The News Content of Macroeconomic Announcements: What if Central Bank Communication Becomes Stale?*

Michael Ehrmann and David Sondermann
European Central Bank

How do financial markets incorporate news? This paper argues that one piece of news not only has direct effects on asset prices and market volatility, but it can also alter the relative importance of other news. Studying the reaction of UK short-term interest rates to the Bank of England's Inflation Report and to macroeconomic announcements, this paper finds support for the notion of interdependent news effects. With time elapsing since the latest release of an Inflation Report, market volatility increases, suggesting that market uncertainty rises until the central bank updates its communication. At the same time, the price response to other macroeconomic announcements becomes more pronounced, and they play a more important role in reducing uncertainty.

JEL Codes: D83, E43, E58, G12, G14.

1. Introduction

How do financial markets incorporate news? If a particular news item contains relevant information, it might exert immediate effects on asset prices and market volatility. Furthermore, it might also alter the importance that gets attached to other, subsequent, pieces

*Copyright © 2012 European Central Bank. We would like to thank Martin T. Bohl, Georgios Chortareas, Philippine Cour-Thimann, Reint Gropp, Bernd Wilfling, two anonymous referees, and seminar participants at the ECB, the European Business School, Marburg University, Norges Bank, Oxford University, the National Bank of Poland conference on "Publishing Central Bank Forecasts in Theory and Practice" and the 2010 ASSA meetings in Atlanta for helpful comments and suggestions. This paper presents the authors' personal opinions and does not necessarily reflect the views of the European Central Bank. Author e-mails: Michael.ehrmann@ecb.int, David.sondermann@ecb.int.

of news (for instance, by making them less relevant). This creates an interdependence of news, making the information content of one item dependent on the relative importance of another item. The aim of this paper is to verify the interdependence of news and to document the corresponding reactions of financial markets. The main hypothesis of the paper is that shortly after the release of a "dominant" piece of news, other news leads to relatively small reactions in financial markets. By contrast, with larger distance to this dominant piece, the relative information content in other news increases, thus also triggering more substantial effects on asset prices.

To study this hypothesis, we will use the Bank of England's Inflation Report as an example for potentially dominant news and look at the reaction of British short-term interest rates to the Inflation Reports themselves. In addition, we incorporate other macroeconomic news and model the reaction to this news as dependent on the time that has elapsed since the last release of an Inflation Report. This choice rests on the assumption that central bank communications are important drivers of short-term interest rates, and exploits the fact that the Bank of England's Inflation Report is released at a quarterly frequency. This implies that in the interim period between two Inflation Reports, financial market participants need to update their beliefs about the course of the economy and the likely setting of monetary policy based on other information, such as the releases of macroeconomic data. Shortly after the release of an Inflation Report, markets should have a relatively clear picture about the future course of interest rates, but with increasing distance to this communication, this picture becomes blurred given that the economy evolves, yet the central bank does not provide an update of its own assessment. Accordingly, other pieces of information (as given by macroeconomic announcements) should become more newsworthy and therefore receive more attention in financial markets.

The evidence provided in this paper is in line with these hypotheses. There are three main findings. First, the release of the Inflation Report leads to a marked decline in market volatility, suggesting that it triggers a reduction in uncertainty among financial market participants about the future course of monetary policy. Second, market volatility increases with the time that has elapsed since the latest release of an Inflation Report, which supports the notion that

its information becomes stale over time. Third, the price response to other macroeconomic announcements does indeed become more pronounced with increasing distance to the latest Inflation Report, and they play a more important role in reducing uncertainty. Finally, the paper finds the same patterns with regard to other news, as uncertainty also increases in between two announcements of inflation data. The findings therefore apply more generally and are not restricted to central bank communications.

These findings have a number of important implications. In the realm of monetary policy, central banks routinely study the market response to macroeconomic news. To appropriately judge the magnitude of such market movements, it is important to compare these against the correct benchmark, which is not the average response but rather the average response *conditional* on the freshness of central bank communication. An above-average response to the release of inflation data shortly prior to the publication of a major central bank release, for instance, is to be expected, and should be assessed accordingly. Beyond a pure monetary policy perspective, these findings might help explain why it is at times difficult to establish a link between asset prices and macroeconomic fundamentals (see, e.g., the discussion on this issue in Andersen et al. 2003). What the current paper suggests is that a missing (or a muted) responsiveness need not automatically imply a broken link. Rather, muted responsiveness can very well arise if the information contained in another source (that could have entered the information set already at an earlier stage) is sufficiently precise to dominate the new signal.

The paper relates to the extensive literature on how macroeconomic announcements (such as the release of data for consumer price inflation) are incorporated into asset prices. Early contributions have shown the responsiveness of stock prices (McQueen and Roley 1993), of money and bond markets (Fleming and Remolona 1999b; Thornton 1998), and exchange rates (Andersen et al. 2003; Faust et al. 2007). Further work has subsequently provided evidence for asymmetries and time variations in the effect of macroeconomic announcements. Andersen et al. (2003), for instance, show that bad news has a greater impact on exchange rates than good news, and that more timely news releases lead to larger market reactions. Andersen et al. (2007) furthermore show that the news effects

are dependent on the business cycle. Finally, a recent contribution by Gilbert et al. (2010) finds a somewhat smaller responsiveness to macro announcements that are subject to larger revisions, and in particular a substantially larger reaction to news with more information content about future monetary policy decisions by the Federal Open Market Committee.

This suggests that interest rates react to macroeconomic announcements because their release provides signals which allow financial market participants to update their expectations about the future course of monetary policy. If this is the case, then signals which are provided by the central bank itself should receive even more attention in financial markets. As a matter of fact, central bank communications have been found to be among the most important market movers, especially for interest rates (Guthrie and Wright 2000; Kohn and Sack 2004; Andersson, Dillén, and Sellin 2006; Ehrmann and Fratzscher 2007). Reinhart and Sack (2006) as well as Reeves and Sawicki (2007) show that, in particular, communication on behalf of the entire policy-making committee is a strong market mover; for the case of the Bank of England, the Inflation Report has been shown to be particularly important.[1]

The current paper is also closely related to Gropp and Kadareja (2012), who look at the aging of the information content contained in commercial banks' annual reports. The idea underlyng that paper is that with increasing distance to an annual report, the quality of the public information about the bank deteriorates. If a signal arrives shortly after the release of the annual report, it is much easier for analysts to determine the implications of this signal for the stock price of the individual bank, whereas over time, uncertainty increases. In line with this hypothesis, the paper finds that with increasing distance to the annual report, the volatility response of stock prices to monetary policy shocks becomes larger and more persistent. Our paper complements theirs by looking at a different

[1]Whereas earlier studies of the market reactions to Bank of England communication (Clare and Courtenay 2001, Lasaosa 2007) had concluded that the news component contained in interest rate decisions increased with the independence of the Bank of England, Bell (2005) argues that in more recent years, the news content of the decisions has declined, due to a more central role of the Inflation Report in the decision-making process.

informational setup (the central bank informing about the state of the economy rather than a commercial bank providing information about itself), different financial markets (interest rates versus stock markets), different data frequency (daily as opposed to intradaily), and a different volatility measure (conditional versus realized). The fact that both papers come to similar conclusions suggests a wider applicability of the phenomenon.

The remainder of this paper is structured as follows. It develops some hypotheses about the reception of news in financial markets and describes the data and the methodology underlying our empirical analysis in section 2. Section 3 provides the empirical results, first looking at the unconditional reception of news and subsequently asking how this changes if central bank communication becomes stale. Section 4 concludes.

2. Modeling the Reception of News in Financial Markets

The purpose of this section is to develop a few hypotheses about the effect of the release of Inflation Reports and of macroeconomic news on financial markets and their interaction, as well as to present the setup of our subsequent empirical analysis.

2.1 Some Hypotheses about the Reception of News in Financial Markets

The impact of macroeconomic announcements on financial markets has typically been studied in the context of Bayesian learning models (Kim and Verrecchia 1991; Veronesi 2000; Gilbert et al. 2010; Hess and Niessen 2010), where market participants need to form an expectation about some economic variable, but they receive only noisy signals about this economic fundamental. Let us assume that prior to the reception of such a signal, market participants have formed an expectation, with μ_F denoting the mean expectation and ρ_F its precision.[2] If they receive a noisy signal μ_A about the economic fundamental, with precision ρ_A, they will update their expectation by calculating a weighted average of the prior expectation and the

[2]This follows the notation of Hess and Niessen (2010).

signal, with the weights being related to the relative quality of each. The updated belief is given as

$$\mu_P = \mu_F \frac{\rho_F}{\rho_F + \rho_A} + \mu_A \frac{\rho_A}{\rho_F + \rho_A} \tag{1}$$

and has precision

$$\rho_P = \rho_F + \rho_A. \tag{2}$$

This very simple setup allows drawing a number of important conclusions. First, an update of the mean expectations will only take place if $\mu_A \neq \mu_F$, i.e., if there is some "news" in the signal. In contrast, the precision of the expectation will change as long as $\rho_A \neq 0$, regardless of whether the signal contains some news content. Second, the updating of the mean expectation will crucially depend on the precision of the prior expectation: the more precise the prior, the less value added is implied in receiving a signal, and the less updating will take place in response to it.

Accordingly, we can formulate the following hypotheses:

1. The release of public signals should lead to an update of agents' expectations about the economic fundamental.
2. The release of public signals should lead to an increased precision of agents' expectations.
3. With passage of time after the release of a signal, its information becomes stale, which should ceteris paribus lead to a decreasing precision of expectations.
4. The more time has elapsed since the release of a signal, the more pronounced the update of expectations in response to other signals.
5. The more time has elapsed since the release of a signal, the stronger the increase in the precision of expectations in response to another signal.

2.2 The Data

We would like to put these hypotheses to an empirical test. The principle should apply generally, for any financial market, and for any piece of news. However, as argued above, the example of central bank communications and short-term interest rates might be promising,

given that they satisfy the main requirements: (i) there is known to be a tight link between the two, (ii) some central bank communications are infrequent, implying that there is sufficient time in between two releases to study time variations in the response to other news, and (iii) some central bank communications have a regular release schedule, which makes them a convenient object of study.

