

A Quantitative Assessment of the Qualitative Aspects of Chairman Greenspan's Communications

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Abstract

A manifestation of the Federal Reserve Board's increased transparency has been Chairman Greenspan's method of communication. The purpose of this paper is to establish the positive aspects of his speeches, testimonies and FOMC statements on financial market variables. This analysis is undertaken using daily data since the middle of 1999, that is the period after which the FOMC provided statements after every FOMC meeting. Using content analysis, we calculate for each communication a measure of its certainty, pessimism, optimism, activity, immediacy and jargon. We then include these variables in standard regression to see if these language variables can help to forecast movements in financial market variables. We find that Chairman Greenspan's language does indeed forecast movements in financial market variables at the same day and 10 day horizons. In particular, FOMC statements contribute substantially to help predict same day and 10 day variation in these measures, though testimonies also contribute to predicting movements at the 10 day horizon. We conclude by arguing that given the given our evidence that Chairman's language predicts movements in the federal funds futures rates and Treasury forward rates, that this is consistent with the beneficial goals from enhanced central bank communications.

JEL Codes:

Keywords: Monetary Policy, Communication, Transparency.

1 Introduction

There can be no doubt that for a *considerable period* of time the Federal Open Market Committee (FOMC) has articulated its message at a *measured pace*. This has not always been the case. Indeed, for much of its history the FOMC has been largely uncommunicative, preferring to surround itself with mystery and secrecy as it has implemented monetary policy.

Since the early 1970's, however, the Federal Reserve System has changed in at least three distinct ways.¹ The first change by the Federal Reserve is the better appreciation of market forces. In the 1970's, the Federal Reserve controlled deposit interest rates, regularly intervened in foreign exchange markets and manipulated margin requirements. Subsequently, the deregulation of financial markets coupled with the prudential supervision of markets has become an important policy theme.

The second major change undertaken by the Federal Reserve Board has been the determination to keep inflation 'low'. While the FOMC had not adopted an official inflation target or announced an official inflation goal, the weight of the evidence is that the members of the FOMC take adverse inflation conditions seriously and act to offset them.

The final change has been the emphasis on transparency in the conduct of monetary policy. Historically, transparency has not been high on any monetary authority's list of priorities. For example, as argued by Rockoff (1990), the imagery of the Wizard of Oz is focused on the debates over a bimetallic currency standard at the end of the 19th century. And the view taken by the book is that those who conduct monetary policy are grandiose wizards, who hide behind smoke and mirrors, and who are ultimately filled with hot air.

In addition, in a widely read book, William Greider (1987) describes the Fed's level of

¹See Hess (2004) for a broader discussion of changes in Federal Reserve thinking over the past 30 years.

transparency in equally unpleasant terms:

“The central bank, notwithstanding its claims to rational method, enfolded itself in the same protective trappings that adorned the temple—secrecy, mystique, and an awesome authority that was neither visible nor legible to mere mortals. Like the temple, the Fed did not answer to the people, it spoke for them. Its decrees were cast in a mysterious language people could not understand, but its voice, they knew, was powerful and important. Greider (1987).

The FOMC, however, has made some recent progress in articulating its decisions. Indeed, it actually started announcing decisions in 1994 as prior to 1994, the FOMC did not announce decisions: rather, it allowed market participants to infer its actions from the conduct of open market operations. Systematically, however, the FOMC has begun to improve the dissemination of its decisions. As of the middle of 1999, for instance, it now provides an approximately 150 word statement after the conclusion of each and every meeting, regularly scheduled or not. Moreover, FOMC members routinely make speeches that are placed on the Federal Reserve Board’s web-site as their prepared testimonies to Congress and the Senate.

Now there are two important questions about Federal Reserve communications. The first is what are the goals of Fed communication? The second is what are the best ways to accomplish these goals? For the time being I will defer discussion of the second question to the end of this paper and concentrate for now on the first one.

In a recent speech, Federal Reserve Bank of St. Louis William Poole (2005) points to several issues as necessary preconditions for the FOMC to implement and design an appropriate communication strategy in an environment where it does not have private information about the economy.² The first issue is that the central bank must be clear about its objectives. The second is that the market and the central bank have a correct understanding of how the economy works.

²See Amato, Morris and Shin (2002) for an analysis of central bank communication when the central bank has private information. They point to the problems of providing public information in these types of environments as it may diminish the range of expectations in the market and force the coordination of market expectations on the outcome.

The third is that unexpected economic outcomes are to be understood as news, that is, information that cannot currently be forecasted.

Consequently, monetary policy communication should lead to an understanding of the strategy for future monetary policy actions. As such, policy should be as informative about future policy as possible and as predictable as possible within the confines of Poole's (2005) three necessary conditions: that the FOMC stick to its objectives, that the FOMC and the market understand the workings of the economy and the understanding that the actual path of future monetary policy may be affected by events that cannot currently be forecasted.

In the evidence below, we undertake a positive analysis that investigates whether Federal Reserve Board Chairman Greenspan's communications are generally accomplishing the goal of providing relevant information as well as making policy more predictable. In section 2 we discuss the recent empirical literature on central bank communication. In section 3 we introduce the empirical data we use in our study and discuss our empirical methodology. We present summary statistics and the empirical results in section 4 and conclude in section 5.

2 Literature Review

There have been a number of recent papers which empirically analyze Federal Reserve communications.³ Kohn and Sack (2003) estimate a standard baseline model, as shown below in equation (1) whereby unexpected movements in monetary policy (i.e. the one month federal funds futures rate) and unexpected movements in macroeconomic variables lead to movements in financial variables. Accordingly, they posit that if Federal Reserve communications provide information to the market, then the residual market volatility should be higher on days when there is a communication by the Fed. Indeed, they find a strong component for this in statements and testimony. They also pro-

³Also note that Jansen and De Haan (2004) investigate the role that contradictory nature of statements by national central bank presidents and the European Central Bank.

vide results from a variance decomposition where they conclude that this information is conveying information on near-term policy moves but also information on the economic outlook.

While Federal Reserve communications, if informative, should move markets, a test of the usefulness of this information is if it can help predict future movements of these financial variables. As such, this paper and work by Ehrmann and Fratzscher (2004,2005) provide investigations into the language of Federal Reserve communications as they help to predict movements in financial markets variables. For instance, Ehrmann and Fratzscher (2004) compare how markets forecasted future financial markets during periods where the Fed was less transparent as compared to its more recent period of greater transparency. In addition, Ehrmann and Fratzcher (2005) compares the more individualistic style of communication in the Federal Reserve System as compared to the more collegial communication strategy of the Bank of England.⁴

Critically, however, the work by Ehrmann and Fratzscher summarize the language of the communications by examining press releases by Reuters just minutes after each communication and then “based on our own judgment and reading of the newswire reports” they classify the communications into measures of stronger, unchanged or weaker economic outlooks as well as tighter, no change or easing policy inclinations. While they acknowledge that they cannot “rule out a wrong classification in individual cases” the inherent biases by central bank economists retrospectively determining the intent of a central bank just 5 year hence is obviously problematic for researchers who prefer a more ahistoric analysis of real-time communication.

