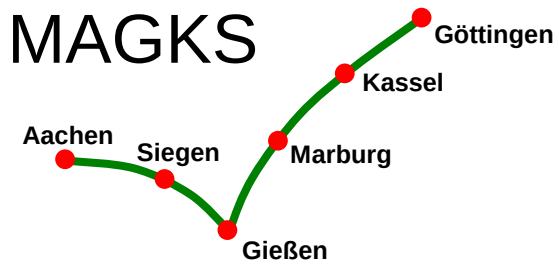

Joint Discussion Paper Series in Economics

by the Universities of

Aachen · Gießen · Göttingen
Kassel · Marburg · Siegen

ISSN 1867-3678

No. 08-2008

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Financial Market Reaction to Federal Reserve Communications: Does the Crisis Make a Difference?

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This version: 30 January 2012

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We thank Ari Belasen, Michael Ehrmann, Michael Lamla, participants of the Annual Conference of the Eastern Economic Association in New York, the Verein für Socialpolitik in Graz, MAREM workshop in Bonn, and research seminars at the Universities of FU Berlin, UL Brussels, Cardiff, Duisburg-Essen, and Marburg for their helpful comments on earlier versions of the paper. The usual disclaimer applies.

Financial Market Reaction to Federal Reserve Communications: Does the Crisis Make a Difference?

Abstract

This paper studies the effects of Federal Reserve communications on US financial market returns from 1998 to 2009 and asks whether a significant change occurred during the financial crisis of August 2007–December 2009. We find, first, that central bank communication moves financial markets in the intended direction. In particular, shorter maturities are affected in an economically meaningful way. Second, speeches by the Chairman generate relatively more public attention than communication by other governors or presidents. Finally, central bank communication is even more market relevant during the financial crisis subsample.

JEL: E52, G14

Keywords: Central Bank Communication, Federal Reserve, Financial Crisis, Financial Markets, Monetary Policy

1. Introduction

The role central bank communication plays in monetary policy has been studied extensively. The majority of this work concentrates on formal communication, as it examines statements after interest rate decisions, minutes of committee meetings, or monetary policy reports. An even larger number of papers examine the impact of the rate decisions themselves. However, speeches are a substantive part of central bank communication, too. These less formal channels of communication are rarely studied, which is surprising as the Federal Reserve (Fed) has not only improved its formal communication over the last decade but, starting in the late 1990, also increased, to an even greater degree, the number of 'informal' speeches delivered.[1] The Federal Open Market Committee (FOMC) meets only eight times a year and the monetary policy report is issued semi-annually. Thus, speeches might be an additional source of information for market participants. Given their greater frequency, speeches can be interpreted as an update to formal statements and monetary policy decisions and hence market participants might very well utilise and react to this additional information.

There is a growing body of literature investigating the effects of (formal) communication on financial markets (for a comprehensive survey of the relevant literature, see Blinder et al., 2008). Here, we summarise a few selected studies only. An important study closely related to our paper is by Ehrmann and Fratzscher (2007). In their panel analysis of three central banks, they do not examine the communication content directly as they use newswire information based on FOMC communication to create their indicators. They find that speeches or interviews regarding the economic outlook (EO) have a consistently positive impact on daily bond returns for up to 10 years. News concerning the course of monetary policy (MP) has a positive effect on only a few maturities. On the equity market, an indication of rising interest rates leads to declining returns, whereas positive EO news generates higher returns. Some other papers also assess the impact of mostly formal communications by the Federal Reserve (e.g., Connolly and Kohler, 2004; Kohn and Sack, 2004; Chirinko and Curran, 2005; Reinhart and Sack, 2005). These papers have at least three findings in common. First, central bank communications regarding the economic outlook and the course of monetary policy have a significant impact on financial market returns and volatility. Second, the impact on financial markets is larger when the communication channel is more formal: post-meeting statements accompanying interest decisions or monetary policy reports are more

[1] In 1998, 114 speeches were delivered by FOMC members; in 2006 the central bankers spoke 190 times.

important than speeches. Third, the more prominent the position held by the speaker, the stronger the financial market reaction.[2]

