Asset Price Spillovers From Unconventional Monetary Policy: A Global Empirical Perspective

Domenico Lombardi, Pierre L. Siklos, Samantha St. Amand

THIS DRAFT: MARCH 2017

Not to be quoted or cited without permission

This is a CIGI-sponsored research project. The opinions in the paper are those of the authors and not the institutions that supported this research. Domenico Lombardi is Director of the Global Economy program at CIGI, Pierre Siklos is a Professor of Economics at Wilfrid Laurier University, the Balsillie School of International Affairs and a CIGI Senior Fellow, and Samantha St. Amand is a CIGI Senior Research Associate. Comments by the editor, three anonymous referees, and Philip Lane on earlier drafts are gratefully acknowledged. Siklos is grateful to the BIS and the Hoover Institution at Stanford University where parts of this paper were written and to CIGI for financing and supporting this research. Previous versions of this paper were presented at the University of Tasmania, the Australian National University, the Canadian Economics Association Conference, an invited session at the 9th International Conference on Computational and Financial Econometrics, and the European Central Bank. A separate Appendix with additional results and estimation details is available on request.

ABSTRACT

This paper sheds new light on spillovers from US unconventional monetary policies by examining the behaviour of select financial asset returns at the daily frequency and incorporating the content of announcements by central banks. US monetary policy surprise easings are found to have decreased yields in most economies since September 2008. The content of US Federal Open Market Committee statements, coded using text analysis software, is found to have a significant impact on asset prices. Importantly, the impact of this content is sensitive to the state of the economy. This variable has, so far, been omitted in the relevant literature.

Keywords: central bank communication, financial asset prices, monetary policy spillovers, unconventional monetary policy

JEL Classification codes: G12, G28, E52, E58

1. Introduction

The recognition that the announcement of monetary policy decisions by central banks can have international spillover effects is not new. In an integrated global financial system, the monetary policy stance of systemically important central banks will have global implications. Analyzing these spillover effects is important: not only are they likely to influence the success of domestic and international policies, but they also affect the likelihood of future international policy cooperation. This topic has taken on even greater urgency since the 2008-09 global financial crisis (GFC) prompted monetary authorities, especially in advanced economies (AE), to intervene in financial markets on a scale previously unseen. Indeed, the introduction of unconventional monetary policies (UMP) in some AE is seen by some (see below) as a potential catalyst for policy spillovers.

This paper sheds new light on the impact of spillovers by examining the response to global monetary policy surprises on select financial asset prices in AE. To do so, we introduce a new critical element to address the issue of spillovers by quantifying and incorporating the impact of the surprise component in the content of announcements by central banks. The US Federal Reserve (Fed) is the principal source of monetary policy surprises in our analysis, and the sample considered in this study covers 10 economies around the world.

Central bank policy rates in AE have remained low since the onset of the GFC. As a result, monetary authorities have placed even greater emphasis on policy communication (e.g., Blinder et. al. 2008; Williams 2013; Yellen 2013), in the form of central bank press statements and the release of policy committee minutes. The policy of forward guidance (e.g., Charbonneau and Rennison 2015; Filardo and Hofmann 2014,) is another manifestation of a strategy that

highlights the importance of written and verbal communication in the conduct of monetary policy.

Central bankers, for the most part, insist that these interventions should not be viewed as commitments about the future course of monetary policy. Instead, they are best interpreted as fulfilling the requirement of transparency while, at the same time, influencing expectations. Still, financial markets closely monitor various forms of central bank communication and incorporate future interest rate expectations into asset prices. It is well-known, however, that the clarity of written communications varies, as does the interpretation by financial markets (e.g., Blinder et al. 2008). Hence, the impact of communications on expectations is not always predictable. Therefore, it is plausible that the content of central bank communication contains a separate element that is incompletely captured by standard proxies for monetary policy surprises.

Accordingly, rather than merely recording, say, the frequency of specifically chosen words that appear in monetary policy communications (e.g., tightening, loosening), it may be useful to evaluate the overall content of central bank documents.[1] After all, central banks are known to carefully choose their words when crafting press releases and other publications. The content of central bank written communication reflects the monetary authority's views about both the current and anticipated state of the economy and how the stance of monetary policy is being determined. Consequently, whether the content of a document signals positive or negative sentiment or opinion, to give two examples, can be conveyed by a combination of several different words. Our approach to quantifying content is detailed in Section 3.

[1] There is nothing wrong, of course, in considering the frequency with which certain words or expressions appear in a document. Indeed, some studies adopt this strategy. The challenge, however, is to identify a set that provides a meaningful representation of the content of central bank documents. We return to this question later.

Most studies of monetary policy spillovers (discussed in Section 2) focus only on the period when the crisis began or during a period when UMP were launched. However, if we are to properly evaluate the effects of UMP on international policy spillovers, it also seems desirable to consider the impact of surprises when monetary policy was more conventional. Following more recent studies like Chen, Griffoli and Sahay (2014), Gilchrist, Yue and Zakrajsek (2014), and Rogers, Scotti and Wright (2014), our sample also includes a period before the GFC.

To preview the results, US monetary policy surprises are found to lower yields in the US and globally. International spillover effects tend to be larger in the post-crisis period and impact the longer-end of the yield curve. This could indicate that the US Fed's efforts to influence the longer-end of the yield curve by implementing UMP proved to be effective. More importantly, we find that the content of central bank statements affects the yields of several assets – included in our analysis are long-term sovereign bond yields and bond spreads, overnight index swaps (OIS), and LIBOR-OIS spreads. Crucially, the content of US Federal Open Market Committee (FOMC) press statements affects US and international asset prices differently depending on the state of the economy. For example, in the pre-crisis period, optimistic and pessimistic language in FOMC communications were generally associated with movements in asset prices that would suggest a positive or negative economic outlook, respectively. During the crisis, however, optimistic language was not effective at moving asset prices, while a shock in pessimistic language appears to have been transmitted through the risk-pricing channel. In addition, the content of FOMC meeting minutes appears to complement the impact of press statements during the crisis period only. This finding emphasizes the importance of carefully crafting central bank communications, especially during periods of financial turmoil. The bottom line is that the content of monetary policy communication is a separate determinant of asset price movements.

The remainder of this paper is organized as follows. Section 2 provides a brief literature review. Section 3 is devoted in part to outlining the various facets and challenges involved in the estimation of the impact of verbal and non-verbal announcements of central bank actions as well as outlining the data employed and the estimated econometric specifications. Section 4 summarizes our principal findings based on a cross-country investigation of several economies, and section 5 concludes.

2. Literature Review

In what follows, we focus on the literature that uses relatively high frequency data (i.e., daily or intra-daily). Typically, studies estimate the relationship between changes in asset price returns, such as bonds, credit default swaps, equity prices or exchange rates, and some indicator or proxy of monetary policy surprises. The simplest relationship is written as:

$$\Delta q_t = \alpha + \beta MPS_t + \varepsilon_t \tag{1}$$

where Δq_t is the change in the return on a particular financial asset and MPS_t proxies monetary policy surprises. Some studies distinguish between positive and negative surprises to introduce asymmetry in the responses to *MPS*. When global sources of surprises are added, this gives rise to so-called spillover effects.

Spillovers can result from portfolio reallocations that prompt investors to shift away, say, from bonds into equities. Given the relative size and significance of the US financial system to the global financial system, US *MPS* are the source of spillover effects in our study and have understandably attracted the most interest in the literature. Interest in US policy spillovers is further reinforced by the unprecedented loosening of US monetary policy through quantitative easing (QE) from 2008 to 2014. As international spillovers can be limited in type and severity by

capital controls or other forms of financial repression, we restrict our focus to AE with open capital accounts.

Several proxies for *MPS* have been proposed. They include: differences between announced and expected monetary policy decisions, measured through surveys of market participants (e.g., Ehrmann and Fratzscher 2003, 2007) or changes in futures prices of monetary policy interest rates (e.g., Kuttner 2001); dummy variables for monetary policy announcements deemed to be surprises or to contain a surprise element based on a review of news articles (e.g., Rosa 2012) or statements by central bankers (e.g., Aizenman, Binici and Hutchison 2016); or by deriving surprises from financial market activity (e.g., Gürkaynak, Sack and Swanson 2005). We adopt this last approach to measuring *MPS*, as it better captures information content about monetary policy decisions than other measures (Chen, Griffoli and Sahay 2014).

MPS, however, does not capture the subtleties inherent in central bank communication. We therefore create a new variable that captures the surprise element of the content of central bank communications; the literature on the impact of this dimension of policymaking on financial markets is briefly discussed below.

It is usually assumed that announcements associated with UMP are intended to reduce asset returns (i.e., $\beta < 0$). This is clear in the case of forward guidance policies—where the central bank communicates its intentions regarding the future path of the policy interest rate (e.g., Greenwood et al. 2015; Swanson 2016). Announcements, unaccompanied by policy action, can also affect financial markets by boosting confidence; this was clearly observed in financial markets' reaction, for example, to European Central Bank (ECB) President Mario Draghi's (2012) assertion to do 'whatever it takes to preserve the euro.' Swanson and Williams (2014), and Winkelmann, Bibinger and Linzert (2014) have demonstrated that the zero or effective lower

bounds (ZLB or ELB) need not reduce the effectiveness of monetary policy, as some yields (e.g., on long-term government bonds) continue to be responsive to news since the GFC.

Rogers, Scotti and Wright (2014) examine the financial market effects of UMP implemented by four major central banks (US Fed, Bank of England, ECB and Bank of Japan) for a variety of asset prices (equities, bonds and exchange rates). They conclude that spillovers from the US to the rest of the world are found to be relatively stronger than global spillovers to the US, and that UMP are found to impact the long-end of the yield curve.[2] In contrast, during 'normal' times, the short-end of the term structure is influenced by monetary policy.

Other studies in this vein include Aït-Sahalia et al. (2012) and Bastidon, Huchet and Kocoglu (2016). The former study finds that spillover effects intensified as the financial crisis progressed. The latter study focuses on the more recent sovereign debt crisis in the Eurozone and concludes that insufficient forward guidance by the ECB blunted the monetary authorities' attempts at subduing stress in financial markets. Gilchrist, Yue and Zakrajsek (2014) find that the pass-through effects of unconventional and conventional monetary policy are roughly similar. Fratzscher, Lo Duca and Straub (forthcoming) suggest that international spillovers associated with Fed UMP announcements had comparatively small effects and diminishing returns. The IMF (2013) conducted a broad investigation of spillovers of UMP; they reported that the impact of monetary policy spillovers is magnified by indirect third party effects. They also conclude that the 'surprise' element of such policies exhibits diminishing effects as markets normalize.

[2] Their study relies mainly on robust least squares but they also estimate VARs that identify shocks of interest via heteroskedasticity. The premise of the approach, established by Rigobon and Sack (2003), and since modified in several directions (e.g., Bohl, Siklos and Werner 2007, Wright 2012, and Neely 2014), is that monetary policy decisions generate more volatility in financial markets around decision days (i.e., when the FOMC meets) as markets try to forecast what the central bank will say or do following the release of their policy statements. Similarly, Rosa (2016) finds that speeches by the Fed's Chair raise asset price volatility beyond what is considered 'normal.' Van Dijk, Lumsdaine, and van der Wel (2016) dispute this view, arguing that markets "set up" well in advance of FOMC meetings; thus, volatility is relatively lower around meeting days. We estimated specifications that identified coefficients via heteroscedasticity (not shown) but our conclusions are unchanged.