Accordingly, for the financial market we chose British zero-coupon government bond yields for different maturities ranging from two to twelve months. Our dependent variable is defined as the first difference of the daily yields, as is common practice in the announcement literature. These data have been provided by the Bank of England. A possibly preferable alternative would have been to use interbank rates, as these are arguably more tightly linked to monetary policy; unfortunately, the available series typically do not vary at the daily frequency, especially at the beginning of our sample, such that we had to use government bond yields instead.[3] The same data have been fruitfully employed in related studies; Gürkaynak, Levin, and Swanson (2010), for instance, use them to investigate whether the UK monetary policy has succeeded in anchoring inflation expectations. The sample spans all trading days from March 1997 until December 2008. While the start of the sample is due to the unavailability of earlier zero-coupon yields data, it coincides roughly with the independence of the Bank of England and, as such, constitutes a meaningful choice. The starting point is also just prior to the 1998 Bank of England Act, which requires the Monetary Policy Committee (MPC), i.e., the Bank of England's rate-setting body, to sign off on the Bank's Inflation Report.[4]

[3]In order to check the robustness of our results, we also used available interbank rates. Although these rates are only available for a considerably shorter time sample (starting in 2001, thus reducing the sample by around one-third) and exhibit consecutive periods of non-fluctuating rates, we find our results broadly unchanged. In particular, we still observe an increase in volatility with the time elapsed since the last Inflation Report.

[4]This need not imply that the MPC, as a group, endorses the entire content of the report; however, the forecasts of inflation and GDP and the associated ranges are typically endorsed by the MPC. Judging from the media (and especially newswire) reporting about the Inflation Report, where especially the forecasts receive a lot of attention, we assume that this part of the reports is central to the financial market participants. For a detailed discussion on the forecasting process and its importance, see Goodhart (2001).

As to the central bank communication variable, we focus on the Bank of England's Inflation Report, despite the fact that there are a large number of other important communication events. Monetary policy decisions and the accompanying statements or the subsequent release of the minutes of MPC meetings are obvious examples, as are speeches by MPC members. However, in contrast to these other publications, Inflation Reports have a regular publication schedule (compared with speeches), a relatively low publication frequency (compared with minutes and policy statements), and they are clearly a publication of major importance: Inflation Reports contain an in-depth analysis of the Bank of England's assessment of the economy (taking the length of the documents as a proxy, Inflation Reports are at around fifty to sixty pages, more than five times as long as minutes, which typically contain around ten pages). Importantly, the Inflation Report also contains the forecasts of inflation and GDP, and as such an important forward-looking element of the Bank's economic assessment, which directly feeds into policy deliberations. According to the Bank of England (2009), the Inflation Report "serves two purposes. First, its preparation provides a comprehensive and forward-looking framework for discussion among MPC members as an aid to our decision making. Second, its publication allows us to share our thinking and explain the reasons for our decisions to those whom they affect." According to Lomax (2005), the Inflation Report plays a "central role" in the MPC's communication. As further indications of its prominence, note that the Inflation Report is the first on the list of the Bank's "Main Publications" on its web site (www.bankofengland.co.uk), and that its publication is accompanied by a regular press conference. As a matter of fact, Reeves and Sawicki (2007) have found the Inflation Report to be a particularly strong market mover, and the reports have been judged to be of very high quality (Fracasso, Genberg, and Wyplosz 2003).

We have collected the release dates of the Bank of England's Inflation Report from the Bank of England web site, and create a dummy variable that is equal to one on release dates and zero otherwise. Our sample covers forty-six Inflation Reports. Note that the release schedule of the Inflation Reports is clearly exogenous to market events: the Bank of England publishes the exact release dates several issues ahead. The release pattern is furthermore highly

regular: 55 percent of reports are released sixty-five days after the preceding report, another 13 percent deviate from this by one day, another 24 percent by four days, and the remaining 6 percent by six days. The time elapsed since the last report is measured by counting the days since the preceding release and dividing this number by the total number of days between the preceding and the subsequent release. To facilitate the interpretation of coefficients, we have normalized the resulting variable by subtracting its mean. The variable therefore ranges from -0.5 (on the first day after the release of an Inflation Report) to $+0.5$ (on the day of the release of the subsequent Inflation Report). Note that this normalization does not affect any of our results qualitatively. Finally, given that asset prices, at the time of a news release, react only to the surprise component contained therein (Kuttner 2001), we need to construct a proxy for the news content of each Inflation Report. We do so by calculating the change in the central tendency of the inflation forecast at the policy-relevant two-year horizon. Of course, this proxy is rather crude, as it neither does justice to the breadth and depth of the report nor takes into account the fact that changes in the inflation forecast might have been partially expected. However, a cross-check with media reporting about the Bank of England's Inflation Reports shows a very strong emphasis on precisely the change in the two-year inflation forecast, such that we consider this proxy as capturing the most relevant news content in the Inflation Reports.

As to other news, we follow a large literature and look at the market response to the release of macroeconomic data. To construct the surprise component, we follow the standard in the announcement literature and deduct the expectation of the announcement from the actual announcement value of the variable. To allow a comparison of the magnitude of the financial market responses, we furthermore standardize the surprises by their own standard deviation. This standardization removes differences in the unit of measurement across variables, and regression coefficients for each series can then be interpreted as a response per one-standard-deviation surprise. We obtained data on financial market expectations of the various macroeconomic data releases from two sources, namely Money Market Services (MMS) and Bloomberg Financial Services, and use the median response of the respective polls as our measure of market

expectations.[5] The macroeconomic announcements contained in our data set relate to the Consumer Price Index (month on month), the Manufacturing Purchasing Managers Index, retail sales (month on month), unemployment, and the trade balance. By opting for nominal and real indicators, we aim to cover a relatively broad spectrum of the economy; by choosing forward-looking ones such as the PMI, we intend to capture indicators that might help markets infer news about the future course of monetary policy. As an alternative to including the CPI, one might consider using the RPIX, given that the Bank of England's inflation target was formulated in terms of this price index until 2003. While having opted for the CPI, we can confirm that using the RPIX does not affect our results.

Table 1 reports summary statistics for all variables and also shows how much time has, on average, elapsed between the release of an Inflation Report and the respective macroeconomic data releases. It is important to note that all releases are rather regular, such that there is relatively little variability in average numbers over time.

Given that the bulk of the announcement literature has studied market responses to U.S. releases, we furthermore collected U.S. announcement data, again covering nominal and real aspects as well as leading indicators, namely the Conference Board's composite index of leading indicators, industrial production, core CPI, and non-farm payrolls. The U.S. data will provide a basis for testing the robustness of our results. Note that we can be agnostic on why U.S. surprises move British yields, given that we are only interested in how financial markets react to public signals conditional on the time elapsed since the preceding Inflation Report, regardless of the underlying perceived transmission mechanism from the U.S. to the British economy.

2.3 The Econometric Model

As mentioned above, we are interested in how expectations about the fundamental, as well as their precision, evolve. Our empirical

[5]Ehrmann et al. (2011) note that the information content of the MMS and Bloomberg series is very similar. In particular, when both surveys co-exist, the release data are identical, and the expectations agree almost perfectly. The quality of these data as measures of expectations has been verified by, e.g., Balduzzi, Elton, and Green (2001) and Andersen et al. (2003) for MMS, and by Ehrmann and Fratzscher (2005) for Bloomberg.

Table 1. Summary Statistics

		No. of Obs.	Min.	Max.	Mean	Avg. Time Elapsed Since Last Inflation Report		
						1st Release	2nd Release	3rd Release
Inflation Report Variables	Release Dummy	2943	0.00	1.00	0.02	—	—	—
	Change of Inflation Forecast (Two Years Ahead)	2943	−1.15	0.81	0.00	—	—	—
BoE Variables	Minutes Dummy	2943	0.00	1.00	0.05	—	—	—
	Speeches	2943	−1.00	1.00	0.00	—	—	—
	Interest Rate Surprises	2943	−0.33	0.25	0.00	—	—	—
Government Bond Yields	Two Month	2943	1.40	7.44	5.03	—	—	—
	Three Month	2943	1.26	7.44	5.02	—	—	—
	Six Month	2943	1.13	7.41	5.01	—	—	—
	Twelve Month	2943	1.30	7.27	5.00	—	—	—

(continued)

Table 1. (Continued)

		No. of Obs.	Min.	Max.	Mean	Avg. Time Elapsed Since Last Inflation Report		
						1st Release	2nd Release	3rd Release
UK Macroeconomic Announcements	UK CPI	2943	−2.59	1.95	0.00	16	35	57
	UK PMI	2943	−2.87	1.52	0.00	16	36	55
	UK Retail Sales	2943	−3.02	5.44	0.01	10	31	51
	UK Unemployment	2943	−1.33	2.67	0.00	17	40	60
	UK Trade Balance	2943	−3.39	2.42	−0.01	14	36	52
US Macroeconomic Announcements	US Composite Index	2943	−1.53	2.15	0.00	9	31	52
	US Industrial Production	2943	−6.31	4.50	0.00	9	30	44
	US CPI	2943	−2.58	1.72	−0.01	10	31	47
	US Non-Farm Payrolls	2943	−2.97	1.84	−0.01	17	39	60

Notes: The table shows summary statistics for the variables used in the empirical analysis. The last three columns report how many days, on average, have elapsed between the preceding release of an Inflation Report and the macroeconomic announcement. Given that the macroeconomic announcements are monthly, there are typically three releases in between two Inflation Reports. In a few instances, there has also been a fourth release, numbers for which are not reported for brevity.

counterparts to these two concepts are the response of interest rates and their volatility, respectively. It is important to note, however, that we are interested in the volatility response *conditional* on the response of interest rate levels. As shown in equations (1) and (2), the arrival of news can have two effects: first, a change in the expectation about the future path of interest rates. This will be reflected in the price response. Second, also the precision of expectations might be affected. Once the market has settled to reflect the new mean expectation, we would expect to see a change in volatility compared with the time prior to the arrival of the news. The "immediate" price response to the signal should therefore not be considered part of the volatility response. We therefore need to estimate an econometric model that allows testing for the effect of news on both the conditional mean and the conditional variance of asset prices. We estimate an exponential GARCH (EGARCH) model, following Nelson (1991).[6] An EGARCH(1,1) model is sufficient to address the non-normality of the data, in particular the serial correlation and heteroskedasticity of the daily interest rate series. We will use different variants of the econometric model. In its most extended version, the conditional mean equation is formulated as

$$r_t = c_1 + \delta^{IR} s_t^{IR} + \sum_k \delta^k s_t^k + \sum_k \phi^k s_t^k g_t + \omega g_t + \psi r_{t-1} + \sum_l \nu^l d_t^l + \mu_t, \tag{3}$$

with r_t as the change in the daily UK zero-coupon rates, r_{t-1} as the lagged change, and d_t^l as a set of controls containing day-of-the-week effects. s_t^k denotes the standardized surprise component contained in macroeconomic announcement k, and s_t^{IR} denotes the proxy for the news component in the Inflation Report. Finally, g_t stands for the time that has elapsed since the preceding release of the Inflation Report. Conditioned on the information set of last