By contrast, the analysis in this paper provides such an ahistoric real-time analysis of Federal Reserve communication. Rather than use our own judgement to interpret the Federal Reserve’s intent from its communications as do Ehrmann and Fratzscher (2004,2005), we allow

⁴Interestingly, they also note and contrast the collegial decision making process of the FOMC to the individualistic decision-making style of the Bank of England.

content analysis to ascertain for each communication the following six characteristics of each communication: certainty, optimism, pessimism, activity, immediacy and jargon. Below, we explain both our empirical strategy and content analysis, and demonstrate that these qualitative aspects of Chairman Greenspan’s communications are statistically and economically important predictive factors of financial market variables.

3 Data and Methods

In the following two subsections, we describe the data and methodology used in our analysis of the quantitative impact of the qualitative factors of official communications by Chairman Greenspan. In sub-section 3.1 we describe the economic data and a baseline specification for predicting movements in standard financial market data. In sub-section 3.2 we describe our use of content analysis to help quantify the effect of Chairman Greenspan’s language on financial markets. We also present some summary statistics of the data in this sub-section.

3.1 Economic Data

Recent research has examined the role that FOMC communications (speeches, statements and testimonies by Chairman Greenspan) have played in moving markets. Kohn and Sack (2002) investigate the role that communications have on raising or lowering the volatility of markets, the former being evidence according to them that there is ‘news’ in the communications that is driving the market. Their evidence involves results from the following regression:

$$\Delta y_t = \alpha_0 + \alpha_1 \Delta f f_t^u + \sum_{i=1}^{13} \beta_i MAC_{it} + \nu_t \quad (1)$$

where Δy_t is the change in one of the financial variables under consideration, $\Delta f f_t^u$ is the unexpected change in the federal funds rate as measured by Kuttner (2001), and MAC_{it} refers to macroeconomic news. This standard baseline specification indicates that financial variables change

in response to unexpected moves in monetary policy as proxied by the federal funds rate, as well as news about the macroeconomy. Implicitly, the level of financial variables should price in the expected path of monetary policy and macroeconomic activity so that changes in financial variables represent unexpected changes or news to these same variables. The residual term, ν_t , allows for omitted factors that move financial variables.

For the dependent variables, we use the daily changes in various financial variables, as done in Kohn and Sack (2003). We use many of the same variables, including the changes in the federal funds futures rate (three and six months ahead), Treasury forward rates (zero to one year ahead, one to two years ahead, and four to five years ahead), and the S&P 500 and the dollar. All the interest rate data are reported in basis points (that is 100 times the percentage) while the data for the U.S. Dollar and the S&P500 are reported in percentages (i.e., 100 times the change in the natural logs levels of the data). The data in the analysis are similar to those in Kohn and Sack.

⁵ The top part of Table 1 provides summary statistics for the dependent variables that we will be investigating. Again the interest rate variables are reported as business daily basis point changes. There are a few items worth noting in this table. First, shorter term interest rates have declined during this time period (recall that it ends in June 2004, the time period when the FOMC began its course of raising the short term nominal funds rate), though longer term interest rates have stayed reasonably constant. Second, generally speaking, longer term interest rates demonstrate more volatility than shorter term interest rates. Third, the dollar and the stock market have been relatively flat during this period, with the stock market showing substantial volatility.⁶

As we discussed above, we also use a proxy variable for the unexpected component of

⁵Indeed, the Treasury forward rate data were obtained from the Federal Reserve Board's Treasury Forward rate curves.

⁶Note that the time period covered in this analysis includes the aftermath of the terrorist attack on the United States on September 11th, 2001. Removing from the data sample the time period after this incident until the end of the 2001 does not affect the results presented below.

monetary policy developed in Kuttner (2001) and used in Kohn and Sack (2003). The Federal funds futures rates are a market based predictor of future policy, though they must be adjusted in order to adequately measure the expected and unexpected component of monetary policy. Two problems must be resolved. First, the settlement price of the contract is the average of the month's overnight Fed funds futures rates, not the rate on the last day of the month. Second, futures contracts are based on the market rate rather than the target Federal funds rate. The difference of the two can be significant on a day-to-day basis. To correct for these problems, Kuttner (2001) derives the unexpected change in the Federal funds target rate for date t as:

$$\Delta f f_t^u = \left[\frac{m}{m-t} \right] \left(f_{s,t}^0 - f_{s,t-1}^0 \right)$$

where the left hand side is the unexpected change in monetary policy (change in the Federal funds target rate), m is the total number of days in the month, t is the day of the month, f is the spot futures rate on a given day t in month s. If the target rate change is in the last three days of the month, the daily change in the one-month spot futures rate is used to correct the targeting error of day-t and the change in the expectation of future targeting errors. A complete description of this variable is available in Kuttner (2001).

The macroeconomic news variables were from the Money Market Services report. These 13 data series are constructed from the median of the survey of forecasts in the Friday before the data are reported for the first time. The surprise is constructed by subtracting the actual reported number from the most recent survey.⁷ The 13 surprise variables are for the employment cost index, advance GDP, capacity utilization, consumer confidence, core consumer index, durable goods orders, Institute of Supply Management Index, non-farm payrolls, new home sales, core producer price index, retail sales, unemployment rate, and initial claims for unemployment. Generally speak-

⁷The data were purchased from Haver Analytics.

ing, to avoid cluttering the paper, individual results on these macroeconomic surprises will not be presented.

3.2 Content Analysis

To further explore the role of the qualitative factors of Greenspan’s language and their quantitative impact on financial markets, we augment equation (1) with language variables constructed from linguistic content analysis:

$$\Delta y_t = \alpha_0 + \alpha_1 \Delta f f_t^u + \sum_{i=1}^{13} \beta_i MAC_{it} + \sum_{j=1}^3 \gamma_j COM_{jt} + \sum_{j=1}^3 \sum_{k=1}^6 \gamma_{jk} COM_{jt} \times LANG_{kt} \quad (2)$$

There are two additional sets of terms that we include on the right side of expression (2). The first is a set of three dummy variables for the presence of a communication on day t , COM_t . Such communications are FOMC statements (STATE), and speeches (SPEECH) and testimonies (TEST) by Chairman Greenspan.

The second additional set of regressors in equation (2) allows for the quantification of the qualitative factors of these communications using content analysis. As a methodology, content analysis allows the investigator insight into the often symbolical laden connotations employed by leaders themselves in context, making it a valuable tool for researchers specifically interested in leadership as the management of meaning – e.g., see Smircich and Morgan (1982). Given the focus on Chairman Greenspan’s language, this suggests that Greenspan’s specific choice of words can be particularly telling about his motives, intentions, and underlying assumptions, and may have significant effects on financial markets – see Bligh and Hess (2005). As well, due to the highly visible and politicized nature of Greenspan’s position, computerized content analysis has the additional advantage of providing a completely impartial analysis of his leadership based solely on his public policy communications.

For each form of communication, the entire text was read into the DICTION Program which is a content analysis program that keeps track of a number of key features of language that conform to key lists of words constructed by linguists. There are 194 communications in our sample made up of 45 FOMC statements, 44 Testimony's before Congress or the Senate and 105 Speeches during the time period May 18th, 1999 to June 30th, 2004. This period was chosen because May 18th, 1999 is the date at which all FOMC meetings were followed with a statement. We then perform content analysis on all these communications and score the messages based on the following criteria: **Certainty, Optimism, Pessimism, Immediacy, Activity** and **Jargon** (these dictionaries are detailed below). Each of these 6 characteristics of speech, for each of the 3 types of communications, is treated separately in the regression, so that there are 18 additional explanatory variables that quantify the content of Chairman Greenspan's communications.