Turning briefly to the burgeoning literature on the impact of qualitative elements of central bank communication, Blinder et al. (2008) is a recent survey that suggests that central bank communication has a separate powerful impact on financial markets. It also stresses that additional work is needed to further our understanding of central bank communication on the transmission and effectiveness of monetary policy. The content of central bank communication is typically evaluated by coding documents according to readers' interpretations (e.g., tightening or loosening of policy), constructed from speeches by central bankers (e.g., Ehrmann and Fratzscher 2007; Hayo, Kutan and Neuenkirch 2015). Alternatively, content is quantified by estimating the frequency with which certain 'bags of words' appear in documents (e.g., Steckler and Symington 2016; Meade, Burk and Josselyn 2015). The use of a dictionary technique to capture the content or 'sentiment' of central bank texts, which is also used in the present study, is becoming more prominent in the relevant literature (e.g., Hubert and Labondance 2017).

Incorporating qualitative elements of monetary policy into our analytical toolkit is found to add considerable value to our understanding of the effectiveness of monetary policy and best practice in central banking (e.g., Sturm and De Haan 2011; Hansen, McMahon and Prat 2014; Neuenkirch 2012). Furthermore, Hubert and Labondance (2017) find that the content of central bank statements do influence financial market expectations beyond the effects of monetary policy decisions and central bank forecasts. To our knowledge, no research has yet incorporated the content of central bank communication in the study of international spillovers of monetary policy.

3. Data and Econometric Specifications

The sample begins in June 2006 in order to include data near the peak of the last tightening cycle by the US Federal Reserve (based on the level of the federal funds rate), and ends in December

2013. The precise starting point of various samples, however, is dictated by data availability across the economies considered. A long enough sample is needed so that pre- and post-crisis periods can be investigated separately. The sub-samples considered are: pre-crisis (June 1, 2006 – September 14, 2008); crisis (September 15, 2008 – September 30, 2009); post-crisis (October 1, 2009 – December 31, 2013); and the Eurozone crisis (November 1, 2009 – September 6, 2012).[3]

The basic hypothesis being investigated is that monetary policy surprises (hereafter MPS) create spillover effects. Whereas previous research has focused on the effects of conventionally measured MPS, we add the spillover effects from a content analysis of press releases and monetary policy committee minutes, described below. In addition, we are interested in whether the GFC and its aftermath amplified or moderated the impact of surprises in the content of central bank communications. As the present study considers cross-country evidence, we also differentiate between domestic and global effects (i.e., primarily from the US) of MPS.

Some research considers the financial market impact of UMP at the intra-daily sampling frequency (e.g., Rogers, Scotti and Wright 2014; Gilchrist, Yue and Zakrajsek 2016).[4] However, as we are applying a time-series methodology and are interested in the reactions to monetary policy announcements in countries that cover several time zones, this supports the rationale for observing asset price changes over a 2-day period (e.g., as in Ehrmann, Fratzscher and Rigobon 2011).[5] When the US FOMC's press releases and meeting minutes are published at 2pm EST,

[3] The sub-samples were chosen based on chronologies from three sources: the St. Louis Fed's timeline, the New York Federal Reserve's chronology, and a timeline prepared by the ECB. Dates were also cross-checked with available chronologies used in the literature, for example, Rogers, Scotti and Wright (2014) and Fratzscher, Lo Duca and Straub (forthcoming).

[4] The resort to intra-daily data raises some technical challenges. For example, daily data are often non-stationary in levels but stationary in first differences whereas the time series properties of intra-daily data can be rather different (see Tsay 2010). Nevertheless, studies that rely on intra-daily data, where an event study approach is usually adopted, do not necessarily reach conclusions that are substantively different from ones that use daily data.

[5] We are grateful to an anonymous referee for the suggestion.

European and Asian markets have long closed for the day. This provides one argument for relying on 2-day observations.

Four dependent variables capture asset price changes. The change in the spread between 3-month and 10-year sovereign bond yields is used to capture changes along the yield curve, while the 2-day log return of 10-year sovereign bond yields captures spillovers at the longer-end of the yield curve. The 2-day log return of OIS with a 1-year term to maturity captures fluctuations in short-term yields and changes in LIBOR-OIS spreads with 1-year term to maturity are used to capture changes in perceived risk in money markets.[6] The sample includes five major AE: the Eurozone, Japan, the UK, the US and Switzerland, which is included in this category due to the characteristics of its financial markets; and five small-open AE: Australia, Canada, New Zealand, Norway and Sweden.

The content of central bank press releases that accompany monetary policy decisions is an important addition to the standard specification (i.e., equation (1)) because it seeks to capture changes in the stance of monetary policy even when policy rates do not change.[7] This merely reflects the possibility that observed and intended policy rates are not always coincident, since central banks can also influence expectations via the content of written communications. For example, the approach developed by Romer and Romer (1989, 2004) provides the essence of the strategy adopted in our study. They rely on the narrative approach to devise the FOMC's

[6] These types of instruments essentially allow investors to swap floating for fixed interest rates. Swaps are often developed from indexes for overnight instruments (e.g., the fed funds rate). Maturities can vary but these instruments are considered 'risk-free.' Hence, spreads of various asset yields relative to OIS are often used to represent credit risk.

[7] Alternatively, recent literature has estimated shadow policy rates in an attempt to capture what the policy rate would be if UMP were incorporated (see Wu and Xia 2016 and references therein). As we are interested in estimating the impact of surprises in the content of certain central bank announcements, we do not pursue this line of enquiry.

intentions for the fed funds rate.[8] Expectations can also, however, be influenced by factors not directly associated with current or expected monetary policy actions.

As press releases and minutes likely incorporate a given central bank's expectations, we construct our indicators by applying an algorithm to reduce the likelihood of endogeneity.[9] Moreover, as observers can and do parse central bank statements differently in ways that are unobserved, the measure we use is arguably more objective. That said, there are some challenges with the adopted strategy. One such limitation is that financial market participants often process central bank news through media reports (Hayo and Neuenkirch 2015). In addition, the media itself typically focusses on changes in the language of central bank communications to convey change in the policy outlook; the Wall Street Journal, for example, publishes a side-by-side comparison of the FOMC press release after successive meetings to facilitate comparisons of changes in wording over time. The precise way that financial actors parse US FOMC statements, however, is unknown.

To measure content, we apply a dictionary technique whereby we define lists of key words that aim to capture specific elements of the content of communication, and normalize the frequency with which the words in these dictionaries appear in each press statement and meeting minutes by the total word count of the document. Although central bank texts are intended for a general audience, words are carefully chosen. The language used in press releases is likely to

[8] The authors separate out the central bank's view about the economic outlook. Hence, their measure is relatively free of the endogeneity problem that plagues conventional measures of monetary policy. Endogeneity arises in part because expectations of future changes in the monetary policy stance are influenced by current forecasts of the economic outlook that serve as the basis for setting the current stance of monetary policy.

[9] Additional suggestive evidence that our indicators of content of press releases and meeting minutes avoid the endogeneity problem is found in the low correlation with other measurements of MPS. Unconditional correlation coefficients between the first principal component of yields on US Treasury futures on the date of monetary policy announcements range between -0.03 and -0.13.

contain a combination of financial and everyday language.[10] In the case of the FOMC minutes, likely read by a smaller and more specialized audience, participants in the meeting are aware that the transcript will be made public and this has been found to influence not only what they say but also the language used (Acosta 2014; Meade and Stasavage 2008). Indeed, observers often look for clues about surprises based on how much, or little, dissent there is in FOMC deliberations (Madeira and Madeira 2016).

Our dictionaries combine those constructed by the DICTION 6.0 algorithm (see Hart, Childers and Lind 2013), which was initially developed to analyze political texts, and Loughran and McDonald's algorithm, who developed dictionaries to reflect the unique characteristic of language used in financial texts (Loughran and McDonald 2011). Although the application of an algorithm would constitute a more objective measurement of content, based on a reading of the documents, additional sets of words were also generated to capture language commonly used in central bank communications. As demonstrated by Loughran and McDonald (2016), because the dictionary approach to text analysis can be sensitive to the choice of words in the dictionaries, we removed words that are believed to be ambiguous in the context of central banking; for example, crisis, unemployment, risk, protection, and so on.[11] Although these terms do typically capture negative or positive sentiment, they are used in more general or clinical ways by central banks.[12] For similar reasons, the constructed dictionaries include inflections rather than

[10] The care taken in the language is clear from a reading of FOMC transcripts where officials are presented with alternative wording combinations depending not only on the likely direction of the stance of monetary policy, but also in an attempt to reflect the degree of consensus about the message the FOMC wishes to convey. Part B of the so-called Tealbook (previously part of the Bluebook) prepared for FOMC meetings has a section entitled 'Monetary Policy Alternatives' that proposes a few alternatives for the language to be used in the FOMC's press release; this is discussed at length during each meeting. While staff proposals for policy statements date back at least to 1969, attention to detail in the choice of words has risen over time, with a clear boost around the time of the GFC.

[11] Loughran and McDonald (2016) criticize DICTION because its dictionaries are not ideally suited to capture the tone of finance-related documents. However, they ignore the fact that DICTION can accommodate dictionaries constructed by the user.

[12] For example, central banks refer to risk (i.e., upside, downside or balanced) and unemployment trends in most monetary policy statements. But they are described in a more clinical way; therefore, we cannot say with confidence

stemming words. For example, 'stabilize' and 'stabilizing' are included in the optimism dictionary, but not 'stability' as it is used more ambiguously in the context of central bank communication; using its stemmed form ('stabil-') would not achieve this end.

Our approach can therefore be seen as a method that mixes the qualitative with the quantitative. The three dimensions of content in central bank documents that we are interested in are: certainty, optimism and pessimism. Briefly, certainty tries to capture the degree to which monetary policy committees make assertions on the state of the economy and the policy stance, and conveys the sense that the committee is speaking with one voice. As noted, earlier research finds that dissent (i.e., a reduction of agreement) inside the FOMC provides important clues about the conduct of US monetary policy. Optimism attempts to capture FOMC language that conveys positive views about the economy and the contribution made by the current stance of monetary policy. This opens the door to a surprise tightening. In contrast, pessimism attempts to capture sentiment that suggests conditions are unsatisfactory. Hence, this raises the possibility of a surprise easing.[13] An online appendix provides further details about the composition of these dictionaries.

Figure 1 plots these content variables in levels—the percent of words from a dictionary in the total word count of the document—over the sample period for US FOMC press statements and meeting minutes. The content of central bank communication changes over time, either

that additional uses of these terms in any given statement means that the committee has become more pessimistic. A similar argument could be made about the word 'crisis'; the GFC might be talked about as an event that led to some bad outcomes, but reference to the event might not imply that the central bank is currently more pessimistic. Furthermore, when we are actually in crisis conditions, central bankers tend to refer to economic or financial 'turmoil' (which is included in the pessimism dictionary) rather than 'crisis.' Despite efforts to adjust for ambiguous meaning, these issues clearly highlight a key challenge of using textual analysis: meaning is often expressed by a complex combination of words.