This paper makes two significant contributions to the literature. First, we use an extensive data set covering *all* speeches delivered by FOMC members and study their impact on US financial market returns (see Hayo et al. 2012). The full set of original communication events is coded into dummy variables on the basis of their written content. We differentiate between news regarding monetary policy and economic outlook as well as between different types of communication (speeches, monetary policy reports and testimony, post-meeting statements) and by positional classification (chairmen, other members of the Board of Governors, voting presidents, and nonvoting presidents). Second, this is the first study on informal communication on US financial markets that also covers the recent financial crisis and explicitly addresses the question of whether there is a different financial market reaction during 'crisis times' compared to during 'normal times.' During the recent financial crisis, we expect central bank communications to play an even more pronounced role. Like many other central banks, the Fed implemented various measures, in addition to lowering short-term interest rates, with the aim of mitigating the effects of the crisis. As some of these additional measures are 'unorthodox', the Fed also put a lot of emphasis on communication in an effort to explain and prepare the public for them.

The sample consists of daily observations from 1998 to 2009. Econometrically, we employ a GARCH specification of financial returns to capture the autoregressive conditional heteroscedasticity that characterises many financial series. Employing data from the US bond and stock markets, we examine three related research questions. First, do speeches have an effect on financial market returns as a result of traders adjusting their behaviour in light of their content? Second, are there quantitative differences between the sizes of the impact across different positions on the Federal Open Market Committee? Third, compared to normal times, is there a different reaction to central bank communications during the financial crisis, the start of which we set to August 2007?

The remainder of this paper is organised as follows. In the next section, we explain our approach of measuring Federal Reserve communication and provide details on the construction of the central bank news. Section 3 describes the data set and empirical

[2] For every major central bank there is at least one study showing that communications other than postmeeting statements or monetary policy reports have an influence on financial markets. For instance, see Guthrie and Wright (2000) for New Zealand, Connolly and Kohler (2004) for six central banks (Australia, Canada, the European Central Bank, New Zealand, the United Kingdom, and the United States), Andersson et al. (2006) for Sweden, Reeves and Sawicki (2007) for the United Kingdom, de Haan (2008) for the European Central Bank, Hayo and Neuenkirch (2010b) for Canada, and Ranaldo and Rossi (2010) for Switzerland.

methodology. In Section 4, we empirically study the effects of communication on US financial market returns. Section 5 discusses the special role of central bank communication during the financial crisis. Section 6 concludes.

2. Measuring Federal Reserve Communications

For our analysis, we employ a data set that covers summaries of 1,994 speeches, 227 congressional hearings (including the semi-annual monetary policy reports), and 94 post-meeting statements from members of the Board of Governors (BOG) and the regional Fed presidents (see Hayo et al. 2012).[3] There is consensus in the literature about how to measure the timing of statements accompanying target rate decisions and monetary policy reports. These are predefined events and the content of the communications can be extracted from central bank websites. In the case of the less formal and irregularly timed speeches, the majority of surveys rely on financial newswire reports, but even advocates of these reports are quick to point out a major drawback of them. For example, Blinder et al. (2008) state: *'However, it is not always straightforward to determine exactly when a communication "event" took place. For example, when a late-Thursday media report on a Tuesday interview with a policymaker causes financial markets to react on Friday morning, was the communication event on Tuesday, Thursday, or Friday?'* (2008, 924). Ehrmann and Fratzscher (2007, 15) add: '*Newswire services are selective in their reporting, thus not covering all statements made by all the relevant committee members ….'* Under our approach, all central banker speeches are extracted from central bank websites. The Fed accurately records the communications of its governors as well as the regional presidents' speeches. Every speech is recorded, along with its time of delivery, so one can verify whether the actual news is created during market hours or afterward. Using this approach, we ensure that every piece of news in central bank speeches is captured at the time it is actually created.