We chose DICTION 5.0 (Hart, 2000) for our analysis, a computerized content analysis program specifically designed for public policy discourse. DICTION has been used to study semantics in a variety of social discourse arenas such as politics and communication, and more recently has been used in business applications such as evaluating annual reports – see Bligh, Kohles and Meindl (2004) and the references therein. Because we wanted the measure of the Chairman's speech to be generic and impartial, DICTION was a natural choice due to its explicit development for political discourse and careful attention to linguistic theory.⁸ To our knowledge, DICTION is the only existing content analysis program that has been specifically designed for public policy dialogue, and that is expressly concerned with the types of words frequently encountered in American public discourse. Thus, it seemed particularly appropriate for the analysis of policy communications by Chairman Greenspan.

There are obvious advantages and disadvantages to using computerized content analysis.

⁸See Hart (1984,1987,2001) for a more thorough discussion of the development of DICTION.

Let's start with some drawbacks. First, the sterility of analysis that may preclude creative insights or innovative breakthroughs (e.g., the recent use by the FOMC of the expression 'a considerable period'); Second, it is based on the assumption that higher frequency usages of a word or phrase mean that concept is more meaningful or important than infrequently utilized words or phrases; and finally, it does not account for the fact that words are divorced from their original contexts – again, see Bligh, Kohles, and Meindl (2004).

With respect to the advantages, first and foremost, content analysis is highly systematic and reliable. This aspect of the analysis should not be undervalued: language for monetary policy purposes does not live in a context separately from all other types of language. Explicitly, the term 'a considerable period' actually means what it says. As such, it should conform to the same standards and analysis as other types of communication. In addition, due to its microscopic nature, DICTION is ideal for uncovering aspects of language that may be missed by the human eye. Third, all of the dictionaries contain individual words only, and homographs are explicitly treated by the program through statistical weighting procedures to partially correct for context – see Hart (2000).

By default, DICTION uses 33 different dictionaries, containing over 10,000 search words, to analyze a given communication. In order to keep our analysis as simple as possible, we construct five composite variables from 16 of these dictionaries that are likely to be of interest with respect to monetary policy making: These composite variables are **Certainty**, **Optimism**, **Pessimism**, **Immediacy** and **Activity**. While Supplemental Appendix A provides a formal definition of these variables and Supplemental Appendix B provides a few examples, a brief description here of the variables is clearly warranted. **Certainty** refers to words that indicate resoluteness, inflexibility, and completeness. **Optimism** is language that endorses or highlights the positive entailments of some person, group, concept, or event, while **Pessimism** endorses or highlights these negatively.

The variable **Immediacy** refers to verbs that describe immediate matters that affect people's everyday lives. Finally, **Activity** refers to words featuring movement, change, the implementation of ideas, and the avoidance of inertia.

We also made two important adjustments to the data. First, a problem with examining individual words is that they can be preceded by a negation that completely reverses the meaning of the individual word. For instance, the common term by Chairman Greenspan of 'There can be no doubt' is clearly impacted by the presence of a negation. As such, we do not count any words that are preceded by the word 'no' or 'not'. Second, we created an additional composite variable to more closely follow the extent to which macroeconomic terms are present in the Chairman's communications. We constructed this list of words by accumulating the dictionary of terms provided at the end of the popular intermediate macroeconomic textbooks Abel and Bernanke (2005), Delong (2002) and Mankiw (2003). We label this variable **Jargon**.

The bottom part of Table 1 provides some summary statistics for the content analysis data of Chairman Greenspan's communications. Note that the data are presented so that it indicates the number of words per 100 in a particular communication.⁹ If a communication does not take place for that day, then its language components are all equal to zero. Each row indicates a particular component of language, (e.g. **Certainty** for a particular form of communication (SPEECH)). There are several important factors worth noting. First, generally speaking, the content characteristics of speeches and testimony are roughly similar, while those for statements can be different. Second, there are two particular ways in which statements differ from testimonies and speeches. First, statements have, on average, lower levels of certainty. This could, of course, be due to the fact that these are written (somewhat) by consensus and so may need to use language that is more

⁹For example, if there are 10 **Jargon** words out of a 500 word communication, **Jargon** would be coded as 2.0 ($100 \times (10/500)$) for that particular day for that particular form of communication.

qualifying and hence less certain. Finally, statements have, on average, more economic jargon. This may in fact be due to the fact that since statements are so short, jargon can be a useful way to parsimoniously convey information.

Table 2 also demonstrates a number of key features of how the volatility of the underlying financial data series change when there is either macroeconomic news on a given day, or some form of communication by the Chairman. Each row represents a financial data series for at either the current (1) day horizon or at the cumulative 10 day horizon. Each column presents the standard deviation of the data over alternative sub-samples of the data. ALL, NO COM NO NEWS, NEWS and COMM refer to whether the statistic is calculated over the full sample, for just days when there is neither communication nor news, only for days when one of the 13 news variables were reported, or only for days when there was a Speech or Testimony by Greenspan, or an FOMC statement, respectively. STATE, SPEECH and TEST refer to days when there was either a Speech, Testimony by Greenspan, or an FOMC statement, respectively. Test results are also presented to answer whether one can reject the null hypothesis that the standard deviation of the data sub-sample differs from that when there is neither news nor communication (i.e. NO COM NO NEWS).

There are five interesting results demonstrated in Table 2. First, on days where macroeconomic news is released, financial markets are generally more volatile for the interest rate data. In short, macroeconomic news moves financial markets. At both the current day and 10 day cumulative horizon, days of macroeconomic news have significantly higher volatility as compared to days when there is neither news nor communication.¹⁰ Second, financial variables on days of communication do not systematically have higher volatility. Indeed, while movements in the federal funds future rates at the 3 and 6 month horizons are more volatile on days of communication, these

¹⁰Since cumulative forecasts using daily data create a non-iid error structure in the data, the standard errors for all the tests in the remainder of the paper are corrected for the moving average structure in the observations.

differences are not statistically significant at either the same day or 10 day horizons. Third, on days of FOMC statements, interest rate volatility, particularly at shorter horizons, is significantly higher. However, at longer horizons there is no rise in interest rate volatility. Interestingly enough, the volatility of the S&P500 and the Treasury Forward rate over the zero to one year horizon are significantly lower 10 days after an FOMC statement. Fourth, generally speaking, speeches do not have an effect on financial market volatility, though speeches do tend to lower volatility on the federal funds futures rates at the three month horizon. Finally, testimonies by Greenspan are associated with some increased volatility in the funds market, although it is also associated with lower volatility of interest rates at longer horizons.

4 Empirical Results

While we discussed the stylized facts in Tables 1 and 2, in this section we discuss results from our estimates of expression (2). These key results are presented in Tables 3-6. Starting with Table 3A, we report the estimated parameters of the key language variables for each of the seven financial market variables. The results in Table 3A are for regressions at the same day (1) horizon. There are a number of key findings. First, controlling for unexpected movements in the federal funds rate is important, as they are predictors of changes in federal funds futures rates at the three month and six months. Second, the language in statements appear to have a broad amount of predictive ability for financial market variables. In particular, statements with more pessimistic language are consistent with declines in federal funds futures rates as well as the dollar. Moreover, increases in active language in statements also are consistent with declines in federal funds futures rates as well as declines in Treasury forward rates at shorter horizons. Second, speeches with more pessimistic and immediate language are associated with similar declines in the S&P500. Third, testimonies have no statistically significant impact on same day movements in financial variables.