[13] These content variables are indeed correlated with key economic indicators. Change in the content of certainty in US FOMC statements is negatively correlated with changes in policy uncertainty, while change in pessimism is positively correlated with change in policy uncertainty, and change in optimism is negatively correlated with changes in inflation forecasts.

owing to changes in economic conditions or through deliberate efforts to change the committee's approach to communication, as identified by Meade, Burk and Josselyn (2015). The figures illustrate that expressions of certainty, and to a lesser extent optimism, have increased over time in FOMC press releases, while pessimism increased during the crisis and decreased over the post-crisis period. A similar trend is observed in the expression of certainty in FOMC meeting minutes; however it is less pronounced. Differences in the trends in content of meeting minutes and press releases can likely be attributed to the fact that press releases are short and deliberately crafted statements; whereas minutes, which are much longer and more detailed, are more descriptive of circumstances.[14]

The surprise element of the content of communication that impacts changes in financial asset returns can be measured several ways. The simplest is to take the change in the content variable; therefore, the surprise content is equal to the change in the percentage of words in the specified dictionary in the total word count.[15] Other proxies were considered with little impact on the conclusions; comparison of the estimation results using alternative measures are available in the online appendix.[16]

A rarely discussed consideration in evaluating the empirical evidence about the impact of UMP is that there are subtle, and not so subtle, differences in both the timing and coverage of

[14] This is not to say that meeting minutes are not also carefully crafted texts.
[15] It is worth repeating that observers form expectations about whether the stance of policy will change and not how the wording of press releases, let alone the content of minutes, will change. Whether press releases in successive meetings are written as if the authors start from a blank page is debatable but even if this is the case, asset return volatility and not their levels will be affected (Ehrmann and Talmi 2016).
[16] There is a possibility that change in the content of statements from meeting to meeting reflects surprises between meetings, rather than a surprise on the day of the meeting. Other studies have found, however, that the central bank statements are themselves a source of new information (e.g., Hubert and Labondance 2017). We also considered two alternative measures of surprise in the content of central bank statements. The first approach standardizes the percentages over the full sample so that the mean is equal to zero and the standard deviation is equal to one. The second approach takes the deviations from the mean value obtained during the pre-crisis sample. Communications in the pre-crisis period may be taken as a benchmark where less emphasis was placed on the choice of words as the policy rate was not constrained by the ZLB; thus, any deviations from this sample could be taken to be a shock in the content of communications.

'events' likely to impact asset prices.[17] Some researchers, including Rogers, Scotti and Wright (2014) who adopt a time series approach to estimate specifications similar to ours, have resorted to identification through heteroskedasticity (e.g., Rigobon 2003). As there are no obvious differences in the volatility of yield changes and spreads between FOMC meeting days and the remaining days in the sample, this suggests that some traditional forms of identification through heteroskedasticity may not necessarily produce different conclusions.[18] We estimate our specifications in the time series setting using robust least squares (Huber's (1981) M-estimator) to mitigate the impact of outliers that can affect some parameter estimates.

The benchmark specification, an extended version of (1), is written:

$$\Delta q_{it} = \alpha_i + \beta \boldsymbol{MPS}_{it} + \theta^j \boldsymbol{\Delta C}_{it}^j + \Delta q_{i(t-1)} + \varepsilon_{it} \quad (2)$$

where the index i identifies the economy in question while the index j identifies whether the determinant of changes in asset prices is domestic or global, where the latter is assumed to originate from the US. Specification (2) also allows for persistence in asset price changes; Δq represents the 2-day log asset return or change in spread, ***MPS*** is a vector of monetary policy surprises, and ***C*** is a vector of indicators that define the content of the language used by policy makers (as defined above) while Δ is the first difference operator.[19] Following Rogers, Scotti and Wright (2014), and others, US ***MPS*** is defined by changes in the first principal component of 2, 5, 10 and 30 year US Treasury futures on the date of key monetary policy announcements. Using this methodology, we construct three MPS variables: one captures the day of US FOMC press

[17] As a result UMP may superficially give the appearance that they are ineffective when their impact may take place after central bank balance sheet operations have terminated and financial markets adjust to these conditions.
[18] Summary statistics that support this view are relegated to an online appendix.
[19] In estimating (2) and (3) we include dummy variables to capture the announcement of domestic monetary policy decisions, as well as the fact that central banks typically practice purdah—a black-out on central bank news or announcements around days when the monetary policy committee meets (e.g., Ehrmann and Fratzscher 2008). We also include surprise macroeconomic announcements. Refer to Table 1 for more details on these measurements. In a previous draft, we added the policy uncertainty measure developed by Baker, Bloom and Davis (2016) for the US and other economies where data were available but this variable proved to be highly insignificant and was dropped.

releases, the second captures the release of FOMC meeting minutes and the third captures the dates of US Fed UMP announcements (including QE and forward guidance).[20] Traditionally, the first principal component represents the 'level effect' following a MPS, and an increase in MPS represents a surprise loosening of US monetary policy.

In a variant of (2), we allow for the differential impact of tightening versus loosening surprises by interacting $\boldsymbol{C}$ with a Heaviside indicator that identifies episodes where MPS > 0. For this purpose, we use the second principal component of the US-based MPS proxy as this reflects the impact of monetary policies when short-term interest rates are reduced relative to long-term yields (i.e., a twist of the yield curve). Normally, a reduction in short-term rates, other things equal, is seen as a loosening of monetary policy. A positive value means that observed yields are lower than expected, which translates into a surprise loosening of policy. The Heaviside variable is labelled I($MPS^2 > 0$), where '2' makes it clear that the indicator is applied to the second principal component of US MPS. We convert all instances when the policy surprise variable is positive to a dummy variable set equal to unity (and zero otherwise). The specification is thus written:

$$\Delta q_{it} = \alpha_i + \beta \boldsymbol{MPS}_{it} + \theta^j \Delta \boldsymbol{C}^j_{it} + \theta^{\dagger,j} \Delta \boldsymbol{C}^j_{it} * \mathrm{I}(MPS^2 > 0) + \Delta q_{i(t-1)} + \varepsilon_{it} \qquad (3)$$

where $\boldsymbol{MPS}$ and $\boldsymbol{C}$ are as described above, and j includes both domestic and US variants. The purpose of this additional analysis is to verify whether asset prices respond to the surprise content of central bank statements asymmetrically when monetary policy is loosened or

[20] While Rogers, Scotti and Wright (2014) prefer measuring the intra-daily measurement indicator under the assumption that markets respond quickly to news, we prefer a daily change which captures fluctuation surrounding the timing of an announcement, as markets both price in expectations before an announcement and can take time to digest news following an announcement. Existing research is not able yet to definitively conclude whether one sampling frequency is preferable to others.

tightened. Readers are referred to Table 1 for more information on the dependent and independent variables and data sources.

4. Econometric Evidence

Given the large number of estimates, the summary below highlights our most salient econometric findings. Other results are relegated to the online appendix or are available on request. The coefficient estimates of β and θ^{US} from specification (2), that is, the estimates of spillover effects of US MPS and content of FOMC documents are presented in Table 2 for the US and the nine other economies in the sample. Estimates for sub-samples are provided to demonstrate how the size and strength of spillovers from US MPS have changed over time in the empirical results.

The results suggest that the impact of a positive MPS, that is a surprise easing of US monetary policy, typically is to reduce yields in both the US and in other AE. International spillovers appear to be larger in the post-crisis period, and they tend to have a larger impact on longer-term sovereign yields, consistent with the findings of Rogers, Scotti and Wright (2014), than on short-term money markets. One notable exception is New Zealand, where the effects of US MPS are largest during the pre-crisis period. Unsurprisingly, US assets are most strongly impacted by US MPS. With respect to short-term yields, European countries and Canada see a decrease in the one-year OIS following a surprise policy easing in the US. Similar to Chen, Grifolli and Sahay (2014), we find the impact on longer-term yields appears to be widespread during the post-crisis period, having a statistically significant impact at least at the *95%* confidence level on assets in both major AE, including the Eurozone and the UK, as well as small-open AE, such as Australia, Canada, Switzerland and Sweden. This suggests that the US Fed's efforts to impact the longer-end of the yield curve during the crisis were not only effective for US assets, but also globally. US Fed UMP announcements also appear to be effective at

flattening the yield curve and long-term yields in the US. As with the findings of IMF (2013), UMP announcements had a larger impact during the crisis than in the post-crisis period. Spillover effects from these announcements are clearly observed in the European countries in our sample.

The coefficients of the content of US FOMC statements are also included in Table 2, while visual summaries of their impact on global asset returns and spreads are shown in Figure 2, which displays the mean and median coefficient estimates of the two groups of countries in our sample—major AE and small-open AE. Our coefficient plots reveal that the impact of UMP emanating from the US varies across countries and time. Expressions of certainty in US FOMC communication had little statistically significant impact in the pre-crisis period; an exception is that certainty has the effect of decreasing LIBOR-OIS spreads in both major AE and small-open AE. This result is consistent with the idea that expressions of certainty, also interpreted here as the absence of doubt, decrease perceived riskiness in short-term money markets. During the crisis, however, expressions of certainty increased OIS and LIBOR-OIS in several small economies, including Australia, New Zealand, Norway and Switzerland. In the post-crisis period, certainty tended to reduce yields at both the short- and long-end of the yield curve in the US and internationally. This appears to reflect a role for global easing from the Fed's bold and sizeable QE policies introduced during the crisis and the FOMC's willingness to take more action if necessary. Not unrelated is the FOMC's expression of agreement about maintaining ultra-loose monetary policy for longer than would be expected according to the underlying data or the mechanical application of, say, a Taylor rule.

Turning to the impact of optimism we similarly conclude that its impact changes depending on whether the US economy is in crisis or not. In the pre-crisis period, optimism

tended to have a larger impact on the longer-end of the yield curve, with more optimistic tones flattening the yield curve and decreasing long-term yields. During the crisis period, the impact of optimistic tones was more muted, with few statistically significant coefficients. As the crisis period was characterized by high levels of uncertainty, perhaps markets could not be persuaded to react to positive language from the US Fed. In the post-crisis period, however, optimistic language from the FOMC has had a relatively larger impact on the short-end of the yield curve. But it also increases yields on long-term sovereign bonds; this effect is consistent with the notion that a positive outlook for the economy increases long-term yields. Interestingly, these effects are only observed in major AE, where policy rates were reduced to the ZLB, if not negative. In this environment, optimism in the US could be taken as a signal that there could soon be a global push towards tightening the stance of monetary policy.

What stands out most from including a role for the pessimistic content of central bank communication is that the impact is considerably higher during crisis conditions, relative to both the pre-crisis and post-crisis periods.[21] Pre-crisis, pessimistic content tended to reduce bond spreads and long-term yields, perhaps reflecting expectations of lower future interest rates. During the crisis period, however, an increase in pessimistic content in FOMC press statements is estimated to increase LIBOR-OIS spreads and long-term yields. This is an indication that pessimistic language may operate through risk-pricing channels. Risk premiums in both short-term and long-term markets are known to be affected in an environment associated with high

[21] Wald tests for statistically significant differences in coefficient across samples confirms that changes in the content of pessimism in FOMC communications had a different impact on US and global asset prices during the crisis period. Specifically, relative to the pre-crisis period, pessimism had a larger impact on short-term money markets during the crisis, while the coefficient changed sign (from negative to positive) at the longer-end of the yield curve and for bond spreads. Similarly, from the crisis to post crisis periods, the coefficient on the longer-end of the yield curve switches signs back to negative. Refer to the online appendix for these results.

uncertainty that characterizes a financial crisis. This effect is also seen as spilling over into other economies.

Turning briefly to the surprise content of FOMC meeting minutes, the largest impact is clearly observed during the crisis. During this period, an increase in optimism contained in meeting minutes increases long-term sovereign bond yields in several countries in our sample. This captures the impact of a more favourable outlook for the economy. Similarly, more optimistic language increased 1-year OIS and decreased LIBOR-OIS spreads in the US and Canada; while pessimistic language increased LIBOR-OIS spreads.[22] On the other hand, an increase in expressions of certainty in meeting minutes decreased long-term bond yields, particularly in Canada, Switzerland and the US. This represents a further indication of the resolve of the FOMC to maintain an accommodative monetary policy stance, and consider further easing through UMP. Interestingly, few countries' asset prices—including those in Canada and US which were most affected by the content of meeting minutes during the crisis—are affected by the content of US FOMC meeting minutes during the post-crisis period. Therefore, it seems that FOMC press releases significantly impact asset prices domestically and internationally regardless of the state of the US economy, while meeting minutes mostly serve as an important additional source of information principally during the crisis period.