The next step after timing the news correctly is to extract the direction of central bank communication, i.e., what is the monetary policy inclination or what is the central banker's forecast about the economic outlook?[4] A standard practice in the literature (e.g., Ehrmann and

[3] Subsamples and variants of this data set have been successfully employed in two different contexts. Hayo and Neuenkirch (2010a) explain US target rate decisions using macroeconomic variables and Federal Reserve communications. They discover that communications significantly explain and predict target rate decisions and improve explanatory power over a Taylor (1993) rule. Hayo and Neuenkirch (2011) use US regional and national macroeconomic variables to explain the content of these communications. They find that the opinions expressed by Fed governors and presidents can be described by a Taylor (1993) rule and, particularly, that regional economic conditions affect the contents of presidents' speeches.

[4] Several papers avoid making suppositions about the direction of monetary policy or the economic outlook. These papers use only the communication events, without any direction as an explanatory variable. For instance,

Fratzscher, 2007) is to assign numerical values using the communications content (and intention): for instance, hawkish statements indicating tighter monetary policy are captured with '+1'; dovish statements inclining future rate cuts are assigned '–1'. We, too, quantify the direction of communication on a numerical scale, but we go one step further: positive and negative communications are captured by separate variables to allow for the possibility of asymmetric market reactions to good and bad news. The economic outlook can be 'positive' (EO +) or 'negative' (EO –); 'tightening' (MP +) or 'easing' (MP –) are used to classify monetary policy stance.[5]

Coding communication events into different categories carries the risk of introducing judgment error on the part of the researcher (or the newswire agency) into the analysis.[6] Content analysis, which is a *'technique for making inferences by objectively and systematically identifying specified characteristics of messages*' (Holsti, 1969, 14), can help reduce the risk of misclassification. In line with this idea, each speech was carefully read and independently coded into the dummy categories by three different individuals. In the rare case of a conflict between the classifications, the relevant speech was checked one more time and the coding adjusted accordingly.[7] In our analysis, we engage in extensive robustness testing to ensure that our results are not dependent on possibly individual-specific coding of ambiguous content.

Communication events occurring after market closure were coded as if they happened the next day. Data are obtained from the official websites of the Fed regional banks and the Board of the Governors of the Federal Reserve System. Table 1 summarises the frequency of these events. From the table, it can be observed that (i) more comments were made regarding the EO than the MP stance, and (ii) a positive economic outlook and hawkish comments occur far more often than a negative economic outlook or an indication of expansionary monetary policy. The first finding is due to an apparent change in Fed communication strategy. In the early years of our sample period, speakers concentrated on explaining previous interest rate

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Kohn and Sack (2004) study the effects of U.S. central bank communication events on the volatility of financial variables. The simple idea behind this approach is that if communications affect the returns on financial assets, the volatility of these returns should be higher on days of central bank communications. On the one hand, this approach is less prone to mistakes by the researcher or misinterpretation by financial newswires. The obvious drawback is that there is no control for whether markets move in the correct (or intended) direction. Additionally, equality restrictions between different types of news are set, so that one cannot distinguish between possibly larger reactions to bad than to good news. Finally, higher volatility can be an indication of (i) higher noise reflecting uncertainty or (ii) actual news requiring traders to alter their behaviour.

[5] Speeches without any information on monetary policy stance or economic outlook and speeches with 'neutral' content are coded as non-events.

[6] An alternative to subjective coding is using content analysis software (e.g., Lucca and Trebbi, 2009). However, communications other than post-meeting statements are not standardised and thus content analysis programs fail to detect all relevant systematic patterns in these much more complex texts.

[7] In the Appendix, we provide a few examples of speeches along with our classification of them.

moves, whereas in the later years, monetary policy speeches were more forward looking. Also, cheaper liquidity tends to cause few problems for market participants and thus a rate cut does not need to be prepared for by the central bank as extensively as does a hike. This second point is also due to the asymmetry of the size of target rate hikes and cuts in our sample. Target rate increases are mostly performed in 25 basis points (bps) steps and well-prepared for in advance by communication, which allows market participants to make necessary adjustments gradually in the run-up to the expected interest rate decision. In contrast, target rate decreases are often done in 50 bps steps and less explained by Fed officials in advance.[8]

