Monetary Policy Slope and the Stock Market*

Andreas Neuhierl† Michael Weber‡

This version: August 2017

Abstract

We construct a slope factor from changes in federal funds futures of different horizons. A positive slope signals faster monetary policy tightening and predicts negative excess returns at the weekly frequency. Investors can achieve increases in weekly Sharpe ratios of 20% conditioning on the slope factor. The tone of speeches by the FOMC chair correlates with the slope factor. Slope predicts changes in future interest rates and forecast revisions of professional forecasters, but macro news does not drive the predictability of slope for future excess returns. Our findings show that the path of future interest rates matters for asset prices, and monetary policy affects asset prices throughout the year and not only at FOMC meetings.

JEL classification: E31, E43, E44, E52, E58, G12

Keywords: Return Predictability, Policy Speeches, Expected Returns, Macro News

*We thank Christiane Baumeister, Dan Cooper, John Campbell, George Constantinides, Thorsten Drautzburg, Jean-Sebastien Fontaine, Yuriy Gorodnichenko, Lars Hansen, Jens Hilscher (discussant), Sam Hartzmark, Zhiguo He, Alex Kostakis (discussant), Emanuel Moench, Stefan Nagel, Stijn Van Nieuwerburgh, Ali Ozdagli, Ľuboš Pástor, Monika Piazzesi, Josh Pollet (discussant), Bernd Schlusche, Martin Schneider, Volker Seiler (discussant), Kelly Shue, Frank Smets (discussant), Dongho Song (discussant), Amir Sufi, Harald Uhlig, Pietro Veronesi, Greg Vilkov (discussant), Paul Whelan (discussant), Luigi Zingales, Eric Zwick, and seminar and conference participants at the 2017 AEA, 2017 CITE conference, 2016 Commodities Markets Conference, 2017 ESAM, 2017 European Winter Finance Summit, 2017 FIRS, 2017 HEC-McGill Winter Finance Workshop, 2016 Ifo Conference on Macro and Survey Data, 2017 SED, 2017 SFS Cavalcade, the University of Chicago, the 2016 Wabash River Conference, and the European Finance Association Annual Meeting 2016 for valuable comments. Weber gratefully acknowledges financial support from the University of Chicago, the Neubauer Family Foundation, and the Fama–Miller Center.

†University of Notre Dame, Notre Dame, IN, USA. e-Mail: aneuhier@nd.edu

‡Booth School of Business, University of Chicago, Chicago, IL, USA. e-Mail: michael.weber@chicagobooth.edu.

I Introduction

The FOMC will, of course, carefully deliberate about when to begin the process of removing policy accommodation. But the significance of this decision should not be overemphasized, because what matters for financial conditions and the broader economy is the entire expected path of short-term interest rates and not the precise timing of the first rate increase.

Janet L. Yellen (2015)

...policy deliberations happen on a rather continuous basis.

Kevin Warsh (2015)

The main objectives of the Federal Reserve (Fed) under its dual mandate are price stability and maximum employment. The fed funds rate is the Fed's main conventional policy tool to achieve those goals. But whereas real consumption, investment, and GDP only respond with a lag to changes in the target rate, a large literature documents that asset prices respond directly and immediately to monetary policy (see Bernanke and Kuttner (2005)). Yellen's quote, however, highlights that asset prices might react not only to changes in short-term interest rates, but also to changes in expectations about the speed of monetary policy loosening and tightening. Former governor Warsh, instead, stresses that monetary policy decisions happen continuously rather than only on eight scheduled Federal Open Market Committee (FOMC) meetings that are the focus of a large event-study literature.

We use weekly changes in the one-month and three-month federal funds futures-implied rates to test for the effect of changes in the future path of monetary policy on asset prices throughout the year.[1] Specifically, we argue that changes in one-month futures, $ff_{t,1}$, affect all future target rates, and we can interpret it as a level factor. Changes in the three-month futures, $ff_{t,3}$, instead also contain information about the

[1]We focus on the one- and three-month futures because longer-term futures either did not exist at the beginning of our sample (1994) or were not heavily traded (see discussion in Gürkaynak, Sack, and Swanson (2005b)). In addition, Gertler and Karadi (2015) instrument for monetary policy shocks using different proxies and find that the change in the three-month federal fund futures has the strongest explanatory power.

future path of monetary policy. We regress changes in the three-month futures-implied rate on the changes in the one-month futures-implied rate to get a purified measure of changes in expectations of the path of future monetary policy. We refer to the residual of this regression as the *slope factor* or simply slope. Slope robustly predicts excess returns of the Center for Research in Security Prices (CRSP) value-weighted index over the following week and explains around 2% of the weekly variation in stock returns.

A positive slope, that is, expectations of faster future monetary policy tightening, predict negative stock returns. The predictability of the slope is not contained within weeks with meetings of the FOMC and stable throughout the year. In fact, we find speeches of the chair or vice chair – which only occur outside of the blackout periods before FOMC meetings – systematically predict the slope factor.

Our findings suggest that the whole future path of monetary policy being important for the real economy and that the FOMC releases most of the news about monetary policy outside of scheduled FOMC meetings throughout the year. This interpretation is consistent with evidence in Gorodnichenko and Weber (2016) who document most monetary policy shocks within narrow event windows around FOMC decisions are tiny. Our findings open up exciting new avenues for future research. Through which channels do future changes in target rates matter for financial markets, such as a risk-free rate, inflation, or risk-premium channel? How does the FOMC communicate and transmit news about monetary policy to the public outside of FOMC meetings? How do financial markets interpret these news?

When we regress the change in the three-month futures on the change in the one-month futures, we find a coefficient estimate of close to 1; therefore, at a basic level, we can think of slope as a difference in differences: $slope = [\mathbb{E}_{t+1}(r_3) - \mathbb{E}_{t+1}(r_1)] - [\mathbb{E}_t(r_3) - \mathbb{E}_t(r_1)]$. A positive slope factor reflects market expectations of a faster monetary policy tightening, or markets assume that interest rates three months from now, $\mathbb{E}_{t+1}(r_3)$, will be higher relative to what the market expected last week and relative to the change in expectations for the federal funds rate in one month. In Section II, we motivate the

regression and our choice of terminology in a simple factor model.

Empirically, we create the slope factor using end-of-day data from Wednesday of week $t-1$ to Wednesday of week t following Lo and MacKinlay (1988). We use slope to predict returns over the following week starting with Wednesday of week t.[2] The predictability we uncover is economically large and is robust to the inclusion of lagged weekly returns.[3] The predictability is contained in the following week and is a robust finding across subsamples from 1988 (the beginning of the federal fund futures market) to 2007.[4] The weekly predictability is of similar magnitude and is orthogonal to the predictive power of other standard return predictors such as the dividend-price ratio, the VIX, the variance risk premium, or the term spread.

The FOMC has eight scheduled meetings per year, and a large literature studies the effects of monetary policy shocks on financial markets in narrow event windows bracketing those eight meetings. Since the first meeting in 1994, the FOMC has released a press statement after meetings and policy decision explaining the decision and discussing the future stance of monetary policy. Our findings are similar in magnitude when we exclude weeks with FOMC meetings and decisions, and does not vary with turning points in monetary policy or policy decisions during unscheduled meetings.

During the same time period, the FOMC changed the conduct of monetary policy and shifted to a more granular, inertial approach (see Figure 1). This increased transparency has decreased the size of monetary policy shocks around FOMC meetings over time (see, e.g., Gorodnichenko and Weber (2016)). We find that small values of the slope factor do not drive our findings.

But policymakers also attempt to guide financial markets throughout the year and not only during scheduled meetings. We use linguistic analysis and find that a more hawkish tone in speeches by the chair or vice chair predicts a faster monetary policy

[2]Equity markets close after the close of futures markets and market participants could trade on the predictions of the slope factor.

[3]Weekly stock returns are autocorrelated; see Lo and MacKinlay (1988).

[4]The zero lower bounds on nominal interest rates determine the end of our sample period. We use longer-dated futures contracts to construct a slope factor during the zero-lower-bound period and find results consistent with our baseline analysis (see discussion in the Online Appendix).

tightening. Our findings are consistent with the idea that monetary policy became more transparent in the 1990s. In fact, Ben Bernanke states in his blog that "monetary policy is 98 percent talk and only two percent action."[5]

Ozdagli and Weber (2016) find a larger effect of surprise monetary easing on financial markets than of surprise tightening. We also find a larger forecasting power of slope in periods with negative slope values, that is, when market participants expect faster monetary policy easing (see Table 5).

One channel through which our slope factor might affect stock returns is through changing expectations about changes in future short-term interest rates. The slope factor predicts changes in future federal funds rates over the following two months and forecast revisions of professional forecasters over the next quarter. Macro news explains 9% of the variation in the slope factor but does not drive our predictability. Hence, news about the economy is unlikely to drive the predictability of weekly stock returns by the slope factor; rather, news about the stance on monetary policy is likely to drive the predictability.

The predictability we uncover is economically large. Using insights from Campbell and Thompson (2008) and Cochrane (1999), we show that an investor conditioning on the slope factor can increase his weekly Sharpe ratio by more than 20% compared to a buy-and-hold investor. We argue below that trading based on the predictions of the slope factor is feasible and transaction costs are small.

Our results are consistent with a delayed market reaction to monetary policy news and short-run monetary policy momentum. We provide anecdotal evidence supporting this interpretation.

A. Related Literature

A large literature at the intersection of macroeconomics and finance investigates the effect of monetary policy shocks on asset prices in an event-study framework. In a seminal study, Cook and Hahn (1989) examine the effects of changes in the federal funds rate

[5]See: http://www.brookings.edu/blogs/ben-bernanke/posts/2015/03/30-inaugurating-new-blog

on bond rates using a daily event window. They show that changes in the federal funds target rate are associated with changes in interest rates in the same direction, with larger effects at the short end of the yield curve. Bernanke and Kuttner (2005)—also using a daily event window—focus on unexpected changes in the federal funds target rate. They find that an unexpected interest rate cut of 25 basis points leads to an increase in the CRSP value-weighted market index of about 1 percentage point. Gürkaynak, Sack, and Swanson (2005b) focus on intraday event windows and find effects of similar magnitudes for the S&P500. They argue that two factors, a target and path factor, are necessary to describe the reaction of notes with up to ten-year maturity to monetary policy shocks. Boyarchenko, Haddad, and Plosser (2017) extend the heteroskedasticity-based identification of Rigobon and Sack (2003) and also argue that two shocks best describe the reaction of financial instruments across a wide range of asset markets: a conventional monetary policy shock and a confidence shock. Lucca and Moench (2015) document that stock returns already appreciate in the twenty-four hours before the actual FOMC announcement. Savor and Wilson (2013) show that 60%-80% of the realized equity premium is earned around scheduled macroeconomic news announcements such as the FOMC meetings, whereas Cieslak, Morse, and Vissing-Jorgensen (2015) document that the entire equity premium since 1994 is earned in even weeks in FOMC-cycle time. Ozdagli and Weber (2016) decompose the overall response into a direct demand effect and higher-order network effects using spatial autoregressions, and find that more than 50% of the overall market response comes from indirect effects. Fontaine (2016) estimates a dynamic term structure model and finds that uncertainty about future rate changes is cyclical. Drechsler, Savov, and Schnabl (2015) provide a framework to rationalize the effect of monetary policy on risk premia.

Besides the effect on the level of the stock market, researchers have recently also studied cross-sectional differences in the response to monetary policy. Ehrmann and Fratzscher (2004) and Ippolito, Ozdagli, and Perez (2015), among others, show that firms with high bank debt, low cash flows, small firms, firms with low credit ratings, low

financial constraints, high price-earnings multiples, and Tobin's q show a higher sensitivity to monetary policy shocks, which is in line with bank-lending, balance sheet, and interest rate channels of monetary policy. Gorodnichenko and Weber (2016) show that firms with stickier output prices have more volatile cash flows and high conditional volatility in narrow event windows around FOMC announcements. Weber (2015) studies how firm-level and portfolio returns vary with measured price stickiness, and shows that sticky-price firms have higher systematic risk and are more sensitive to monetary policy shocks.

We also contribute to a long literature on return predictability. Campbell (1991) and Cochrane (1992) start from a first-order Taylor series approximation of the definition of returns, and show that variation in the dividend-price ratio has to predict either future cash flows or expected returns. Empirically, they find that the dividend-price ratio is a strong predictor of stock returns, especially at horizons longer than one year, whereas they do not find any cash flow predictability. Lettau and Ludvigson (2001) provide evidence for return predictability using a proxy for the consumption-wealth ratio. Evidence for return predictability by the dividend-price ratio has declined in recent years (see, e.g., Welch and Goyal (2008)). Lettau and Van Nieuwerburgh (2008), Cochrane (2008), and Van Binsbergen and Koijen (2010) allow for structural breaks in the process for the dividend-price ratio, impose theoretical predictions, or estimate a latent process and find strong evidence in favor of return predictability. Ang and Bekaert (2007) and Fama and French (1988) show that short-term interest rates, term spreads, and default spreads are strong predictors of aggregate market returns, whereas Kelly and Pruitt (2013) use information in the cross section of book-to-market ratios. Bianchi, Lettau, and Ludvigson (2016) show low frequency shifts in the consumption-wealth ratio of Lettau and Ludvigson (2001) and relate it to changes in the long run expected value of the real federal funds rate. They show a consumption-wealth ratio corrected for structural breaks strong predictive power for future stock returns. DellaVigna and Pollet (2007) show that predictable changes in demographics affect future firm profitability, and subsequent industry returns. The predictability they uncover is also consistent with inattention. All these studies find

evidence for return predictability at longer horizons typically larger than a few quarters and up to several years.

A recent literature studies the effect of macro announcements on financial markets. Andersen, Bollerslev, Diebold, and Vega (2003) construct surprises from Money Market Services and show that the conditional mean of six exchange rate jumps following the announcement surprises. Gürkaynak, Sack, and Swanson (2005a) use the same surprise data and find a strong impact of macro surprises on long-term yields. Gilbert (2011) shows that the reaction of the S&P500 to these surprises is consistent with predictions of rational expectations trading models, whereas Gilbert, Scotti, Strasser, and Vega (2016) show that the intrinsic value of macro surprises drives the financial markets response. Ghosh and Constantinides (2016) show innovations in macroeconomic variables are highly correlated with the dividend-price ratio. We also use data from Money Market Services to study the impact of macro surprises on the slope factor and show that financial forecasters adjust their forecasts for federal funds rates following changes in the slope factor.

We make the following contributions to the literature. First, we document that monetary policy has large effects on asset prices outside of the eight scheduled FOMC meetings. Bernanke and Kuttner (2005), in fact, already conjecture that monetary policy is likely to affect asset prices throughout the year and not only on FOMC meeting days. Second, we find that changes in expectations about the future path of short-term interest rates are important for the response of stock returns, providing evidence in favor of the effectiveness of forward guidance outside of liquidity traps. Third, we find that speeches by the chair affect the slope factor, which then predicts future changes in short-term interest rates, which could speak to the puzzle documented by Cieslak et al. (2015). But ultimately, the question remains why financial markets react so strongly to macroeconomic surprises in general and monetary policy news in particular. Does monetary policy news predict future consumption growth, do market participants reach for yield, or does monetary policy directly affect risk premia?