[6] In order to test for asymmetries in volatility, we apply the Engle and Ng (1993) sign and size bias test. It examines whether sign and size of the shocks impact differently upon the conditional variance. The joint hypothesis of no asymmetry is rejected for all maturities, suggesting the use of Nelson's (1991) EGARCH. The results are not displayed but are available from the authors upon request.

period (I_{t-1}), we assume the distribution of the disturbance to be $\mu_t|I_{t-1} \sim (0, h_t)$. Hence, we express the conditional variance of UK interest rate changes, h_t, as

$$\log(h_t) = c_2 + \kappa_1 \left(\left| \frac{\mu_{t-1}}{\sqrt{h_{t-1}}} \right| - \sqrt{2/\pi} \right) + \kappa_2 \left(\frac{\mu_{t-1}}{\sqrt{h_{t-1}}} \right) + \kappa_3 \log(h_{t-1}) + \lambda^{IR} a_t^{IR} + \sum_k \lambda^k a_t^k + \sum_k \rho^k a_t^k g_t + \zeta g_t + \sum_l \tau^l d_t^l. \quad (4)$$

a_t^k and a_t^{IR} are announcement dummies that take the value one on all days a macroeconomic announcement or an Inflation Report is released, and zero otherwise.[7] All other variables are as described in equation (3). The model is estimated via maximum likelihood, using the BHHH algorithm for optimization. Note that the model is estimated for all business days in the sample, i.e., also for days when neither an Inflation Report is issued nor a macroeconomic announcement is made. The corresponding variables are equal to zero on such days.

In the context of this econometric model, the hypotheses developed in section 2.1 translate into the following:

1. The publication of an Inflation Report and the release of macro news should lead to an update of agents' expectations about the future course of monetary policy, and thus to a response of interest rates: $H_0 : \delta^k \neq 0$; $\delta^{IR} > 0$.[8]
2. The publication of an Inflation Report and the release of macro news should lead to an increased precision of agents' expectations and thus to lower conditional volatility: $H_0 : \lambda^k < 0$; $\lambda^{IR} < 0$.
3. With passage of time, the information contained in a given Inflation Report becomes stale, which should lead to a

[7]Introducing the announcement dummies lagged by one day does not affect our results.

[8]The expected sign depends on the type of news. An increased inflation forecast in the Inflation Report or an unexpectedly high inflation release or release about real variables should lead to increasing interest rates, whereas unexpectedly high unemployment numbers should lower interest rates.

decreasing precision of expectations and thus to an increase in conditional volatility—until the subsequent Inflation Report is released: $H_0 : \zeta > 0$.[9]

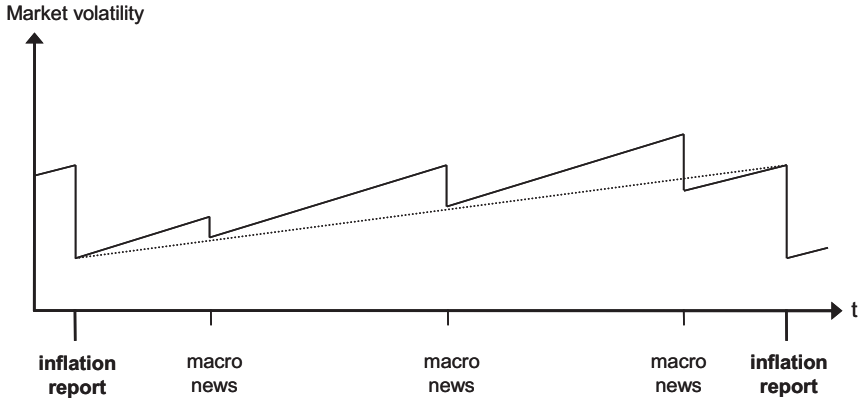
4. The update of expectations in response to macro news should be more pronounced the more time has elapsed since the preceding release of an Inflation Report: $H_0 : sign(\delta^k) = sign(\phi^k)$.
5. The increase in the precision of expectations in response to macro news should be stronger the more time has elapsed since the preceding release of an Inflation Report: $H_0 : \rho^k < 0$.

Hypotheses 2, 3, and 5 are illustrated in figure 1. The solid line shows the evolution of market volatility that is predicted by the various hypotheses. Importantly, the figure also contains a dotted line, which shows that the estimate of the volatility increase over time depends crucially on the inclusion of macro announcements in the regression model: without these, the slope of the line gets underestimated. This is important to bear in mind when interpreting our results: while our model controls for a few macroeconomic announcements, it will never be able to include all relevant news, such that we would expect to find a relatively subdued estimate for ζ.

It is important to note that much of the literature has discussed that macro announcements increase market volatility. Ederington and Lee (1993) and Fleming and Remolona (1999a) have identified two distinct adjustment processes: In the first stage, prices adjust nearly instantaneously to news, thus confirming the conjecture of French and Roll (1986) that public information affects prices before anyone can trade on it. In the second stage, which is somewhat more persistent, trading volume surges and price volatility persists, as residual disagreements among the traders about the interpretation of the news triggers trading. Note, however, that these two periods span a couple of hours, i.e., are typically concluded within

[9] We are interested in the direct effect of the aging process of the Inflation Report and not the overall effect (which furthermore takes into account that with stale central bank communication, macroeconomic announcements will lead to a stronger volatility reduction). Accordingly, we formulate this hypothesis as $H_0 : \zeta > 0$ rather than $H_0 : \zeta + \sum_k \rho^k a^k > 0$.

Figure 1. The Predicted Evolution of Market Volatility



Notes: This stylized figure shows the predicted evolution of market volatility. Volatility falls in response to news such as the Inflation Report. Subsequently, it increases with the distance to the last Inflation Report. The reduction in volatility in response to macro news increases with the distance to the last Inflation Report. The dotted line shows the slope for this volatility increase that would be estimated if macro news were mistakenly omitted from the econometric model.

the course of a trading day. Accordingly, we might expect volatility to increase in the very short run yet still be muted over longer horizons.

Another distinction that is important in that respect is whether the increase or decrease is related to a *realized* or a *conditional* volatility. Realized volatility is likely to increase (due to a response of the conditional mean equation), whereas conditional volatility could also fall in response to news. A number of papers in this literature estimate conditional mean and conditional variance equations: Andersen et al. (2003, 2007) and Ehrmann and Fratzscher (2005) using a weighted least-squares approach; Jones, Lamont, and Lumsdaine (1998) or Flannery and Protopapadakis (2002) using GARCH models; and Goodhart et al. (1993) even using GARCH in mean models. The key insight from these studies is that the effects on the conditional mean might very well differ from the effects on the conditional variance. Flannery and Protopapadakis (2002), for instance, find that inflation news affects only the conditional mean

of stock returns, whereas some real factors trigger responses in the conditional variance without affecting the conditional mean.

Still, positive reaction coefficients are also found in studies of conditional volatility. How does this result square with equation (2), which states that any additional piece of information will increase the precision of the expectation?[10] This simplistic model, of course, assumes that the economic fundamental is static in nature, such that the new information helps in updating and narrowing down the prior belief. In a dynamic setting, the economic fundamental can move over time, however, such that a large surprise (i.e., a case where μ_A is substantially different from μ_F) might make the prior expectation look unreliable or biased with regard to the new state of the economic fundamental. In this case, the piece of news serves two purposes: its incidence should lower uncertainty, as there is a new piece of information about the fundamental, but depending on the magnitude of the surprise, it might increase uncertainty, as it makes the prior expectation less valuable. Which effect dominates remains an empirical question. In our analysis, we will therefore distill the pure effect on volatility arising from the incidence of the public news by controlling for the effect of the surprise component in the signal.

3. Financial Market Reactions to the Arrival of News

This section presents the empirical results. We will first ask how financial markets respond to the arrival of news in general, looking at the response to Inflation Reports as well as to macro releases. Subsequently, we will test what happens over time following the release of an Inflation Report, with the information becoming stale.

3.1 The Unconditional Reception of News

Our first test relates to the reaction of yields to the release of public signals, i.e., hypotheses 1 and 2. Table 2 shows the results of a model that contains, in the variance equation, dummies that are

[10] This issue is touched upon in DeGennaro and Shrieves (1997), Kim and Sheen (2000), and Kim, McKenzie, and Faff (2004).

Table 2. The Average Effect of Announcements on Yields

	Two Months		Three Months		Six Months		Twelve Months	
	Coeff.	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***
UK CPI	0.004***	*0.002*	0.012***	*0.002*	0.021***	*0.002*	0.028***	*0.003*
UK PMI	0.005***	*0.002*	0.006**	*0.003*	0.010***	*0.004*	0.019***	*0.007*
UK Retail Sales	0.003***	*0.001*	0.005***	*0.001*	0.014***	*0.002*	0.018***	*0.003*
UK Unemployment	−0.001	*0.001*	−0.002	*0.001*	−0.001	*0.002*	−0.004	*0.004*
UK Trade Balance	−0.003***	*0.001*	−0.004***	*0.001*	−0.005***	*0.002*	−0.002	*0.002*
Δ IR Inflation Forecast	0.008	*0.010*	0.010	*0.012*	0.018	*0.014*	0.069***	*0.019*

(continued)

Table 2. (Continued)

	Two Months		Three Months		Six Months		Twelve Months	
	Coeff.	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***
Variance Equation								
UK CPI (Dummy)	−0.169	*0.117*	0.046	*0.114*	0.105	*0.104*	0.018	*0.100*
UK PMI (Dummy)	−0.555***	*0.089*	−0.627***	*0.080*	−0.412***	*0.080*	−0.165**	*0.073*
UK Retail Sales (Dummy)	−0.861***	*0.064*	−0.879***	*0.061*	−0.598***	*0.060*	−0.361***	*0.069*
UK Unemployment (Dummy)	−0.808***	*0.099*	−0.732***	*0.098*	−0.541***	*0.089*	−0.167**	*0.077*
UK Trade Balance (Dummy)	0.112*	*0.060*	0.126**	*0.058*	0.155***	*0.057*	0.100*	*0.057*
Inflation Report (Dummy)	−0.933***	*0.082*	−0.859***	*0.082*	−0.517***	*0.085*	−0.270***	*0.086*

Notes: The table shows, for the different maturities (in the various columns), the reaction coefficient of UK zero-coupon yields to macroeconomic announcements and the release of the Inflation Report. Numbers in italics denote the standard errors. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. The mean equation is specified as $r_t = c_1 + \delta^{IR} s_t^{IR} + \sum_k \delta^k s_t^k + \psi r_{t-1} + \sum_l \nu^l d_t^l + \mu_t$, the variance equation as $\log(h_t) = c_2 + \kappa_1(|\mu_{t-1}/\sqrt{h_{t-1}}| - \sqrt{2/\pi}) + \kappa_2(\mu_{t-1}/\sqrt{h_{t-1}}) + \kappa_3 \log(h_{t-1}) + \lambda^{IR} a_t^{IR} + \sum_k \lambda^k a_t^k + \sum_l \tau d_t^l$.

equal to one on release dates for Inflation Reports and the UK macro announcements, and that controls, in the mean equation, for the effect of macroeconomic releases and the Inflation Report.[11] As to hypothesis 1, we do indeed find that interest rates are responsive to a number of macroeconomic releases and (although not at all maturities) to our proxy of the news content of the Inflation Reports. The direction of these effects is as one would expect, with interest rates rising in response to higher than expected inflation and real developments, and with interest rates falling in response to higher than expected unemployment (although this effect is not statistically significant).