Generally, the estimation results suggest the impact of the content of US FOMC statements differs across countries and over time. Results from estimates of equation (3), which permits asymmetric effects, confirm this finding (see the online appendix). Changes in the pessimistic content of central bank statements have a different impact on asset prices when there is a surprise loosening of US Fed monetary policy. Specifically, pessimistic content shocks

[22] Since we do not have LIBOR-OIS for many countries in our sample (viz., Japan, Norway, Sweden, Switzerland, and the United Kingdom) a proper international comparison is not possible.

increase short- and long-term yields, and steepen the yield curve when there is a surprise loosening. Otherwise, the impact is negative. This result indicates that pessimism is associated with heightened uncertainty or risk. Similarly, more certainty in the content of FOMC communications decreases LIBOR-OIS spreads during tightening shocks only, while a surprise loosening of monetary policy has a positive impact on Canadian and US longer-term yields when coupled with a shock to optimistic content in FOMC statements. The upshot of the foregoing results is that the language of the content of central bank communication acts as an additional variable that can be used to explain monetary policy action.

5. Conclusion

Unprecedented actions by central banks in major advanced economies continue to draw the attention of policy makers and academics. We empirically examine the behavior of financial asset prices in ten economies in response to US monetary policy surprises (MPS). We find that the impact of MPS easings has been to decrease yields in most economies since the GFC. More importantly, our analysis provides evidence that the content of US Fed communication, coded using text analysis software, moves asset prices. In addition, specific aspects of communication have different effects depending on the state of the economy. Expression of certainty appears to be important for reducing only the LIBOR-OIS spread in the pre-crisis period, whereas it conveys the FOMC's agreement and resoluteness in maintaining accommodative monetary policy in the post-crisis period across the various financial asset prices considered. Optimism has increased short- and long-term yields in the post-crisis period as financial participants begin anticipating the tightening of global monetary policy stance. Overall, our empirical results highlight a neglected source of influence on yields before, during, and after the financial crisis: the role of central bank communication. It also provides evidence that central bank

communication matters more during periods of financial turmoil and when the policy interest rate is at the zero or effective lower bound.

There are a number of worthwhile extensions to our analysis that might be contemplated. First, our estimates of spillovers are based on country pairs. A panel setting might provide additional insights, as there are likely to be cross-sectional elements that our estimations have omitted. Second, key speeches by central bankers could also be coded using the text software employed in this paper as this is an additional source of spillovers not considered in this study. Finally, market participants became used to discerning the stance of monetary policy via some version of the eponymous Taylor rule. Some of the central banks in our study reached the ZLB (US, UK, and the Eurozone). Hence, the stance of monetary policy could no longer be easily measured via the observed policy rate. Instead, shadow policy rates have been estimated. Accordingly, there may be an element of surprise in the change in the shadow rate, in addition to the content of press releases. We leave these extensions to future research.

References

Acosta, M. (2015) "FOMC Responses to Calls for Transparency", Finance and Economic Discussion Series, 2015-060, Washington, D.C.: Board of Governors of the Federal Reserve System.

Aizenman, J., M. Binici and M. M. Hutchison (2016) "The Transmission of Federal Reserve Tapering News to Emerging Financial Markets," *International Journal of Central Banking* 12(2): 317-56.

Aït-Sahalia, Y., J. Andritzky, A. Jobst, S. Nowak and N. Tamirisa (2012) "Market response to policy initiatives during the global financial crisis," *Journal of International Economics* 87: 162-77.

Baker, S. R., N. Bloom and S. J. Davis (2016) "Measuring Economic Policy Uncertainty," *Quarterly Journal of Economics* 131(4): 1593-1636.

Bastidon, C., N. Huchet and Y. Kocoglu (2016) "Unconventional Monetary Policy in the Eurozone: A Lack of Forward Guidance?", *Emerging Markets Finance and Trade* 52(1): 76-97.

Blinder, A., M. Ehrmann, M. Fratzscher, J. De Haan and D.-J. Jansen (2008) "Central Bank Communication and Monetary Policy: A Survey of Theory and Evidence", NBER Working Paper Series, 13932.

Bohl, M., P. L. Siklos and T. Werner (2007) "Do Central Banks React to the Stock Market? The Case of the Bundesbank", *Journal of Banking and Finance* 31(March): 719-733.

Charbonneau, K., and L. Rennison (2015) "Forward Guidance at the Effective Lower Bound", Bank of Canada Staff Discussion Paper, 2015-05, November.

Chen, J., T. M. Griffoli and R. Sahay (2014) "Spillovers from U.S. Monetary Policy on Emerging Markets: Different This Time?", IMF working paper 14/240, December.

Draghi, M. (2012) Speech delivered at the Global Investment Conference, London, 26 July.

Ehrmann, M., and J. Talmi (2016) "Starting From a Blank Page? Semantic Similarity in Central Bank Communication and Market Volatility", Bank of Canada working paper 2016-37, July.

Ehrmann, M., M. Fratzscher and R. Rigobon (2011) "Stocks, Bond, Money Markets and Exchange Rates: Measuring International Financial Transmission", *Journal of Applied Econometrics* 26: 947-74.

Ehrmann, M., and M. Fratzscher (2008) "Purdah – On the Rationale for Central Bank Silence around Policy Meetings", *Journal of Money, Credit and Banking* 41(2-3): 517-28.

Ehrmann, M., and M. Fratzscher (2007) "Communication By Central Bank Committee Members: Different Strategies, Same Effectiveness?", *Journal of Money, Credit and Banking* 39(2-3): 509-41.

Ehrmann, M., and M. Fratzscher (2003) "Monetary Policy Announcements and Money Markets: A Transatlantic Perspective", *International Finance* 6(3): 309-28.

Filardo, A., and B. Hofmann (2014) "Forward Guidance at the Zero Lower Bound", BIS Quarterly Review, March: 37-53.

Fratzscher, M., M. Lo Duca and R. Straub (*forthcoming*) "On the International Spillovers of US Quantitative Easing", *The Economic Journal*, online, 22 October.

Gilchrist, S., V. Yue and E. Zakrajsek (2016) "The Response of Sovereign Bond Yields to U.S. Monetary Policy", working paper, 22 April.

Greenwood, R., S. Hanson and E. Vayanos (2015) "Forward Guidance in the Yield Curve: Short Rates versus Bond Supply", NBER Working Paper, 21750.

Gürkaynak, R. S., B. Sack and E. T. Swanson (2005) "Do Actions Speak Louder Than Words? The Response of Asset Prices to Monetary Policy Actions and Statements", *International Journal of Central Banking* 1(1): 55-93.

Hansen, S., M. McMahon and A. Prat (2014) "Transparency and Deliberation Within the FOMC: A Computational Linguistics Approach", CFM discussion paper series, 2014-11, London: Centre For Macroeconomics.

Hart, R. P., J. P. Childers and C. J. Lind (2013) *Political Tone: How Leaders Talk and Why* (Chicago: University of Chicago Press).

Hayo, B., A. Kutan and M. Neuenkirch (2015) "Financial Market Reaction to Federal Reserve Communications: Does the Global Financial Crisis Make a Difference?", *Empirica* 42(1): 185-203.

Hayo, B., and M. Neuenkirch (2015) "Central bank communication in the financial crisis: Evidence from a survey of financial market participants", *Journal of International Money and Finance* 50: 166-81.

Huber, Peter J. (1981) *Robust Statistics* (Hoboken, New Jersey: John Wiley and Sons).

Hubert, P., and F. Labondance (2017) "Central bank sentiment and policy expectations", Bank of England Staff Working Paper, 648.

IMF (2013) "Unconventional Monetary Policies – Recent Experience and Prospects", IMF Background Paper.

Kuttner, K. N. (2001) "Monetary policy surprises and interest rates: Evidence from the Fed funds futures market", *Journal of Monetary Economics* 47(3): 523-44.

Loughran, T., and B. McDonald (2011) "When Is a Liability Not a Liability? Textual Analysis, Dictionaries, and 10-Ks", *Journal of Finance* LXVI(February): 35-65.

Loughran, T., and B. McDonald (2016) "Textual Analysis in Accounting and Finance: A Survey", *Journal of Accounting Research* 54(September): 1187-1230.

Madeira, C., and J. Madeira (2016), "The effect of FOMC dissent on financial markets", mimeo, January.

Meade, E. E., M. A. Burk and J. Josselyn (2015) "The FOMC Meeting Minutes: An Assessment of Counting Words and the Diversity of Views", FEDS Notes, 26 May.

Meade, E. E., and D. Stasavage (2008) "Publicity of Debate and the Incentive to Dissent: Evidence from the US Federal Reserve", *The Economic Journal* 118(528): 695-717.

Neely, C. J. (2014) "How Persistent are Monetary Policy Effects at the Zero Lower Bound?", Working Paper Federal Reserve Bank of St. Louis, 2014-004A.

Neuenkirch, M. (2012) "Managing Financial Market Expectations: The Role of Central Bank Transparency and Central Bank Communication", *European Journal of Political Economy* 28(1): 1-13.

Rigobon, R. (2003) "Identification Through Heteroskedasticity," *The Review of Economics and Statistics* 85(4): 777-92.

Rigobon, R., and B. Sack (2003) "Measuring the Reaction of Monetary Policy to the Stock Market," *The Quarterly Journal of Economics* 118(2): 639-69.

Rogers, J. H., C. Scotti, and J. H. Wright (2014) "Evaluating Asset-Market Effects of Unconventional Monetary Policy: A Cross-Country Comparison", International Finance Discussion Papers, 1101.

Romer, C. D. and D. H. Romer (1989) "Does Monetary Policy Matter? A New Test in the Spirit of Friedman and Schwartz", NBER Macroeconomics Annual 1989 (Cambridge, Mass.: The MIT Press).

Romer, C. D. and D. H. Romer (2004) "A New Measure of Monetary Policy Shocks: Derivation and Implications", *American Economic Review* 94 (September): 1055-84.

Rosa, C. (2016) "Fedspeak: Who Moves U.S. Asset Prices?", *International Journal of Central Banking* December: 223-261.

Rosa, C. (2012) "How "Unconventional" Are Large-Scale Asset Purchases? The Impact of Monetary Policy on Asset Prices", Federal Reserve Bank of New York Staff Report, 560.

Steckler, H., and H. Symington (2016) "Evaluating Qualitative Forecasts: The FOMC Minutes", *International Journal of Forecasting* 32: 59-70.

Sturm, J.-E., and J. De Haan (2011) "Does central bank communication really lead to better forecasts of policy decisions? New evidence based on a Taylor rule model for the ECB", *Review of World Economics* 147: 41-58.

Svensson, L. E. (1994) "Estimating and Interpreting Forward Interest Rates: Sweden 1992-1994", Centre for Economic Policy Research Discussion Paper, 1051.

Swanson, E. T. (2016) "Measuring the Effects of Federal Reserve Forward Guidance and Asset Purchases on Financial Markets", mimeo, 25 March.

Swanson, E. T., and J. C. Williams (2014) "Measuring the Effect of the Zero Lower Bound on Medium and Longer-Term Interest Rates", *American Economic Review* 104(October): 3154-85.

Tsay, R. (2010) *Analysis of Financial Time Series*, Third Edition (New York: John Wiley & Sons).

Van Dijk, D., R. L. Lumsdaine and M. van der Wel (2016) "Market Set-Up in Advanced of Federal Reserve Policy Rate Decisions", *The Economic Journal* 126(592): 618-53.

Williams, J. C. (2013) "Lessons from the Financial Crisis for Unconventional Monetary Policy", panel discussion at the NBER Conference, Boston, 18 October.

Winkelmann, L., M. Bibinger and T. Linzert (2016) "ECB Monetary Policy Surprises: Identification Through Cojumps in Interest Rates", *Journal of Applied Econometrics* 31(4): 613-29.