II Data

A. Stock Returns

We sample daily returns for the CRSP value-weighted index directly from CRSP. The index is an average of all common stocks trading on NYSE, Amex, or Nasdaq. We then subtract the risk-free rate to obtain excess returns and compound those from Thursday of week $t+1$ to Wednesday of week $t+2$ in line with Lo and MacKinlay (1988) to minimize the number of missing observations due to exchange closure. If the Wednesday in week $t+2$ is missing, we use Thursday's closing price, and if both Wednesday and Thursday (in week $t+2$) are missing, we use Tuesday's closing price. If Tuesday, Wednesday, and Thursday are missing, we report the return as missing for that particular week.[6]

B. Federal Funds Futures Data

Federal funds futures started trading on the Chicago Board of Trade in October 1988. These contracts have a face value of $5,000,000. Prices are quoted as 100 minus the daily average federal funds rate as reported by the Federal Reserve Bank of New York. Federal funds futures face limited counterparty risk due to daily marking to market and collateral requirements by the exchange. We use end-of-day data of the federal funds futures directly from the Chicago Mercantile Exchange (CME). Futures contracts with maturity of up to three years trade on the CME, but futures with maturities longer than six months are not very liquid.[7]

Our sample period starts in 1994 and ends in 2007 for a total of 725 weeks. We start in 1994 to be comparable to the large event-study literature. With the first meeting in 1994, the FOMC started to communicate its decision by issuing press releases after every meeting and policy decision. The liquidity trap and zero lower bound on nominal interest

[6]We lose approximately 0.6% of all observations due to this convention. Most of these observations are around Christmas and New Year.

[7]Gürkaynak et al. (2005b) argue that federal fund futures with maturity beyond three months were illiquid before 1998.

rates determine the end of our sample because there is little variation in federal funds futures-implied rates. In robustness checks, we employ data going back to 1988, when federal funds futures were introduced, and we study changes in longer-term futures during the liquidity trap period.

C. Slope Factor

Most previous papers have studied the relationship between monetary policy surprises and stock returns in an event study around FOMC press releases. Kuttner (2001) shows that scaled changes of the current-month futures allow isolation of the surprise component of monetary policy.[8] The FOMC has eight scheduled meetings per year and, starting with the first meeting in 1994, most press releases are issued around 2:15 p.m. E.T.

We instead are interested in whether monetary policy also matters for asset prices outside of narrowly defined event windows and whether changes in expectations for the path of future short-term rates are important drivers of future stock returns.

Let $ff_{t,1}$ denote the rate implied by the one-month federal funds futures on date t and assume an FOMC meeting takes place during that month. d_1 is the day of the FOMC meeting and m_1 is the number of days in the month. We can then write $ff_{t,1}$ as a weighted average of the prevailing federal funds target rate, r_0, and the expectation of the target rate after the meeting, r_1:

$$ff_{t,1} = \frac{d_1}{m_1} r_0 + \frac{m_1 - d_1}{m_1} \mathbb{E}_t(r_1) + \mu_{t,1}, \tag{1}$$

where $\mu_{t,1}$ is a risk premium.[9] Gürkaynak et al. (2007) estimate risk premia of one to three basis points, and Piazzesi and Swanson (2008) show that they only vary at business cycle frequencies. We focus on weekly changes and neglect risk premia in the following as is common in the literature.

[8]The scaling is necessary to account for the different days of the months of FOMC meetings; see Kuttner (2001).

[9]We implicitly assume the beginning of week t is after the previous FOMC meeting. Meetings are typically around six to eight weeks apart.

The one-week change in the one-month futures implied rate in months with FOMC meetings is:

$$\Delta ff_{t,t+1,1} = \frac{m_1 - d_1}{m_1} \left[\mathbb{E}_{t+1}(r_1) - r_0 \right]. \tag{2}$$

When t and $t+1$ are in different months, we already use the next month's future; that is, we roll the contract forward.

Similarly, we can write the one-week change in the three-month futures implied rate in months with FOMC meetings as:

$$\Delta ff_{t,t+1,3} = \frac{d_3}{m_3} \left[\mathbb{E}_{t+1}(r_{3\_}) - \mathbb{E}_t(r_{3\_}) \right] + \frac{m_3 - d_3}{m_3} \left[\mathbb{E}_{t+1}(r_3) - \mathbb{E}_t(r_3) \right], \tag{3}$$

where $r_{3\_}$ denotes the federal funds target rate prevailing before the FOMC meeting, which in most cases will coincide with r_1.

Changes in the near-term futures contract contain information affecting the level of all future federal funds target rates, whereas changes in the longer-term futures also contain information about the path of future short-term rate changes. We assume

$$\Delta ff_{t,t+1,1} = level_{t,t+1} \tag{4}$$

$$\Delta ff_{t,t+1,3} = \beta level_{t,t+1} + slope_{t,t+1}. \tag{5}$$

We can now define the slope factor as the residual of a regression of weekly changes in the three-month federal funds futures-implied rate, $\Delta ff_{t,t+1,3}$, on a constant and changes in the one-month futures-implied rate:

$$\Delta ff_{t,t+1,3} = \alpha + \beta \Delta ff_{t,t+1,1} + slope_{t,t+1}. \tag{6}$$

The definition of our slope factor is similar in spirit to structural vector autoregressions (VAR), and we identify slope by imposing a zero restriction. Of course, similar to identified

VARs, different assumptions are possible.

The point estimate of α is -0.00 and is indistinguishable from 0, and the point estimate of β is 1.17 with a standard deviation of 0.03:

$$\Delta ff_{t,t+1,3} = \underset{(0.00)}{-0.00} + \underset{(0.03)}{1.17}\Delta ff_{t,t+1,1} + slope_{t,t+1}.$$

The R^2 of the regression is 67%, which indicates that the slope factor explains around one third of the variation in three-month futures changes.

Figure 2 plots the times series of slope in the top panel, together with the time series for changes in the one-month and three-month futures-implied rates in the middle and bottom panel, respectively. By construction, slope is orthogonal to the change in the one-month futures-implied rate but exhibits a correlation of 57% with changes in the three-month futures-implied rate, indicating that the slope factor contains useful information about the path of future monetary policy changes.

Figure 3 plots the regression coefficient of equation (6) for a rolling estimating. The red dashed line uses a constant window of 250 weeks, whereas the blue solid line indicates estimates from an expanding window sample. The regression estimate is stable through time and varies between 1.07 and 1.33.

The autocorrelation of the slope factor is 0.11 and spurious predictability arising from highly persistent regressors is no concern in our setting (see Stambaugh (1999) and Kostakis, Magdalinos, and Stamatogiannis (2015) for a recent discussion).

In our empirical analysis, we use a regression residual to predict excess returns. Full-sample estimates incorporate forward-looking information, and the estimation of slope requires a correction of standard errors. Economically, the point estimate is close to 1. We exploit this feature and construct as robustness a slope factor as a simple difference in differences: $slope = \Delta(ff_{t+1,3} - ff_{t,3}) - \Delta(ff_{t+1,1} - ff_{t,1})$. This slope has the advantage that we do not use forward-looking information and it does not require any estimation. It also allows a simple interpretation of slope as indicating faster future monetary policy tightening and easing: $slope = \Delta(ff_{t+1,3} - ff_{t+1,1}) - \Delta(ff_{t,3} - ff_{t,1})$. A positive slope

factor reflects market expectations of a faster monetary policy tightening, or markets assume that interest rates three months from now will be higher relative to what the market expected last week and relative to the change in expectations for the federal funds rate in one month.

D. Descriptive Statistics

Table 1 reports descriptive statistics of weekly changes in the futures-implied rate, the slope factor, and weekly stock returns. The slope is a regression residual and has a mean of 0. The federal funds rate implied by the one- and three-month federal funds futures are 4.23% and 4.29%, respectively, with average weekly changes of -0.01 for both. The average federal funds target rate was 4.20% during our sample period, and the CRSP value-weighted index had an average weekly excess return of 0.12%.

III Empirical Results

A. Methodology

We focus on one-week predictability of stock returns by the slope factor to establish an effect from changes in the future path of monetary policy on stock returns. Contemporaneous windows might cause concerns of reverse causality. Stock prices are the present discounted value of future dividends, and the CRSP value-weighted index captures almost 100% of the overall market capitalization in the United States. In the long run, economy-wide dividends and GDP are co-integrated, good news about future dividends is good news about the economy, and market participants might expect a faster tightening of future interest rates following good news. In this case, we would find a positive contemporaneous relationship between our slope factor and stock returns. Rigobon and Sack (2003) use a heteroskedasticity-based identification method and indeed

find monetary policy systematically reacting to movements in stock prices.[10]

Another potential concern of studying the contemporaneous relationship between the slope factor and stock returns is the fact that both might react to macroeconomic announcements during the week. Weaker-than-expected unemployment numbers might lead to a drop in stock prices and expectations that the FOMC might lower the speed of interest rate increases. We would find a positive contemporaneous association between slope and stock returns which would, however, be an endogenous response to news about the economy.

Changes in slope could still reflect changes in economic fundamentals. An upward adjustment in inflation expectations or GDP growth could lead to a positive slope factor.[11] We would expect a positive association between slope and future stock returns if slope captures positive news about the macroeconomy, but we find instead slope predicting negative returns. We might expect no reaction of subsequent stock returns to slope if slope captures news of changes in inflation expectations, because stocks are claims to real assets and should be less affected by inflation.[12]

In section IV*D.*, we show that speeches by the chair and vice chair, instead, affect the slope factor. Macro news also affects the slope factor, but has no independent predictive power for future stock returns conditional on the slope factors (see section IV*E.*). Professional forecasters instead change their forecasts about future federal funds rates as a response to changes in the slope factor (see section IV*B.*). Our results are consistent with a delayed market reaction to monetary policy news and short-run monetary policy time series momentum.

[10]We also find a positive contemporaneous association of the slope factor and stock returns at the weekly frequency which is, however, fully driven by conventional monetary policy shocks (see discussion in the Online Appendix).

[11]Empirically, a Taylor (1993) rule in which nominal interest rates respond positively to inflation and output growth is a good description of actual nominal rates in the data.

[12]For a discussion, see Katz, Lustig, and Nielsen (2017).

B. Baseline

Table 2 presents our baseline finding regressing weekly excess returns in percent of the CRSP value-weighted index starting in week $t+1$, R_{t+1}, on the slope factor of week t, $slope_t$, calculated according to equation (6) and additional covariates measured at the end of week t, X_t:

$$R_{t+1} = \alpha + \beta slope_t + \gamma X_t + \varepsilon_t. \tag{7}$$

We use in-sample slope estimates in our baseline specification but show results for rolling out-of sample estimations below. We address the first-stage estimation of the slope factor by reporting bootstrapped standard errors in parentheses. We resample changes in federal funds futures and returns simultaneously. For each sample we draw, we re-estimate the slope factor and then estimate the predictive regression (on the re-sampled data). We repeat this process 1,000 times to obtain standard errors for the regression coefficients in the predictive regression.[13]

The point estimate of β is negative and highly statistically significant. Economically, a one-standard-deviation increase in the slope factor (0.04) leads to a drop in weekly returns of 0.3%, which is 1.5 times the average weekly return and 13.5% of a one-standard-deviation move in returns (2.19%). The slope factor explains around 2% of the weekly variation in stock returns.

Campbell, Lo, and MacKinlay (1997) document that weekly stock returns are negatively autocorrelated in the modern period. We add the lagged excess return of the CRSP value-weighted index in column (2). We also find negative autocorrelation for our sample period. However, adding the lagged excess return has little influence on our point estimate of β and adds little explanatory power. Interestingly, the lagged return only explains around 1% of the weekly variation in excess returns when it is the only explanatory variable.

[13] We do not detect any significant error-term autocorrelation, which is why we do not block bootstrap the data.

The remaining columns of Table 2 study the robustness of the predictive power of the slope factor when we add other, standard return predictors, which are available at sufficiently high frequencies.

The dividend-price ratio predicts variation in risk premia at the business-cycle frequency (see Campbell (1991) and Cochrane (1992)). We add the dividend-price ratio of the CRSP value-weighted index (dp_t) as a return predictor in column (3). We also find that high dp_t predicts high weekly returns but barely changes the point estimate of the slope factor.

Bollerslev et al. (2009) argue that time-varying economic uncertainty affects risk premia, and they provide evidence of predictability of quarterly excess returns by the variance risk premium. We add the level of the VIX index (VIX_t) in column (4), realized variance (RV_t) in column (5), and the variance risk premium (VRP_t) as the difference between VIX_t and RV_t in column (6). We do not find evidence for predictability of weekly stock returns by any of the three variance-related measures, and adding them has little impact on the predictability by the slope factor.

Both stock returns and the slope might vary with the level of the federal funds rate. To ensure our baseline regression does not capture these effects, we add the federal funds target rate as covariate in column (7). We find little evidence supporting this consideration. The point estimate is statistically insignificant, the point estimate of β barely changes, and the explanatory power of the regression remains identical.

The slope of the yield curve might be a useful predictor of recessions and economic activity. Fama and French (1988) and Lettau and Ludvigson (2010) document the forecasting power of the term spread for stock returns. We add the term spread from the Federal Reserve Bank of Cleveland in column (8). The term spread has no predictive power for weekly excess returns, and adding it as an additional covariate has little impact on our point estimate of interest.

In column (9), we add the 30-minute monetary policy shock around FOMC

announcements from Gorodnichenko and Weber (2016), (mp_t).[14] Tighter monetary policy negatively predicts the next weeks' stock returns but has little impact on the forecasting power of the slope factor.

Column (10) adds all covariates jointly and supports our baseline finding. All predictors jointly explain 7.5% of the weekly variation in stock returns, with the slope factor remaining highly statistically and economically significant. We find in unreported results the explanatory power decreases by 1.5% when we exclude the slope factor from column (10).

C. Subsample Analysis

Stock markets react strongly to monetary policy surprises in tight windows around FOMC press releases (Bernanke and Kuttner (2005)), but an upward drift occurs in stock returns in the twenty-four hours before scheduled FOMC meetings (see Lucca and Moench (2015)). We study in Table 3 whether a systematic response of stock returns to monetary policy surprises around FOMC press releases or an upward drift in stock returns before the release might drive our findings. Column (1) repeats our baseline estimation. Column (2) removes all weeks from our sample that contain a scheduled or unscheduled FOMC meeting during the period over which we measure stock returns. This restriction removes 118 weeks from our sample but has little impact on our point estimates, statistical significance, or explanatory power of the slope factor. Column (3), instead, removes weeks with FOMC meetings during the period over which we estimate the slope factor. Again, we find little evidence for FOMC weeks driving our findings. Lastly, column (4) removes weeks with meetings in either week t or week $t+1$, reducing our sample size by 1/3. The point estimate is now slightly reduced to -6.10 from our baseline estimate of -6.96, but statistical significance and explanatory power are unchanged. Hence, FOMC meetings do not drive our results.