The important thing to note in table 2 is that conditional volatility is reduced in response to nearly all announcements, i.e., providing support for hypothesis 2. The importance of the Inflation Report to market participants is confirmed by the fact that the volatility-reducing effect in response to its release is one of the strongest across the different announcements contained in this model. Another interesting fact is the consistency of these results across maturities. At all maturities, the announcements reduce volatility, with the effect becoming smaller the longer the horizon. The single exception in the table relates to the UK trade balance. Its release seems to heighten rather than dampen market uncertainty.

As argued above, the precision-enhancing effect of macro news might be difficult to detect if one does not control for the possibility that large surprises in a given piece of news lead to a revision of the prior expectation about the economic fundamental. In order to take this into account, we have expanded the current regression model by furthermore controlling for the absolute surprise in the conditional volatility equation. Table 3 reports the corresponding

[11]For brevity, the EGARCH coefficients are not displayed in table 2 and the following tables. Throughout all estimations, the GARCH term is strongly significant and close to but below one, indicating a high persistence of the conditional volatility. Both EGARCH parameters are equivalently significant in all estimations. The sign asymmetry parameter exhibits a negative sign, although small in size. The estimates confirm the asymmetry assumption proposed by the Engle and Ng (1993) test results and can be read as a negative innovation increasing volatility more than a positive innovation of equal magnitude. The results are available from the authors upon request.

Table 3. The Average Effect of Announcements on Yields: Incidence vs. Surprise Component

	Two Months		Three Months		Six Months		Twelve Months	
	Coeff.	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***
UK CPI	0.006***	*0.002*	0.013***	*0.002*	0.022***	*0.003*	0.028***	*0.003*
UK PMI	0.008**	*0.003*	0.007*	*0.004*	0.011*	*0.005*	0.019**	*0.008*
UK Retail Sales	0.003***	*0.001*	0.005***	*0.001*	0.014***	*0.002*	0.019***	*0.003*
UK Unemployment	−0.001	*0.001*	−0.001	*0.002*	−0.002	*0.002*	−0.004	*0.004*
UK Trade Balance	−0.001	*0.002*	−0.003	*0.002*	−0.003	*0.003*	−0.002	*0.003*
Δ IR Inflation Forecast	−0.009	*0.011*	0.013	*0.012*	0.036**	*0.016*	0.082***	*0.023*
Variance Equation								
UK CPI (Dummy)	−0.539***	*0.175*	−0.473***	*0.165*	−0.195	*0.147*	−0.045	*0.145*
UK PMI (Dummy)	−1.009***	*0.125*	−1.157***	*0.107*	−0.794***	*0.106*	−0.369***	*0.096*
UK Retail Sales (Dummy)	−1.038***	*0.083*	−1.032***	*0.081*	−0.574***	*0.077*	−0.362***	*0.079*
UK Unemployment (Dummy)	−1.101***	*0.150*	−1.147***	*0.149*	−0.913***	*0.127*	−0.328***	*0.109*
UK Trade Balance (Dummy)	−0.438***	*0.089*	−0.419***	*0.069*	−0.346***	*0.072*	−0.105	*0.076*

(continued)

Table 3. (Continued)

	Two Months		Three Months		Six Months		Twelve Months	
	Coeff.	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***
Variance Equation								
UK CPI (Abs. Surprise)	0.336**	*0.131*	0.508***	*0.121*	0.365***	*0.121*	0.118	*0.123*
UK PMI (Abs. Surprise)	0.831***	*0.175*	0.874***	*0.154*	0.617***	*0.155*	0.276***	*0.105*
UK Retail Sales (Abs. Surprise)	0.306***	*0.054*	0.308***	*0.050*	0.108**	*0.053*	0.066	*0.053*
UK Unemployment (Abs. Surprise)	0.125	*0.107*	0.238**	*0.100*	0.245***	*0.088*	0.040	*0.075*
UK Trade Balance (Abs. Surprise)	0.644***	*0.060*	0.629***	*0.054*	0.561***	*0.054*	0.246***	*0.049*
Inflation Report (Dummy)	−0.960***	*0.111*	−0.972***	*0.111*	−0.630***	*0.111*	−0.431***	*0.113*
Inflation Report (Abs. Surprise)	0.562	*0.746*	1.079*	*0.635*	0.890	*0.636*	0.953*	*0.525*

Notes: The table shows, for the different maturities (in the various columns), the reaction coefficient of UK zero-coupon yields to macroeconomic announcements and the release of the Inflation Report, separating the effect of the announcement incidence and the absolute surprise in the variance equation. Numbers in italics denote the standard errors. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. The mean equation is specified as $r_t = c_1 + \delta^{IR} s_t^{IR} + \sum_k \delta^k s_t^k + \psi r_{t-1} + \sum_l \nu^l d_t^l + \mu_t$, the variance equation as $\log(h_t) = c_2 + \kappa_1(|\mu_{t-1}/\sqrt{h_{t-1}}| - \sqrt{2/\pi}) + \kappa_2(\mu_{t-1}/\sqrt{h_{t-1}}) + \kappa_3 \log(h_{t-1}) + \lambda^{IR} a_t^{IR} + \sum_k \lambda^k a_t^k + \sum_k \varpi^k |s_t^k| + \sum_l \tau d_t^l$.

results and very convincingly supports the conjecture. First, volatility increases in response to the surprise component of virtually all announcements (including our proxy for the surprise component in the Inflation Report, albeit at low levels of statistical significance). Second, the results with regard to the announcement dummies (now cleanly measuring the effect of the *incidence* of a release) improve in several ways: the coefficient estimate with regard to the trade balance dummy switches sign and turns negative in line with all other coefficients; at the two- and three-month maturities, the previously insignificant coefficient on the CPI dummy is now also significant and negative; all coefficients are substantially larger than their correspondents in table 2.

Based on this evidence, we conclude that the arrival of news leads to an update in expectations. Their incidence tends to enhance the precision of expectations, but this effect can possibly be overshadowed by the volatility-enhancing effect of the announcement's surprise component. However, in the majority of cases, the volatility-reducing factor turns out to be dominating. Taken together, these results provide strong evidence in favor of hypotheses 1 and 2.

3.2 What if Central Bank Communication Becomes Stale?

To test hypotheses 3–5, we will now turn to measuring the market reaction conditional on the freshness of central bank communication. For that purpose, we expand the econometric model by including the variable that measures how much time has elapsed since the preceding release of an Inflation Report, and by interacting this variable with the macroeconomic release data. The results are provided in table 4.

Looking at the direct effect of the elapsed time, it is apparent that volatility does indeed increase with the distance from the preceding Inflation Report release. This effect is strongest at the two-month maturity but is also present and statistically significant up to a horizon of six months. Despite its statistical significance, it has to be noted that the magnitude of the effect is small. However, figure 1 has shown that the omission of macroeconomic announcements will tend to depress estimates of ζ and, as we will see later on, this

Table 4. The Effect of Announcements on Yields: Distance to the Preceding Inflation Report

	Two Months		Three Months		Six Months		Twelve Months	
	Coeff.	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***
UK CPI	0.004**	*0.002*	0.009***	*0.002*	0.018***	*0.002*	0.026***	*0.003*
UK PMI	0.003	*0.002*	0.005*	*0.003*	0.010**	*0.004*	0.020***	*0.007*
UK Retail Sales	0.004***	*0.001*	0.006***	*0.001*	0.014***	*0.002*	0.017***	*0.003*
UK Unemployment	−0.002	*0.001*	−0.002	*0.002*	−0.002	*0.002*	−0.003	*0.004*
UK Trade Balance	−0.002	*0.001*	−0.005***	*0.002*	−0.004*	*0.002*	0.000	*0.002*
UK CPI * Time Elapsed	0.014***	*0.005*	0.018***	*0.005*	0.023***	*0.007*	0.027***	*0.010*
UK PMI * Time Elapsed	0.014*	*0.007*	0.007	*0.009*	0.001	*0.013*	−0.008	*0.024*
UK Retail Sales * Time Elapsed	0.006	*0.004*	0.004	*0.004*	0.000	*0.006*	−0.005	*0.009*
UK Unemployment * Time Elapsed	−0.006**	*0.003*	−0.004	*0.005*	−0.007	*0.005*	0.003	*0.010*
UK Trade Balance * Time Elapsed	−0.005	*0.006*	−0.005	*0.006*	−0.007	*0.006*	−0.012*	*0.007*
Time Elapsed	−0.001	*0.001*	0.001	*0.001*	0.001	*0.002*	0.001	*0.002*
Δ IR Inflation Forecast	0.006	*0.010*	0.002	*0.011*	0.017	*0.015*	0.061***	*0.019*

(continued)

Table 4. (Continued)