Table 1: Number of Non-Zero Values for Communication Dummies

	MP +	**MP –**	**EO +**	**EO –**
Statement	35	13	33	27
MPR/Testimony	11	9	38	22
Board of Governors	33	8	97	44
Presidents	105	24	282	120

3. Data and Econometric Methodology

Our US financial market indicators comprise daily closing interest rates on government securities as well as daily returns on stock markets from January 2, 1998 through December 31, 2009.[9] As dependent variables, we employ daily changes of 3-month, 6-month, and 1-year Treasury bills, and 5-year Treasury notes. For the stock market, we examine the daily growth rates of the S&P 500 Index.[10] Descriptive statistics (see Table A1 in the Appendix) show that all financial markets series exhibit excess kurtosis, indicating ARCH effects (Engle, 1982). To increase the estimation efficiency, we employ a GARCH (1,1) model (Bollerslev, 1986) for all bond maturities and the stock market series.[11] The general specification is as follows:

[8] On nine occasions in our sample, financial market participants were surprised by an interest rate cut, whereas the Fed unexpectedly raised its target rate only four times. Bloomberg surveys are used to identify surprises that occur during scheduled meetings. Intermeeting moves are naturally classified as surprises. For instance, a 'surprise hike' can be (i) an unexpected rise in the target rate or (ii) an unchanged target rate when a rate cut was expected.

[9] Data sources: bond and foreign exchange market series—Federal Reserves' Statistical Releases H10 and H15; stock market series—Yahoo! Finance database.

[10] We chose daily data instead of intra-day data for two reasons. At a conceptual level, we are interested in the question of whether there are effects of economic importance characterised by some sort of persistence over time instead of just picking out short blips in the data. Even though the scheduled delivery time of speeches is recorded at the central bank's website, we find it impossible to time the central bank *news* precisely in 5-minute time intervals, as can be done for newswire reports.

[11] Estimation within an EGARCH framework (Nelson, 1991) was not possible, as the algorithm did not converge. Doornik and Ooms (2008) suggest that the presence of dummy variables could cause such problems.

$$(1)\ returns_t = \gamma + \delta\ financial\ control\ variables_{t-1} + \zeta\ day\ of\ the\ week\ effects_t + \eta\ macroeconomic\ shocks_t + \theta\ target\ rate\ movements_t + \iota\ unorthodox\ measures_t + \lambda\ communication_t + \mu_t,$$

$$\mu_t = \epsilon_t h_t^{1/2},$$

$$h_t = \alpha_0 + \alpha_1 \mu_{t-1}^2 + \beta_1 h_{t-1},$$

where α_0, α_1, β_1, μ, γ, δ, ζ, η, θ, ι, λ, and ν are parameters or vectors of parameters and $\varepsilon_t|\Gamma_{t-1} = t(\nu)$, with Γ_{t-1} capturing all the information up to t-1 and t(ν) being a t-distribution with ν degrees of freedom. Equation (1) is an autoregressive-distributed lag model with one lag. The vector of financial control variables comprises bond returns, S&P 500 returns, and returns of the US broad foreign exchange rate index.[12] Day of the week effects are captured by dummies, using Monday as the reference day. Student-t distributed errors (Bollerslev, 1987) are assumed; these provide a better approximation of residuals that are not normally distributed.

We include in the estimation the surprise components of several macroeconomic announcements commonly watched by market participants.[13] We choose 10 news items: advance gross domestic product (GDP), industrial production (IP), and trade balance (TB) to capture growth expectations; the Institute for Supply Management (ISM) survey and the Conference Board consumer confidence (CC) for producer and consumer confidence; nonfarm payroll (NFP) and the unemployment rate (UR) to proxy labour market conditions; retail sales (RET) for actual consumption; and the consumer price index (CPI) and producer price index (PPI) for inflation. We use the same variables as Ehrmann and Fratzscher (2007), but, in contrast to their approach, take into account possible asymmetric reactions of financial markets, as the standardised macroeconomic shocks enter the equations as separate positive or negative variables on the day of their announcement.