The sensitivity of stock returns to monetary policy shocks varies across types of

[14] We merge the monetary policy shock during the week over which we calculate the slope factor and set it to zero for weeks without a meeting.

events. Ozdagli and Weber (2016) find larger sensitivities of stock returns to monetary policy shocks on turning points in monetary policy compared to regular meetings, and no sensitivity on intermeeting policy decisions. Turning points are target-rate changes in the direction opposite to the previous target-rate change. Turning points signal changes in the current and future stance on monetary policy (Jensen, Mercer, and Johnson (1996); Piazzesi (2005); Coibion and Gorodnichenko (2012)). Intermeeting policy decisions are changes in target rates on unscheduled meetings of the FOMC. Faust et al. (2004) argue that intermeeting policy decisions are likely to reflect new information about the state of the economy, and hence, the stock market might react to news about the economy rather than changes in monetary policy.

Table 4 adds dummy variables equal to 1 if the week during which we create the slope factor contains any meeting (*meeting*), a regular meeting (*regular*), an unscheduled meeting (*intermeeting*), and if the policy decision was a turning point (*turningpoint*), as well as interactions with the slope factor. Stock returns are negative following any meetings, weeks of regular FOMC meetings, intermeetings, and weeks in which the decision was a turning point (columns (2) to (5)). However, we do not find any variation of the slope factor as a function of meeting types.

Faster monetary policy easing might have different effects than an expected increase in the speed of tightening. Ozdagli and Weber (2016) show for a sample similar to ours that the stock market reacts mainly to surprise cuts in interest rates. Table 5 conditions the slope factor on positive and negative realizations. We see in columns (1) and (2) that most of the predictive power comes from negative realizations of slope: increases in the speed of monetary policy easing are more than three times as important as positive values of slope. Defining upside and downside slope factors as realizations more than one standard deviation above or below 0 similar to Lettau et al. (2014) leads to similar conclusions (see columns (3) and (4)).

Monetary policy has become more predictable over time, and many slope observations are small in absolute value. To ensure these observations do not drive our results, we follow

Ozdagli and Weber (2016) and Gorodnichenko and Weber (2016) and restrict our sample to weeks with values of the slope factor larger than 0.015 in absolute value in column (5), cutting our sample almost in half. Economic and statistical significance increases when we exclude small values of the slope factor.

D. Robustness

We construct the slope factor as a regression residual of changes in the three-month federal funds futures-implied rate on the one-month futures-implied rate. We study in Table 6 whether the slope factor contains information over and above the raw changes in the futures or principal components. Column (1) repeats our baseline regression for convenience for the common sample. In column (2), we use the first two principal components of the changes in federal funds futures-implied rates using maturities up to six months as covariates and add them to the slope factor in column (3). The first two principal components explain 96.7% of the overall variation. The principal components add little explanatory power and do not change estimates of our coefficient of interest. The raw change in the one-month futures-implied rate has no explanatory power for next weeks' stock returns (column (4)), and the raw change in the three-month futures-implied rate alone is marginally statistically significant and explains less than about one-third of the variation the slope factor explains. We add both raw changes in column (5). Now, changes in the one-month futures positively predict future stock returns, and changes in the three-month futures negatively predict returns. Once we add the slope factor in columns (7) and (8), we find the raw changes in the futures lose their predictive power for future returns.

In our baseline analysis, we use a first-stage regression to purge the short-run variation in federal funds futures and define the regression residual as slope. Table A.1 in the Online Appendix shows results that are economically and statistically indistinguishable from our baseline results in Table 2 when we define slope as a simple difference in differences, which does not require any estimation: $slope = \Delta(ff_{t+1,3} - ff_{t+1,1}) - \Delta(ff_{t,3} - ff_{t,1})$.

Gürkaynak et al. (2005b) document that two factors are necessary to explain the reaction of yields to monetary-policy news. Table A.2 in the Online Appendix shows that their target and path factors explain variation in returns orthogonal to our slope factor. The Fed restricts the extent to which members of the FOMC can give public speeches during FOMC blackout periods. Table A.3 in the Online Appendix shows that blackout periods do not drive our results either. Table A.4 in the Online Appendix shows that a slope based on a simple difference between the three-months and one-months futures has no predictive power for future returns.

We show in Online Appendix Table A.5 that our results are robust throughout our sample and different subsample. Financial markets typically react to economic news within minutes. We instead focus on weekly predictability. The slope factor only predicts returns for the next week and has no predictive power for the following weeks (see Table A.6 in the Online Appendix). The delayed market response is in line with findings in Gürkaynak et al. (2005b). They find an immediate reaction of bond yields and stock returns to their target factor that resembles the monetary policy surprise typically used in the event-study literature. For the path factor, however, they find that the financial market needs some time to process the information.

Gürkaynak et al. (2005b) show that federal funds futures with maturities beyond three months were either not traded before 1998 or very illiquid and Gertler and Karadi (2015) show that the three-month futures are the strongest predictor of future monetary policy. Table A.7 in the Online Appendix shows that longer-term information or higher-order moments beyond level and slope might not matter for the predictive power of information in federal funds futures for excess returns.

We also report in the Online Appendix the contemporaneous association between slope and excess returns and a construction of slope during the zero-lower-bound period. We find a positive contemporaneous association which is, however, fully explained by conventional monetary policy shocks in FOMC weeks, and results during the liquidity trap using longer-dated futures are similar to our baseline associations.

IV Economic Mechanism and Magnitudes

A. Future Changes

We argue that changes in the whole future path of short-term interest rates matter for changes in asset prices and create a slope factor using changes of federal fund futures of different horizons. We indeed find that slope can predict stock returns: increases in slope result in lower future stock returns. However, we have not shown that changes in the slope factor are related to future changes in federal funds rates.

Table 7 regresses future changes in target rates on the slope factor. We define the one-month change in the target rate as the difference in the actual federal funds target rate over the 21-trading-day period after the period over which we calculate the slope factor. We define longer-period changes accordingly. We see in column (1) that slope predicts one-month changes in federal funds target rates with a positive sign. In column (2), we predict two-month changes in federal funds rates orthogonal to the one-month change. The slope factor predicts two-month changes with a positive sign and adds predictive power to the one-month change. In the remaining columns, we regress future changes of up to six months orthogonalized to the one-month change. We do not detect any predictability in these changes once we condition on the two-month change.

B. Changes in Expectations

The slope factor has predictive power for future equity returns but also predicts changes in future federal funds rates, whereas speeches by the FOMC chair affects the slope factor as we show below. One interpretation of these results is that members of the FOMC communicate news about their monetary policy stance throughout the year outside of scheduled FOMC meetings through speeches and testimonies. If the slope factor reveals news about the future monetary policy stance to the public, we should see market participants updating their expectations for future federal funds rates.

To test for this channel, we regress changes in expectations for future federal funds

rates on the slope factor in Table 8. We obtained monthly forecasts for the federal funds rate one to three quarters ahead from Blue Chip financial forecasts. Blue Chip surveys leading business and financial economists typically in a period between the 22$^{\text{nd}}$ and 25$^{\text{th}}$ of the previous months, and releases the forecasts on the first of the month. We create one-month changes in these forecasts and regress them on the three-week cumulative slope factor ending on or before the 20$^{\text{th}}$ of the previous month.[15]

We see in columns (1)–(3) that the three-week slope factor significantly predicts forecast revisions of professional forecasters for future federal funds rates over the next three quarters and explains around 12% of the variation. The coefficient on the slope factor is indistinguishable from 1. Slope loses its forecasting power more than one quarter ahead, once we condition on the forecast revision for the first quarter (see columns (4) and (5)), which we would expect because the slope factor only contains information for future federal funds target rates of up to three months ahead. The one-quarter-ahead forecast revision explains more than 80% of the changes in two- and three-quarters-ahead predictions, indicating high persistence in forecast revisions.

Financial market participants update forecasts for future federal funds rates following changes in slope. This finding is consistent with the idea that changes in slope reveal information about the speed of future monetary policy tightening and loosening, and professional forecasters update their forecast to the new information.

C. Narrative Evidence: Speeches, Speed, and Momentum

A positive slope factor predicts negative stock returns over the next week. We also find below that macro news has little impact on the predictability, but market participants instead update their expectations about future federal funds rates. These findings are consistent with delayed market reaction to the monetary policy news, that is, short-run monetary policy momentum, and provide evidence that monetary policy news comes out throughout the year and not only during scheduled FOMC meetings. The FOMC has

[15]The timing ensures Blue Chip collected the forecasts after the period over which we calculate the slope factor.

increased the transparency of their decisions and manages expectations of participants in financial markets in speeches and testimonies. One way the FOMC might affect market expectations about the speed of future monetary policy easing and tightening might be through the tone of speeches, which we might capture with our slope factor. We now discuss as representative example the narrative background for a week in which the slope factor was large in absolute value (above the 95^{th} percentile).

On September 26, 2005, Chairman Alan Greenspan gave a speech to the American Bankers Association Annual Convention in Palm Dessert. He started off with,

> In my remarks today, I plan, in addition, to focus on one of the key factors driving the U.S. economy in recent years: the sharp rise in housing valuations and the associated buildup in mortgage debt. Over the past decade, the market value of the stock of owner-occupied homes has risen annually by approximately 9 percent on average, from $8 trillion at the end of 1995 to $18 trillion at the end of June of this year. Home mortgage debt linked to these structures has risen at a somewhat faster rate.

The *Washington Post* article, "Concerns Raised as Home Sales, Prices Rise Again; Greenspan Issues Sternest Warning Yet to Bankers Group," says,

> U.S. home sales and prices surged again last month, an industry group reported yesterday, as Federal Reserve Chairman Alan Greenspan warned that the growing use of riskier new mortgages could result in 'significant losses' for lenders and borrowers if the market cools. And some cooling is likely, Greenspan suggested in remarks delivered via satellite to the American Bankers Association convention in Palm Desert, Calif., repeating his view that 'home prices seem to have risen to unsustainable levels' in certain local markets. [...] The Fed [...] indicated it will keep moving the rate higher in coming months to keep inflation under control.

The slope factor is 0.08 in the week ending on September 28, 2005, and the following week's excess return is -1.50%.

D. Policy Speeches: Linguistic Analysis

The example in the previous section is suggestive, but by no means conclusive. We now systematically study whether the tone of speeches correlates with the slope factor. We collect all speeches for members of the FOMC from http://www.federalreserve.gov/newsevents/. To classify the tone of speeches, we use a "search-and-count" approach as in Apel and Grimaldi (2012).[16] Search-and-count is an automated method to classify text into categories. A pre-specified word list which classifies speeches as "hawkish" or "dovish" is the central input. Using this word list, we can count the hawkish and dovish terms within one speech and aggregate over the document. Following this procedure, we obtain a classification if a speech is on average more hawkish or dovish.[17]

As in Apel and Grimaldi (2012), we also compute a net index, to determine if a speech is on average more hawkish, dovish, or possibly neutral. We calculate the net index by

$$NetIndex = \left[\left(\frac{\#hawk}{\#hawk + \#dove}\right) - \left(\frac{\#dove}{\#hawk + \#dove}\right)\right] + 1.$$

A value above 1 implies the speech contains more hawkish than dovish terms, and we would expect a faster future monetary policy tightening; that is, a positive coefficient when we regress the slope on the net index.

We test in Table 9 whether the tone of speeches by FOMC officials affects the slope factor. We see in columns (1) and (2) that more hawkish speeches by any member of the FOMC result in an increase in the slope factor, independent of whether we use the net index or the number of hawkish and dovish terms. Neither the coefficient on the net index nor the coefficient on the components is statistically significant, however.

The media and market participants might not focus on all speeches by all FOMC

[16] Malmendier, Nagel, and Yan (2017) also use a similar method to relate lifetime inflation experiences of FOMC members to their stance on inflation and the output gap.

[17] The online appendix contains more details on the procedure, the actual classification we use in Table A.8, and the speeches in Table A.7.

members equally, and not every FOMC member might convey equally important information on the stance of future monetary policy. At the same time, some FOMC members might be more powerful and able to affect the future path of actual federal funds target rates. In columns (3) and (4), we only study speeches by the chair and vice chair. We see that a more hawkish tone as indicated by the net index is positively correlated with the slope factor. When we split the net index, we see that a more frequent mention of hawkish words by the chair signals faster monetary tightening, whereas a more dovish speech is negatively correlated with the slope factor. We see similar results in columns (5) and (6) when we restrict our sample to speeches by the chair or vice chair that contain at least one of the hawkish or dovish terms of our classification. Speeches now explain more than 12% of the variation in the slope factor, which is a regression residual. In column (7), we interact the hawk and dove classification with a dummy variable which equals 1 when the speech is by the chair or vice chair and results are similar.

In line with the interpretation that speeches are a major driver of the variation in the slope factor, we find only four speeches during the blackout period that have at least one hawkish or dovish classification. The slope factor is economically small in absolute value in all four weeks and well within one standard deviation of 0.

The results on the effect of speeches on the slope factor, the slope factor predicting future interest-rate changes, and the fact that market participants update their forecasts for future federal funds rates, combined, suggest monetary policy predictability and short-run monetary policy momentum.

E. Monetary Policy News versus News about the Economy

A Taylor (1993) rule with nominal interest rates reacting to the output gap and inflation empirically describes actual monetary policy in the United States well. Positive changes in the slope factor might indicate upward revisions of market participants about future output growth or inflation. The reaction of stock returns to the slope factor might therefore constitute a reaction to news about the macro economy rather than monetary

policy shocks.

Table 10 adds macroeconomic shocks to our baseline analysis using data from Haver Analytics. We define macro shocks as the difference between the actual release as first reported and the median forecast from Haver Analytics. We assign the shock values to the five-day period over which we calculate the changes in federal funds futures when the macro announcement occurs between Thursday of week $t-1$ and Wednesday of week t.

We add surprise GDP growth (*shock_gdp*) as an additional covariate to our baseline specification in column (1) of Table 10. Positive news about GDP positively predicts weekly stock returns, but is only marginally statistically significant. GDP news, however, has little impact on economic or statistical significance of the slope factor. In column (2), we add news about core consumer price inflation (*shock_cpi*). Higher-than-expected inflation negatively predicts stock returns, but statistical significance is sparse. Inflation surprises have no impact on the predictive power of the slope factor. Column (3) adds both inflation and GDP news jointly. The point estimate on slope barely changes.

Column (4) also adds news about capacity utilization (*shock_cu*), consumer confidence (*shock_cc*), employment costs (*shock_ec*), initial unemployment claims (*shock_ic*), the manufacturing composite index (*shock_mfg*), new home sales (*shock_nhs*), non-farm payroll (*shock_nfp*), core producer price inflation (*shock_ppi*), retail sales (*shock_rs*), and unemployment (*shock_ur*). In addition to GDP news, retail sales positively predict the next weeks' stock returns, whereas higher-than-expected capacity utilization and news about higher unemployment negatively predict next weeks' returns. The additional covariates, however, have no impact on the economic or statistical significance of the slope factor.[18]

In the last column, we regress the slope factor on the macro surprises. Higher-than-expected capacity utilization, consumer confidence, manufacturing index, non-farm payroll, producer price inflation, retail sales, and lower-than-expected unemployment numbers lead to an increase in slope consistent with the idea that stronger macroeconomic

[18]We find a point estimate and statistical significance of slope which is unaltered when we measure macro news over the return week and an R^2 of 2.18 instead of 2.17 as in column (4).

fundamentals warrant an increase in the speed of future monetary policy tightening.