The results in Table 3B repeats the same regression analysis except the dependent variable is now the 10 day cumulative change in the financial variable.¹¹ There are a number of similarities and differences as compared to the results in Table 3A. Again, speeches provide important forecast information for interest rates. In particular, decreases in language optimism and increases in language pessimism and activity lead to declines in interest rates. Furthermore, speeches again do not have a strong impact on financial markets. Though, interestingly, increased pessimism in speeches forecasts a fall in the S&P500 10 days out. The most striking result in Table 3B, however, is the impact of the language in testimonies on longer term interest rates. Indeed, testimony language does not forecast 10 day movements in federal funds futures rates. However, in testimonies, increases in language certainty and activity and declines in language optimism forecast higher Treasury forward rates at the 1 to 2 year horizon and the 4 to 5 year horizon. As a final matter, higher levels of pessimism in speeches and testimonies forecast higher stock market growth at the 10 day horizon, perhaps due to what they may suggest about the future path of monetary policy.

Table 4 nicely summarizes much of the information in Tables 3A and 3B. Table 4 reports the level of statistical significance at which one can exclude the macroeconomic news variables (MAC), just the communication dummy variables (COM), the language variables for statements (STATE), speeches (SPEECH) and testimonies (TEST). Finally, the p-values from the joint test for whether all the language variables for statements, speeches and testimonies are reported in the language (LANG) column. Again, the results are clear. First, macroeconomic news moves financial variables. Second, the language in statements contains important forecasting information at both the same day and 10 day horizons. Third, the language content of Chairman Greenspan's speeches is a very significant predictor of daily movements in the stock market. Fourth, the language in

¹¹Note that the standard errors, robust to heteroskedasticity, are corrected for the non-iid moving average process that is present for the case of the 10 day cumulative movements in the variable of interest.

testimony by Chairman Greenspan is a very significant predictor of 10 day movements in Treasury forward rates. Finally, language in communications by Chairman Greenspan is a very significant predictor of daily movements in financial markets as well as at the 10 day cumulative horizon.

The results in Table 5 indicate a number of important aspects of the unexplained volatility in financial markets after controlling for unexpected movements in monetary policy, macroeconomic news and linguistic factors in communication. In almost all cases, even at the 10 day horizon, the p-value for MAC is below the .1 level of statistical significance. In other words, even after controlling for the significant predictive power of macroeconomic news on the change in financial markets, days of news still have a higher level of volatility in financial markets. Second, generally speaking, the volatility in financial markets on communication days at the one day horizon is statistically indistinguishable from days when there is neither news nor communication. An important exception is the effect of speeches on lower levels of three month movements in the federal funds futures rate as well as on near term movements in Treasury forward rates. Third, over the longer horizon of 10 days, communication matters: days of communication have reduced financial market volatility at this longer horizon. As can be seen from the table, the results hold over a wide variety of financial market data. Clearly statements and testimonies play a role in reducing longer term unexplained financial market volatility. Note that the decrease in unexplained volatility are economically important, often being on the order of a 10 to 20 percent reduction in the standard deviation of the error.

To provide a final component to our analysis, the results in Table 6 provide a broader understanding as to how Chairman Greenspan's communication and language predict the remaining volatility in the movements in financial variables. Recall from the regression specification (2) that ν_t is the unexplained shock to financial markets even after controlling for unexpected movements in monetary policy, macroeconomic news, communication and the language of these communications.

We then take the squared errors, ν_t^2 as the dependent variable and then regress these against the squared change in unexpected monetary policy, $(\Delta f f_t^u)^2$, the squared change in macroeconomic news, MAC_{it}^2 , as well as the presence of Chairman Greenspan's communications, COM , and the language of those communications, $COM \times LANG$. The regression specification is:¹²

$$\nu_t^2 = \alpha_0 + \alpha_1 (\Delta f f_t^u)^2 + \sum_{j=1}^{13} \beta_j MAC_{it}^2 + \sum_{j=1}^3 \gamma_j COM_{jt} + \sum_{j=1}^3 \sum_{k=1}^6 \phi_{jk} COM_{jt} \times LANG_{kt} + \epsilon_t \quad (3)$$

The results in Table 6 report the p-values from the test that the relevant variables indicated at the top of the columns are jointly equal to zero. The results indicate a number of clear findings. First, macroeconomic news volatility also forecasts financial market volatility at both horizons. Second, the language in speeches and statements, by themselves, are not systematically related to predicting financial market volatility in interest rates. However, the language in statements does have some predictive ability in forecasting stock market and exchange rate volatility. Finally, the language in testimony can predict movements in interest rate variables, particularly the Treasury forward rates, at the one day horizon.

5 Conclusion

The positive evidence suggests that the language in monetary policy communications by Chairman Greenspan are informative and aid in the improved predictability of financial market variables. These effects have been demonstrated to be statistically significant. Moreover, they have been demonstrated to be economically important: that is, we have demonstrated that the improved predictability is relevant at the 10 day horizon and, in addition, the decrease in unexplained volatility is often of the order of 10 to 20 percent. An important question remains, however, as to whether the Federal Reserve System has fully exploited the net gains from communication.

¹²Note that even with heteroskedasticity, the first state estimates in (2) are unbiased and consistent, though inefficient. As such the errors are not biased nor are the squared errors.

Generally speaking, a number of argument can be put forth that the Federal Reserve System has under-utilized its ability to beneficially communicate to the markets and broader public. First, as indicated by the evidence, testimony by Chairman Greenspan appears to have an important impact on longer horizon predictability of financial market variables. As such, richer in-depth explanations and analysis are likely to be important factors to market participants. Generally speaking, the Federal Reserve Board and the FOMC provides too little of this. By comparison, the Bank of England provides a richer description of economic activity in its Inflation Report which not only gives a perspective on policy and economic activity but also provides a range of forecasts which can help market participants delineate expected from unexpected movements in economic activity.

Second, as articulated by a number of authors, communication is not a one-way street. While we are not suggesting that the FOMC is unresponsive to pertinent issues in the market, the nature of monetary policy discussions involves reflection and the judicious discernment of permanent and temporary factors. These need not live solely within the Federal Reserve vacuum: FOMC decisions should be supported with facts, analysis and answers to real-time questions from market participants. One hundred word statements are simply not enough.

Finally, an additional reason for the why the Federal Reserve System has more to gain than it loses from continuing to improve its transparency with enhanced communication lies in the fact that it while it is independent, it exists within the political realm. As such, it needs to remain mindful that it is an appointed, non-elected body that has the final say in monetary policy decisions. Very few institutions in the U.S. are given such a level of responsibility and autonomy. Historically, such autonomy does not come cheap. Enhanced communication would thus be a way for the Federal Reserve system to continue to earn this autonomy by better justifying and

documenting in its decision making in real time.