Furthermore, we control for movements in the Federal Funds target rate (split into expected hikes, expected cuts, surprise hikes, and surprise cuts). The next group of variables incorporates several variables for the 'unorthodox' measures taken by the Fed during the financial crisis. These are grouped into five categories: (i) the discount rate change on August 17, 2007, (ii) the announcement of joint initiatives with the federal government, (iii) the announcement of additional unilateral liquidity actions, (iv) the announcement of

[12] The contemporaneous other market returns are omitted to avoid simultaneity problems.

[13] The surprise component of macroeconomic announcements is constructed by subtracting median market expectations (obtained through a Bloomberg survey of market participants) from the actually released figure. To ensure comparability, we standardise the surprise component by its respective standard deviation.

internationally coordinated liquidity actions, and (v) the announcement of measures to mitigate problems in the asset-backed security market. Finally, we add our communication variables: (i) postmeeting statements, (ii) monetary policy reports and testimony, (iii) speeches by the Fed Chairman, (iv) speeches by other governors, (v) speeches by voting presidents, and (vi) speeches by nonvoting presidents, which are coded into four different categories (EO +, EO –, MP +, MP –).

After estimating these rich GARCH (1,1) models, we exclude all insignificant variables in a consistent general-to-specific approach (Hendry, 1995).

4. Federal Reserve Communications and Financial Market Returns

In this section, we discuss the reaction of financial markets to central bank communications using Equation (1) and the full sample period (1998–2009). To assess the relative influence of communication compared to other factors, Table 2 also shows the results for macroeconomic shocks, target rate changes, and unorthodox measures.[14]

We find that the shorter bond maturities (3-month and 6-month) are affected by a larger variety of communications (as well as by target rate changes and unorthodox measures) than are the longer maturities (1-year and 5-year). In contrast, macroeconomic surprises are more important for the longer maturities. Thus, US monetary policy actions and related communications lead to 'target surprises' rather than to 'path surprises' (Gürkaynak et al., 2005). To put it differently, the Fed is able to change its short-term monetary policy without affecting longer-term inflation expectations. However, when significant reactions are found, the impact of communication is ascending with maturity. Ehrmann and Fratzscher (2007) report a similar result.

The monetary policy part of communications is more important than the economic outlook as we find only one significant coefficient for the latter. Our interpretation is that financial market participants alter their expectations about the future course of monetary policy after central bank communications, whereas macroeconomic news has more of an effect on expectations about the real economy. Generally, central bank communications move the financial markets in the intended direction:[15] (i) hawkish communications raise bond yields, (ii) communication indicating a future target rate cut leads to a decrease in bond returns, and (iii) a worse economic outlook decreases stock returns.

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[14] The coefficients can be interpreted as follows: 0.016 denotes an increase of 3-month bonds by 1.6 bps after a one standard deviation shock in NFP +; –0.085 denotes a decrease by 8.5 bps after a 25 bps target rate surprise cut; 0.027 denotes an increase by 2.7 bps after a hawkish speech delivered by the Chairman.

[15] All but three coefficients ('ISM –' on the stock market and 'Discount Rate' on the 1-year and 5-year bond market) show the expected sign.

Table 2: Reaction of Financial Market Returns (Full Sample)