Table 10 shows that macro news affects the slope factor, but news about the economy is unlikely to drive the predictability of weekly stock returns by the slope factor. Rather, news about the stance of monetary policy seems to be the driving force behind the stock return predictability by the slope factor.

F. Economic Magnitudes

We employ the results in Campbell and Thompson (2008) to assess the economic significance of our findings. Specifically, we assess how much an investor could possibly gain following the predictions the slope factor generates, to create a link between statistical measures of forecast performance (out-of-sample R^2) and more interesting economic quantities, such as gains in excess returns or increases in Sharpe ratios. The Online Appendix contains details of the calculations.

We find that an investor with mean-variance preferences and unit risk aversion can increase the average weekly excess returns to 0.81% when trading on the predictions of the slope factor relative to a weekly excess return of 0.53% a buy-and-hold investor earns.

Cochrane (1999) suggests an alternative methodology to evaluate the economic significance of return predictability. When we follow the method in Cochrane (1999), we get an increase in the weekly Sharpe ratio of almost 20% from 7.31% to 9.00% when trading on slope.

Slope is a regression residual and one concern is that trading based on information about the speed of future monetary policy tightening and loosening might not be profitable due to transaction costs. The average percentage bid-ask spread of the SPDR S&P 500 (SPY) between 2002 and 2015 is 0.01% and the median spread is 0.008%. The average absolute weekly excess return instead is 1.7%, indicating transaction costs are not a major concern.

V Concluding Remarks

Stock prices are the present discounted value of future cash flows and should be sensitive to changes in market expectations of the whole path of future short-term interest rates. We construct a slope factor from changes in federal funds futures-implied rates of different maturities. Increases in the slope factor predict future increases in federal funds target rates and negative stock returns at the weekly frequency. The stock return predictability is a robust feature of the data, holds out-of-sample and during subsamples, and has predictive power similar to or larger than standard return predictors.

The predictive power of the slope factor is large in economic terms. An investor who conditions on the slope factor when making portfolio decisions can increase his weekly Sharpe ratio by 20% compared to a buy-and-hold investor.

Consistent with the idea that "monetary policy is 98 percent talk and only two percent action,"[19] we find that speeches by the chair and vice chair change the slope factor, which predicts future changes in federal funds target rates as well as forecast revisions by professional forecasters. Our findings indicate that monetary policy affects stock markets continuously throughout the year, rather than only during eight scheduled FOMC meetings that have been the focus of an extensive event-study literature. The predictability results are consistent with a delayed market reaction to monetary policy news and short-run monetary policy momentum. We provide anecdotal evidence supporting this interpretation.

Speeches affect stock returns via their effect on market participants' expectations about the speed of future monetary policy loosening or tightening. Our findings provide evidence for the power of forward guidance and committing to future interest rate policies outside of liquidity-trap periods.

[19] See: http://www.brookings.edu/blogs/ben-bernanke/posts/2015/03/30-inaugurating-new-blog

References

Andersen, T. G., T. Bollerslev, F. X. Diebold, and C. Vega (2003). Micro effects of macro announcements: Real-time price discovery in foreign exchange. *The American Economic Review 93*(1), 38–62.

Ang, A. and G. Bekaert (2007). Stock return predictability: Is it there? *Review of Financial Studies 20*(3), 651–707.

Apel, M. and M. Grimaldi (2012). The information content of central bank minutes. *Riksbank Research Paper Series* (92).

Bernanke, B. S. and K. N. Kuttner (2005). What explains the stock market's reaction to Federal Reserve policy? *The Journal of Finance 60*(3), 1221–1257.

Bianchi, F., M. Lettau, and S. C. Ludvigson (2016). Monetary policy and asset valuation: Evidence from a Markov-switching cay. Technical report, National Bureau of Economic Research.

Bollerslev, T., G. Tauchen, and H. Zhou (2009). Expected stock returns and variance risk premia. *Review of Financial Studies 22*(11), 4463–4492.

Boyarchenko, N., V. Haddad, and M. C. Plosser (2017). The federal reserve and market confidence. *Unpublished Manuscript, UCLA*.

Campbell, J. Y. (1991). A variance decomposition for stock returns. *Economic Journal 101*(405), 157–179.

Campbell, J. Y., A. W.-C. Lo, and A. C. MacKinlay (1997). *The econometrics of financial markets*, Volume 2. Princeton, NJ: Princeton University Press.

Campbell, J. Y. and S. B. Thompson (2008). Predicting excess stock returns out of sample: Can anything beat the historical average? *Review of Financial Studies 21*(4), 1509–1531.

Cieslak, A., A. Morse, and A. Vissing-Jorgensen (2015). Stock returns over the FOMC cycle. *Unpublished Manuscript, University of California at Berkeley*.

Cochrane, J. H. (1992). Explaining the variance of price-dividend ratios. *Review of Financial Studies 5*(2), 243–280.

Cochrane, J. H. (1999). New facts in finance. *Federal Reserve Bank of Chicago Economic Perspectives 23*(3), 36–58.

Cochrane, J. H. (2008). The dog that did not bark: A defense of return predictability. *Review of Financial Studies 21*(4), 1533–1575.

Coibion, O. and Y. Gorodnichenko (2012). Why are target interest rate changes so persistent? *American Economic Journal: Macroeconomics 4*(4), 126–162.

Cook, T. and T. Hahn (1989). The effect of changes in the federal funds rate target on market interest rates in the 1970s. *Journal of Monetary Economics 24*(3), 331 – 351.

DellaVigna, S. and J. M. Pollet (2007). Demographics and industry returns. *The American Economic Review 97*(5), 1667–1702.

Drechsler, I., A. Savov, and P. Schnabl (2015). A model of monetary policy and risk premia. *Journal of Finance (forthcoming)*.

Ehrmann, M. and M. Fratzscher (2004). Taking stock: Monetary policy transmission to equity markets. *Journal of Money, Credit, and Banking 36*(4), 719–737.

Fama, E. F. and K. R. French (1988). Dividend yields and expected stock returns. *Journal of Financial Economics 22*(1), 3–25.

Faust, J., E. T. Swanson, and J. H. Wright (2004). Do Federal Reserve policy surprises reveal superior information about the economy? *Contributions to Macroeconomics 4*(1), 1–29.

Fontaine, J.-S. (2016). What fed funds futures tell us about monetary policy uncertainty. *Unpublished Manuscript, Bank of Canada*.

Gertler, M. and P. Karadi (2015). Monetary policy surprises, credit costs, and economic activity. *American Economic Journal: Macroeconomics 7*(1), 44–76.

Ghosh, A. and G. M. Constantinides (2016). What information drives asset prices. *Unpublished Manuscript, University of Chicago*.

Gilbert, T. (2011). Information aggregation around macroeconomic announcements: Revisions matter. *Journal of Financial Economics 101*(1), 114–131.

Gilbert, T., C. Scotti, G. Strasser, and C. Vega (2016). Is the intrinsic value of macroeconomic news announcements related to their asset price impact? *Unpublished Manuscript, University of Washington*.

Gorodnichenko, Y. and M. Weber (2016). Are sticky prices costly? Evidence from the stock market. *American Economic Review 106*(1), 165–199.

Gürkaynak, R. S., B. Sack, and E. Swanson (2005a). The sensitivity of long-term interest rates to economic news: Evidence and implications for macroeconomic models. *The American Economic Review 95*(1), 425–436.

Gürkaynak, R. S., B. P. Sack, and E. T. Swanson (2005b). Do actions speak louder than words? The response of asset prices to monetary policy actions and statements. *International Journal of Central Banking 1*(1), 55–93.

Gürkaynak, R. S., B. P. Sack, and E. T. Swanson (2007). Market-based measures of monetary policy expectations. *Journal of Business & Economic Statistics 25*(2), 201–212.

Ippolito, F., A. K. Ozdagli, and A. Perez (2015). Is bank debt special for the transmission of monetary policy? Evidence from the stock market. *Unpublished manuscript, Universitat Pompeu Fabra*.

Jensen, G. R., J. M. Mercer, and R. R. Johnson (1996). Business conditions, monetary policy, and expected security returns. *Journal of Financial Economics 40*(2), 213–237.

Katz, M., H. N. Lustig, and L. N. Nielsen (2017). Are stocks real assets? *Review of Financial Studies 30*(2), 539–587.

Kelly, B. and S. Pruitt (2013). Market expectations in the cross-section of present values. *The Journal of Finance 68*(5), 1721–1756.

Kostakis, A., T. Magdalinos, and M. P. Stamatogiannis (2015). Robust econometric inference for stock return predictability. *Review of Financial Studies 28*(5), 1506–1553.

Kuttner, K. (2001). Monetary policy surprises and interest rates: Evidence from the Fed funds futures market. *Journal of Monetary Economics 47*(3), 523–544.

Lettau, M. and S. Ludvigson (2001). Consumption, aggregate wealth, and expected stock returns. *Journal of Finance 56*(3), 815–849.

Lettau, M. and S. C. Ludvigson (2010). Measuring and modeling variation in the risk-

return trade-off. In L. P. Hansen and Y. Ait-Sahalia (Eds.), *Handbook of Financial Econometrics: Tools and Techniques*, Volume 1 of *Handbooks in Finance*, Chapter 11, pp. 617 – 690. San Diego: North-Holland.

Lettau, M., M. Maggiori, and M. Weber (2014). Conditional risk premia in currency markets and other asset classes. *Journal of Financial Economics 114*(2), 197–225.

Lettau, M. and S. Van Nieuwerburgh (2008). Reconciling the return predictability evidence. *Review of Financial Studies 21*(4), 1607–1652.

Lo, A. W. and A. C. MacKinlay (1988). Stock market prices do not follow random walks: Evidence from a simple specification test. *Review of Financial Studies 1*(1), 41–66.

Lucca, D. O. and E. Moench (2015). The pre-FOMC announcement drift. *The Journal of Finance 70*(1), 329–371.

Malmendier, U., S. Nagel, and Z. Yan (2017). The making of hawks and doves: Inflation experiences on the FOMC. *NBER Working Paper 23228*.

Ozdagli, A. and M. Weber (2016). Monetary policy through production networks: Evidence from the stock market. *Unpublished Manuscript, University of Chicago*.

Piazzesi, M. (2005). Bond yields and the Federal Reserve. *Journal of Political Economy 113*(2), 311–344.

Piazzesi, M. and E. Swanson (2008). Futures prices as risk-adjusted forecasts of monetary policy. *Journal of Monetary Economics 55*(4), 677–691.

Rigobon, R. and B. Sack (2003). Measuring the reaction of monetary policy to the stock market. *Quarterly Journal of Economics 118*(2), 639–669.

Savor, P. and M. Wilson (2013). How much do investors care about macroeconomic risk? Evidence from scheduled economic announcements. *Journal of Financial and Quantitative Analysis 48*(2), 343–375.

Stambaugh, R. F. (1999). Predictive regressions. *Journal of Financial Economics 54*(3), 375–421.

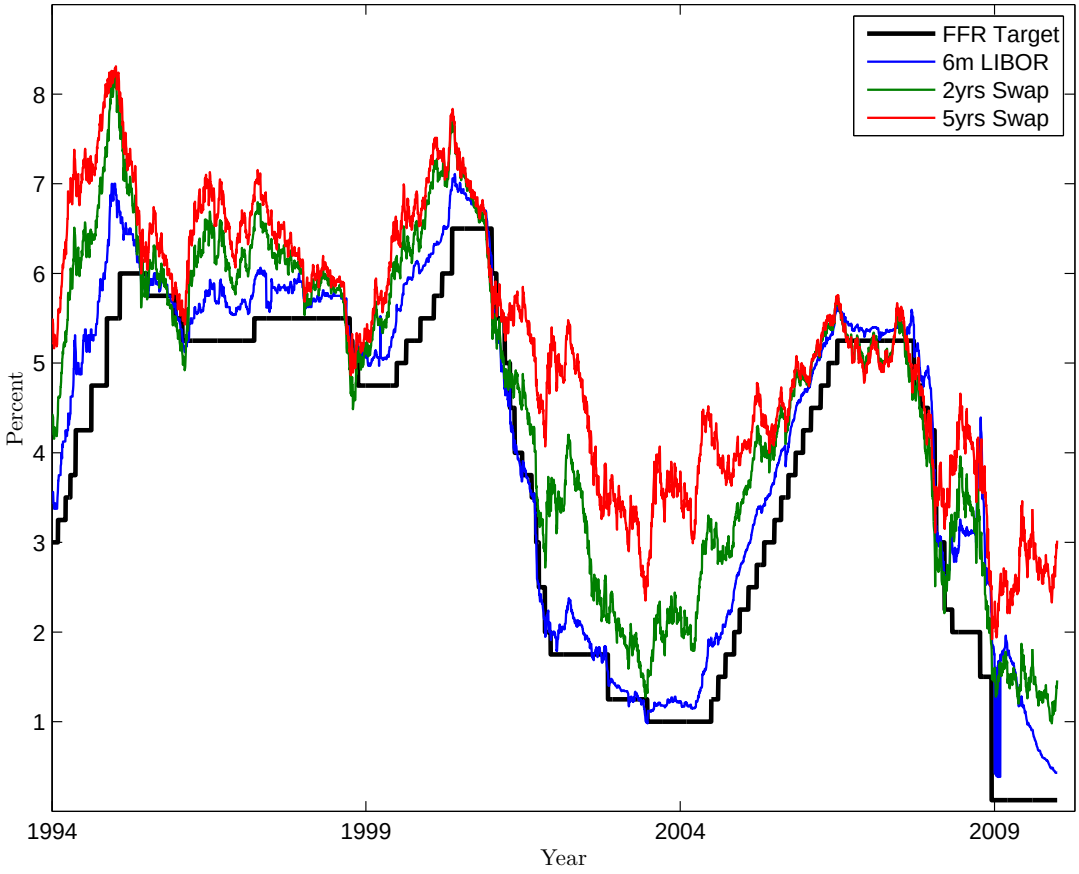
Taylor, J. B. (1993). Discretion versus policy rules in practice. In *Carnegie-Rochester conference series on public policy*, Volume 39, pp. 195–214. Elsevier.

Van Binsbergen, Jules, H. and R. S. Koijen (2010). Predictive regressions: A present-value approach. *The Journal of Finance 65*(4), 1439–1471.

Weber, M. (2015). Nominal rigidities and asset pricing. *Unpublished manuscript, University of Chicago Booth School of Business*.