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Table 1: Sample Statistics for Financial Variables and Federal Reserve Language: May 18th, 1999 to June 30th, 2004

Variable	COMM	MEAN	STD. DEV	MIN	MEDIAN	MAX	NOBS
$\Delta FFF3$		-0.27	3.53	-35.00	0.00	21.00	1279
$\Delta FFF6$		-0.23	4.78	-37.00	0.00	30.50	1279
$\Delta TFW D(0 - 1)$		-0.24	5.40	-53.52	-0.18	22.54	1279
$\Delta TFW D(1 - 2)$		-0.17	8.31	-50.03	-0.33	36.80	1279
$\Delta TFW D(4 - 5)$		-0.06	7.24	-24.03	-0.56	31.03	1279
$\% \Delta DOLLAR$		-0.01	0.41	-1.37	0.01	1.43	1279
$\% \Delta SP500$		-0.01	1.30	-6.00	-0.01	5.57	1279
CERTAINTY	ST	5.51	2.37	0.00	5.70	11.25	48
OPTIMISM	ST	1.74	1.06	0.00	1.67	4.09	48
PESSIMISM	ST	1.16	0.76	0.00	1.11	3.23	48
IMMEDIACY	ST	2.01	0.96	0.00	1.97	4.43	48
ACTIVITY	ST	7.31	2.48	0.00	7.46	13.13	48
JARGON	ST	4.80	1.63	0.00	5.16	7.05	48
CERTAINTY	SP	7.93	1.38	2.96	7.82	12.63	100
OPTIMISM	SP	2.27	0.77	0.75	2.13	5.46	100
PESSIMISM	SP	1.19	0.69	0.00	1.04	3.16	100
IMMEDIACY	SP	1.32	0.53	0.36	1.22	3.46	100
ACTIVITY	SP	7.50	1.82	3.50	7.32	12.63	100
JARGON	SP	2.66	1.20	0.23	2.62	5.72	100
CERTAINTY	TE	7.59	1.37	4.77	7.69	11.35	44
OPTIMISM	TE	2.13	0.66	0.68	2.16	4.11	44
PESSIMISM	TE	1.16	0.55	0.33	0.98	2.61	44
IMMEDIACY	TE	1.14	0.43	0.24	1.09	2.46	44
ACTIVITY	TE	7.23	1.48	4.29	7.18	10.52	44
JARGON	TE	2.98	0.90	0.61	3.07	4.66	44

Notes: Data are for business days from May 18th, 1999 to June 30th, 2004. There are 194 communications sample made up of 48 FOMC statements, 44 Testimony's before Congress or the Senate and 100 Speeches during this time period. $\Delta FFF3$ and $\Delta FFF6$ are the change in the federal funds futures rate three and six months ahead, respectively, $\Delta TFW D(0 - 1)$, $\Delta TFW D(1 - 2)$, $\Delta TFW D(4 - 5)$ are the change treasury forward rates (zero to one years ahead, one to two years ahead, and four to five years ahead), $\% \Delta Dollar$ is the log growth rate of trade weighted dollar, and $\% \Delta SP500$ is the log growth rate of the S&P500. All the interest rate data are reported in basis points (that is 100 times the percentage) while the data for the Dollar, and the S&P500 are in percentages. Note that for the case of the 10 day horizon, the estimated regression (not shown) and the test statistic is adjusted for the moving average error structure imposed by time aggregation. Language variables, CERTAINTY, OPTIMISM, PESSIMISM, IMMEDIACY, ACTIVITY and JARGON ARE discussed in the text. NOBS is the number of observations.

Table 2: Standard Deviations of Financial Variables Across News and Communications

	HORIZON	NO NEWS						
		ALL	NO COM	NEWS	COM	STATE	SPEECH	TEST
$\Delta FFF3$	1	3.53	2.10	4.21 ^c	5.33	8.80 ^a	1.37 ^c	2.55
$\Delta FFF6$	1	4.78	3.54	5.59 ^c	5.13	7.83 ^b	2.15	3.79 ^c
$\Delta TFWD(0 - 1)$	1	5.40	4.61	6.10 ^c	4.70	6.03 ^b	3.48	4.07 ^c
$\Delta TFWD(1 - 2)$	1	8.31	7.25	9.27 ^c	7.00	8.69	5.85	6.96 ^b
$\Delta TFWD(4 - 5)$	1	7.24	6.54	7.88 ^c	6.21	7.91	5.40	5.28
$\% \Delta DOLLAR$	1	0.41	0.40	0.42	0.38	0.27	0.37	0.49
$\% \Delta SP500$	1	1.30	1.31	1.26	1.29	1.76	1.09	0.80
$\Delta FFF3$	10	14.21	13.00	15.61 ^a	14.40	17.8	13.80	9.67
$\Delta FFF6$	10	17.11	16.02	18.52 ^b	16.30	17.9	16.20	14.5
$\Delta TFWD(0 - 1)$	10	17.20	16.26	18.57 ^b	15.80	14.2 ^b	17.50	14.5
$\Delta TFWD(1 - 2)$	10	26.23	25.29	27.43 ^b	25.20	21.4	28.10	23.2 ^b
$\Delta TFWD(4 - 5)$	10	24.13	23.14	24.72 ^a	24.90	22.5	27.90	20.3
$\% \Delta DOLLAR$	10	1.32	1.36	1.31	1.20	1.22	1.11	1.43
$\% \Delta SP500$	10	3.72	3.84	3.67	3.68	3.04 ^b	3.93	4.08

Notes: See Table 1. The standard deviations are of the actual data. ALL, NO COM NO NEWS, NEWS and COMM refer to whether the statistic is calculated over the full sample, for just days when there is neither communication nor news, one of the 13 news variables were reported, only for days when there was a Speech or Testimony by Greenspan, or an FOMC statement. STATE, SPEECH and TEST refer to days when there was either a Speech, Testimony by Greenspan, or an FOMC statement, respectively. The superscripts a,b, and c indicate the .10, .05 and .01 level of statistical significance at which one can reject the null hypothesis that the standard deviation of the data sample differs from that when there is neither news nor communication. The p-values are derived from tests that are robust to heteroskedasticity of unknown form and they are corrected for the non-iid moving average process that is present for the case of the 10 day cumulative movements in the dependent variable.

$$\Delta y_t = \alpha_0 + \alpha_1 \Delta f f_t^u + \sum_{j=1}^{13} \beta_i MAC_{it} + \sum_{j=1}^3 \gamma_j COM_{jt} + \sum_{j=1}^3 \sum_{k=1}^6 \phi_{jk} COM_{jt} \times LANG_{kt} + \nu_t$$