	Two Months		Three Months		Six Months		Twelve Months	
	Coeff.	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***
Variance Equation								
UK CPI (Dummy)	−0.231*	*0.138*	−0.024	*0.130*	0.072	*0.110*	−0.026	*0.099*
UK PMI (Dummy)	−0.549***	*0.099*	−0.589***	*0.085*	−0.436***	*0.086*	−0.182**	*0.074*
UK Retail Sales (Dummy)	−0.857***	*0.074*	−0.903***	*0.071*	−0.611***	*0.071*	−0.397***	*0.073*
UK Unemployment (Dummy)	−0.758***	*0.104*	−0.664***	*0.103*	−0.574***	*0.096*	−0.103	*0.079*
UK Trade Balance (Dummy)	0.140**	*0.065*	0.135**	*0.062*	0.154***	*0.060*	0.080	*0.058*
UK CPI (Dummy) * Time Elapsed	−1.129***	*0.283*	−0.939***	*0.264*	−0.330	*0.234*	0.339	*0.249*
UK PMI (Dummy) * Time Elapsed	−0.332	*0.279*	−0.244	*0.258*	−0.181	*0.280*	0.289	*0.297*
UK Retail Sales (Dummy) * Time Elapsed	−0.428*	*0.242*	−0.460*	*0.237*	−0.638***	*0.247*	−0.428*	*0.226*

(continued)

Table 4. (Continued)

	Two Months		Three Months		Six Months		Twelve Months	
	Coeff.	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***
Variance Equation								
UK Unemployment (Dummy) * Time Elapsed	0.506*	*0.280*	0.368	*0.275*	0.202	*0.296*	−0.359	*0.247*
UK Trade Balance (Dummy) * Time Elapsed	−0.443**	*0.225*	−0.079	*0.249*	0.146	*0.226*	0.136	*0.182*
Time Elapsed	0.074***	*0.116*	0.031*	*0.017*	0.040**	*0.017*	−0.007	*0.017*
Inflation Report (Dummy)	−1.091***	*0.110*	−1.004***	*0.106*	−0.704***	*0.121*	0.335***	*0.095*

Notes: The table shows, for the different maturities (in the various columns), the reaction coefficient of UK zero-coupon yields to macroeconomic announcements and the release of the Inflation Report in general and depending on the time elapsed since the release of the preceding Inflation Report. Numbers in italics denote the standard errors. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. The mean equation is specified as $r_t = c_1 + \delta^{IR} s_t^{IR} + \sum_k \delta^k s_t^k + \sum_k \phi^k s_t^k g_t + \omega g_t + \psi r_{t-1} + \sum_l \nu^l d_t^l + \mu_t$, the variance equation as $\log(h_t) = c_2 + \kappa_1(|\mu_{t-1}/\sqrt{h_{t-1}}| - \sqrt{2/\pi}) + \kappa_2(\mu_{t-1}/\sqrt{h_{t-1}}) + \kappa_3 \log(h_{t-1}) + \lambda^{IR} a_t^{IR} + \sum_k \lambda^k a_t^k + \sum_k \rho^k a_t^k g_t + \zeta g_t + \sum_l \tau d_t^l$.

conjecture is confirmed by the inclusion of four U.S. announcements in a subsequent robustness test, with the estimates of ζ doubling or even tripling in magnitude. The volatility-increasing effect disappears at the one-year horizon, and consistently so in all further models that we will analyze. At the same time, as should be expected, the elapsed time does not matter for the mean of yields, as shown by the very small and statistically highly insignificant coefficients for this variable in the mean equation. This result is in clear support of hypothesis 3.

What about the volatility reduction in response to macroeconomic releases? Hypothesis 5 stated that this effect should be more pronounced the more time has elapsed since the preceding release of an Inflation Report. As a matter of fact, with very few exceptions, the interaction terms are typically negative, supporting the hypothesis. Although a number of these are not estimated to be significant, the picture that emerges is fairly consistent: with one exception, all significant coefficients are negative. Furthermore, the effects are sizable. Take the example of the CPI release: its effect on average is estimated to be -0.23 for the two-month maturity. However, the first CPI release after a given Inflation Report has virtually no effect on volatility, with its coefficient estimated at $+0.063$, while the third CPI release has a coefficient estimate of -0.591.[12] As before, the effects are particularly pronounced at shorter maturities.

The results strengthen by imposing the split of announcement effects into the announcement incidence and the absolute surprise component, as shown in table 5. In this specification, all statistically significant coefficients on the non-interacted dummies are negative, as are all the significant coefficients on the interaction terms. At the same time, all significant coefficients on the absolute surprise as well as on the respective interaction terms are positive. Controlling for the surprise component, in the example of CPI the differences

[12]These numbers are calculated as follows: the average value of the "time-elapsed" variable g_t is calculated for the first and the third CPI releases. These values amount to -0.260 and 0.319, respectively. The average effect of the first CPI release on volatility is then given by $\lambda^{CPI} + (-0.260)\rho^{CPI} = -0.231 + 0.260^{*}1.129 = 0.063$; the average effect for the third CPI release is $\lambda^{CPI} + 0.319\rho^{CPI} = -0.231 - 0.319^{*}1.129 = -0.591$.

Table 5. The Effect of Announcements on Yields: Distance to Inflation Report and Incidence vs. Absolute Surprise, Mean Equation

	Two Months		Three Months		Six Months		Twelve Months	
	Coeff.	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***
UK CPI	0.004*	*0.002*	0.009***	*0.003*	0.018***	*0.003*	0.026***	*0.003*
UK PMI	0.003	*0.004*	0.007	*0.004*	0.011*	*0.006*	0.020**	*0.008*
UK Retail Sales	0.004***	*0.002*	0.006***	*0.002*	0.014***	*0.002*	0.018***	*0.003*
UK Unemployment	−0.001	*0.001*	−0.002	*0.002*	−0.002	*0.002*	−0.003	*0.004*
UK Trade Balance	0.000	*0.002*	−0.002	*0.003*	−0.003	*0.004*	0.000	*0.003*
UK CPI * Time Elapsed	0.014**	*0.006*	0.016**	*0.007*	0.021***	*0.008*	0.025***	*0.009*
UK PMI * Time Elapsed	0.011	*0.012*	0.002	*0.014*	−0.005	*0.018*	−0.009	*0.027*
UK Retail Sales * Time Elapsed	0.005	*0.005*	0.003	*0.006*	0.002	*0.006*	−0.003	*0.009*
UK Unemployment * Time Elapsed	−0.004	*0.003*	−0.002	*0.004*	−0.004	*0.007*	0.004	*0.012*
UK Trade Balance * Time Elapsed	−0.007	*0.008*	−0.007	*0.009*	−0.006	*0.011*	−0.011	*0.008*
Time Elapsed	−0.001	*0.001*	0.000	*0.001*	0.000	*0.001*	0.000	*0.002*
Δ IR Inflation Forecast	0.010	*0.010*	0.000	*0.012*	0.039**	*0.017*	0.078***	*0.024*

(continued)

Table 5. (Continued)

	Two Months		Three Months		Six Months		Twelve Months	
	Coeff.	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***
Variance Equation								
UK CPI (Dummy)	−0.573***	*0.209*	−0.454**	*0.202*	−0.160	*0.176*	−0.051	*0.144*
UK PMI (Dummy)	−0.989***	*0.140*	−1.127***	*0.122*	−0.794***	*0.113*	−0.360***	*0.097*
UK Retail Sales (Dummy)	−1.048***	*0.091*	−1.109***	*0.089*	−0.643***	*0.088*	−0.460***	*0.087*
UK Unemployment (Dummy)	−0.922***	*0.179*	−1.027***	*0.178*	−0.873***	*0.145*	−0.117	*0.109*
UK Trade Balance (Dummy)	−0.493***	*0.094*	−0.488***	*0.080*	−0.357***	*0.081*	−0.109	*0.085*
UK CPI (Abs. Surprise)	0.294	*0.190*	0.414**	*0.169*	0.284*	*0.167*	0.073	*0.127*
UK PMI (Abs. Surprise)	0.769***	*0.204*	0.765***	*0.185*	0.599***	*0.165*	0.260***	*0.101*
UK Retail Sales (Abs. Surprise)	0.377***	*0.069*	0.412***	*0.067*	0.201***	*0.059*	0.107*	*0.055*
UK Unemployment (Abs. Surprise)	−0.022	*0.125*	0.094	*0.125*	0.179*	*0.102*	−0.030	*0.075*
UK Trade Balance (Abs. Surprise)	0.735***	*0.071*	0.755***	*0.066*	0.609***	*0.066*	0.211***	*0.057*
UK CPI (Dummy) * Time Elapsed	−1.080**	*0.508*	−1.031*	*0.543*	−0.816	*0.534*	−0.003	*0.407*
UK PMI (Dummy) * Time Elapsed	0.124	*0.412*	0.016	*0.394*	0.100	*0.409*	0.357	*0.381*

(continued)

Table 5. (Continued)

	Two Months		Three Months		Six Months		Twelve Months	
	Coeff.	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***
Variance Equation								
UK Retail Sales (Dummy) * Time Elapsed	−0.828***	*0.322*	−0.942***	*0.329*	−1.488***	*0.333*	−1.102***	*0.310*
UK Unemployment (Dummy) * Time Elapsed	−0.200	*0.577*	−0.268	*0.564*	−0.289	*0.459*	−1.144***	*0.374*
UK Trade Balance (Dummy) * Time Elapsed	−0.531*	*0.319*	−0.463	*0.339*	−0.392	*0.297*	−0.255	*0.294*
UK CPI (Abs. Surprise) * Time Elapsed	0.159	*0.551*	0.321	*0.488*	0.730	*0.498*	0.775**	*0.371*
UK PMI (Abs. Surprise) * Time Elapsed	−0.289	*0.704*	−0.777	*0.687*	−0.709	*0.696*	−0.616	*0.575*
UK Retail Sales (Abs. Surprise) * Time Elapsed	0.409	*0.342*	0.383	*0.348*	0.925***	*0.311*	0.607**	*0.256*

(continued)

Table 5. (Continued)

	Two Months		Three Months		Six Months		Twelve Months	
	Coeff.	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***
Variance Equation								
UK Unemployment (Abs. Surprise) * Time Elapsed	1.302***	*0.405*	1.472***	*0.403*	1.102***	*0.323*	0.807***	*0.289*
UK Trade Balance (Abs. Surprise) * Time Elapsed	−0.587*	*0.311*	−0.353	*0.314*	−0.070	*0.325*	0.178	*0.238*
Time Elapsed	0.085***	*0.018*	0.061***	*0.018*	0.063***	*0.020*	0.012	*0.020*
Inflation Report (Dummy)	−1.231***	*0.145*	−1.207***	*0.145*	−0.885***	*0.155*	−0.520***	*0.121*
Inflation Report (Abs. Surprise)	1.503*	*0.846*	1.670*	*0.864*	1.348	*0.838*	1.518***	*0.517*