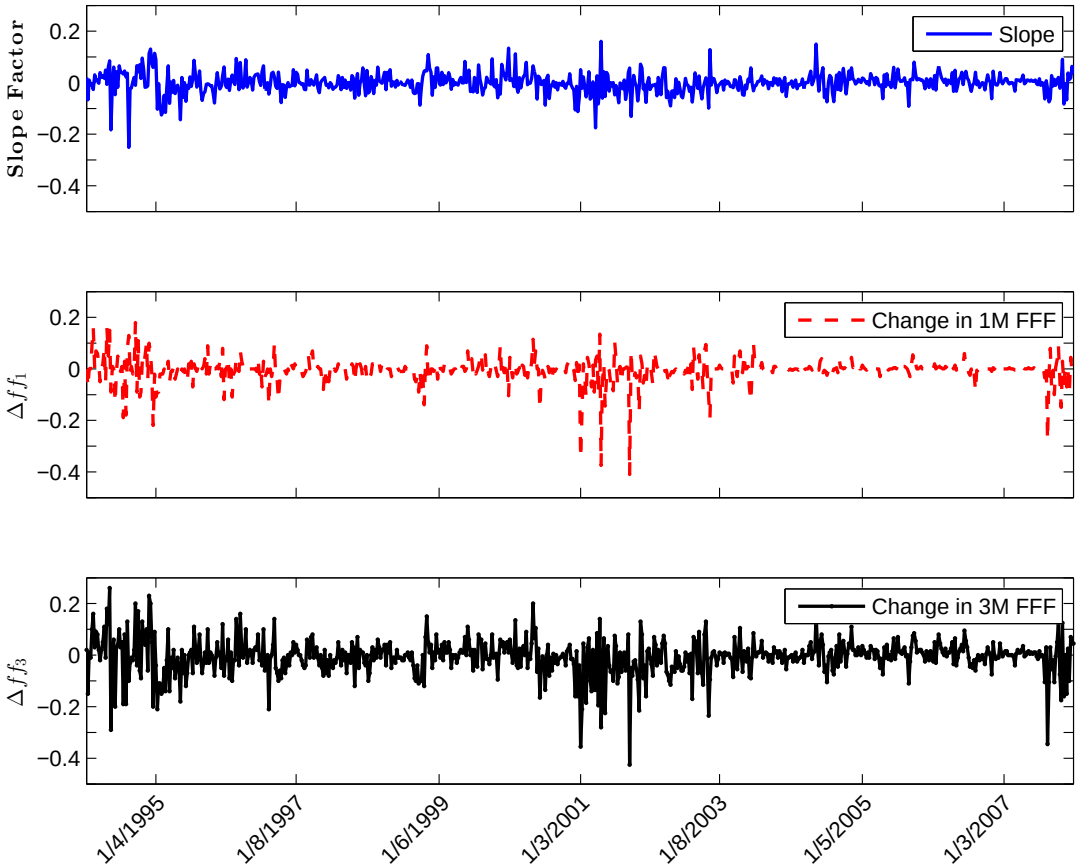
Welch, I. and A. Goyal (2008). A comprehensive look at the empirical performance of equity premium prediction. *Review of Financial Studies 21*(4), 1455–1508.

Figure 1: **Time Series of Interest Rates**



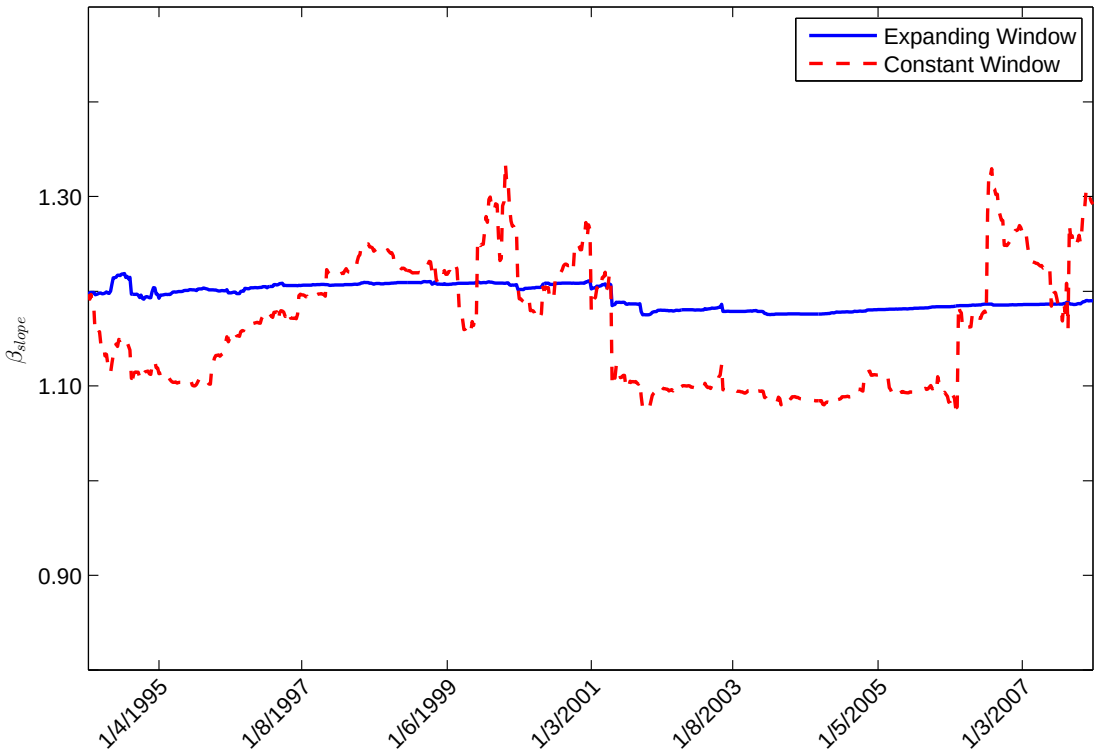
This figure plots the time series of the federal funds target rate, the six-month Libor, and the two- and five-year swap rates from 1994 to 2009.

Figure 2: **Time Series of Slope Factor and Changes in Futures**



This figure plots the time series of the slope factor in the top panel, the weekly changes in the one-month futures-implied federal funds rate in the middle panel, and the weekly changes in the three-month futures-implied federal funds rate in the bottom panel for a sample from 1994 to 2007.

Figure 3: **Regression Coefficient for Slope Estimation**



This figure plots the time series of the regression coefficient, regressing changes in the six-month futures-implied federal funds rate on changes in the one-month futures-implied federal funds rate from 1994 to 2007. The blue solid line reports estimates of an expanding window regression, whereas the red dashed reports coefficients for a constant window estimation of 60 weeks.

Table 1: **Descriptive Statistics**

This table reports descriptive statistics for the slope factor, one- and three-month federal funds futures rates $ff_{t,t+1}$, one-week changes in these rates, the actual federal funds target rate, the absolute value of the slope factor, and weekly excess returns of the CRSP value-weighted index. The sample period is January 1994 to December 2007 for a total of 725 weeks.

	$Slope_t$	$ff_{t,t+1,1}$	$ff_{t,t+1,3}$	$\Delta ff_{t,t+1,1}$	$\Delta ff_{t,t+1,3}$	Target Rate	abs($Slope_t$)	R_{t+1}
Mean	0.00	4.23	4.29	-0.01	-0.01	4.20	0.03	0.12
Std	(0.04)	(1.73)	(1.74)	(0.05)	(0.07)	(1.75)	(0.03)	(2.21)
Nobs					725			

Table 2: **Predictive Regressions**

This table reports weekly predictive regressions of the excess returns of the CRSP value-weighted index on the slope factor ($Slope_t$), lagged index returns (R_t), the dividend-price ratio (dp_t), the VIX (VIX_t), realized variance (RV_t), the variance risk premium (VRP_t), the federal funds target rate ($Fedfunds_t$), the term spread ($TermSpread_t$), and the monetary policy shock (mp_t) from Gorodnichenko and Weber (2016). We report bootstrapped standard errors in parentheses. We construct the slope factor as a regression residual of weekly changes of the three-month federal funds futures-implied rate on the one-month federal funds futures-implied rate (see equation (6)). Our sample period is from the first week of 1994 to the last week of 2007 for a total of 725 weeks.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Constant	0.20**	0.13*	−0.61*	−0.02	0.03	0.14	0.03	−0.05	0.11*	−2.32***
	(0.08)	(0.09)	(0.41)	(0.29)	(0.20)	(0.15)	(0.22)	(0.20)	(0.09)	(0.80)
$Slope_t$	−7.49***	−6.96***	−7.19***	−6.85***	−6.87***	−6.95***	−6.97***	−6.83***	−6.32***	−6.21***
	(2.16)	(1.98)	(2.00)	(1.97)	(1.97)	(1.99)	(1.99)	(1.99)	(1.96)	(1.95)
R_t		−0.09**	−0.09**	−0.08**	−0.09**	−0.09**	−0.09**	−0.08*	−0.11**	−0.10**
		(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
dp_t			40.78**							94.24***
			(19.72)							(27.00)
VIX_t				0.01						0.02
				(0.02)						(0.03)
RV_t					0.01					0.02
					(0.02)					(0.03)
VRP_t						0.00				
						(0.03)				
$Fedfunds_t$							0.02			−0.12
							(0.05)			(0.10)
$TermSpread_t$								0.07		0.19*
								(0.07)		(0.14)
mp_t									−11.85***	−11.74***
									(2.74)	(2.73)
R^2	1.92	2.61	3.20	2.66	2.66	2.62	2.65	2.55	5.78	7.49
Nobs	725	724	724	723	724	723	724	718	724	717

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table 3: **Predictive Regressions: Meeting Weeks**

This table reports weekly predictive regressions of the excess returns of the CRSP value-weighted index on the slope factor ($Slope_t$) and lagged index returns (R_t), excluding weeks with scheduled and unscheduled FOMC meetings. We report bootstrapped standard errors in parentheses. We construct the slope factor as a regression residual of weekly changes of the three-month federal funds futures-implied rate on the one-month federal funds futures-implied rate (see equation (6)). Our sample period is from the first week of 1994 to the last week of 2007 for a total of 725 weeks.

	All Weeks	No Meeting Return Week	No Meeting Previous Week	No Meeting in either Week
	(1)	(2)	(3)	(4)
Constant	0.13^{*}	0.23^{***}	0.12^{*}	0.24^{***}
	(0.09)	(0.09)	(0.09)	(0.09)
$Slope_t$	-6.96^{***}	-6.87^{***}	-6.58^{***}	-6.10^{**}
	(1.98)	(2.50)	(2.15)	(2.78)
R_t	-0.09^{**}	-0.08^{*}	-0.08^{*}	-0.09
	(0.05)	(0.06)	(0.06)	(0.07)
R^2	2.61	2.10	2.25	1.74
Nobs	724	606	606	490

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table 4: **Predictive Regressions: Meeting Types**

This table reports weekly predictive regressions of the returns of the CRSP value-weighted index on the slope factor ($Slope_t$) and lagged index returns (R_t) conditional on meetings types. We report bootstrapped standard errors in parentheses. We construct the slope factor as a regression residual of weekly changes of the three-month federal funds futures-implied rate on the one-month federal funds futures-implied rate (see equation (6)). Our sample period is from the first week of 1994 to the last week of 2007 for a total of 725 weeks.

	(1)	(2)	(3)	(4)	(5)
Constant	0.13^{*}	0.23^{***}	0.23^{***}	0.13^{*}	0.16^{**}
	(0.09)	(0.09)	(0.09)	(0.08)	(0.09)
$Slope_t$	-6.96^{***}	-6.90^{***}	-6.91^{***}	-7.07^{***}	-7.44^{***}
	(1.98)	(2.49)	(2.40)	(2.10)	(1.95)
R_t	-0.09^{**}	-0.08^{*}	-0.08^{*}	-0.09^{***}	-0.08^{***}
	(0.05)	(0.05)	(0.05)	(0.04)	(0.04)
$Meeting$		-0.59^{***}			
		(0.22)			
$Slope \times Meeting$		-0.55			
		(4.39)			
$Regular$			-0.66^{***}		
			(0.23)		
$Slope \times Regular$			-0.90		
			(4.60)		
$Intermeeting$				1.27	
				(1.01)	
$Slope \times Intermeeting$				0.68	
				(12.45)	
$Turningpoint$					-2.33^{***}
					(0.85)
$Slope \times Turningpoint$					28.42
					(20.16)
R^2	2.61	3.57	3.75	2.84	4.23
Nobs	724	724	724	724	724

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table 5: **Predictive Regressions: Asymmetries**

This table reports weekly predictive regressions of the excess returns of the CRSP value-weighted index on the slope factor ($Slope_t$) lagged index returns (R_t) allowing for asymmetric effects of slope: $Slope > 0$ captures positive values of the slope factor; $Slope <= 0$ captures negative values of the slope factor; $Slope_{upside}$ captures values of the slope factor larger than one standard deviation above 0; $Slope_{downside}$ captures values of the slope factor larger than one standard deviation below 0; $Slope_{normal}$ captures the intermediate values of slope; $Slope_{large}$ captures value of the slope factor larger than 0.015 in absolute value. We report bootstrapped standard errors in parentheses. We construct the slope factor as a regression residual of weekly changes of the three-month federal funds futures-implied rate on the one-month federal funds futures-implied rate (see equation (6)). Our sample period is from the first week of 1994 to the last week of 2007 for a total of 725 weeks.

	(1)	(2)	(3)	(4)	(5)
Constant	−0.01	0.01	0.05	0.07	0.27***
	(0.11)	(0.11)	(0.09)	(0.09)	(0.11)
$Slope_t > 0$	−2.54	−2.07			
	(3.67)	(3.61)			
$Slope_t <= 0$	−12.21***	−11.25***			
	(3.62)	(3.44)			
R_t		−0.08**		−0.08**	−0.08*
		(0.05)		(0.05)	(0.06)
$Slope_{t,\ normal}$			7.52	7.84	
			(6.27)	(6.20)	
$Slope_{t,\ upside}$			−3.82	−3.41	
			(3.47)	(3.43)	
$Slope_{t,\ downside}$			−12.08***	−11.21***	
			(3.43)	(3.27)	
$Slope_{t,\ large}$					−7.33***
					(1.97)
R^2	2.31	2.96	2.34	3.02	4.22
Nobs	725	724	725	724	413

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table 6: **Predictive Regressions: Raw Changes and PCA**

This table reports weekly predictive regressions of the excess returns of the CRSP value-weighted index on the slope factor ($Slope_t$), the first two principal components of changes in federal funds futures (PC_1, PC_2), and the changes in the one-month and three-month federal funds futures-implied rates ($\Delta ff_{t,t+1,1}$, $\Delta ff_{t,t+1,3}$). We report bootstrapped standard errors in parentheses. We construct the slope factor as a regression residual of weekly changes of the three-month federal funds futures-implied rate on the one-month federal funds futures-implied rate (see equation (6)). Our sample period is from the first week of 1994 to the last week of 2007 for a total of 725 weeks.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	0.14^{*}	0.14^{*}	0.14^{*}	0.14^{*}	0.12^{*}	0.13^{*}	0.13^{*}	0.13^{*}
	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)
$Slope_t$	-6.76^{***}		-7.61^{**}				-6.75^{***}	-6.32^{***}
	(1.98)		(3.85)				(1.98)	(2.59)
R_t	-0.09^{**}	-0.10^{**}	-0.09^{**}	-0.11^{**}	-0.11^{**}	-0.09^{**}	-0.09^{**}	-0.09^{**}
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
PC_1		0.90^{**}	-0.01					
		(0.49)	(0.64)					
PC_2		-2.74	1.11					
		(2.26)	(3.25)					
$\Delta ff_{t,t+1,1}$				-0.65		7.41^{***}	-0.50	
				(2.01)		(3.01)	(2.01)	
$\Delta ff_{t,t+1,3}$					-2.61^{**}	-6.75^{***}		-0.43
					(1.30)	(1.98)		(1.69)
R^2	2.62	2.15	2.65	1.26	1.86	2.63	2.63	2.63
Nobs	695	695	695	695	695	695	695	695

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table 7: **Predictive Regressions: Future Fed Funds Rate**

This table reports weekly predictive regressions of a residual of a regression of changes in future realized federal funds target rates on the one-month target rate on the slope factor ($Slope_t$), and one-month and two-month changes in federal funds rates (Δff_{t+1}, Δff_{t+2}) for horizons lasting from one month ($M1$) to six months ($M6$). We report bootstrapped standard errors in parentheses. We construct the slope factor as a regression residual of weekly changes of the three-month federal funds futures-implied rate on the one-month federal funds futures-implied rate (see equation (6)). Our sample period is from the first week of 1994 to the last week of 2007 for a total of 725 weeks.