Table 3A: Regression Results at Current (1) Day Horizon

VAR	COM	$\Delta FFF3$	$\Delta FFF6$	$\Delta TFW D$ (0 - 1)	$\Delta TFW D$ (1 - 2)	$\Delta TFW D$ (4 - 5)	% Δ \$	% ΔSP 500
		0.623 ^c	0.398 ^c	0.133	-0.145	-0.219	-0.004	-0.050
		(0.068)	(0.074)	(0.113)	(0.170)	(0.197)	(0.004)	(0.044)
CERTAINTY	ST	0.719 ^c	0.963 ^b	0.916 ^a	0.882	0.690	0.042	0.017
		(0.266)	(0.474)	(0.501)	(0.674)	(0.571)	(0.030)	(0.130)
OPTIMISM	ST	0.426	1.011	0.592	0.893	0.716	-0.027	0.124
		(0.370)	(0.747)	(0.930)	(1.327)	(0.877)	(0.034)	(0.173)
PESSIMISM	ST	-1.422 ^b	-2.816 ^c	-1.461	-2.018	-2.032	-0.118 ^b	-0.548
		(0.580)	(0.800)	(1.053)	(1.541)	(1.254)	(0.052)	(0.365)
IMMEDIACY	ST	0.126	-0.709	0.362	1.087	0.547	0.002	0.023
		(0.576)	(0.915)	(1.134)	(1.612)	(1.183)	(0.049)	(0.252)
ACTIVITY	ST	-0.681 ^c	-0.843 ^b	-1.284 ^b	-2.224 ^c	-0.885	-0.037	0.042
		(0.240)	(0.421)	(0.550)	(0.790)	(0.802)	(0.033)	(0.134)
JARGON	ST	0.768 ^c	1.800 ^c	1.820 ^b	1.501	0.591	0.098 ^b	-0.123
		(0.261)	(0.551)	(0.785)	(1.165)	(0.927)	(0.040)	(0.147)
CERTAINTY	SP	0.193	0.265	0.401	0.372	0.538	-0.007	0.002
		(0.123)	(0.248)	(0.307)	(0.501)	(0.443)	(0.029)	(0.081)
OPTIMISM	SP	-0.251	-0.395	-0.860	-1.236	-1.788 ^b	-0.118 ^a	0.055
		(0.326)	(0.525)	(0.654)	(1.065)	(0.911)	(0.065)	(0.162)
PESSIMISM	SP	-0.303	-0.506	-0.774	-0.856	-0.564	-0.064	-0.450 ^b
		(0.312)	(0.568)	(0.696)	(1.124)	(0.851)	(0.063)	(0.217)
IMMEDIACY	SP	-0.157	0.066	-0.115	-0.400	-0.850	0.099	-1.024 ^c
		(0.399)	(0.738)	(0.802)	(1.436)	(1.178)	(0.071)	(0.236)
ACTIVITY	SP	-0.167	-0.337	-0.363	-0.462	-0.233	-0.017	0.047
		(0.131)	(0.245)	(0.256)	(0.428)	(0.433)	(0.023)	(0.067)
JARGON	SP	0.057	-0.116	-0.409	-0.754	-0.756	-0.060 ^a	-0.043
		(0.197)	(0.323)	(0.386)	(0.639)	(0.550)	(0.033)	(0.108)
CERTAINTY	TE	-0.388	-0.744	-0.744	-0.634	-0.652	0.017	0.044
		(0.340)	(0.611)	(0.628)	(1.297)	(1.109)	(0.067)	(0.109)
OPTIMISM	TE	0.605	-0.333	-1.279	-1.955	-0.104	-0.053	-0.187
		(0.611)	(0.989)	(1.097)	(2.011)	(1.582)	(0.124)	(0.253)
PESSIMISM	TE	-0.094	-0.691	-0.617	-0.080	0.009	-0.093	-0.314
		(0.623)	(0.973)	(1.066)	(1.916)	(1.782)	(0.114)	(0.365)
IMMEDIACY	TE	-0.962	0.340	1.911	1.809	-1.283	0.223	-0.141
		(1.015)	(2.012)	(2.113)	(3.998)	(3.613)	(0.250)	(0.314)
ACTIVITY	TE	-0.299	-0.371	-0.353	-0.439	-0.430	-0.019	0.127
		(0.351)	(0.437)	(0.409)	(0.675)	(0.651)	(0.062)	(0.085)
JARGON	TE	-0.208	-0.990	-1.165	-0.713	-1.250	-0.084	0.207
		(0.491)	(0.891)	(0.955)	(1.828)	(1.866)	(0.081)	(0.176)
		\bar{R}^2	0.250	0.178	0.089	0.066	0.045	0.019
		NOBS	1279	1279	1279	1279	1279	1279

Notes: See Tables 1 and 2. Regressions also include a constant, lagged dependent variable and macroeconomic news variables. \bar{R}^2 is adjusted R-squared. ST, SP and TE refer to STATEMENT, SPEECH and TESTIMONY. There are 13 macroeconomic surprise variables, 3 communication variables and 6 language variables per type of communication.

$$\Delta y_t = \alpha_0 + \alpha_1 \Delta f f_t^u + \sum_{j=1}^{13} \beta_j MAC_{it} + \sum_{j=1}^3 \gamma_j COM_{jt} + \sum_{j=1}^3 \sum_{k=1}^6 \phi_{jk} COM_{jt} \times LANG_{kt} + \nu_t$$

Table 3B: Regression Results at 10 Day Horizon

VAR	COM	$\Delta FFF3$	$\Delta FFF6$	$\Delta TFW D$ (0 - 1)	$\Delta TFW D$ (1 - 2)	$\Delta TFW D$ (4 - 5)	% Δ \$	% Δ SP 500
		0.656 ^c (0.221)	0.381 ^b (0.148)	0.182 (0.149)	-0.322 ^b (0.155)	-0.303 (0.264)	-0.019 (0.021)	-0.067 (0.055)
CERTAINTY	ST	1.534 ^a (0.902)	1.252 (1.061)	0.959 (1.085)	-0.987 (1.971)	0.330 (2.137)	0.072 (0.094)	0.014 (0.257)
OPTIMISM	ST	3.494 ^a (1.875)	4.763 ^b (2.190)	6.742 ^c (1.808)	11.387 ^c (3.298)	5.585 (3.658)	0.213 (0.163)	0.177 (0.391)
PESSIMISM	ST	-4.587 ^a (2.494)	-6.921 ^c (2.620)	-4.434 ^b (1.900)	-5.941 ^b (2.843)	-5.478 (5.176)	-0.403 ^a (0.241)	0.242 (0.635)
IMMEDIACY	ST	-0.701 (1.747)	0.636 (2.174)	2.062 (1.863)	3.886 (2.984)	5.199 (3.673)	0.308 ^a (0.168)	0.221 (0.574)
ACTIVITY	ST	-1.092 (0.921)	-2.568 ^c (0.984)	-3.826 ^c (1.090)	-5.537 ^c (1.866)	-3.422 ^b (1.680)	-0.060 (0.092)	-0.229 (0.339)
JARGON	ST	-0.322 (1.890)	-1.116 (1.927)	1.190 (1.576)	2.186 (2.297)	3.136 (2.959)	0.194 (0.172)	0.253 (0.363)
CERTAINTY	SP	0.627 (0.957)	1.356 (1.222)	2.204 ^a (1.288)	2.981 (2.278)	2.864 (2.377)	0.168 (0.107)	-0.232 (0.275)
OPTIMISM	SP	0.024 (1.693)	-1.451 (2.020)	-1.703 (2.388)	-0.482 (3.691)	-3.031 (4.204)	-0.336 ^b (0.166)	0.763 (0.536)
PESSIMISM	SP	3.938 (2.542)	3.991 (2.925)	3.629 (3.144)	3.458 (4.444)	0.608 (4.380)	-0.066 (0.172)	1.315 ^b (0.645)
IMMEDIACY	SP	1.073 (2.765)	0.787 (3.388)	1.644 (3.362)	0.276 (5.004)	-0.206 (4.644)	0.000 (0.221)	-0.364 (0.724)
ACTIVITY	SP	-0.661 (0.854)	-0.757 (1.042)	-0.512 (1.111)	-1.723 (1.664)	-1.086 (1.656)	-0.011 (0.071)	0.046 (0.198)
JARGON	SP	-2.118 (1.913)	-1.423 (2.222)	-0.570 (2.213)	-1.775 (2.910)	-0.660 (2.401)	0.129 (0.111)	-0.163 (0.341)
CERTAINTY	TE	-0.542 (1.236)	-1.397 (1.667)	-0.411 (1.536)	4.185 (3.243)	6.529 ^a (3.665)	0.142 (0.179)	0.679 (0.460)
OPTIMISM	TE	1.725 (2.207)	-2.041 (3.284)	-3.289 (2.766)	-15.908 ^c (4.658)	-18.467 ^c (4.854)	-0.123 (0.251)	-0.735 (0.783)
PESSIMISM	TE	2.221 (3.096)	7.483 (5.206)	8.177 (5.337)	8.425 (7.407)	5.149 (6.513)	0.107 (0.275)	2.122 ^b (1.034)
IMMEDIACY	TE	0.420 (3.589)	1.896 (5.845)	2.279 (5.105)	16.759 ^a (8.764)	11.610 (7.179)	0.715 (0.636)	1.797 (1.507)
ACTIVITY	TE	0.273 (1.235)	1.458 (1.470)	2.772 ^b (1.190)	5.072 ^b (2.080)	5.552 ^b (2.216)	0.030 (0.147)	1.058 ^b (0.433)
JARGON	TE	0.281 (1.555)	1.933 (2.335)	1.232 (1.993)	4.199 (4.022)	6.184 (4.028)	-0.040 (0.202)	0.290 (0.471)
		\overline{R}^2	0.090	0.050	0.028	0.022	0.014	0.005
		NOBS	1279	1279	1279	1279	1279	1279