Wright, J. (2012), "What Does Monetary Policy Do To Long-Term Interest Rates at the Zero Lower Bound", *Economic Journal* 122 (November): F447-F466.

Wu, J. C., and F. D. Xia (2016) "Measuring the Macroeconomic Impact of Monetary Policy At the Zero Lower Bound", *Journal of Money, Credit and Banking* 48(2-3): 253-291.

Yellen, J. (2013) "Communication in Monetary Policy", speech delivered at the Society of American Business Editors and Writers 50th Anniversary Conference, Washington, D.C., 4 April.

Table 1: Description of Variables

Dependent Variable	**Description**	**Source**
Overnight Index Swaps (OIS)	1-year maturity; 2-day log return	Thomson Reuters Datastream
LIBOR-OIS spread	1-year maturity; difference over 2-days	Thomson Reuters Datastream
Sovereign bond spread	10-year – 3-month spread; difference over 2-days	Thomson Reuters Datastream (except Eurozone)[1]
Long-term sovereign bond yield	10-year maturity; 2-day log return	Thomson Reuters Datastream (except Eurozone)[1]
Independent Variable	**Description**	**Source**
US Monetary Policy Surprises	Includes 3 variables: first difference of 1st principal component of US Treasury futures (2-year to 30-year maturity) the day of (1) US FOMC monetary policy statements, (2) US Fed UMP announcements (QE and forward guidance), and (3) US FOMC minutes release.	US Treasury futures: Thomson Reuters Datastream Monetary policy announcement dates: Central bank websites
Monetary Policy Communication Content	All countries: change in the content of monetary policy press statements and, where available, meeting minutes (Japan, Sweden, US and UK).	Central bank websites
Domestic Monetary Policy Announcements	All countries: dummy variable equal to one on the day of monetary policy press statement and, where available, the release of meeting minutes (Japan, Sweden and UK). Eurozone, Japan and UK: dummy variable equal to one on the day of UMP announcements.[2]	Central bank websites
Surprise Macroeconomic Announcements	Difference between the observed value and the most recent forecast, normalized over the sample period. Ten key US macroeconomic announcements are included in all regressions; Eurozone and UK regressions include 5 and 4 key domestic macroeconomic announcements, respectively.	Econoday
Purdah Period	Dummy variable equal to one on dates where the purdah period is active. Practiced in Canada, Eurozone, Japan, Sweden, US and UK.	Central bank website
Lag of Dependent Variable	See dependent variable.	See dependent variable source

[1] Eurozone bond yield and bond spread data is take from the ECB, which issuers with triple-A ratings and uses Svensson (1994) model. We also used the first principle component of asset returns of the major Eurozone economies, our results remained unchanged.

[2] We also included a dummy variable for Canada's forward guidance period, but omitted the variable as it did not have any material impact on the results.

Figure 1: US FOMC Content Variables in Levels

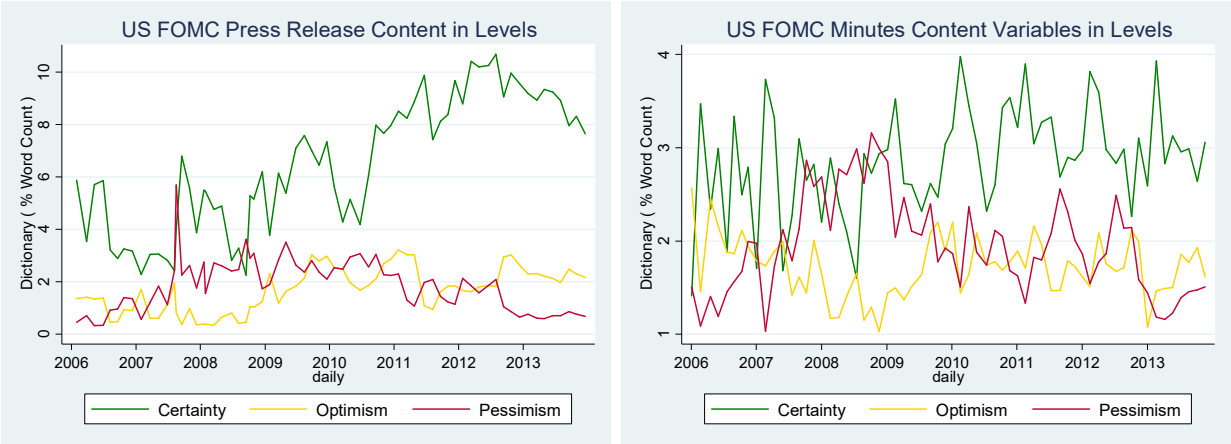

Figure 2: Coefficient Plot Estimates of US FOMC Communication Content (*C*) by sub-sample and group of countries

Note: Plotted are the mean and median (lighter shade) coefficient estimates of θ^{US} for the two groups of countries in our sample. Major advanced economies (AE) include the Eurozone, Japan, Switzerland, United Kingdom and United States. Small-open AE include Australia, Canada, New Zealand, Norway and Sweden.

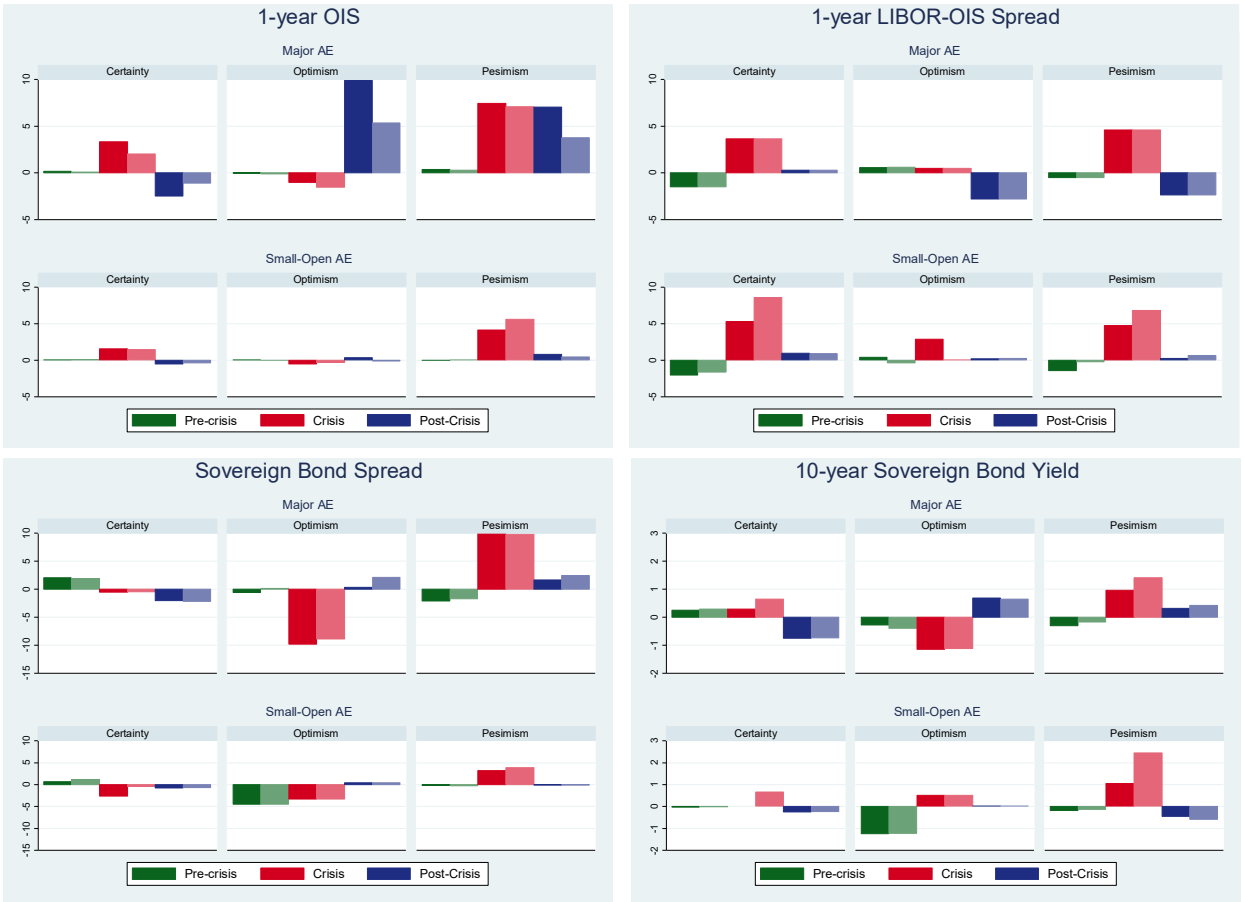

Table 2: Coefficient Estimates of β and θ^{US}

Note: Displayed are the coefficient estimates of β and θ^{US} from specification (2) with standard errors in brackets. *, **, and *** represent statistical significance at the 10%, 5% and 1% level.

a) United States

USA	1y OIS	LIBOR-OIS	Bond Spread	10y Yield	1y OIS	LIBOR-OIS	Bond Spread	10y Yield	1y OIS	LIBOR-OIS	Bond Spread	10y Yield	1y OIS	LIBOR-OIS	Bond Spread	10y Yield
	Pre-Crisis				Crisis				Post-Crisis				Full Sample			
Press Release	-0.02	-0.39***	-0.26	0.01	0.03	-0.63***	0.05	-0.17	-0.26**	0.03	-0.64***	-0.22***	-0.01	-0.04	-0.49***	-0.12***
	(0.03)	(0.14)	(0.21)	(0.04)	(0.18)	(0.15)	(0.45)	(0.11)	(0.11)	(0.02)	(0.14)	(0.06)	(0.05)	(0.03)	(0.10)	(0.03)
UMP Announcement					-0.07	-0.08	-0.87**	-0.28**	-0.01	0.00	0.16	0.04	-0.03	0.02	0.13	-0.01
					(0.21)	(0.17)	(0.40)	(0.11)	(0.14)	(0.03)	(0.18)	(0.07)	(0.06)	(0.03)	(0.12)	(0.04)
Minutes Release	-0.08*	0.15	-0.44	-0.33***	0.13	-0.28*	2.47	0.72	0.12	0.00	-0.40**	-0.14*	0.04	-0.03	-0.29**	-0.12***
	(0.05)	(0.19)	(0.37)	(0.07)	(0.20)	(0.16)	(1.58)	(0.45)	(0.12)	(0.02)	(0.19)	(0.08)	(0.06)	(0.03)	(0.14)	(0.04)
PR: Certainty	-0.06	-2.20*	-0.61	0.29	-1.72	9.43***	-2.04	-0.99	1.02	-0.46**	-2.24*	-0.74	-0.20	-0.59**	-2.36***	-0.20
	(0.29)	(1.20)	(1.64)	(0.31)	(2.31)	(1.85)	(7.52)	(1.50)	(0.95)	(0.19)	(1.17)	(0.47)	(0.47)	(0.24)	(0.89)	(0.28)
PR: Optimism	0.16	0.78	-7.31**	-0.55	-2.24	2.39	-13.93	0.04	5.34**	-1.16**	3.67	1.44	0.44	0.41	-0.71	-0.14
	(0.67)	(2.80)	(3.68)	(0.69)	(5.32)	(4.26)	(12.22)	(2.88)	(2.53)	(0.50)	(3.14)	(1.27)	(1.09)	(0.57)	(2.02)	(0.64)
PR: Pessimism	0.17	-0.63	-6.02***	-0.03	1.03	16.09***	20.31**	-1.54	-0.47	0.00	3.34	0.42	0.68	1.35***	2.51*	-0.12
	(0.30)	(1.25)	(1.73)	(0.33)	(4.03)	(3.22)	(8.63)	(2.94)	(2.69)	(0.53)	(3.33)	(1.34)	(0.68)	(0.36)	(1.29)	(0.41)
Minutes: Certainty	0.24	1.00	0.10	-0.72	-1.21	11.59*	-190.67*	-58.66**	-2.69	0.34	2.83	1.11	-0.47	0.28	1.21	0.46
	(0.48)	(2.00)	(3.50)	(0.66)	(8.32)	(6.71)	(103.97)	(29.36)	(1.79)	(0.36)	(2.98)	(1.21)	(0.91)	(0.47)	(2.21)	(0.71)
Minutes: Optimism	1.52	1.80	14.39*	-0.52	9.75	-18.92**	36.51	11.80*	-0.08	-0.01	1.82	1.19	0.90	-0.48	6.40	1.05
	(1.27)	(5.31)	(8.07)	(1.52)	(10.76)	(8.65)	(22.27)	(6.32)	(2.84)	(0.56)	(5.51)	(2.23)	(1.77)	(0.92)	(4.24)	(1.36)
Minutes: Pessimism	0.59	-1.67	-3.02	-0.63	-0.62	14.73**	43.96	12.82	2.19	-0.50	-1.18	-0.01	0.53	-2.15**	1.57	1.15
	(1.05)	(4.39)	(7.15)	(1.35)	(8.31)	(6.70)	(29.27)	(8.25)	(3.06)	(0.61)	(4.27)	(1.73)	(1.67)	(0.87)	(3.64)	(1.16)
N	468	468	402	402	218	218	186	186	886	886	745	748	1,572	1,572	1,335	1,338
R^2 Adjusted	0.48	0.00	0.38	0.28	0.30	0.54	0.42	0.28	0.25	0.23	0.28	0.28	0.29	0.10	0.36	0.29