Notes: The table shows, for the different maturities (in the various columns), the reaction coefficient of UK zero-coupon yields to macroeconomic announcements and the release of the Inflation Report in general and depending on the time elapsed since the release of the preceding Inflation Report, separating the effect of the announcement incidence and the absolute surprise in the variance equation. Numbers in italics denote the standard errors. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. The mean equation is specified as $r_t = c_1 + \delta^{IR} s_t^{IR} + \sum_k \delta^k s_t^k + \sum_k \phi^k s_t^k g_t + \omega g_t + \psi r_{t-1} + \sum_l \nu^l d_t^l + \mu_t$, the variance equation as $\log(h_t) = c_2 + \kappa_1(|\mu_{t-1}/\sqrt{h_{t-1}}| - \sqrt{2/\pi}) + \kappa_2(\mu_{t-1}/\sqrt{h_{t-1}}) + \kappa_3 \log(h_{t-1}) + \lambda^{IR} a_t^{IR} + \sum_k \lambda^k a_t^k + \sum_k \rho^k a_t^k g_t + \sum_k \varpi^k |s_t^k| + \sum_k \iota^k |s_t^k| g_t + \zeta g_t + \sum_l \tau d_t^l$.

between the first and the last announcement are even more striking, with an effect of −0.292 for the first and of −0.918 for the last, suggesting that the volatility reduction of the last announcement is more than three times as large as for the first announcement. The evidence is therefore clearly in support of hypothesis 5.

The last hypothesis to be tested, number 4, stated that the reaction of asset prices to macroeconomic news should be stronger the more time has elapsed since the preceding release of an Inflation Report. To see whether this is the case, we need to check the coefficients in the mean equation. As mentioned above, the non-interacted coefficients in the mean equation show the sign that should be expected according to economic reasoning. The question to be settled is whether the coefficients on the interacted variables show the same sign and are statistically significant. While it is generally true that the coefficients of the interacted variables have the same sign as those of the non-interacted variables, their statistical significance (against zero) is rather weak. Only in the case of the CPI announcement do we find such a pattern consistently across the different maturities.

One interesting observation in that context relates to the evolution of coefficients across the maturity spectrum. Contrary to what was observed for the volatility equation, effects are now larger with increasing maturities. This finding is in line with Fleming and Remolona (1999b), who had also found an increasing magnitude over the maturities studied in the current paper. At the one-year horizon, the effects are relatively stark, though: the response of one-year yields to a one-standard-deviation surprise in the first CPI release following an Inflation Report is estimated at 1.8 basis points, whereas the response to the last CPI release is substantially larger at 3.3 basis points.

3.3 Robustness and Extensions

We have tested the robustness of these results in a number of ways. First, we are interested in whether the inclusion of other Bank of England communication events makes a difference, given that these provide an occasion for financial market participants to update their information set. This might apply in particular to the

communications in the context of interest rate changes,[13] to the release of the minutes of the MPC meetings, and possibly also to speeches by MPC members. For interest rate decisions, it is possible to control for the surprise component by means of a Reuters survey among financial market participants; for minutes, our analysis just comprises the inclusion of a dummy variable that is equal to one on the days of the release of the minutes. With regard to speeches and interviews by MPC members, we have used an update of the data set by Ehrmann and Fratzscher (2007). This data set collects all speeches by MPC members containing some forward-looking reference to monetary policy inclinations. The communications are coded as +1 if they indicate a tendency towards tightening, as 0 for neutral statements, and as −1 for statements suggesting an easing of monetary policy. As in Ehrmann and Fratzscher (2007), we will enter this variable into the mean equation and a dummy variable for the incidence of such speeches in the variance equation. As shown in table 6, our findings remain qualitatively robust.

The additional communication variables provide interesting results themselves. The surprise component in policy rate changes leads to significant responses of market interest rates, with the effects decreasing for longer maturities. Also the speeches affect interest rates consistently, and in the expected direction: relatively hawkish statements raise interest rates, while relatively dovish statements lower them. The magnitude is very much in line with the results of Ehrmann and Fratzscher (2007), with 0.004 vs. 0.005 at the three-month maturity and 0.009 in both studies at the one-year maturity. Turning to the variance equation, we find—in line with the results for macroeconomic announcements—the surprise component in policy rate changes raises conditional volatility, whereas the incidence

[13] A broader measure would be to include *all* monetary policy decisions, i.e., also the no-change decisions. Decisions not to change interest rates (especially when they had not been fully anticipated, i.e., some market participants had indeed expected a change to occur at a given MPC meeting) typically raise questions as to the timing of the next policy rate change, an uncertainty that, by definition, is less imminent in the case of policy rate changes. Using the broader variable in our regressions does not affect our results, with the exception of the response of conditional volatility to the incidence of a decision, where we find a reduction for change decisions and an increase for the broader measure. We suspect that this relates to the uncertainty about the timing of the next move and should vanish at longer maturities.

Table 6. The Effect of Announcements on Yields: Distance to Inflation Report and Incidence vs. Absolute Surprise and Other BoE Communications, Mean Equation

	Two Months		Three Months		Six Months		Twelve Months	
	Coeff.	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***
UK CPI	0.005**	*0.002*	0.009***	*0.002*	0.018***	*0.003*	0.026***	*0.003*
UK PMI	0.003	*0.003*	0.004	*0.004*	0.010*	*0.005*	0.019***	*0.007*
UK Retail Sales	0.004***	*0.001*	0.006***	*0.002*	0.014***	*0.002*	0.017***	*0.003*
UK Unemployment	−0.001	*0.001*	−0.001	*0.002*	−0.002	*0.002*	−0.004	*0.004*
UK Trade Balance	−0.001	*0.003*	−0.004	*0.004*	−0.004	*0.004*	0.000	*0.003*
UK CPI * Time Elapsed	0.009	*0.006*	0.015**	*0.007*	0.021***	*0.008*	0.023***	*0.008*
UK PMI * Time Elapsed	0.007	*0.010*	−0.001	*0.012*	−0.009	*0.016*	−0.011	*0.023*
UK Retail Sales * Time Elapsed	0.004	*0.005*	0.002	*0.005*	−0.001	*0.006*	−0.005	*0.009*
UK Unemployment * Time Elapsed	−0.005	*0.003*	−0.003	*0.005*	−0.004	*0.007*	0.004	*0.012*
UK Trade Balance * Time Elapsed	−0.004	*0.009*	−0.005	*0.010*	−0.003	*0.011*	−0.011	*0.008*
Interest Rate Changes	0.500***	*0.021*	0.482***	*0.020*	0.464***	*0.034*	0.418***	*0.034*
Speeches by MPC Members	0.002	*0.001*	0.004***	*0.002*	0.005**	*0.002*	0.009***	*0.003*

(continued)

Table 6. (Continued)

	Two Months		Three Months		Six Months		Twelve Months	
	Coeff.	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***
Time Elapsed	−0.001	*0.001*	0.000	*0.001*	0.000	*0.001*	−0.001	*0.002*
Δ IR Inflation Forecast	−0.013	*0.010*	−0.004	*0.012*	0.037**	*0.017*	0.068***	*0.024*
Variance Equation								
UK CPI (Dummy)	−0.412*	*0.217*	−0.446**	*0.213*	−0.149	*0.178*	−0.069	*0.127*
UK PMI (Dummy)	−0.624***	*0.153*	−0.893***	*0.136*	−0.629***	*0.129*	−0.226**	*0.096*
UK Retail Sales (Dummy)	−0.700***	*0.099*	−0.836***	*0.103*	−0.380***	*0.097*	−0.286***	*0.091*
UK Unemployment (Dummy)	−0.723***	*0.185*	−0.827***	*0.193*	−0.644***	*0.163*	0.131	*0.109*
UK Trade Balance (Dummy)	−0.225**	*0.102*	−0.268***	*0.091*	−0.209**	*0.088*	−0.061	*0.086*
UK CPI (Abs. Surprise)	0.165	*0.200*	0.342*	*0.181*	0.239	*0.168*	0.025	*0.108*
UK PMI (Abs. Surprise)	0.385*	*0.210*	0.533**	*0.208*	0.511***	*0.172*	0.098	*0.097*
UK Retail Sales (Abs. Surprise)	0.278***	*0.081*	0.343***	*0.083*	0.121*	*0.066*	0.051	*0.056*

(continued)

Table 6. (Continued)

	Two Months		Three Months		Six Months		Twelve Months	
	Coeff.	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***
Variance Equation								
UK Unemployment (Abs. Surprise	−0.062	*0.136*	0.047	*0.145*	0.101	*0.122*	−0.115	*0.077*
UK Trade Balance (Abs. Surprise)	0.754***	*0.080*	0.823***	*0.083*	0.602***	*0.072*	0.170***	*0.060*
UK CPI (Dummy) * Time Elapsed	−0.884*	*0.535*	−0.905	*0.582*	−0.807	*0.535*	0.099	*0.359*
UK PMI (Dummy) * Time Elapsed	−0.605	*0.489*	−0.456	*0.467*	−0.072	*0.450*	0.171	*0.370*
UK Retail Sales (Dummy) * Time Elapsed	−0.310	*0.371*	−0.510	*0.385*	−0.975***	*0.343*	−0.549*	*0.313*
UK Unemployment (Dummy) * Time Elapsed	−0.653	*0.612*	−0.539	*0.614*	−0.407	*0.481*	−1.538***	*0.372*
UK Trade Balance (Dummy) * Time Elapsed	−0.866**	*0.339*	−0.702*	*0.363*	−0.712**	*0.315*	−0.257	*0.279*

(continued)

Table 6. (Continued)