Notes: See Table 3A.

Table 4: Statistical Significance of Macroeconomic News and Language on Financial Variables

VAR	HORIZON	MAC	COM	STATE	SPEECH	TEST	LANG
$\Delta FFF3$	1	.000	.323	.000	.197	.891	.002
$\Delta FFF6$	1	.000	.157	.000	.582	.362	.002
$\Delta TFWD(0 - 1)$	1	.000	.228	.081	.324	.085	.045
$\Delta TFWD(1 - 2)$	1	.000	.707	.137	.607	.675	.433
$\Delta TFWD(4 - 5)$	1	.000	.715	.378	.230	.984	.624
$\% \Delta DOLLAR$	1	.001	.295	.011	.340	.669	.072
$\% \Delta S \& P 500$	1	.025	.415	.367	.000	.608	.008
$\Delta FFF3$	10	.002	.988	.051	.579	.832	.380
$\Delta FFF6$	10	.000	.239	.011	.466	.646	.104
$\Delta TFWD(0 - 1)$	10	.000	.384	.000	.511	.088	.000
$\Delta TFWD(1 - 2)$	10	.000	.112	.000	.755	.000	.000
$\Delta TFWD(4 - 5)$	10	.114	.116	.184	.763	.000	.007
$\% \Delta DOLLAR$	10	.320	.693	.121	.069	.964	.189
$\% \Delta S \& P 500$	10	.044	.123	.929	.484	.288	.494

Notes: See Tables 1-3B. Data are daily from May 18th, 1999 to June 30th, 2004. There are 194 communications sample made up of 45 FOMC statements, 44 Testimony's before Congress or the Senate and 105 Speeches during the time period May 18th, 1999 to June 30th, 2004. Horizon refers to the cumulative numbers of days including the current day when calculating the change in the variables. The remaining column heads refer to p-values for F-test for the exclusion of the following variables. MAC refers to the macroeconomic news variables, COM refers to the dummy variables for Chairman Greenspan's Speeches, Statements and Testimonies. Note that for the case of the 10 day horizon, the estimated regressions (Table 3A,B) and the test statistic is adjusted for the moving average error structure imposed by time aggregation.

Table 5: Standard Deviations of Unexplained Movements in Financial Variables Across News and Communications

	Horizon	NO NEWS						
		Full	NO COM	NEWS	COM	STATE	SPEECH	TEST
$\Delta FFF3$	1	3.01	2.10	3.89 ^c	2.27	2.97	1.47 ^b	2.68
$\Delta FFF6$	1	4.27	3.56	4.95 ^c	3.44	4.71	2.40	3.41
$\Delta TFWD(0 - 1)$	1	5.08	4.61	5.62 ^b	4.14	5.52	3.43 ^a	3.37
$\Delta TFWD(1 - 2)$	1	7.92	7.25	8.56 ^c	6.58	7.96	5.73	6.45
$\Delta TFWD(4 - 5)$	1	6.98	6.54	7.39 ^c	5.81	7.27	5.02	5.31
$\% \Delta DOLLAR$	1	0.40	0.40	0.41	0.36	0.25 ^c	0.37	0.47
$\% \Delta SP500$	1	1.27	1.31	1.25	1.20	1.56	1.09	0.78 ^c
$\Delta FFF3$	10	13.37	12.70	14.75 ^a	11.50 ^b	10.98 ^b	12.83	8.58 ^b
$\Delta FFF6$	10	16.44	15.92	17.74 ^a	14.01 ^b	11.20 ^c	15.66	13.63
$\Delta TFWD(0 - 1)$	10	16.72	16.20	17.99 ^b	14.48 ^b	9.56 ^c	17.29	13.26 ^b
$\Delta TFWD(1 - 2)$	10	25.56	25.27	26.61	22.69 ^a	15.85 ^c	26.99	19.91
$\Delta TFWD(4 - 5)$	10	23.61	23.14	24.10	23.16	19.64 ^b	27.86	15.23
$\% \Delta DOLLAR$	10	1.30	1.35	1.29	1.12 ^c	1.01 ^c	1.07 ^b	1.39
$\% \Delta SP500$	10	3.65	3.82	3.65	3.36 ^c	2.84 ^c	3.70 ^a	3.29 ^a

Notes: See Tables 1-4. The standard deviations are of the residuals estimated in models reported in Tables 3A and 3B. ALL, NO COM NO NEWS, NEWS and COMM refer to whether the statistic is calculated over the full sample, for just days when there is neither communication nor news, one of the 13 news variables were reported, only for days when there was a Speech or Testimony by Greenspan, or an FOMC statement. STATE, SPEECH and TEST refer to days when there was either a Speech, Testimony by Greenspan, or an FOMC statement, respectively. The superscripts a,b, and c indicate the .10, .05 and .01 level of statistical significance at which one can reject the null hypothesis that the standard deviation of the data sample differs from that when there is neither news nor communication.

$$\nu_t^2 = \alpha_0 + \alpha_1 (\Delta f f_t^u)^2 + \sum_{j=1}^{13} \beta_j MAC_{it}^2 + \sum_{j=1}^3 \gamma_j COM_{jt} + \sum_{j=1}^3 \sum_{k=1}^6 \phi_{jk} COM_{jt} \times LANG_{kt} + \epsilon_t$$

Table 6: Statistical Significance of Macroeconomic News and Language on Squared Residuals from Financial Regressions

VAR	HORIZON	MAC ²	COM	STATE	SPEECH	TEST	LANG
$\Delta FFF3$	1	0.011	0.204	0.515	0.568	0.280	0.511
$\Delta FFF6$	1	0.000	0.483	0.005	0.460	0.026	0.003
$\Delta TFWD(0-1)$	1	0.008	0.652	0.166	0.642	0.006	0.026
$\Delta TFWD(1-2)$	1	0.016	0.792	0.144	0.808	0.006	0.032
$\Delta TFWD(4-5)$	1	0.000	0.282	0.230	0.872	0.258	0.433
$\% \Delta DOLLAR$	1	0.001	0.569	0.618	0.100	0.082	0.092
$\% \Delta SP500$	1	0.006	0.364	0.723	0.155	0.171	0.236
$\Delta FFF3$	10	0.000	0.807	0.127	0.632	0.749	0.451
$\Delta FFF6$	10	0.002	0.321	0.340	0.271	0.047	0.103
$\Delta TFWD(0-1)$	10	0.004	0.552	0.395	0.025	0.111	0.080
$\Delta TFWD(1-2)$	10	0.003	0.474	0.150	0.165	0.229	0.101
$\Delta TFWD(4-5)$	10	0.001	0.070	0.091	0.416	0.113	0.043
$\% \Delta DOLLAR$	10	0.005	0.016	0.004	0.003	0.374	0.001
$\% \Delta SP500$	10	0.005	0.046	0.006	0.215	0.145	0.003

Notes: See Tables 1-5. Dependent Variables are the squared residuals from regressions reported in Tables 3A and 3B.