b) Eurozone

EUR	1y OIS	LIBOR-OIS	Bond Spread	10y Yield	1y OIS	LIBOR-OIS	Bond Spread	10y Yield	1y OIS	LIBOR-OIS	Bond Spread	10y Yield	1y OIS	LIBOR-OIS	Bond Spread	10y Yield	1y OIS	LIBOR-OIS	Bond Spread	10y Yield
	Pre-Crisis				GF Crisis				EZ Crisis				Post-Crisis				Full Sample			
Press Release	0.00	-0.02	-0.14	-0.01	0.09	-0.13	-0.62**	-0.08*	-0.22*	0.14*	-0.29**	-0.11**	-0.28**	0.10**	-0.34***	-0.14***	-0.02	-0.01	-0.17**	-0.04**
	(0.02)	(0.07)	(0.11)	(0.02)	(0.12)	(0.15)	(0.27)	(0.04)	(0.12)	(0.07)	(0.14)	(0.04)	(0.14)	(0.05)	(0.11)	(0.04)	(0.05)	(0.04)	(0.07)	(0.02)
UMP Announce.					-0.16	0.19	0.20	-0.05	0.01	0.00	-0.09	-0.04	0.02	0.04	-0.06	-0.02	0.02	0.00	-0.08	-0.04
					(0.13)	(0.17)	(0.25)	(0.05)	(0.13)	(0.08)	(0.16)	(0.05)	(0.16)	(0.06)	(0.13)	(0.05)	(0.05)	(0.04)	(0.08)	(0.02)
Minutes Release	-0.01	0.02	-0.47*	-0.10**	0.17	-0.23	-0.15	-0.03	0.06	0.01	-0.19	-0.04	-0.21	0.03	-0.22*	-0.05	-0.07	0.05	-0.22**	-0.06**
	(0.03)	(0.10)	(0.26)	(0.04)	(0.13)	(0.16)	(0.23)	(0.05)	(0.13)	(0.08)	(0.16)	(0.05)	(0.14)	(0.05)	(0.12)	(0.04)	(0.05)	(0.04)	(0.09)	(0.02)
PR: Certainty	0.10	-0.83	5.02***	0.16	2.03	-2.16	2.08	0.94*	-1.18	1.07*	-0.81	-0.48	-1.09	1.06**	-0.78	-0.57*	-0.12	-0.21	1.02	0.12
	(0.16)	(0.61)	(1.16)	(0.19)	(1.51)	(1.90)	(4.64)	(0.53)	(0.94)	(0.57)	(1.12)	(0.35)	(1.15)	(0.42)	(0.93)	(0.33)	(0.41)	(0.33)	(0.69)	(0.17)
PR: Optimism	-0.12	0.39	4.39	-0.30	0.74	-1.40	-3.91	-1.50	1.97	-4.43***	1.89	0.10	1.47	-4.38***	2.33	0.54	-0.97	0.82	-0.19	-0.32
	(0.37)	(1.43)	(2.66)	(0.45)	(3.54)	(4.38)	(7.63)	(1.23)	(2.46)	(1.50)	(2.92)	(0.92)	(3.11)	(1.11)	(2.47)	(0.88)	(0.97)	(0.78)	(1.53)	(0.40)
PR: Pessimism	0.27*	-0.44	0.88	0.03	7.09***	-6.88**	2.33	1.80*	2.19	-3.71**	-1.55	-0.48	3.77	-4.77***	-0.38	-0.32	0.65	-0.85*	-0.32	0.00
	(0.16)	(0.63)	(0.97)	(0.20)	(2.62)	(3.27)	(5.32)	(0.92)	(2.55)	(1.56)	(3.04)	(0.96)	(3.28)	(1.18)	(2.63)	(0.94)	(0.60)	(0.48)	(0.89)	(0.25)
Minutes: Certainty	0.49*	-1.95*	2.17	0.09	2.65	-1.97	-1.34	-0.52	-0.03	0.18	1.88	0.22	-2.64	0.55	-0.33	-0.57	-1.07	-0.19	0.73	-0.07
	(0.28)	(1.09)	(2.70)	(0.37)	(5.50)	(6.78)	(9.69)	(1.95)	(2.49)	(1.52)	(2.96)	(0.94)	(2.17)	(0.79)	(1.84)	(0.66)	(0.83)	(0.67)	(1.43)	(0.36)
Minutes: Optimism	0.41	0.58	10.50**	0.83	-18.38**	18.87**	10.63	2.41	-0.23	0.89	1.48	-0.69	-3.89	0.33	0.18	-0.92	-3.31**	1.22	2.53	-0.09
	(0.70)	(2.72)	(4.90)	(0.91)	(7.17)	(8.81)	(12.65)	(2.56)	(3.60)	(2.20)	(4.29)	(1.36)	(3.42)	(1.25)	(3.30)	(1.18)	(1.57)	(1.26)	(2.63)	(0.72)
Minutes: Pessimism	0.54	-3.05	5.99	0.41	-2.22	5.75	-1.55	-0.20	-0.61	-0.01	7.74*	2.64*	0.77	0.72	3.53	0.47	-0.89	-0.10	3.45	0.30
	(0.59)	(2.29)	(5.05)	(0.80)	(5.53)	(6.87)	(9.87)	(1.96)	(3.17)	(1.94)	(4.29)	(1.35)	(3.69)	(1.35)	(3.31)	(1.18)	(1.49)	(1.20)	(2.48)	(0.66)
N	465	465	326	441	218	218	203	204	593	595	571	571	882	886	843	843	1,565	1,569	1,372	1,488
R^2 Adjusted	0.4	0.1	0.31	0.3	0.35	0.36	0.35	0.35	0.63	0.34	0.3	0.38	0.55	0.37	0.31	0.37	0.7	0.29	0.34	0.38

c) United Kingdom

GBR	10y Yield	10y Yield	Bond Spread	10y Yield	Bond Spread	10y Yield
	Pre-crisis	Crisis	Post-Crisis		Full Sample	
Press Release	0.02	-0.02	-0.33**	-0.12**	-0.32**	-0.05*
	(0.02)	(0.09)	(0.16)	(0.06)	(0.15)	(0.03)
UMP Announcement		-0.10	-0.12	-0.18**	0.19	-0.16***
		(0.08)	(0.27)	(0.08)	(0.21)	(0.03)
Minutes Release	-0.11*	-0.03	-0.40**	-0.14**	-0.25*	-0.14***
	(0.05)	(0.09)	(0.18)	(0.06)	(0.15)	(0.04)
PR: Certainty	0.10	0.65	-3.62**	-0.85*	-2.84*	0.04
	(0.21)	(1.32)	(1.67)	(0.44)	(1.48)	(0.23)
PR: Optimism	-0.39	-1.13	-4.60	0.64	-7.89**	-0.59
	(0.48)	(2.51)	(5.34)	(1.19)	(3.21)	(0.53)
PR: Pessimism	-0.18	1.41	4.76	0.54	-3.11	-0.26
	(0.21)	(2.01)	(3.92)	(1.27)	(2.00)	(0.33)
Minutes: Certainty	0.52	1.05	-3.72	-0.45	-2.42	-0.06
	(0.70)	(3.86)	(2.42)	(0.90)	(2.53)	(0.61)
Minutes: Optimism	0.45	8.73	-3.47	-2.87*	-1.44	-1.11
	(1.09)	(6.13)	(4.83)	(1.59)	(4.87)	(1.05)
Minutes: Pessimism	1.02	-0.48	-5.36	-0.04	-7.40*	-0.27
	(1.17)	(4.72)	(5.02)	(1.67)	(4.26)	(1.00)
N	419	197	509	800	672	1,417
R^2 Adjusted	0.3	0.25	0.31	0.32	0.3	0.34

d) Japan

JPN	Bond Spread	10y Yield	Bond Spread	10y Yield	Bond Spread	10y Yield	Bond Spread	10y Yield
	Pre-Crisis		Crisis		Post-Crisis		Full Sample	
Press Release	-0.04	-0.05	0.14*	-0.04	-0.02	-0.04	0.03	-0.03
	(0.08)	(0.05)	(0.08)	(0.05)	(0.06)	(0.05)	(0.04)	(0.03)
UMP Announcement			-0.17*	-0.05	-0.07	-0.07	-0.07	-0.05
			(0.09)	(0.06)	(0.10)	(0.06)	(0.05)	(0.03)
Minutes Release	-0.17	-0.12*	0.04	-0.03	-0.03	-0.01	-0.03	-0.05
	(0.12)	(0.07)	(0.09)	(0.06)	(0.08)	(0.05)	(0.05)	(0.03)
PR: Certainty	-0.23	-0.37	-1.23***	-0.41	-0.16	0.07	-0.17	-0.01
	(1.23)	(0.75)	(0.46)	(0.30)	(0.23)	(0.14)	(0.18)	(0.11)
PR: Optimism	2.03	1.86	0.29	2.32	0.98**	0.36	1.11**	0.40
	(4.70)	(2.88)	(2.26)	(1.47)	(0.48)	(0.32)	(0.49)	(0.29)
PR: Pessimism	0.44	-0.06	-3.83***	-0.92	-0.05	0.09	-0.76*	0.03
	(2.94)	(1.81)	(1.15)	(0.75)	(0.61)	(0.36)	(0.44)	(0.26)
Minutes: Certainty	-0.16	-0.63	-0.56	-0.32	1.45	0.07	0.46	-0.06
	(2.01)	(1.23)	(0.98)	(0.64)	(0.91)	(0.53)	(0.64)	(0.39)
Minutes: Optimism	3.84	1.87	0.55	-0.26	3.46	0.35	2.21	0.44
	(4.58)	(2.81)	(3.89)	(2.55)	(2.42)	(1.58)	(1.88)	(1.18)
Minutes: Pessimism	-1.49	-0.74	-1.06	-1.05	-0.47	-0.63	-0.71	-0.75
	(3.57)	(2.20)	(2.20)	(1.43)	(1.83)	(1.07)	(1.34)	(0.79)
N	450	456	218	218	524	877	1,192	1,551
R^2 Adjusted	0.21	0.2	0.41	0.31	0.26	0.32	0.27	0.3