	$\Delta M1$	$\Delta M2 \perp \Delta M1$	$\Delta M3 \perp \Delta M1$	$\Delta M4 \perp \Delta M1$	$\Delta M5 \perp \Delta M1$	$\Delta M6 \perp \Delta M1$
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.00	0.01*	0.03***	0.04***	0.05***	0.06***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
$Slope_t$	0.78***	0.98***	−0.13	0.02	0.23	0.29
	(0.23)	(0.21)	(0.30)	(0.35)	(0.45)	(0.63)
Δff_{t+1}		0.36***				
		(0.05)				
Δff_{t+2}			0.87***	1.20***	1.49***	1.73***
			(0.03)	(0.05)	(0.06)	(0.07)
R^2	2.42	15.35	63.41	63.34	61.00	56.80
Nobs	726	726	726	726	726	726

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table 8: **Predictive Regressions: Future Forecast Changes**

This table reports monthly predictive regressions of changes in expectations of future fed funds rates on the cumulative slope factor over the previous three weeks ($Slope_{t-3:t}$), and the one-month change in expectations for horizons lasting from one quarter ($Q1$) to three quarters ($Q3$). We report Newey-West standard errors in parentheses. We construct the slope factor as a regression residual of weekly changes of the three-month federal funds futures-implied rate on the one-month federal funds futures-implied rate (see equation (6)). Our sample period is from February 1994 to December of 2007 for a total of 163 months.

	$\Delta Q1$	$\Delta Q2$	$\Delta Q3$	$\Delta Q2$	$\Delta Q3$
	(1)	(2)	(3)	(4)	(5)
Constant	-0.01	-0.01	-0.02	-0.00	-0.01
	(0.02)	(0.03)	(0.03)	(0.01)	(0.01)
$Slope_{t-3:t}$	0.89^{***}	1.02^{***}	1.00^{***}	0.11	0.12
	(0.17)	(0.16)	(0.16)	(0.08)	(0.12)
$\Delta\,\mathbb{E}\,ff_{t+1}$				1.03^{***}	1.00^{***}
				(0.04)	(0.04)
R^2	11.32	12.22	11.55	88.26	82.26
Nobs	163	163	163	163	163

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table 9: **Linguistic Analysis Speeches**

This table reports weekly predictive regressions of the slope factor on speeches by members of the FOMC. We use linguistic analysis to count the number of occurrences of hawkish or dovish words. The online appendix contains our dictionary. $Hawk - DoveIndex$ is a net index that is larger than 1 if the speech contains more hawkish than dovish terms. Hawk and Dove count the occurrences of hawkish and dovish words. Chair is a dummy that equals 1 if a speech is by the chair or vice chair (Chair). We report Newey-West standard errors in parentheses. We construct the slope factor as a regression residual of weekly changes of the three-month federal funds futures-implied rate on the one-month federal funds futures-implied rate (see equation (6)). Our sample period is from the first week of 1994 to the last week of 2007 for a total of 725 weeks.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	−0.32	−0.13	−1.56***	−0.68**	−1.99*	−0.94	−0.18
	(0.41)	(0.24)	(0.59)	(0.27)	(1.10)	(0.90)	(0.23)
Hawk-Dove Index	0.33		1.06**		1.73**		
	(0.33)		(0.45)		(0.75)		
Hawk		0.09		0.56***		0.61*	0.02
		(0.05)		(0.21)		(0.31)	(0.07)
Dove		−0.09		−0.30*		−0.28*	0.29
		(0.16)		(0.17)		(0.17)	(0.25)
Hawk × Chair							0.43*
							(0.22)
Dove × Chair							−0.68**
							(0.33)
R^2	0.21	0.61	2.98	4.60	12.38	12.35	1.97
Num. obs.	380	380	173	173	43	43	380
Only Speeches by Chair			X	X	X	X	
At least 1 classification					X	X	

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table 10: **Predictive Regressions: Macro News**

This table reports weekly predictive regressions of the excess returns of the CRSP value-weighted index on the slope factor ($Slope_t$), lagged index returns (R_t), and macro surprises from Haver Analytics: news about GDP growth (shock_gdp), core consumer price inflation (shock_cpi), capacity utilization (shock_cu), consumer confidence (shock_cc), employment costs (shock_ec), initial unemployment claims (shock_ic), the manufacturing composite index (shock_mfg), new home sales (shock_nhs), non-farm payroll (shock_nfp), core producer price inflation (shock_ppi), retail sales (shock_rs), and unemployment (shock_ur). We report bootstrapped standard errors in parentheses. We construct the slope factor as a regression residual of weekly changes of the three-month federal funds futures-implied rate on the one-month federal funds futures-implied rate (see equation (6)). Our sample period is from the first week of 1994 to the last week of 2007 for a total of 725 weeks.

	(1)	(2)	(3)	(4)	(5)
Constant	0.13^{*}	0.13^{*}	0.12^{*}	0.09	-0.00
	(0.09)	(0.09)	(0.09)	(0.09)	(0.00)
$Slope_t$	-6.84^{***}	-6.86^{***}	-6.74^{***}	-6.71^{***}	
	(1.98)	(1.99)	(1.99)	(2.04)	
R_t	-0.09^{**}	-0.09^{**}	-0.09^{**}	-0.08^{*}	
	(0.05)	(0.05)	(0.05)	(0.05)	
shock_gdp	0.59^{*}		0.58^{*}	0.55^{*}	-0.00
	(0.37)		(0.37)	(0.37)	(0.01)
shock_cpi		-1.99	-1.98	-1.43	0.02
		(1.58)	(1.58)	(1.57)	(0.04)
shock_cu				-0.77^{*}	0.02^{**}
				(0.52)	(0.01)
shock_cc				-0.03	0.00^{**}
				(0.04)	(0.00)
shock_ec				0.04	0.04
				(1.56)	(0.04)
shock_ic				-0.00	-0.00^{*}
				(0.00)	(0.00)
shock_mfg				-0.05	0.00^{***}
				(0.07)	(0.00)
shock_nhs				-0.00	0.00
				(0.00)	(0.00)
shock_nfp				-0.00^{**}	0.00^{***}
				(0.00)	(0.00)
shock_ppi				0.58	0.02^{**}
				(0.68)	(0.01)
shock_rs				0.54^{*}	0.02^{***}
				(0.35)	(0.01)
shock_ur				-2.40^{**}	-0.05^{**}
				(1.20)	(0.02)
R^2	2.97	2.76	3.12	5.17	9.23
Nobs	724	724	724	724	726

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Online Appendix: Monetary Policy Slope and the Stock Market

Andreas Neuhierl and Michael Weber

Not for Publication

I Linguistic Speech Classification

In applying the search-and-count approach, we first follow a procedure often employed in natural language processing, i.e., we first remove stop words (e.g., "and" or "the") and then create stem words.

We collect all speeches for members of the FOMC from http://www.federalreserve.gov/newsevents/. To classify the tone of speeches, we use a "search-and-count" approach as in Apel and Grimaldi (2012). Search-and-classify is an automated method to classify text into categories. The key input into "search-and-count" classification is a pre-specified word list which the research classifies as "hawkish" or "dovish." Using this pre-specified word list, we can count the hawkish and dovish terms within one speech and aggregate over the document. Following this procedure, we obtain a classification if a speech is on average more hawkish or dovish.

A subtlety arises in applying the approach of Apel and Grimaldi (2012) to our data as they work with Swedish texts. In Swedish, compound words such as "output gap" appear with a blank between the two words. In English many interesting words in our application are compound words, e.g., "labor force participation." We therefore first use a list of such compound words to create a list of relevant nouns to be paired with an adjective or verb. We then look at all two-grams (contiguous combinations of two words within a document). We require that one word within a two-gram contains either one of our nouns or verbs or adjectives. After this filtering step, we obtain a list of two-grams which we classify into hawkish and dovish. To obtain this classification, we read a large number of speeches to determine in which context these two-grams are typically used. We make the classified two-grams and our initial word list available under http://faculty.chicagobooth.edu/michael.weber/research/data/HD_classification.xlsx and in Table A.8.

II Additional Results

A. Difference-in-Differences Slope

In our baseline analysis, we use a first-stage regression to purge the short-run variation in federal funds futures and define the regression residual as slope. One concern might be a generated regressor problem or a small sample bias in point estimates, or in sample overfit. To sidestep these concerns, we now construct a new slope factor as a simple difference-in-differences estimator:

$$slope_{simple\_diff} = \Delta ff_{t,t+1,3} - \Delta ff_{t,t+1,1}. \tag{A.1}$$

This construction has the advantage that it does not rely on first-stage estimation, does not use full-sample data in the construction, and we do not have to bootstrap standard errors. Table A.1 reports the results. We see results are economically and statistically indistinguishable from our baseline results in Table 2.

B. title

Empirically, monetary policy has become more predictable over time because of increased transparency and communication by the Fed and a higher degree of monetary policy smoothing (see Figure 1). We, therefore, study subsample results in Table A.5. Column (1) repeats our baseline sample for comparison. Restricting our sample from 1994 to 2002, we find slightly larger effects of the slope factor on stock returns. Both the point estimate of β and the explanatory power of the regression increase. The weaker stock market response in the period until 2007 is consistent with Gorodnichenko and Weber (2016) and Ozdagli and Weber (2016), who find weaker reactions of stock returns to monetary policy after 2002. We extend our sample to starting in 1988 in columns (3) and (4). We find slightly lower predictability for this enlarged sample.

C. Blackout Periods

The Fed restricts the extent to which members of the FOMC can give public speeches during FOMC blackout periods. These periods start at midnight ET seven days before the

beginning of the FOMC meeting and end at midnight ET on the day after the meeting. Table A.3 in the Online Appendix shows that our results are robust to the exclusion of blackout weeks. In column (2), we exclude weeks with FOMC meetings; that is, the week we calculate the slope factor covers the blackout period. Results are economically and statistically similar to our baseline results in column (1). The same holds true when we exclude weeks in which our return calculation overlaps with the blackout period or when we exclude both weeks in columns (3) and (4).

D. Target, Path, and Slope

Gürkaynak et al. (2005b) document that two factors are necessary to explain the reaction of yields to monetary policy news. They use the first two principal components in federal funds futures to explain the reaction of bond yields to FOMC press releases, and show rotations of the principal components resemble a target and a path factor. The target factor is similar to the measure of monetary policy surprise used in the event-study literature, whereas the path factor contains information in FOMC press releases that moves future rates.[1] Unconditionally, we find a correlation of the slope factor with the target factor of 15.09% and with the path factor of 14.37%.

Table A.2 adds the path and target factors from Gürkaynak et al. (2005b).[2] Column (1) repeats the baseline results. We see in column (2) that a higher target factor increases the predictive power and leads to a drop in the next weeks' excess return. Adding the target factor, however, has no effect on the point estimate of the slope factor. Similar results hold when we add the path factor in column (3) or both in column (4). Adding the path factor, however, adds little explanatory power for stock returns. We also add the 30-minute intraday monetary policy shock around FOMC press releases from Gorodnichenko and Weber (2016) in column (5). The high-frequency shock further increases the predictive power and drives out the target factor but has no impact on the point estimate for the slope factor.

These results are consistent with Gürkaynak et al. (2005b), who find little predictive power of their path factor for stock returns. The slope factor differs from their path factor in that it indicates the speed of future increases or decreases in federal funds target rates

[1]The correlation between the target factor of Gürkaynak et al. (2005b) and the monetary policy shock of Gorodnichenko and Weber (2016) is 95.5% over the common sample.

[2]The data for target and path factors limit our sample to end in December 2004.

rather than just any future policy change.

E. Longer Horizons

Table A.6 repeats our baseline estimation of equation (6) for different horizons ranging from one to four weeks. The predictive power of the slope factors for returns is contained at the one-week horizon. Returns over the next two to four weeks are still negative but smaller in absolute value and no longer statistically significant.

F. Slope over Different Horizons

We focus on the one- and three-month futures in the construction of slope, because longer-term futures either did not exist at the beginning of our sample (1994) or were not heavily traded (see discussion in Gürkaynak et al. (2005b)). In addition, Gertler and Karadi (2015) instrument for monetary policy shocks using different proxies and find that the change in the three months federal fund futures has the strongest explanatory power. Table A.7 reports our baseline predictive regressions when we use futures of different horizons to calculate a slope factor. When we use the six-month and one-month futures-implied rate in column (2), we also find a higher slope factor predicting lower returns. We lose 30 weeks because the six-month futures contract was not always traded and the predictive power is 0.6% lower. The new slope factor loses its predictive power once we condition on our baseline slope factor in column (3). Our sample drops by 50% when we use information from nine-month futures, because the futures contract did not constantly trade on the CME. The residual of a regression of the nine-month futures-implied rates on the one-month futures-implied rate has no predictive power for future excess returns. We see in column (5) that the baseline slope has economically similar predictive power but is not statistically significant, as standard errors increase due to a smaller sample size. A slope based on a regression of six-month futures-implied rates on three-month futures-implied rates has no predictive power beyond the baseline slope factor (see columns (6) and (7)). The results in Table A.7 indicate that longer-term information or higher-order moments beyond level and slope might not matter for the predictive power of information in federal funds futures for excess returns.

G. Simple-Difference Slope

In Table A.4, we create a placebo slope factor based on the difference between the changes in the three-month federal funds futures-implied rate and the one-month futures-implied rate:

$$slope_{placebo} = ff_{t+1,3} - ff_{t+1,1}.$$

The placebo slope factor has no predictive power for weekly stock returns across specifications and explains less than 0.15% of the variation in stock returns.

H. Contemporaneous Association

We argue in the main body of the paper that studying the contemporaneous association between the slope factor and the excess returns of the CRSP value-weighted index is difficult due to endogeneity and reverse-causality concerns. We indeed find a positive, statistically significant coefficient on slope of 8.52 (s.e. 2.99). Once we remove scheduled FOMC meeting weeks, the point estimate reduces to 5.57 (s.e. 3.77) and is no longer statistically significant. Notwithstanding other concerns, scheduled FOMC meetings and regular monetary policy shocks measured as in Gorodnichenko and Weber (2016) drive the positive contemporaneous association between the slope-factor and excess stock market returns.[3]

I. Zero-Lower-Bound Period

Our definition of the slope factor hinges on changes in the three-month and one-month Fed funds futures-implied rates. During most of the period between 2008 and 2014, both changes are close to 0 and our definition of the slope factor breaks down. We circumvent this issue by studying changes in longer-term futures contracts with a sample starting in 2011 when market participants started speculating about a monetary policy liftoff. Specifically, we regress changes in the six-month futures-implied rate on changes in the three-month future-implied rate, and use the residual of the regression as the slope factor

[3]The change in the one-month futures is highly correlated with the standard monetary policy shock around FOMC meetings during meetings weeks, and enters the calculation of the slope factor with a negative sign.

during the zero-lower-bound period. Our estimation and prediction period is from the first week of 2011 until the last week of 2014 for a total of 207 observations. We find that slope predicts next-week returns with a point estimate of -29.93 with a p-value of 9.2%.