	Two Months		Three Months		Six Months		Twelve Months	
	Coeff.	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***
Variance Equation								
UK CPI (Abs. Surprise) * Time Elapsed	0.083	*0.570*	0.218	*0.507*	0.655	*0.496*	0.789**	*0.316*
UK PMI (Abs. Surprise) * Time Elapsed	−0.696	*0.766*	−1.144	*0.766*	−0.790	*0.690*	−0.370	*0.483*
UK Retail Sales (Abs. Surprise) * Time Elapsed	−0.189	*0.401*	−0.098	*0.429*	0.483	*0.342*	0.259	*0.253*
UK Unemployment (Abs. Surprise) * Time Elapsed	1.368***	*0.459*	1.642***	*0.457*	1.225***	*0.357*	1.010***	*0.277*
UK Trade Balance (Abs. Surprise) * Time Elapsed	−0.117	*0.319*	−0.124	*0.340*	0.154	*0.338*	0.297	*0.203*
Interest Rate Changes (Dummy)	−1.043***	*0.153*	−0.619***	*0.154*	−0.150	*0.161*	0.187	*0.120*

(continued)

Table 6. (Continued)

	Two Months		Three Months		Six Months		Twelve Months	
	Coeff.	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***
Variance Equation								
Interest Rate Changes (Abs. Surprise)	8.833***	*0.930*	6.841***	*0.969*	4.404***	*1.047*	0.642	*0.662*
Speeches by MPC Members (Dummy)	0.155***	*0.046*	0.101**	*0.044*	0.044	*0.041*	0.082***	*0.030*
BoE Minutes (Dummy)	−0.154*	*0.081*	−0.109	*0.071*	−0.154**	*0.070*	−0.240***	*0.071*
Time Elapsed	0.085***	*0.025*	0.068***	*0.024*	0.065***	*0.025*	−0.012	*0.019*
Inflation Report (Dummy)	−0.720***	*0.143*	−0.888***	*0.150*	−0.686***	*0.153*	−0.307***	*0.115*
Inflation Report (Abs. Surprise)	0.567	*0.865*	1.245	*0.909*	1.029	*0.863*	1.098**	*0.485*

Notes: The table shows, for the different maturities (in the various columns), the reaction coefficient of UK zero-coupon yields to macroeconomic announcements and the release of the Inflation Report in general and depending on the time elapsed since the release of the preceding Inflation Report, separating the effect of the announcement incidence and the absolute surprise in the variance equation. Furthermore, the econometric model controls for the effect of interest rate changes, the release of the minutes of MPC meetings, and speeches by MPC members. Numbers in italics denote the standard errors. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. For the model specification, see table 5.

of their announcements lowers it. The release of the minutes, just like the release of the Inflation Report, also leads to a reduction in conditional volatility. Finally, the effect of speeches is different, as these communications tend to heighten conditional volatility. However, this finding is plausible, given that in contrast to all other communications, speeches are made on individual accounts and therefore do not necessarily represent the MPC consensus view. These differences between committee communication on the one hand and speeches and interviews on the other have already been highlighted by Reinhart and Sack (2006) and Reeves and Sawicki (2007). Interestingly, the magnitude of the responses to other forms of Bank of England communication does not depend on the time elapsed since the last Inflation Report. This suggests that due to their immediate relevance for the future path of interest rates, these signals are always considered an important piece of information, regardless of the freshness of other central bank communication.

Second, table 7 reports the estimated coefficients in a model including U.S. macro releases. The overall picture is confirmed: some, albeit little, evidence that the price response to news becomes larger with further distance from the previous Inflation Report, and strong evidence that the announcements reduce conditional volatility and that, as central bank communication becomes stale, this effect becomes more pronounced, while market volatility as such increases.[14] Importantly, the volatility increase with the time elapsed since the last Inflation Report is estimated to be two to three times as large as in table 4. This clearly shows that controlling for the volatility reduction of additional news has substantial effects on this parameter estimate.

Third, Inflation Reports are not the only type of news that is released at a quarterly schedule. GDP announcements, for instance, also are made quarterly. If these were to coincide roughly with the Inflation Report releases, our results might be driven by either central bank communication or the information content of GDP releases becoming stale. Although we believe that for short-term

[14] We refrain from also including the absolute surprise component and its interaction with the elapsed time in this model, as estimating an EGARCH model of this size would not be feasible.

Table 7. The Effect of UK and U.S. Announcements on Yields: Distance to Inflation Report, Mean Equation

	Two Months		Three Months		Six Months		Twelve Months	
	Coeff.	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***
UK CPI	0.004**	*0.002*	0.009***	*0.002*	0.019***	*0.002*	0.027***	*0.003*
UK PMI	0.003	*0.002*	0.005*	*0.003*	0.010**	*0.004*	0.018**	*0.007*
UK Retail Sales	0.003***	*0.001*	0.005***	*0.001*	0.013***	*0.002*	0.018***	*0.003*
UK Unemployment	−0.001	*0.001*	−0.002	*0.002*	−0.001	*0.002*	−0.003	*0.004*
UK Trade Balance	−0.001	*0.002*	−0.002	*0.002*	−0.004	*0.002*	−0.001	*0.003*
US Composite Index	0.005*	*0.003*	0.005	*0.003*	0.006	*0.004*	0.005	*0.006*
US Industrial Production	0.001	*0.001*	0.000	*0.001*	0.000	*0.002*	0.003	*0.003*
US CPI	0.001	*0.001*	0.001	*0.002*	0.002	*0.002*	0.004	*0.003*
US Non-Farm Payrolls	−0.002	*0.003*	0.000	*0.003*	0.007*	*0.004*	0.019***	*0.003*
UK CPI * Time Elapsed	0.013**	*0.005*	0.018***	*0.005*	0.024***	*0.007*	0.028***	*0.010*
UK PMI * Time Elapsed	0.014*	*0.008*	0.008	*0.010*	0.001	*0.014*	−0.005	*0.025*
UK Retail Sales * Time Elapsed	0.004	*0.004*	0.003	*0.004*	−0.001	*0.006*	−0.005	*0.009*

(continued)

Table 7. (Continued)

	Two Months		Three Months		Six Months		Twelve Months	
	Coeff.	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***
UK Unemployment * Time Elapsed	−0.005*	*0.003*	−0.003	*0.005*	−0.004	*0.006*	0.005	*0.013*
UK Trade Balance * Time Elapsed	−0.006	*0.006*	−0.007	*0.006*	−0.006	*0.006*	−0.011	*0.007*
US Composite Index * Time Elapsed	0.013	*0.008*	0.013	*0.010*	0.013	*0.012*	0.014	*0.016*
US Industrial Production * Time Elapsed	−0.001	*0.003*	0.000	*0.004*	−0.004	*0.006*	−0.005	*0.010*
US CPI * Time Elapsed	0.005	*0.005*	0.002	*0.007*	0.000	*0.008*	−0.012	*0.011*
US Non-Farm Payrolls * Time Elapsed	−0.005	*0.010*	−0.001	*0.009*	−0.003	*0.011*	−0.017*	*0.010*
Time Elapsed	−0.001	*0.001*	0.000	*0.001*	0.001	*0.002*	0.000	*0.002*
Δ IR Inflation Forecast	0.014	*0.012*	0.012	*0.015*	0.023	*0.018*	0.062**	*0.026*

(continued)

Table 7. (Continued)

	Two Months		Three Months		Six Months		Twelve Months	
	Coeff.	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***
Variance Equation								
UK CPI (Dummy)	−0.194	*0.140*	0.028	*0.137*	0.121	*0.110*	0.005	*0.098*
UK PMI (Dummy)	−0.582***	*0.104*	−0.636***	*0.091*	−0.440***	*0.087*	−0.277***	*0.077*
UK Retail Sales (Dummy)	−0.801***	*0.080*	−0.806***	*0.077*	−0.532***	*0.076*	−0.263***	*0.089*
UK Unemployment (Dummy)	−0.660***	*0.110*	−0.588***	*0.109*	−0.402***	*0.097*	0.071	*0.077*
UK Trade Balance (Dummy)	0.124*	*0.072*	0.088	*0.068*	0.099	*0.066*	0.038	*0.063*
US Composite Index (Dummy)	0.229***	*0.065*	0.213***	*0.062*	0.093	*0.066*	−0.051	*0.071*
US Industrial Production (Dummy)	−0.223**	*0.088*	−0.212**	*0.089*	−0.253**	*0.111*	−0.218**	*0.107*

(continued)

Table 7. (Continued)

	Two Months		Three Months		Six Months		Twelve Months	
	Coeff.	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***
Variance Equation								
US CPI (Dummy)	−0.276***	*0.095*	−0.284***	*0.099*	−0.147	*0.108*	−0.166	*0.110*
US Non-Farm Payrolls (Dummy)	0.088	*0.068*	0.176***	*0.064*	0.128*	*0.070*	0.165**	*0.074*
UK CPI (Dummy) * Time Elapsed	−0.834***	*0.293*	−0.670**	*0.287*	−0.102	*0.294*	0.542**	*0.263*
UK PMI (Dummy) * Time Elapsed	−0.612*	*0.344*	−0.496	*0.324*	−0.164	*0.308*	0.240	*0.310*
UK Retail Sales (Dummy) * Time Elapsed	−0.335	*0.259*	−0.431*	*0.253*	−0.670**	*0.266*	−0.636***	*0.244*
UK Unemployment (Dummy) * Time Elapsed	0.328	*0.274*	0.366	*0.273*	0.184	*0.287*	−0.445*	*0.250*
UK Trade Balance (Dummy) * Time Elapsed	−0.723***	*0.246*	−0.368	*0.263*	−0.074	*0.235*	0.016	*0.193*

(continued)

Table 7. (Continued)

	Two Months		Three Months		Six Months		Twelve Months	
	Coeff.	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***
Variance Equation								
US Composite Index (Dummy) * Time Elapsed	−0.276	*0.212*	−0.270	*0.215*	0.047	*0.250*	0.207	*0.261*
US Industrial Production (Dummy) * Time Elapsed	−0.405	*0.281*	−0.350	*0.249*	−0.296	*0.282*	−0.422*	*0.225*
US CPI (Dummy) * Time Elapsed	−0.511*	*0.286*	−0.499*	*0.259*	−0.363	*0.280*	0.089	*0.215*
US Non-Farm Payrolls (Dummy) * Time Elapsed	−0.265	*0.181*	−0.582***	*0.184*	−0.507**	*0.205*	−0.605***	*0.221*
Time Elapsed	0.147***	*0.027*	0.110***	*0.028*	0.076**	*0.031*	0.031	*0.028*
Inflation Report (Dummy)	−1.242***	*0.137*	−1.163***	*0.131*	−0.851***	*0.140*	−0.425***	*0.130*
Inflation Report (Abs. Surprise)	1.359*	*0.720*	1.400**	*0.666*	1.409**	*0.648*	1.480***	*0.453*