e) Switzerland

CHE	1y OIS	Bond Spread	10y Yield	1y OIS	Bond Spread	10y Yield	1y OIS	Bond Spread	10y Yield	1y OIS	Bond Spread	10y Yield
	Pre-Crisis			Crisis			Post-Crisis			Full Sample		
Press Release	0.02	-0.07	-0.05	0.32	-1.77***	-0.05	-0.41	-0.38***	-0.23***	-0.20***	-0.30***	-0.03
	(0.03)	(0.12)	(0.03)	(0.37)	(0.51)	(0.07)	(0.31)	(0.14)	(0.08)	(0.07)	(0.09)	(0.03)
UMP Announcement				-1.07**	1.39**	-0.05	-0.04	-0.41**	-0.16*	-0.09	0.15	-0.05
				(0.42)	(0.57)	(0.08)	(0.46)	(0.17)	(0.09)	(0.09)	(0.11)	(0.04)
Minutes Release	-0.02	-0.21	-0.10*	0.20	0.52	-0.34***	-0.03	-0.28*	-0.02	-0.07	-0.30***	-0.07*
	(0.04)	(0.24)	(0.05)	(0.41)	(0.55)	(0.07)	(0.36)	(0.15)	(0.08)	(0.09)	(0.11)	(0.04)
PR: Certainty	0.43*	3.65***	0.36	9.65**	-3.67	0.02	-7.41***	-3.39***	-1.35**	0.07	0.81	-0.20
	(0.26)	(1.11)	(0.26)	(4.71)	(6.45)	(0.85)	(2.85)	(1.17)	(0.65)	(0.68)	(0.82)	(0.30)
PR: Optimism	-0.12	-0.18	-0.61	-1.55	-20.01	-2.14	22.89***	2.11	2.76	-1.65	-2.55	-0.27
	(0.60)	(2.59)	(0.60)	(10.96)	(14.97)	(1.97)	(6.26)	(3.12)	(1.73)	(1.50)	(1.92)	(0.70)
PR: Pessimism	0.70***	-2.52**	-0.81***	14.14*	17.22	1.18	17.85**	2.46	2.64	0.36	-3.37***	-0.27
	(0.27)	(1.16)	(0.27)	(8.17)	(11.16)	(1.48)	(7.34)	(3.30)	(1.84)	(0.89)	(1.19)	(0.43)
Minutes: Certainty	-0.10	1.36	0.38	27.73	-0.79	-5.39*	-4.12	-1.87	-1.44	0.07	-0.90	-0.03
	(0.50)	(1.91)	(0.44)	(17.13)	(23.15)	(3.11)	(7.14)	(2.20)	(1.23)	(1.49)	(1.59)	(0.58)
Minutes: Optimism	-0.77	-0.93	0.04	-33.23	-92.43***	12.34***	-24.34**	1.06	-0.90	-1.23	-1.02	-0.22
	(1.15)	(5.14)	(1.18)	(22.57)	(29.86)	(4.02)	(10.10)	(3.49)	(1.94)	(2.79)	(3.10)	(1.13)
Minutes: Pessimism	-0.94	1.53	-0.08	6.14	7.83	-1.42	-5.55	-3.94	-1.00	-1.17	-1.69	0.12
	(1.05)	(4.09)	(0.94)	(17.17)	(23.13)	(3.11)	(8.11)	(3.75)	(2.09)	(2.44)	(2.92)	(1.06)
N	455	467	467	218	218	218	419	886	886	1,092	1,572	1,572
R^2 Adjusted	0.31	0.16	0.54	0.11	0.18	0.41	0.54	0.09	0.27	0.71	0.1	0.34

f) Australia

AUS	1y OIS	LIBOR-OIS	10y Yield	1y OIS	LIBOR-OIS	10y Yield	1y OIS	LIBOR-OIS	10y Yield	1y OIS	LIBOR-OIS	10y Yield
	Pre-Crisis			Crisis			Post-Crisis			Full Sample		
Press Release	0.01	-0.07	-0.14***	-0.12	0.00	-0.23	-0.05	0.02	-0.12***	-0.02	0.06	-0.09***
	(0.01)	(0.09)	(0.02)	(0.07)	(0.23)	(0.40)	(0.03)	(0.11)	(0.04)	(0.02)	(0.06)	(0.02)
UMP Announcement				0.03	-0.23	-0.04	0.02	-0.01	-0.05	0.01	-0.09	-0.04
				(0.08)	(0.25)	(0.08)	(0.04)	(0.13)	(0.05)	(0.02)	(0.07)	(0.02)
Minutes Release	-0.02	0.13	-0.08*	0.18**	-0.44*	-0.07	-0.01	0.05	-0.10**	-0.03	0.06	-0.08***
	(0.02)	(0.13)	(0.04)	(0.08)	(0.24)	(0.07)	(0.03)	(0.10)	(0.04)	(0.02)	(0.07)	(0.03)
PR: Certainty	0.12	-3.10***	-0.17	1.34	8.59***	-2.86	-0.37	0.80	-0.22	-0.08	-0.19	-0.03
	(0.11)	(0.81)	(0.19)	(0.91)	(2.87)	(8.58)	(0.25)	(0.83)	(0.35)	(0.14)	(0.54)	(0.19)
PR: Optimism	0.14	2.28	-0.92**	0.08	10.88*	1.20	-0.13	0.25	-0.30	0.18	0.19	-0.41
	(0.26)	(1.90)	(0.45)	(2.05)	(6.45)	(5.67)	(0.68)	(2.22)	(0.89)	(0.32)	(1.28)	(0.44)
PR: Pessimism	0.00	0.39	-0.34	0.79	6.81	-3.98	0.08	1.19	-0.13	-0.03	2.02**	0.03
	(0.11)	(0.84)	(0.21)	(1.55)	(4.94)	(13.01)	(0.72)	(2.33)	(1.01)	(0.20)	(0.78)	(0.27)
Minutes: Certainty	-0.05	1.07	-0.14	10.26***	-26.70***	-0.05	0.34	0.10	-0.93	0.02	0.33	-0.54
	(0.18)	(1.35)	(0.37)	(3.30)	(10.21)	(3.03)	(0.48)	(1.55)	(0.63)	(0.27)	(1.05)	(0.38)
Minutes: Optimism	0.15	2.83	1.08	-9.75**	13.07	0.02	-0.91	0.10	-0.72	-0.37	1.78	-0.06
	(0.48)	(3.58)	(0.92)	(4.19)	(13.14)	(3.97)	(0.76)	(2.51)	(1.13)	(0.53)	(2.08)	(0.77)
Minutes: Pessimism	0.02	1.28	-0.24	1.32	-11.25	-0.17	1.17	4.48*	-0.92	0.31	0.87	-0.77
	(0.40)	(2.96)	(0.80)	(3.43)	(10.46)	(3.09)	(0.82)	(2.65)	(1.13)	(0.50)	(1.94)	(0.70)
N	468	468	424	215	215	197	886	765	802	1,569	1,448	1,424
R^2 Adjusted	0.13	0.16	0.34	0.49	0.41	0.14	0.34	0.29	0.28	0.42	0.29	0.28

g) Canada

CAN	1y OIS	LIBOR-OIS	Bond Spread	10y Yield	1y OIS	LIBOR-OIS	Bond Spread	10y Yield	1y OIS	LIBOR-OIS	Bond Spread	10y Yield	1y OIS	LIBOR-OIS	Bond Spread	10y Yield
	Pre-Crisis				Crisis				Post-Crisis				Full Sample			
Press Release	0.06	-0.17	-0.33***	-0.04	0.13	0.17	-0.30	-0.05	-0.14**	0.18**	-0.36**	-0.14***	0.00	0.06	-0.25***	-0.05**
	(0.05)	(0.21)	(0.12)	(0.03)	(0.17)	(0.12)	(0.25)	(0.06)	(0.06)	(0.07)	(0.14)	(0.05)	(0.04)	(0.05)	(0.08)	(0.02)
UMP Announcement					-0.26	-0.05	-0.07	-0.10	-0.01	-0.02	0.09	0.03	-0.04	-0.05	0.04	-0.04
					(0.19)	(0.13)	(0.28)	(0.07)	(0.07)	(0.08)	(0.16)	(0.06)	(0.04)	(0.06)	(0.09)	(0.03)
Minutes Release	-0.04	-0.14	0.18	-0.07	-0.08	1.06***	2.27	1.15*	-0.18***	0.19***	-0.45**	-0.04	-0.16***	0.12*	-0.18	-0.04
	(0.11)	(0.43)	(0.29)	(0.06)	(0.18)	(0.13)	(2.72)	(0.68)	(0.06)	(0.07)	(0.18)	(0.06)	(0.05)	(0.07)	(0.12)	(0.03)
PR: Certainty	0.65	-1.64	-1.35	-0.19	0.32	-2.95*	0.23	0.66	-1.30***	1.21**	-2.50**	-0.45	-1.30***	0.93*	-1.37*	-0.18
	(0.68)	(2.74)	(1.35)	(0.28)	(2.13)	(1.51)	(3.11)	(0.77)	(0.47)	(0.55)	(1.12)	(0.37)	(0.35)	(0.50)	(0.76)	(0.22)
PR: Optimism	-0.02	-0.57	-4.54	-1.57**	-1.43	-2.25	-3.38	-0.17	1.52	-0.70	0.44	0.36	0.21	0.89	-1.40	-0.09
	(1.46)	(5.90)	(3.24)	(0.66)	(4.93)	(3.45)	(7.18)	(1.78)	(1.25)	(1.45)	(2.76)	(0.99)	(0.87)	(1.27)	(1.76)	(0.51)
PR: Pessimism	-0.12	-4.50	-1.11	-0.58**	5.64	-7.17***	7.48	2.45*	2.43*	-1.07	1.72	-0.72	1.91***	-2.97***	-0.38	-0.19
	(0.83)	(3.35)	(1.21)	(0.24)	(3.70)	(2.60)	(5.43)	(1.35)	(1.33)	(1.52)	(3.24)	(1.06)	(0.60)	(0.86)	(1.05)	(0.31)
Minutes: Certainty	-0.38	3.07	2.20	0.49	-13.35*	0.91	-136.03	-77.88*	0.04	-0.71	0.97	0.94	-0.11	0.00	0.75	0.80*
	(1.25)	(5.08)	(2.16)	(0.44)	(7.72)	(5.41)	(177.35)	(44.09)	(0.89)	(1.02)	(2.98)	(0.93)	(0.77)	(1.10)	(1.63)	(0.47)
Minutes: Optimism	1.89	-7.10	2.37	1.43	21.64**	-12.73*	29.76	15.64*	-1.21	1.20	7.39	0.92	0.53	-2.69	5.17	1.24
	(2.05)	(8.28)	(5.80)	(1.19)	(9.96)	(7.02)	(34.99)	(8.69)	(1.40)	(1.64)	(6.02)	(1.78)	(1.25)	(1.80)	(3.82)	(1.02)
Minutes: Pessimism	-1.44	9.74	7.22	0.07	-10.29	-18.86***	5.73	10.88**	-0.35	-1.93	3.07	0.81	-0.52	1.06	3.52	1.22
	(1.90)	(7.71)	(5.37)	(1.10)	(7.70)	(5.41)	(21.81)	(5.47)	(1.51)	(1.73)	(4.74)	(1.50)	(1.21)	(1.72)	(3.32)	(0.94)
N	282	282	402	404	218	218	187	187	886	765	576	763	1,386	1,265	1,166	1,355
R^2 Adjusted	0.33	0.19	0.26	0.29	0.37	0.61	0.38	0.29	0.45	0.3	0.2	0.28	0.5	0.35	0.27	0.29