	3-month		**6-month**		**1-year**		**5-year**		**S&P 500**	
IP +									0.258	*0.01*
ISM +					0.014	*0.00*	0.035	*0.00*		
ISM –							–0.018	*0.01*	0.398	*0.01*
NFP +	0.016	*0.01*			0.039	*0.00*	0.061	*0.00*		
NFP –	–0.009	*0.02*	–0.020	*0.00*	–0.030	*0.00*	–0.032	*0.00*		
Retail +			0.008	*0.00*	0.011	*0.02*	0.027	*0.00*		
Retail –			–0.005	*0.02*	–0.012	*0.00*				
TB –					–0.007	*0.01*	–0.014	*0.01*		
UR –			0.010	*0.00*						
Target Rate –	–0.032	*0.00*	–0.032	*0.00*						
Target Rate Surp. +			0.083	*0.02*						
Target Rate Surp. –	–0.085	*0.00*	–0.061	*0.03*	–0.062	*0.02*				
Discount Rate	–0.032	*0.00*	–0.032	*0.00*	0.008	*0.00*	0.090	*0.00*	2.488	*0.00*
Joint w/ Government	–0.006	*0.02*	–0.016	*0.02*						
Coord. Liquidity	–0.025	*0.00*	–0.035	*0.00*						
ABS Measure					–0.008	*0.02*				
Statement MP –	–0.010	*0.05*	–0.024	*0.00*						
MPR/Test. EO –									–0.710	*0.01*
Chairman MP +	0.027	*0.00*	0.017	*0.01*	0.036	*0.02*	0.039	*0.00*		
Chairman MP –	–0.047	*0.00*								
Voting Pres. MP –	–0.011	*0.03*	–0.015	*0.00*						
Nonvot. Pres. MP +			0.007	*0.03*	0.009	*0.02*				
Nonvot. Pres. MP –	–0.011	*0.00*	–0.014	*0.02*						

Notes: Figures in italics show p-values. Standard errors are heteroscedasticity-consistent. Only the variables of interest of the reduced model resulting from the testing-down process are listed. The testing-down restrictions are never rejected in any of the models: $Chi^2(44) = 40.5$; $Chi^2(41) = 52.5$; $Chi^2(44) = 57.2$; $Chi^2(51) = 68.4$; $Chi^2(55) = 72.9$, respectively. Full tables are available upon request.

One of the novel aspects of this paper is its consideration of communication by individual members of the Fed. We compare the impact of speeches by the Chairman, other governors, voting presidents, and nonvoting presidents on US financial markets. Our prior is that the 'inside' governors (particularly the Chairman) should command greater attention from financial market participants and, therefore, exert a greater influence on returns than the 'outside' presidents (particularly the nonvoting presidents). In line with the literature (Ehrmann and Fratzscher, 2007), our results suggest that communications by the Chairman of the Board of Governors generate relatively more public attention than speeches by other

governors or presidents.[16] We find no significant differences between voting and nonvoting presidents. Finally, we also find evidence of the asymmetry hypothesis as dovish speeches (when they are significant) move interest rates more than hawkish ones; for example, we observe differences between the Chairman's positive and negative monetary policy inclination.[17]

In the next step, we evaluate the economic impact of central bank communication on financial markets relative to other macroeconomic shocks. The coefficients in Table 2 can be misleading insofar as some news categories might typically occur more often than others. As a consequence, a fairly small coefficient might have a large cumulative influence on the observed behaviour of financial markets if the frequency of this event is relatively high, and vice versa. Therefore, we compare the impact by taking into account the frequency of news as measured in our 12-year sample. Table 3 shows the cumulative impact on returns per category on each market.

Table 3: Cumulative Absolute Returns for Bond and Stock Markets (Full Sample)

	3-month	**6-month**	**1-year**	**5-year**	**S&P 500**
Macro News	1.3	2.7	5.9	9.5	33.0
Communications	0.6	1.2	0.7	0.1	15.6
… Monetary Policy	0.6	1.2	0.7	0.1	
… Economic Outlook					15.6

Note: The figures are calculated by taking the absolute estimates from Table 2, which are then multiplied by the respective frequency of news.

Due to their higher frequency, macroeconomic shocks exert a larger impact on all bond maturities as well as on the stock market. However, for the short maturities (3-month and 6-month) and the equity market, the influence of central bank communication is economically relevant, as its cumulative impact is almost half as large as that of macroeconomic shocks. In confirmation of the finding that Fed communications cause 'target surprises' rather than 'path surprises', the maximum impact of monetary policy communications is found for 6-month bonds and is close to zero for the 5 year horizon.

[16] Statistical tests confirm this result for 3-month bonds (Chairman MP – vs. Voting Pres. MP –: $Chi^2(1)$ = 14.2**; Chairman MP – vs. Nonvot. Pres. MP –: $Chi^2(1)$ = 18.0**). For the longer maturities, we find larger point estimates for the Chairman.