J. Economic Magnitudes

We employ the results in Campbell and Thompson (2008) to assess the economic significance of our findings. Specifically, we assess how much an investor could possibly gain following the predictions the slope factor generates, to create a link between statistical measures of forecast performance (out-of-sample R^2) and more interesting economic quantities, such as gains in excess returns or increases in Sharpe ratios.

To generate out-of-sample forecasts, we first re-estimate equation (6) from 1988 through 1994 and use the parameters estimates ($\hat{\alpha}$ and $\hat{\beta}$) to compute an out-of-sample version of the slope factor for the time period from 1995 through 2007:

$$slope_t^{oos} = \Delta ff_{t,t+1,3} - \left(\hat{\alpha} + \hat{\beta}\Delta ff_{t,t+1,1}\right). \tag{A.2}$$

For the period from 1988 through 1994, we also estimate the following predictive regression:

$$R_{t+1} = \gamma_0 + \gamma_1 slope_t. \tag{A.3}$$

We then use the parameters estimates from equation (A.3) together with the out-of-sample slope factor to compute an out-of-sample prediction for excess returns, as

$$\widehat{R_{t+1}} = \hat{\gamma}_0 + \hat{\gamma}_1 slope_t^{oos}. \tag{A.4}$$

Following Campbell and Thompson (2008), we then compute the out-of-sample R^2 as

$$R^2_{OOS} = 1 - \frac{\sum_{t=1}^{T}\left(R_{t+1} - \widehat{R_{t+1}}\right)^2}{\sum_{t=1}^{T}\left(R_{t+1} - \bar{R}_{t+1}\right)^2}, \tag{A.5}$$

where $\bar{R}_{t+1}$ denotes the average excess return over the period from 1988 through 1994.

We obtain an out-of-sample R^2 of 0.27%.

Assuming mean-variance preferences with risk-aversion parameter ρ, Campbell and Thompson (2008) show that a buy-and-hold investor will earn an excess return of

$$\frac{S^2}{\rho},$$

where S^2 denotes the unconditional squared Sharpe ratio.

An investor conditioning on the prediction of the slope factor will earn an average excess return of

$$\left(\frac{1}{\rho}\right)\left(\frac{S^2+R^2_{OOS}}{1-R^2_{OOS}}\right).$$

The weekly unconditional Sharpe ratio from 1988 through 2007 is approximately 7.31%, so a buy-and-hold investor with unit risk aversion would have received an average weekly excess return of 0.53%. An investor using the slope factor to make conditional portfolio choices would have earned an average weekly excess return of 0.81%.

Cochrane (1999) suggests an alternative methodology to evaluate the economic significance of return predictability. Sharpe ratios of a buy-and-hold investor (S) and an investor conditioning on the slope factor are related by $S^* = \sqrt{\frac{S^2+R^2_{OOS}}{1-R^2_{OOS}}}$. For our example, we get an increase in the weekly Sharpe ratio of almost 20%, that is, $S^* = 9.00\%$ compared to $S = 7.31\%$.

Slope is a regression residual and one concern is that trading based on information about the speed of future monetary policy tightening and loosening might not be profitable due to transaction costs. The average percentage bid-ask spread of the SPDR S&P 500 (SPY) between 2002 and 2015 is 0.01% and the median spread is 0.008%. The average absolute weekly excess return instead is 1.7%, indicating transaction costs are not a major concern.

Table A.1: **Predictive Regressions: Difference Slope**

This table reports weekly predictive regressions of the excess returns of the CRSP value-weighted index on the slope factor ($Slope_t$), lagged index returns (R_t), the dividend-price ratio (dp_t), the VIX (VIX_t), realized variance (RV_t), the variance risk premium (VRP_t), the federal funds target rate ($Fedfunds_t$), the term spread ($TermSpread_t$) and the monetary policy shock (mp_t) from Gorodnichenko and Weber (2016). We report Newey-West standard errors in parentheses. We construct the slope factor as the simple difference of weekly changes of the three-month federal funds futures-implied rate on the one-month federal funds futures-implied rate (see equation (A.1)). Our sample period is from the first week of 1994 to the last week of 2007 for a total of 725 weeks.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Constant	0.12	−0.64	−0.02	0.03	0.13	0.03	−0.05	0.12	−2.33***
	(0.09)	(0.42)	(0.30)	(0.16)	(0.12)	(0.24)	(0.23)	(0.08)	(0.77)
$Slope_t$	−6.76***	−7.05***	−6.65***	−6.65***	−6.76***	−6.75***	−6.61***	−6.23***	−6.13***
	(2.06)	(2.09)	(1.96)	(2.04)	(2.07)	(2.01)	(2.04)	(1.89)	(1.85)
R_t	−0.09**	−0.09**	−0.08**	−0.09**	−0.09**	−0.09**	−0.08**	−0.11**	−0.10**
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
dp_t		41.80**							94.60***
		(20.13)							(26.71)
VIX_t			0.01						0.02
			(0.02)						(0.03)
RV_t				0.01					0.02
				(0.01)					(0.02)
VRP_t					0.00				
					(0.02)				
$Fedfunds_t$						0.02			−0.12
						(0.05)			(0.09)
$TermSpread_t$							0.07		0.19
							(0.08)		(0.13)
mp_t								−11.76***	−11.73***
								(2.56)	(2.49)
R^2	2.59	3.22	2.64	2.64	2.60	2.62	2.53	5.56	7.28
Nobs	724	724	723	724	723	724	718	724	717

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table A.2: **Predictive Regressions: Target and Path Factor**

This table reports weekly predictive regressions of the returns of the CRSP value-weighted index on the slope factor ($Slope_t$), lagged index returns (R_t), the target ($Targetfactor$) and path ($Pathfactor$) factors from Gürkaynak et al. (2005b), and the monetary policy shock (mp_t) from Gorodnichenko and Weber (2016). We report bootstrapped standard errors in parentheses. We construct the slope factor as a regression residual of weekly changes of the three-month federal funds futures-implied rate on the one-month federal funds futures-implied rate (see equation (6)). Our sample period is from the first week of 1994 to the last week of 2007 for a total of 725 weeks.

	(1)	(2)	(3)	(4)	(5)
Constant	0.13^{*}	0.14^{*}	0.13^{*}	0.14^{*}	0.07
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)
$Slope_t$	-7.48^{***}	-6.93^{***}	-7.28^{***}	-6.71^{***}	-6.66^{***}
	(2.07)	(2.06)	(2.04)	(2.02)	(2.01)
R_t	-0.06	-0.08^{*}	-0.06	-0.08^{*}	-0.08^{*}
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
$Targetfactor$		-0.10^{***}		-0.10^{***}	0.10
		(0.03)		(0.03)	(0.09)
$Pathfactor$			-0.04^{**}	-0.04^{***}	-0.04^{***}
			(0.02)	(0.02)	(0.02)
mp_t					-20.66^{***}
					(8.14)
R^2	2.42	4.57	3.13	5.38	6.76
Nobs	568	568	568	568	568

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table A.3: **Predictive Regressions: Blackout Periods**

This table reports weekly predictive regressions of the excess returns of the CRSP value-weighted index on the slope factor ($Slope_t$) and lagged index returns (R_t), excluding weeks during blackout period which restrict the extent of public communication. We report bootstrapped standard errors in parentheses. We construct the slope factor as a regression residual of weekly changes of the three-month federal funds futures-implied rate on the one-month federal funds futures-implied rate (see equation (6)). Our sample period is from the first week of 1994 to the last week of 2007 for a total of 725 weeks.

	All Weeks	No Meeting Return Week	No Meeting Next Week	No Meeting in either Week
	(1)	(2)	(3)	(4)
Constant	0.13^{*}	0.23^{*}	0.04^{*}	0.13^{*}
	(0.09)	(0.09)	(0.09)	(0.09)
$Slope_t$	-6.96^{***}	-6.87^{***}	-6.63^{***}	-6.36^{***}
	(1.98)	(1.98)	(1.98)	(1.98)
R_t	-0.09^{**}	-0.08^{**}	-0.07^{**}	-0.08^{**}
	(0.05)	(0.05)	(0.05)	(0.05)
R^2	2.61	2.10	2.54	2.17
Nobs	724	606	606	490

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table A.4: **Predictive Regressions: Placebo Slope**

This table reports weekly predictive regressions of the excess returns of the CRSP value-weighted index on a placebo slope factor ($Slope_{Placebo}$) and lagged index returns (R_t). We report bootstrapped standard errors in parentheses. We construct the placebo slope factor as the change of weekly changes of the three-month federal funds futures-implied rate and the one-month federal funds futures-implied rate. Our sample period is from the first week of 1994 to the last week of 2007 for a total of 725 weeks.

	(1)	(2)
Constant	0.15^{*}	0.17^{**}
	(0.10)	(0.10)
$Slope_{t\ Placebo}$	-0.43	-0.45
	(0.45)	(0.45)
R_t		-0.10^{**}
		(0.05)
R^2	0.15	1.25
Nobs	725	724

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table A.5: **Predictive Regressions: Subsamples**

This table reports weekly predictive regressions of the excess returns of the CRSP value-weighted index on the slope factor ($Slope_t$) for different subsamples. We report bootstrapped standard errors in parentheses. We construct the slope factor as a regression residual of weekly changes of the three-month federal funds futures-implied rate on the one-month federal funds futures-implied rate (see equation (6)). Our sample period is from the first week of 1994 to the last week of 2007 for a total of 725 weeks.

	1994-2007	1994-2002	1988-2007	1988-2002
	(1)	(2)	(3)	(4)
Constant	0.13^{*}	0.11	0.14^{**}	0.12^{*}
	(0.09)	(0.11)	(0.07)	(0.08)
$Slope_t$	-6.96^{***}			
	(1.98)			
R_t	-0.09^{**}	-0.06	-0.09^{**}	-0.07^{*}
	(0.05)	(0.06)	(0.04)	(0.05)
$Slope_{1994-2002}$		-8.05^{***}		
		(2.32)		
$Slope_{1988-2007}$			-4.63^{***}	
			(1.56)	
$Slope_{1988-2002}$				-4.96^{***}
				(1.62)
R^2	2.61	2.85	1.75	1.65
Nobs	724	463	995	734

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table A.6: **Predictive Regressions: Different Horizons**

This table reports weekly predictive regressions of the excess returns of the CRSP value-weighted index on the slope factor ($Slope_t$) for different forecast horizons running from one week to four weeks. We report bootstrapped standard errors in parentheses. We construct the slope factor as a regression residual of weekly changes of the three-month federal funds futures-implied rate on the one-month federal funds futures-implied rate (see equation (6)). Our sample period is from the first week of 1994 to the last week of 2007 for a total of 725 weeks.

	R(t,t+1)	R(t,t+2)	R(t,t+3)	R(t,t+4)
	(1)	(2)	(3)	(4)
Constant	0.12^{*}	0.23^{**}	0.33^{***}	0.43^{***}
	(0.08)	(0.11)	(0.14)	(0.16)
$Slope_t$	-7.70^{***}	-3.31	-2.83	-5.17^{*}
	(2.07)	(3.01)	(3.23)	(3.84)
R^2	1.91	0.19	0.10	0.23
Nobs	725	725	725	725

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table A.7: **Predictive Regressions: Termstructure**

This table reports weekly predictive regressions of the excess returns of the CRSP value-weighted index on the slope factor ($Slope_t$) for different subsamples. We report bootstrapped standard errors in parentheses. We construct the slope factor as a regression residual of weekly changes of the three-month federal funds futures-implied rate on the one-month federal funds futures-implied rate (see equation (6)). Our sample period is from the first week of 1994 to the last week of 2007 for a total of 725 weeks.

		$\Delta ff_{t,t+1,6} \perp \Delta ff_{t,t+1,1}$		$\Delta ff_{t,t+1,9} \perp \Delta ff_{t,t+1,1}$		$\Delta ff_{t,t+1,6} \perp \Delta ff_{t,t+1,3}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	0.14	0.14	0.14	0.05	0.06	0.14	0.14
	(0.09)	(0.09)	(0.09)	(0.12)	(0.13)	(0.09)	(0.09)
$Slope_t$	-6.76^{***}		-9.16^{*}		-6.37		-7.24^{***}
	(2.23)		(4.71)		(5.73)		(2.48)
R_t	-0.09^{**}	-0.10^{**}	-0.10^{**}	-0.15^{**}	-0.15^{*}	-0.11^{***}	-0.10^{**}
	(0.04)	(0.04)	(0.04)	(0.08)	(0.08)	(0.04)	(0.04)
$Slope_{6,1}$		-2.59^{***}	1.42				
		(1.00)	(2.14)				
$Slope_{9,1}$				-0.48	1.09		
				(0.96)	(1.57)		
$Slope_{6,3}$						-0.48	1.51
						(1.87)	(2.09)
R^2	2.62	2.02	2.68	2.18	2.63	1.25	2.69
Nobs	695	695	695	350	350	695	695

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table A.8: **Hawk–Dove Classification**

This table reports the classification of the twograms we use to classify speeches by FOMC members as dovish or hawkish. Our sample period is from January 1996 to December 2007.

Dovish	Hawkish
anchor inflationexpectations	aggregatedemand higher
anchored inflationexpectations	assetprices increase
boost aggregatedemand	assetprices rise
boost economicactivity	businessinvestment increased
cut federalfundsrate	declines unemploymentrate
cut interestrates	declining unemploymentrate
cuts federalfundsrate	drop unemploymentrate
cutting federalfundsrate	economicactivity increased
declines assetprices	economicoutlook increased
declines crudeoil	employment increased
declines economicactivity	energyprices rise
declines employment	exchangerates lower
declines energyprices	gradualincreases federalfundsrate
declines houseprices	grossdomesticproduct rising
declines laborforceparticipation	growing currentaccountdeficit
declining houseprices	higher assetprices
declining interestrates	higher employment
downwardpressure assetprices	higher energyprices
downwardpressure houseprices	higher federalfundsrate
downwardpressure interestrates	higher houseprices
drop crudeoil	higher inflationexpectations
drop houseprices	higher interestrates
easedstance monetarypolicy	higher productivitygrowth
easing monetarypolicy	higher unitlaborcosts
employment declined	houseprices increase
employment fallen	houseprices increased
employment fell	houseprices rise
employment stable	houseprices rising
federalfundsrate lower	increase assetprices
firmlyanchored inflationexpectations	increase coreinflation
houseprices declined	increase currentaccountsurpluses
houseprices fallen	increase economicactivity
houseprices fell	increase employment
increase aggregatedemand	increase energyprices
increase currentaccountdeficit	increase federalfundsrate
increase laborproductivity	increase houseprices
increase unemploymentrate	increase inflationexpectations
increased productivitygrowth	increase interestrates
increases laborproductivity	increase productivitygrowth
increases productivitygrowth	increase resourceutilization

continued on next page

Table A.6: **Hawk–Dove Classification (continued)**

Continued from previous page.

