10)	(0.34)
60 minutes	Pre-BI			0.03	**0.36**	0.17	-0.023	+0.024
				(0.08)	**(0.00)**	(0.10)	(0.66)	(0.70)
	Post-BI			-0.003	0.02	-0.21	-0.06	-0.054
				(0.68)	(0.81)	(0.16)	(0.93)	(0.44)

Table 13. Price variations, abnormal reactions to all US macroeconomic announcements

	Min.	Short Sterling	Long Gilt	FTSE100	USD	EUR
All US macroeconomic announcements						
Ho: Equality of populations (Kruskal-Wallis test)	5	No***	No***	No***	No**	No**
	15	No***	No***	Yes	No	Yes
	60	No***	No***	Yes	Yes	Yes
Difference in medians (post-BI minus pre-BI)	5	**+0.01***	**+1.5***	**-2.8***	**-0.5****	**+0.4****
	15	**-0.1***	**+1.6***	-0.9	-1.0	+0.7
	60	**-0.4***	**+3.1***	+0.4	+0.4	-1.3
Difference in means (post-BI minus pre-BI)	5	**-0.1***	**-4.6***	**-1.5***	**-0.9****	**+1.0****
	15	**-0.3***	**-5.4***	+3.1	-0.7	+1.1
	60	**-0.6***	**-3.4***	+6.7***	-0.9	+0.7

: significant at 5% level; *: significant at 1% level

Table 14. Price variations: abnormal reactions post-June 99 minus from June 97 to June 99

	Min.	Short Sterling	Long Gilt	FTSE100	USD	EUR
Panel A						
All UK macroeconomic announcements						
Difference in means (post June 99-pre June 99)	5	**-0.8****	**-3.1*****	-0.5	**-2.4*****	**-2.9*****
	15	**-0.8****	-1.5	**+6.2*****	**-3.3*****	**-2.7*****
	60	**-0.6****	**+0.1*****	**+6.1*****	**-2.5*****	**-3.1*****
Difference in medians (post June 99-pre June 99)	5	**-1.0****	**-0.7*****	-1.3	**-1.6*****	**-2.1*****
	15	**-1.1****	+0.5	**+4.5*****	**-1.8*****	**-1.5*****
	60	**-0.9****	**+1.7*****	**+8.9*****	**-1.9*****	**-3.4*****
Panel B						
Interest rate changes						
Difference in medians (post June 99-pre June 99)	5	-5.3	-4.9	**-23.2****	-5.1	-2.5
	15	-5.5	+4.5	-10.7	**-1.6****	-12.2
	60	-5.3	+8.1	-3.5	**-1.6****	**-20.7**
Difference in means (post June 99-pre June 99)	5	-6.4	-15.7	**-28.8****	-8.9	-6.2
	15	-5.7	-7.6	-17.5	**-2.2****	**-14.3**
	60	-6.6	-20.3	-4.5	**-2.6****	**-22.1**
Interest rate decisions						
Difference in medians (post June 99-pre June 99)	5	**-4.1*****	+0.4	+18.5	**-3.1*****	**-1.5****
	15	**-3.9*****	+4.2	+12.6	**-7.1*****	+4.5
	60	**-4.7*****	+8.2	+11.3	-5.0	+4.0
Difference in means (post June 99-pre June 99)	5	**-3.3*****	-6.6	-2.0	**-4.6*****	**-1.8****
	15	**-3.2*****	+0.2	+10.6	**-5.6*****	-2.4*
	60	**-3.2*****	-4.2	+17.2	+3.9	+2.1
Inflation Report						
Difference in medians (post June 99-pre June 99)	5	**-1.1****	+0.3	+5.8	+0.9	**-5.0****
	15	**-2.3****	+7.0	**+20.3****	-1.2	-1.2
	60	-1.6*	+8.4	+10.5	-4.9	-1.6
Difference in means (post June 99-pre June 99)	5	**-1.9****	-2.2	+3.5	+0.9	**-3.0****
	15	**-2.5****	-3.0	**+1.2****	-1.1	-3.2
	60	-2.1	-2.6	+0.8	-7.1	-9.7

*: significant at 10% level; **: significant at 5% level; ***: significant at 1% level

Table 14. Price variations: abnormal reactions post-June 99 minus from June 97 to June 99 (continued)

	Min.	Short Sterling	Long Gilt	FTSE100	USD	EUR
Panel C						
RPI						
Difference in medians	5	-1.0	**-2.8****	-0.1	**-6.2****	**-3.8*****
(post June 99-pre June 99)	15	**-1.1*****	-1.7	+5.3	**-4.6*****	**-3.9****
	60	-0.9	+0.2	+6.3	**-4.0****	-7.5
Difference in means	5	-0.6	**-5.8****	+1.4	**-6.7****	**-7.9*****
(post June 99-pre June 99)	15	**-1.2*****	-6.4	+1.2	**-8.8*****	**-7.8****
	60	**-1.1**	-5.8	+1.6	**-9.3****	-8.9
PPI						
Difference in medians	5	-1.0	-1.3	-2.7	-0.6	-1.2
(post June 99-pre June 99)	15	-1.0	-0.3	+3.1	-1.3	**-3.6****
	60	+0.1	-0.3	+11.7	-3.5	-6.5
Difference in means	5	-0.3	-3.2	-3.0	-10.1	-2.5
(post June 99-pre June 99)	15	-0.3	-2.2	+3.2	-1.3	**-2.2****
	60	+0.1	-1.9	+0.6	-4.	-4.8
Retail sales						
Difference in medians	5	-1.0	-2.0	-2.1	**-5.5*****	**-4.2****
(post June 99-pre June 99)	15	-0.6	+0.4	-0.6	**-9.9*****	**-6.6*****
	60	-0.5	+0.8	-10.6	-3.6	**-1.3*****
Difference in means	5	-1.7	-9.0	+3.5	**-7.0*****	**-7.8****
(post June 99-pre June 99)	15	-1.2	-7.8	+11.4	**-11.0*****	**-7.1*****
	60	-1.2	-5.4	+13.3	-8.6	**-1.2*****
Unemployment/ Average earnings						
Difference in medians	5	+0.5	+0.3	-0.7	**-5.3****	-1.5
(post June 99-pre June 99)	15	-0.2	+6.5	+6.3	-5.1	-3.2
	60	+0.9	+3.8	+9.8	-1.2	-7.8
Difference in means	5	-0.1	-4.1	+2.6	**-4.4****	-3.3
(post June 99-pre June 99)	15	-0.6	-3.3	+8.5	-5.4	-6.0
	60	-0.3	-7.9	+16.0	-9.1	-7.7
Industrial production						
Difference in medians	5	-1.0	**-1.4****	-2.0	-2.0	**-5.4****
(post June 99-pre June 99)	15	-1.1	+1.8	+3.5	-0.6	-1.7
	60	-0.1	**+7.4*****	+11.0	-0.4	-7.4*
Difference in means	5	-1.0	**-3.9****	-4.1	-3.1	**-6.0****
(post June 99-pre June 99)	15	-0.9	-0.5	+3.0	-2.6	-2.4
	60	-0.3	**+5.8*****	+0.9	+1.1	-1.5

***: significant at 10% level; **: significant at 5% level; ***: significant at 1% level

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