[17] 3-month bonds: Chairman MP + vs. Chairman MP –: $Chi^2(1)$ = 5.6*.

5. The Special Role of Central Bank Communication During the Financial Crisis

Because our sample includes the period August 2007–December 2009, we can address the question of whether there is a different financial market reaction during 'crisis times' compared to during 'normal times.' We expect central bank communications to play an even more pronounced role during the recent financial crisis, as the Fed put a great deal of effort into preparing and explaining both its conventional and unconventional monetary policy actions. Table 4 presents the results for Equation (1) estimated over the subsample period of August 2007–December 2009.

Table 4: Reaction of Financial Market Returns (Financial Crisis)

	3-month		**6-month**		**1-year**		**5-year**		**S&P 500**	
Statement MP –	–0.012	*0.08*	–0.029	*0.00*	–0.068	*0.00*			1.423	*0.01*
Statement EO +			0.008	*0.02*						
Statement EO –									–4.555	*0.01*
Chairman MP –	–0.042	*0.00*	–0.018	*0.00*						
Chairman EO +					0.030	*0.00*	0.151	*0.00*	1.995	*0.00*
Chairman EO –			–0.065	*0.00*	–0.079	*0.00*				
Oth. Govern. MP +	0.046	*0.00*	0.029	*0.01*					–1.412	*0.00*
Oth. Govern. MP –									1.072	*0.10*
Oth. Govern. EO –	–0.027	*0.00*	–0.025	*0.00*						
Voting Pres. MP –	–0.011	*0.01*								
Nonvot. Pres. MP –	–0.011	*0.00*	–0.018	*0.00*			–0.042	*0.01*		

Notes: Figures in italics show p-values. Standard errors are heteroscedasticity-consistent. Only the variables of interest of the reduced model resulting from the testing-down process are listed. The testing-down restrictions are never rejected in any of the models: $Chi^2(43) = 50.0$; $Chi^2(42) = 53.1$; $Chi^2(44) = 60.4$; $Chi^2(46) = 54.4$; $Chi^2(45) = 52.2$, respectively. Full tables are available upon request.

As in case of the full sample, all significant central bank communication variables move financial markets in the intended direction. The shorter maturities (3-month and 6-month) are affected by a larger variety of communications than are the longer maturities (1-year and 5-year). In general, we find a greater number of significant communication variables in this subsample (particularly for the stock market), indicating that central bank communication plays a more pronounced role during the financial crisis. In addition, the absolute size of the coefficient is higher on bond and stock markets.

Our results suggest that communication by the Chairman generates a (slightly) larger reaction from financial markets than do speeches by other governors (which are, however, significant during the financial crisis) and both receive much more attention than those by

presidents.[18] Finally, we find speeches by nonvoting presidents to be more important in terms of significant coefficients than those of voting presidents.

During the financial crisis, the economic outlook aspect of communication becomes relevant. Given that there is no room for further target rate cuts at the zero lower bound, financial markets might perceive a negative economic outlook as an 'implied easing' signal, in the sense that the Fed will keep rates low for a long period of time. To assess the relative economic importance of communication referring to the economic outlook or the monetary policy inclination, we take into account the impact of the frequency of news. Table 5 shows the cumulative impact on returns per category on each market in our sample.

Table 5: Cumulative Absolute Returns for Bond and Stock Markets (Financial Crisis)

	3-month	**6-month**	**1-year**	**5-year**	**S&P 500**
Communications	1.0	1.4	1.2	0.8	74.6
… Monetary Policy	0.6	0.8	0.9	0.6	27.0
… Economic Outlook	0.4	0.6	0.3	0.2	47.5

Note: The figures are calculated by taking the absolute estimates from Table 4, which are then multiplied by the respective frequency of news.

Although the economic outlook is now relevant for all bond maturities, the cumulative influence of the monetary policy inclination continues to be larger. A second notable finding is that—in comparison to the full sample (Table 3)—the cumulative impact is larger on all bond markets and, in particular, on the stock market. This confirms that central bank communication was of increased importance during the August 2007–September 2009 period. As in the case of the full sample, communication exerts the largest influence on 6-month bonds, but the difference from other maturities is smaller during the financial crisis.