Notes: The table shows, for the different maturities (in the various columns), the reaction coefficient of UK zero-coupon yields to UK and US macroeconomic announcements and the release of the Inflation Report in general and depending on the time elapsed since the release of the preceding Inflation Report. Numbers in italics denote the standard errors. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. The mean equation is specified as $r_t = c_1 + \delta^{IR} s_t^{IR} + \sum_{k\in(UK,US)} \delta^k s_t^k + \sum_{k\in(UK,US)} \phi^k s_t^k g_t + \omega g_t + \psi r_{t-1} + \sum_l \nu^l d_t^l + \mu_t$, the variance equation as $\log(h_t) = c_2 + \kappa_1(|\mu_{t-1}/\sqrt{h_{t-1}}| - \sqrt{2/\pi}) + \kappa_2(\mu_{t-1}/\sqrt{h_{t-1}}) + \kappa_3 \log(h_{t-1}) + \lambda^{IR} a_t^{IR} + \sum_{k\in(UK,US)} \lambda^k a_t^k + \sum_{k\in(UK,US)} \rho^k a_t^k g_t + \zeta g_t + \sum_l \tau d_t^l$.

interest rates, monetary policy communications should be a dominant news source, compared with, e.g., GDP releases, it is important to exclude other possibilities. With regard to GDP, the average release is made with a forty-five calendar-day distance to the closest Inflation Report, i.e., pretty much exactly halfway between two reports. The same number is obtained for the releases of current account data, since these are usually published on the same day as GDP. In the case of GDP announcements, we would furthermore argue that their schedule is actually monthly, not quarterly, given that each month one news release of preliminary, provisional, and final data is made. Another source of news that might be correlated with Inflation Reports is the Bank of England's interest rate changes, which are known to be more frequent in Inflation Report months (King 2007). Indeed, we find that eighteen interest rate changes in our sample are made in Inflation Report months, and eighteen in the other two months, which appears like a non-random distribution. However, our sample contains forty-six Inflation Reports, i.e., a majority without an accompanying interest rate change. To ensure that we do indeed identify Inflation Report effects, we have included corresponding "time-elapsed" variables for GDP and current account announcements as well as for interest rate changes. Neither of the included variables changes our results qualitatively, supporting the robustness of our findings.

Fourth, with respect to the functional form of the time-elapsed variable, we have assumed a proportional increase in volatility with every additional day distance to the last Inflation Report. To control for possible non-linearity in this effect—i.e., a disproportional increase of conditional volatility—we use a quadratic trend as a substitute for the linear form of the variable. The coefficients of the quadratic time-elapsed variable are similarly significant throughout the maturities. This suggests that the volatility effects of stale central bank communication increase in a non-linear fashion the more time has elapsed, such that our linear specification might provide us with a lower bound of its relevance. However, it is important to note that the fit of the model remains basically unaltered.

Fifth, the incidents of the 2007–10 global financial crisis might have affected UK government bond yields. In order to ensure that the findings are not driven by the developments of 2007 and 2008,

we shortened the sample period from March 1997 to the end of 2006. The results of this shortened sample are again qualitatively robust.[15]

Finally, it is worthwhile testing whether the patterns identified in this paper relate only to central bank communications or apply more generally. To test hypotheses 3–5 put forward in section 2.1, it is important to have available news that arrive at different frequencies (like the quarterly frequency of the Inflation Report and the monthly frequency of the macro announcements). With news that are released at the same frequency, it is only possible to test hypothesis 3, i.e., whether conditional volatility increases with the time that has elapsed since the last news update. Table 8 reports the results of a corresponding experiment, namely the test whether market volatility is (additionally) increasing in the time window in between the release of inflation data. As a matter of fact, there is very clear evidence that hypothesis 3 holds not only for the central bank communication but also for these macro releases.

4. Conclusions

The pricing processes in financial markets are, despite an extensive literature, still not well understood. This paper argues that the reaction of financial markets to news cannot be studied in isolation, as there can be important interdependencies: one piece of news not only has direct effects on asset prices and market volatility, but it can also alter the relative importance of other pieces of news.

We have put this hypothesis to an empirical test for the specific example of the reaction of UK short-term interest rates to the Bank of England's Inflation Report and to macroeconomic announcements on the one hand, and to the interrelationship between the two on the other hand. Due to the quarterly frequency at which the Bank of England releases one of its main publications, it cannot be excluded that it becomes stale over time. In the course of this aging process, market volatility should increase. At the same time, in the presence of heightened uncertainty, other pieces of information should become more newsworthy and therefore receive more attention in financial markets.

[15]The results of the robustness checks are not displayed in the paper but are available from the authors upon request.

Table 8. The Effect of Announcements on Yields: Distance to the Preceding Inflation Report and Preceding CPI

	Two Months		Three Months		Six Months		Twelve Months	
	Coeff.	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***
UK CPI	0.004**	*0.002*	0.009***	*0.002*	0.017***	*0.003*	0.026***	*0.004*
UK PMI	0.003	*0.002*	0.005**	*0.003*	0.009***	*0.004*	0.019***	*0.007*
UK Retail Sales	0.004***	*0.001*	0.006***	*0.001*	0.014***	*0.002*	0.018***	*0.003*
UK Unemployment	−0.001	*0.001*	−0.002	*0.002*	−0.002	*0.002*	−0.003	*0.004*
UK Trade Balance	−0.001	*0.002*	−0.004**	*0.002*	−0.004	*0.002*	−0.001	*0.002*
UK CPI * IR Time Elapsed	0.014***	*0.006*	0.019***	*0.006*	0.025***	*0.007*	0.027**	*0.011*
UK PMI * IR Time Elapsed	0.014**	*0.006*	0.008	*0.008*	0.000	*0.012*	−0.007	*0.022*
UK Retail Sales * IR Time Elapsed	0.005	*0.004*	0.005	*0.005*	0.000	*0.006*	−0.005	*0.010*
UK Unemployment * IR Time Elapsed	−0.005*	*0.003*	−0.004	*0.005*	−0.007	*0.005*	0.002	*0.010*

(continued)

Table 8. (Continued)

	Two Months		Three Months		Six Months		Twelve Months	
	Coeff.	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***
UK Trade Balance * IR Time Elapsed	−0.006	*0.006*	−0.006	*0.006*	−0.007	*0.006*	−0.011	*0.007*
IR Time Elapsed	−0.001	*0.001*	0.001	*0.001*	0.001	*0.002*	0.001	*0.002*
CPI Time Elapsed	0.000	*0.001*	0.000	*0.001*	−0.002	*0.002*	−0.003	*0.002*
Δ IR Inflation Forecast	0.012	*0.009*	0.002	*0.012*	0.018	*0.015*	0.060***	*0.020*
Variance Equation								
UK CPI (Dummy)	−0.259*	*0.142*	−0.053	*0.134*	0.027	*0.113*	−0.038	*0.098*
UK PMI (Dummy)	−0.620***	*0.099*	−0.632***	*0.087*	−0.440***	*0.086*	−0.191***	*0.074*
UK Retail Sales (Dummy)	−0.588***	*0.080*	−0.595***	*0.081*	−0.330***	*0.083*	−0.192**	*0.083*
UK Unemployment (Dummy)	−0.720***	*0.104*	−0.661***	*0.103*	−0.513***	*0.094*	−0.064	*0.075*
UK Trade Balance (Dummy)	−0.016	*0.066*	0.004	*0.062*	0.028	*0.061*	0.002	*0.060*
UK CPI (Dummy) * IR Time Elapsed	−1.167***	*0.285*	−1.024***	*0.272*	−0.395*	*0.236*	0.341	*0.244*

(continued)

Table 8. (Continued)

	Two Months		Three Months		Six Months		Twelve Months	
	Coeff.	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***	**Coeff.**	***Std. Error***
Variance Equation								
UK PMI (Dummy) * IR Time Elapsed	−0.337	*0.287*	−0.297	*0.265*	−0.185	*0.274*	0.274	*0.291*
UK Retail Sales (Dummy) * IR Time Elapsed	−0.417*	*0.247*	−0.495**	*0.242*	−0.664***	*0.253*	−0.455**	*0.223*
UK Unemployment (Dummy) * IR Time Elapsed	0.767***	*0.275*	0.719***	*0.276*	0.446	*0.299*	−0.224	*0.247*
UK Trade Balance (Dummy) * IR Time Elapsed	−0.677***	*0.235*	−0.319	*0.261*	−0.004	*0.238*	0.089	*0.182*
IR Time Elapsed	0.088***	*0.016*	0.046***	*0.017*	0.043**	*0.018*	−0.005	*0.017*
CPI Time Elapsed	0.254***	*0.027*	0.275***	*0.026*	0.234***	*0.028*	0.167***	*0.030*
Inflation Report (Dummy)	−1.144***	*0.114*	−1.074***	*0.108*	−0.757***	*0.120*	−0.396***	*0.095*

Notes: The table shows, for the different maturities (in the various columns), the reaction coefficient of UK zero-coupon yields to macroeconomic announcements and the release of the Inflation Report in general and depending on the time elapsed since the release of the preceding Inflation Report. Furthermore, the econometric model controls for the effect of the time that has elapsed since the release of the latest CPI data. Numbers in italics denote the standard errors. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. For the model specification, see table 4.

The empirical evidence supports these hypotheses. Macroeconomic announcements and the release of the Inflation Report lead to a reduction in market volatility, especially when controlling for their surprise component. While the increase in market volatility over the time window between two Inflation Reports is statistically significant but small in magnitude, the reactions to macroeconomic news are dependent on the freshness of central bank communication: the volatility reduction of an announcement towards the end of the time window can be more than three times as large as for an announcement at the beginning of the time window, and the response coefficient in the mean equation is also substantially elevated once central bank communication has become stale.

These findings have a number of important implications. They affect the benchmark against which a given market reaction to a macroeconomic release is to be judged: it is the typical reaction *conditional* on the freshness of central bank communication that constitutes the appropriate benchmark. Also, these findings suggest that even if there is only a small or an insignificant response to news on average, its magnitude can easily be larger if other information is relatively noisy or, more generally, if agents' expectations are relatively imprecise. Rather, muted responsiveness can very well arise if the information contained in another source (that could have entered the information set already at an earlier stage) is sufficiently precise to dominate the new signal. Finally, the patterns are found to hold more generally, not only for Inflation Reports but also for the releases of inflation data. While we have used a specific example as a testing case, the overall hypothesis should apply equally to other financial markets and other news. We leave further tests for future research.

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