h) New Zealand

NZL	1y OIS	LIBOR-OIS	Bond Spread	10y Yield	1y OIS	LIBOR-OIS	Bond Spread	10y Yield	1y OIS	LIBOR-OIS	Bond Spread	10y Yield	1y OIS	LIBOR-OIS	Bond Spread	10y Yield
	Pre-Crisis				Crisis				Post-Crisis				Full Sample			
Press Release	0.00	-0.14**	-0.37***	-0.09***	-0.02	0.10	-0.33	-0.01	-0.03	0.04	-0.19*	-0.03	-0.01	-0.14***	-0.26***	-0.04***
	(0.01)	(0.07)	(0.11)	(0.02)	(0.05)	(0.24)	(0.27)	(0.04)	(0.02)	(0.07)	(0.11)	(0.02)	(0.01)	(0.04)	(0.07)	(0.01)
UMP Announcement					-0.03	0.26	0.06	-0.04	-0.01	-0.01	-0.02	-0.01	0.00	0.10*	0.05	-0.02
					(0.06)	(0.23)	(0.31)	(0.05)	(0.03)	(0.08)	(0.14)	(0.03)	(0.01)	(0.05)	(0.09)	(0.01)
Minutes Release	0.00	-0.02	0.16	-0.02	0.09*	-0.13	-0.21	0.03	-0.02	0.03	-0.17	-0.07***	-0.01	0.02	-0.14	-0.05***
	(0.01)	(0.10)	(0.16)	(0.02)	(0.06)	(0.22)	(0.30)	(0.05)	(0.02)	(0.07)	(0.12)	(0.02)	(0.01)	(0.05)	(0.09)	(0.01)
PR: Certainty	0.11	-1.31**	1.50	-0.02	1.48**	10.32***	-0.52	-0.23	-0.16	0.92*	-1.15	-0.23	0.15	-0.45	-0.19	0.03
	(0.07)	(0.61)	(1.00)	(0.14)	(0.64)	(3.07)	(3.45)	(0.53)	(0.18)	(0.55)	(0.97)	(0.18)	(0.09)	(0.40)	(0.66)	(0.11)
PR: Optimism	-0.03	-0.41	-1.07	-0.89***	-0.33	0.07	0.96	-1.48	-0.25	1.14	-2.41	-0.47	-0.16	0.44	0.04	-0.47*
	(0.17)	(1.42)	(2.34)	(0.32)	(1.46)	(5.89)	(7.90)	(1.21)	(0.47)	(1.46)	(2.59)	(0.49)	(0.22)	(0.94)	(1.54)	(0.26)
PR: Pessimism	-0.01	-0.23	3.28***	-0.12	1.48	14.60**	2.90	-0.83	0.04	0.68	-1.75	-0.29	-0.02	-0.78	1.97**	0.01
	(0.08)	(0.64)	(1.04)	(0.14)	(1.10)	(6.02)	(5.99)	(0.91)	(0.49)	(1.52)	(2.72)	(0.52)	(0.14)	(0.58)	(0.96)	(0.16)
Minutes: Certainty	0.24*	-1.41	0.81	0.32	-1.03	2.29	-5.87	-2.76	-0.23	0.29	-1.95	-0.44	0.09	-0.35	-1.08	-0.10
	(0.12)	(1.01)	(1.67)	(0.23)	(2.31)	(9.04)	(12.54)	(1.93)	(0.33)	(1.10)	(1.81)	(0.35)	(0.18)	(0.80)	(1.28)	(0.22)
Minutes: Optimism	-0.22	5.06*	-0.30	0.17	1.18	-8.85	-8.47	0.75	-0.80	1.65	-4.33	-0.54	-0.57	1.43	-3.81	-0.33
	(0.32)	(2.69)	(4.45)	(0.61)	(2.98)	(11.65)	(16.27)	(2.47)	(0.52)	(1.63)	(2.88)	(0.55)	(0.36)	(1.52)	(2.49)	(0.42)
Minutes: Pessimism	0.52*	-4.21*	6.28*	0.82	-3.22	9.03	10.89	-1.73	0.21	0.08	1.24	0.17	0.26	-0.09	3.65	0.38
	(0.27)	(2.22)	(3.70)	(0.51)	(2.32)	(9.05)	(12.42)	(1.91)	(0.56)	(1.76)	(3.09)	(0.59)	(0.34)	(1.43)	(2.35)	(0.40)
N	462	462	468	468	217	217	218	218	886	712	870	870	1,566	1,392	1,556	1,556
R^2 Adjusted	0.34	0.15	0.6	0.46	0.42	0.38	0.34	0.38	0.36	0.39	0.39	0.48	0.43	0.37	0.49	0.48

i) Norway

NOR	1y OIS	Bond Spread	10y Yield	1y OIS	Bond Spread	10y Yield	1y OIS	Bond Spread	10y Yield	1y OIS	Bond Spread	10y Yield
	Pre-Crisis			Crisis			Post-Crisis			Full Sample		
Press Release	-0.01	-0.86***	-0.02	0.13**	1.45***	0.04	-0.07***	0.07	-0.05	-0.04**	0.02	-0.02
	(0.02)	(0.16)	(0.02)	(0.06)	(0.35)	(0.05)	(0.03)	(0.12)	(0.03)	(0.01)	(0.08)	(0.02)
UMP Announcement				-0.23***	-0.01	-0.15***	-0.04	-0.25*	-0.04	-0.04**	-0.11	-0.05**
				(0.07)	(0.31)	(0.05)	(0.03)	(0.15)	(0.04)	(0.02)	(0.10)	(0.02)
Minutes Release	-0.05**	-0.69***	-0.09***	-0.02	0.46	0.06	-0.02	-0.18	-0.06*	-0.03*	-0.25***	-0.05***
	(0.02)	(0.23)	(0.03)	(0.06)	(0.29)	(0.05)	(0.03)	(0.13)	(0.03)	(0.02)	(0.10)	(0.02)
PR: Certainty	-0.18	1.70	0.06	2.30***	-10.07**	1.39**	0.07	0.63	0.10	-0.13	1.05	0.13
	(0.15)	(1.46)	(0.18)	(0.76)	(4.38)	(0.60)	(0.22)	(1.03)	(0.28)	(0.13)	(0.75)	(0.15)
PR: Optimism	-0.45	-0.13	-0.60	3.21	-3.34	1.06	-0.47	4.07	-0.14	-0.64**	1.58	-0.37
	(0.36)	(3.39)	(0.42)	(1.99)	(9.45)	(1.56)	(0.59)	(2.81)	(0.76)	(0.30)	(1.76)	(0.35)
PR: Pessimism	0.09	-3.11**	0.12	5.63***	-2.55	3.86***	0.48	-1.60	-0.58	0.18	-1.68	0.25
	(0.16)	(1.50)	(0.19)	(1.35)	(8.85)	(1.07)	(0.62)	(2.92)	(0.79)	(0.19)	(1.09)	(0.22)
Minutes: Certainty	0.16	2.34	0.08	-0.87	1.70	0.82	-0.19	-0.49	-0.39	0.04	0.96	-0.15
	(0.26)	(2.44)	(0.30)	(2.72)	(12.14)	(2.15)	(0.41)	(1.93)	(0.52)	(0.25)	(1.45)	(0.29)
Minutes: Optimism	0.34	-12.09*	-0.09	2.08	-3.59	-0.59	0.37	-1.84	-0.72	0.29	-2.62	-0.56
	(0.68)	(6.42)	(0.80)	(3.50)	(15.66)	(2.76)	(0.64)	(3.05)	(0.83)	(0.49)	(2.83)	(0.56)
Minutes: Pessimism	0.07	6.41	0.08	-4.84*	-15.76	-2.63	0.24	1.71	-0.55	0.18	2.96	-0.40
	(0.56)	(5.29)	(0.66)	(2.73)	(12.12)	(2.17)	(0.69)	(3.29)	(0.89)	(0.46)	(2.67)	(0.53)
N	468	468	468	218	217	218	886	886	886	1,571	1,572	1,572
R^2 Adjusted	0.28	0.35	0.32	0.4	0.48	0.32	0.4	0.49	0.56	0.42	0.49	0.54

j) Sweden

SWE	1y OIS	Bond Spread	10y Yield	1y OIS	Bond Spread	10y Yield	1y OIS	Bond Spread	10y Yield	1y OIS	Bond Spread	10y Yield
	Pre-Crisis			Crisis			Post-Crisis			Full Sample		
Press Release	-0.04**	-0.01	-0.01	0.02	-0.09	0.01	-0.18***	-0.22*	-0.16***	-0.08***	-0.08	-0.07***
	(0.02)	(0.10)	(0.02)	(0.16)	(0.29)	(0.07)	(0.05)	(0.13)	(0.05)	(0.03)	(0.07)	(0.02)
UMP Announcement				-0.25	-0.23	-0.19***	0.03	-0.19	-0.04	0.09***	-0.22**	-0.15***
				(0.16)	(0.26)	(0.07)	(0.06)	(0.16)	(0.06)	(0.03)	(0.09)	(0.03)
Minutes Release	-0.08	-0.28*	-0.07*	-0.07	-0.56**	0.07	-0.07	0.06	0.00	-0.05	-0.16*	-0.01
	(0.06)	(0.15)	(0.04)	(0.15)	(0.24)	(0.07)	(0.06)	(0.14)	(0.05)	(0.04)	(0.09)	(0.03)
PR: Certainty	-0.39**	0.80	0.07	2.34	-0.46	1.03	-0.92**	-0.41	-0.44	-0.66***	0.18	0.01
	(0.16)	(0.91)	(0.21)	(2.44)	(4.84)	(1.03)	(0.44)	(1.09)	(0.43)	(0.25)	(0.66)	(0.21)
PR: Optimism	-0.73*	-0.65	-0.35	-3.84	-4.88	-2.06	-0.80	-0.12	-0.11	-1.73***	-0.11	-0.19
	(0.40)	(2.13)	(0.49)	(4.49)	(7.93)	(1.91)	(1.18)	(2.93)	(1.15)	(0.59)	(1.53)	(0.49)
PR: Pessimism	-0.12	0.38	0.05	7.17**	4.80	3.77***	1.11	1.42	-0.59	-0.02	1.36	0.14
	(0.18)	(0.95)	(0.22)	(3.27)	(5.51)	(1.38)	(1.26)	(3.11)	(1.22)	(0.37)	(0.95)	(0.31)
Minutes: Certainty	-0.33	-0.95	-0.31	4.47	4.05	-0.95	-1.09	-1.63	-0.26	-0.69	-0.92	-0.32
	(0.39)	(1.52)	(0.35)	(6.48)	(10.19)	(2.75)	(0.86)	(2.04)	(0.80)	(0.57)	(1.27)	(0.41)
Minutes: Optimism	-0.42	2.24	0.37	-9.39	0.73	2.67	-3.23**	-5.42*	-2.16*	-2.39**	-2.41	-0.94
	(0.95)	(4.05)	(0.94)	(8.31)	(13.07)	(3.53)	(1.54)	(3.23)	(1.27)	(1.09)	(2.48)	(0.79)
Minutes: Pessimism	0.12	-1.30	-0.46	-6.28	6.77	-3.45	-0.26	-0.10	0.22	-0.78	-0.74	-0.69
	(0.85)	(3.38)	(0.78)	(6.56)	(10.30)	(2.77)	(1.41)	(3.48)	(1.36)	(0.95)	(2.34)	(0.75)
N	342	468	468	211	217	218	868	886	886	1,422	1,572	1,572
R^2 Adjusted	0.4	0.31	0.3	0.36	0.39	0.43	0.37	0.29	0.45	0.49	0.34	0.48