6. Conclusions

In this paper, we study the effects of Federal Reserve communications, particularly speeches, on financial market returns for the period 1998 to 2009. Whereas previous literature relies on newswire reports to create a data set of central bank news, we employ a different approach and extract all speeches, along with their time of delivery, from the Fed's website. Using a GARCH model and this comprehensive data set, we analyse the influence of speeches, post-meeting statements, and congressional hearings (including the semi-annual monetary policy

[18] Statistical tests confirm this finding for 3-month bonds (Chairman MP – vs. Voting Pres. MP –: $Chi^2(1) = 8.6$**; Chairman MP – vs. Nonvot. Pres. MP –: $Chi^2(1) = 9.6$**) and 6-month bonds (Chairman EO – vs. Oth. Govern. EO –: $Chi^2(1) = 11.0$**).

reports) on bond and stock markets in the United States. We find the following answers to our three research questions.

First, central bank communication moves financial markets in the intended direction. Hawkish communications raise bond yields; communications indicating a future target rate cut lead to a decrease in bond returns. Shorter maturities are affected by a larger variety of communications than are longer maturities and the monetary policy part of communications is more important than the economic outlook part. A comparison with the absolute cumulative impact of macroeconomic shocks reveals that central bank communication is economically relevant—at least for the shorter maturities and the stock market.

Second, one of the novel aspects of this study is its consideration of communication by individual members of the Fed. Our results suggest that communications by the Chairman generate relatively more public attention than speeches by other governors or presidents. We find no significant difference in the attention given to speeches of voting and nonvoting presidents. Finally, financial markets show an asymmetric reaction: dovish speeches move interest rates more than hawkish ones.

Third, as to whether there is a different financial market reaction during ‘crisis times’ compared to during ‘normal times’, we find, in general, more significant communication variables in the financial crisis subsample (especially for the stock market). In addition, the absolute size of the coefficients is higher on all bond and stock markets. The strong reaction during the financial crisis shows how crucial central bank communication is in turbulent times. Financial markets closely monitor every speech and adjust their prices to a larger extent than they do during ‘normal times’.

In future research it would be interesting to examine to what extent financial market agents monitor central bank actions and communications directly and when and why they rely on newswire services. This question could be answered using a survey of financial market participants.

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Appendix

Examples of Speeches and Their Coding

Remarks by Chairman Alan Greenspan Before the Economic Club of New York (24 May 2001)

Moreover, with inflation low and likely to be contained, the main threat to satisfactory economic performance appeared to come from excessive weakness in activity. … The period of sub-par economic growth is not yet over, and we are not free of the risk that economic weakness will be greater than currently anticipated, requiring further policy response.

Coding: Speech Alan Greenspan EO Negative / Alan Greenspan MP Easing

Testimony of Chairman Alan Greenspan Before the Joint Economic Committee, US Senate (21 April 2004)

After having risen at an annual rate of 2 1/2 percent in the first half of last year, real GDP increased at an annual pace of more than 6 percent in the second half. … Although real GDP is not likely to continue advancing at the same pace as in the second half of 2003, recent data indicate that growth of activity has remained robust thus far this year. … As I have noted previously, the federal funds rate must rise at some point to prevent pressures on price inflation from eventually emerging.

Coding: Testimony Alan Greenspan EO Positive / Alan Greenspan MP Tightening

Table A1: Descriptive Statistics of Daily Returns

	3-month	**6-month**	**1-year**	**5-year**	**S&P 500**
Observations	2992	2992	2992	2992	2992
Mean	–0.002	–0.002	–0.002	–0.001	0.014
Standard Deviation	0.065	0.052	0.052	0.069	1.377
Skewness	–0.849	0.013	–0.612	–0.020	0.003
Excess Kurtosis	36.92	35.13	15.55	2.73	7.23
Minimum	–0.81	–0.61	–0.59	–0.46	–9.03
Maximum	0.76	0.75	0.52	0.34	10.99