SUPPLEMENTAL APPENDIX A

Diction Dictionaries and Composite Dictionaries

Dictionary	Description	Sample Words
Certainty =	Language indicating resoluteness, inflexibility, and completeness as well as a tendency to speak ex cathedra.	Tenacity + Leveling + Concreteness + Insistence – Ambivalence
Tenacity	Includes all uses of the verb “to be”, definitive verb forms and their variants, and associated contractions. These verbs connote confidence and totality.	Is, am, will, shall, has, must do, he’ll, they’ve, ain’t
+ Leveling	Words used to ignore individual differences and to build a sense of completeness and assurance.	Everybody, anyone, each, fully, always, completely, inevitably, consistently, unconditional, consummate, absolute
+ Concreteness	A dictionary of words denoting tangibility and materiality, including physical structures, modes of transportation, articles of clothing, household animals, etc.	Airplane, ship, bicycle, stomach, eyes, lips, slacks, pants, shirt, cat, insects, horse, wine grain, sugar, oil, silk, sand, courthouse, temple, store
– Ambivalence	Words expressing hesitation or uncertainty, implying an inability or unwillingness to commit to what is being said.	Allegedly, perhaps, might, almost, approximate, vague, baffled, puzzling, hesitate, could, would, guess, suppose, seems
Optimism =	Language endorsing or highlighting the positive entailments of some person, group, concept, or event.	Praise + Satisfaction + Inspiration
Praise	Affirmations of a person, group, or abstract entity.	Dear, delightful, witty, mighty, handsome, beautiful, shred, bright, vigilant, reasonable, successful, renowned, faithful, good, noble
+ Satisfaction	Terms associated with positive affective states, moments of undiminished joy, and moments of triumph.	Cheerful, passionate, happiness, smile, welcome, excited, fun, lucky, celebrating, pride, secure, relieved
+ Inspiration	Abstract virtues deserving of universal respect and attractive personal qualities.	Honesty, self-sacrifice, virtue, courage, dedication, wisdom, mercy, patriotism, success, education, justice
Pessimism =	Language endorsing or highlighting the negative entailments of some person, group, concept, or event.	Blame + Hardship
*Blame +	Terms designating social inappropriateness and evil, as well as unfortunate circumstances.	Mean, naïve, sloppy, stupid, fascist, repugnant, malicious, bankrupt, rash, morbid, weary, nervous, painful, detrimental, cruel
*Hardship +	Natural disasters, hostile actions, censurable human behavior, unsavory political outcomes, and human fears.	Earthquake, starvation, killers, bankruptcy, enemies, vices, infidelity, despots, betrayal, injustices, exploitation, grief, death

Notes: See next page.

Dictionary	Description	Sample Words
Activity =	Language featuring movement, change, the implementation of ideas, and the avoidance of inertia.	Aggression + Accomplishment + Communication + Motion + Cognitive Terms
Aggression	Words denoting human competition and forceful action, including physical energy, social domination, and goal-directedness.	Blast, crash, explode, collide, conquest, attacking, violation, commanded, challenging, overcome, mastered, pound, shove, dismantle, overturn, prevent, reduce, defend
+ Accomplishment	Words expressing task-completion and organized human behavior.	Establish, finish, influence, proceed, motivated, influence, leader, manage, strengthen, succeed, agenda, enacted, working, leadership
+ Communication	Terms referring to social interaction, both face-to-face and mediated. Includes modes of intercourse as well as social actors and social purposes.	Listen, interview, read, speak, film, videotape, telephone, email, translate, quote, scripts, broadcast, reporter, spokesperson, hint, rebuke, respond, persuade
+ Motion	Terms connoting human movement, physical processes, journeys, speed, and modes of transit.	Bustle, lurch, leap, momentum, revolve, wandering, travels, nimble, ride, fly, glide, swim
+ Cognitive terms	Words referring to cerebral processes, both functional and imaginative. Includes modes of discovery and domains of study. Also includes mental challenges, insitutional learning practices, and intuitional, rationalistic, and speculative processes.	Learn, deliberate, consider, compare, biology, psychology, logic, economics, question, forget, reexamine, paradox, graduation, teaching, classroom, invent, perceive, speculate, interpret, estimate, examine, diagnose, analyze, software, fact-finding
Immediacy =	Language describing immediate matters that affect people's everyday lives	Present concerns – Past concerns
Present Concern	Present-tense verbs denoting an emphasis on the here and now.	Cough, tastes, sing, take, canvass, touch, govern, meet, make, cook, print, paint.
– Past concern	The past-tense forms of the verbs in the Present concern dictionary.	Coughed, tasted, sang, took, canvassed, touched, governed, met, made, cooked, printed, painted
Jargon	The dictionary of terms provided at the end of the popular intermediate macroeconomic textbooks by Professors Abel and Bernanke (2004), Delong (2003) , and Mankiw (2004).	Unemployment, inflation, natural rate.

Notes: To offset the potential problem of negation affecting the meaning of a word, words that were preceded by “no” or “not” were omitted from the analysis.

APPENDIX B
Computerized Coding of Sample Statement Passages

Construct	Computerized Coding
Certainty	“The <u>evidence accumulated</u> over the <u>intermeeting period</u> <u>indicates</u> that <u>output is continuing</u> to expand at a <u>solid</u> pace and <u>labor market conditions</u> have improved.” (06/30/04)
Optimism	“ <u>Strengthening productivity growth</u> has been <u>fostering favorable</u> trends in unit costs and prices, and much recent information suggests that these trends have been <u>sustained</u> .” (10/05/99)
Pessimism	“Heightened <u>uncertainty</u> and <u>concerns</u> about a <u>deterioration</u> in business conditions both here and abroad are <u>damping</u> economic activity.” (11/06/01)
Activity	“Taken together, and with inflation <u>contained</u> , these circumstances have <u>called</u> for a <u>rapid</u> and <u>forceful response</u> of monetary policy.” (01/31/01)
Immediacy	“The patterns evident in <u>recent months</u> --declining profitability and business capital spending, weak expansion of consumption, and slowing growth abroad-- <u>continue</u> to <u>weigh</u> on the economy.” (06/27/01)
Jargon	“ <u>Consumer and business confidence</u> has eroded further, exacerbated by rising energy <u>costs</u> that continue to drain <u>consumer purchasing power</u> and press on <u>business profit margins</u> .” (01/31/01)