Dovish	Hawkish
inflationexpectations anchored	increase targetfederalfunds
inflationexpectations declined	increase unitlaborcosts
inflationexpectations firmlyanchored	increased economicactivity
inflationexpectations remainedstable	increased employment
inflationexpectations stable	increased laborforceparticipation
inflationexpectations wellanchored	increases aggregatedemand
interestrates declined	increases assetprices
interestrates drop	increases businessinvestment
interestrates easing	increases crudeoil
interestrates lower	increases employment
interestrates lowering	increases energyprices
interestrates remain	increases federalfundsrate
keeping interestrates	increases houseprices
keeping monetarypolicy	increases inflationexpectations
laborproductivity increased	increases interestrates
lower energyprices	increases outputgap
lower federalfundsrate	increases unitlaborcosts
lower houseprices	inflationexpectations increased
lower inflationexpectations	interestrates higher
lower interestrates	interestrates increase
lower levelrealoilprices	interestrates increased
lower potentialoutput	interestrates mightrise
lowered federalfundsrate	interestrates mustrise
lowering federalfundsrate	interestrates raise
lowering interestrates	interestrates raised
monetarypolicy easing	interestrates rise
nonaccelerating inflationrate	interestrates rising
productivitygrowth increased	lower currentaccountdeficit
productivitygrowth increases	lower productivitygrowth
raise aggregatedemand	lower unemploymentrate
rapid productivitygains	monetarypolicy tightening
reduce federalfundsrate	personalsavingrate fallen
reduce interestrates	raise federalfundsrate
reduce unemploymentrate	raise interestrates
reduced economicactivity	raised interestrates
reduced federalfundsrate	raising assetprices
reduced interestrates	raising federalfundsrate
reducing federalfundsrate	raising interestrates
reducing interestrates	rapid productivitygrowth

continued on next page

Table A.6: **Hawk–Dove Classification (continued)**

Continued from previous page.

Dovish	Hawkish
reduction aggregatedemand	reduce currentaccountdeficit
reduction federalfundsrate	reductions unemploymentrate
reduction inflationexpectations	resourceutilization increased
reduction interestrates	rise assetprices
reductions federalfundsrate	rise coreinflation
reductions interestrates	rise employment
resourceutilization subdued	rise energyprices
rise productivitygrowth	rise federalfundsrate
rise unemploymentrate	rise headlineinflation
rising currentaccountdeficit	rise houseprices
rising productivitygrowth	rise inflationexpectations
risks economicactivity	rise interestrates
risks economicoutlook	rise personalsavingrate
risks outlookeconomicactivity	rise unitlaborcosts
stabilizing economicactivity	rising assetprices
stabilizing employment	rising employment
stabilizing monetarypolicy	rising energyprices
stable economicconditions	rising houseprices
stable inflationexpectations	rising inflationexpectations
stable inflationrate	rising interestrates
stable interestrates	risks longterminflationoutlook
stable monetarypolicy	sharpincreases energyprices
stableprices moderate	sharpincreases interestrates
subdued unitlaborcosts	sharprise interestrates
sustainable employment	tightening monetarypolicy
unemploymentrate declined	unemploymentrate declining
unemploymentrate rising	unemploymentrate fallen
upwardpressure exchangerates	unemploymentrate fell
wellanchored inflationexpectations	unemploymentrate lower
	upwardpressure coreinflation
	upwardpressure interestrates

Table A.7: **Speeches by FOMC members**

This table reports the speeches we use for the linguistic analysis, the speaker with link to the speech, the role of the speaker, the number of hawkish and dovish words, and the net index. The sample period is June 1996 to December 2007 for a total of 794 speeches.

Date	Speaker with link	Role	Chair	# Hawks	# Doves	Net Index
6/13/1996	Alan Greenspan	Chairman	yes	0	0	1
6/18/1996	Edward W. Kelley, Jr.	Governor		0	0	1
9/8/1996	Laurence H. Meyer	Governor		1	1	1
9/19/1996	Alan Greenspan	Chairman	yes	0	0	1
10/2/1996	Lawrence B. Lindsey	Governor		0	0	1
10/5/1996	Alan Greenspan	Chairman	yes	0	0	1
10/7/1996	Alan Greenspan	Chairman	yes	0	0	1
10/9/1996	Lawrence B. Lindsey	Governor		1	1	1
10/11/1996	Lawrence B. Lindsey	Governor		0	0	1
10/16/1996	Alan Greenspan	Chairman	yes	0	0	1
10/24/1996	Susan M. Phillips	Governor		0	0	1
10/31/1996	Edward W. Kelley, Jr.	Governor		0	0	1
11/18/1996	Alan Greenspan	Chairman	yes	0	0	1
11/21/1996	Laurence H. Meyer	Governor		0	0	1
11/25/1996	Susan M. Phillips	Governor		0	0	1
12/3/1996	Edward W. Kelley, Jr.	Governor		0	0	1
12/5/1996	Alan Greenspan	Chairman	yes	0	1	0
12/6/1996	Alan Greenspan	Chairman	yes	2	0	2
12/19/1996	Alice M. Rivlin	Vice Chair	yes	0	0	1
1/5/1997	Laurence H. Meyer	Governor		0	1	0
1/14/1997	Alan Greenspan	Chairman	yes	1	0	2
1/16/1997	Laurence H. Meyer	Governor		3	2	1.2
1/24/1997	Laurence H. Meyer	Governor		0	0	1
1/28/1997	Susan M. Phillips	Governor		0	0	1
1/29/1997	Edward W. Kelley, Jr.	Governor		0	0	1
2/14/1997	Susan M. Phillips	Governor		0	0	1
2/21/1997	Alan Greenspan	Chairman	yes	0	0	1
3/3/1997	Susan M. Phillips	Governor		0	0	1
3/7/1997	Alan Greenspan	Chairman	yes	0	0	1
3/13/1997	Alice M. Rivlin	Vice Chair	yes	0	0	1
3/22/1997	Alan Greenspan	Chairman	yes	0	0	1

continued on next page

Table A.7: **Speeches by FOMC members (continued)**

Continued from previous page.

Date	Speaker with link	Role	Chair	# Hawks	# Doves	Net Index
4/4/1997	Alice M. Rivlin	Vice Chair	yes	0	1	0
4/10/1997	Laurence H. Meyer	Governor		0	0	1
4/12/1997	Alan Greenspan	Chairman	yes	0	0	1
4/24/1997	Laurence H. Meyer	Governor		11	2	1.692308
4/29/1997	Alan Greenspan	Chairman	yes	0	0	1
5/1/1997	Alan Greenspan	Chairman	yes	0	0	1
5/3/1997	Alan Greenspan	Chairman	yes	0	0	1
5/8/1997	Alan Greenspan	Chairman	yes	3	0	2
5/23/1997	Laurence H. Meyer	Governor		0	1	0
6/10/1997	Alan Greenspan	Chairman	yes	0	0	1
6/18/1997	Susan M. Phillips	Governor		0	0	1
6/18/1997	Laurence H. Meyer	Governor		0	0	1
9/4/1997	Laurence H. Meyer	Governor		2	3	0.8
9/5/1997	Alan Greenspan	Chairman	yes	0	0	1
9/12/1997	Alan Greenspan	Chairman	yes	0	0	1
9/12/1997	Laurence H. Meyer	Governor		0	0	1
9/17/1997	Laurence H. Meyer	Governor		2	2	1
9/19/1997	Susan M. Phillips	Governor		0	0	1
9/23/1997	Edward W. Kelley, Jr.	Governor		0	0	1
10/5/1997	Alan Greenspan	Chairman	yes	0	0	1
10/11/1997	Alan Greenspan	Chairman	yes	0	0	1
10/14/1997	Alan Greenspan	Chairman	yes	0	0	1
10/14/1997	Alan Greenspan	Chairman	yes	0	0	1
10/14/1997	Laurence H. Meyer	Governor		5	2	1.428571
10/15/1997	Susan M. Phillips	Governor		0	0	1
10/30/1997	Susan M. Phillips	Governor		0	0	1
10/31/1997	Laurence H. Meyer	Governor		0	0	1
11/4/1997	Susan M. Phillips	Governor		0	0	1
11/7/1997	Alan Greenspan	Chairman	yes	0	0	1
12/1/1997	Laurence H. Meyer	Governor		0	0	1
12/2/1997	Alan Greenspan	Chairman	yes	3	0	2
12/3/1997	Alan Greenspan	Chairman	yes	0	0	1

continued on next page

Table A.7: **Speeches by FOMC members (continued)**

Continued from previous page.

Date	Speaker with link	Role	Chair	# Hawks	# Doves	Net Index
12/15/1997	Edward W. Kelley, Jr.	Governor		0	0	1
1/3/1998	Alan Greenspan	Chairman	yes	3	0	2
1/8/1998	Laurence H. Meyer	Governor		2	3	0.8
1/12/1998	Alan Greenspan	Chairman	yes	0	0	1
1/16/1998	Alan Greenspan	Chairman	yes	0	0	1
2/11/1998	Edward W. Kelley, Jr.	Governor		0	0	1
2/17/1998	Alice M. Rivlin	Vice Chair	yes	0	0	1
2/26/1998	Alan Greenspan	Chairman	yes	0	0	1
2/27/1998	Alan Greenspan	Chairman	yes	0	0	1
2/27/1998	Edward M. Gramlich	Governor		1	1	1
3/2/1998	Laurence H. Meyer	Governor		0	0	1
3/3/1998	Alan Greenspan	Chairman	yes	0	0	1
3/4/1998	Roger W. Ferguson, Jr.	Governor		1	0	2
3/6/1998	Edward M. Gramlich	Governor		0	0	1
3/9/1998	Roger W. Ferguson, Jr.	Governor		0	0	1
3/16/1998	Laurence H. Meyer	Governor		7	3	1.4
3/17/1998	Susan M. Phillips	Governor		0	0	1
3/19/1998	Roger W. Ferguson, Jr.	Governor		0	0	1
3/19/1998	Alice M. Rivlin	Vice Chair	yes	0	0	1
3/26/1998	Susan M. Phillips	Governor		0	0	1
4/2/1998	Alan Greenspan	Chairman	yes	0	0	1
4/2/1998	Laurence H. Meyer	Governor		3	4	0.857143
4/4/1998	Roger W. Ferguson, Jr.	Governor		0	0	1
4/9/1998	Laurence H. Meyer	Governor		1	2	0.666667
4/16/1998	Laurence H. Meyer	Governor		0	0	1
4/16/1998	Roger W. Ferguson, Jr.	Governor		1	1	1
4/23/1998	Alice M. Rivlin	Vice Chair	yes	0	0	1
4/30/1998	Laurence H. Meyer	Governor		2	1	1.333333
5/2/1998	Alan Greenspan	Chairman	yes	0	0	1
5/7/1998	Alan Greenspan	Chairman	yes	0	0	1
5/7/1998	Alice M. Rivlin	Vice Chair	yes	0	0	1
5/12/1998	Laurence H. Meyer	Governor		0	0	1

continued on next page

Table A.7: **Speeches by FOMC members (continued)**

Continued from previous page.

Date	Speaker with link	Role	Chair	# Hawks	# Doves	Net Index
5/12/1998	Alice M. Rivlin	Vice Chair	yes	0	0	1
5/20/1998	Alan Greenspan	Chairman	yes	0	0	1
6/3/1998	Laurence H. Meyer	Governor		0	1	0
6/9/1998	Laurence H. Meyer	Governor		0	0	1
6/18/1998	Alice M. Rivlin	Vice Chair	yes	2	0	2
7/9/1998	Roger W. Ferguson, Jr.	Governor		2	3	0.8
7/10/1998	Alan Greenspan	Chairman	yes	0	0	1
7/20/1998	Roger W. Ferguson, Jr.	Governor		0	0	1
8/28/1998	Alan Greenspan	Chairman	yes	1	0	2
9/4/1998	Alan Greenspan	Chairman	yes	0	0	1
9/15/1998	Edward M. Gramlich	Governor		0	0	1
9/17/1998	Roger W. Ferguson, Jr.	Governor		2	2	1
9/18/1998	Laurence H. Meyer	Governor		0	0	1
9/28/1998	Alice M. Rivlin	Vice Chair	yes	0	0	1
9/29/1998	Roger W. Ferguson, Jr.	Governor		0	0	1
10/5/1998	Laurence H. Meyer	Governor		0	7	0
10/14/1998	Roger W. Ferguson, Jr.	Governor		0	0	1
10/16/1998	Roger W. Ferguson, Jr.	Governor		0	0	1
10/22/1998	Roger W. Ferguson, Jr.	Governor		0	1	0
10/22/1998	Laurence H. Meyer	Governor		0	0	1
10/22/1998	Alice M. Rivlin	Vice Chair	yes	2	0	2
10/27/1998	Roger W. Ferguson, Jr.	Governor		0	0	1
10/29/1998	Edward W. Kelley, Jr.	Governor		0	1	0
11/5/1998	Alan Greenspan	Chairman	yes	1	0	2
11/6/1998	Edward M. Gramlich	Governor		0	0	1
11/12/1998	Laurence H. Meyer	Governor		0	0	1
1/3/1999	Roger W. Ferguson, Jr.	Governor		1	3	0.5
1/4/1999	Laurence H. Meyer	Governor		0	0	1
1/11/1999	Laurence H. Meyer	Governor		0	0	1
1/15/1999	Roger W. Ferguson, Jr.	Governor		0	1	0
1/21/1999	Roger W. Ferguson, Jr.	Governor		0	0	1
2/11/1999	Roger W. Ferguson, Jr.	Governor		1	0	2

continued on next page

Table A.7: **Speeches by FOMC members (continued)**

Continued from previous page.

Date	Speaker with link	Role	Chair	# Hawks	# Doves	Net Index
2/16/1999	Alan Greenspan	Chairman	yes	0	0	1
2/24/1999	Alice M. Rivlin	Vice Chair	yes	0	0	1
2/25/1999	Laurence H. Meyer	Governor		7	6	1.076923
2/25/1999	Roger W. Ferguson, Jr.	Governor		0	0	1
3/1/1999	Alice M. Rivlin	Vice Chair	yes	0	0	1
3/3/1999	Roger W. Ferguson, Jr.	Governor		0	0	1
3/8/1999	Edward M. Gramlich	Governor		0	0	1
3/8/1999	Alan Greenspan	Chairman	yes	2	0	2
3/9/1999	Alan Greenspan	Chairman	yes	0	0	1
3/10/1999	Edward W. Kelley, Jr.	Governor		0	0	1
3/12/1999	Laurence H. Meyer	Governor		0	0	1
3/16/1999	Alan Greenspan	Chairman	yes	0	1	0
3/16/1999	Roger W. Ferguson, Jr.	Governor		0	0	1
3/19/1999	Alan Greenspan	Chairman	yes	0	0	1
3/25/1999	Edward W. Kelley, Jr.	Governor		0	1	0
4/6/1999	Alice M. Rivlin	Vice Chair	yes	0	0	1
4/13/1999	Roger W. Ferguson, Jr.	Governor		0	0	1
4/14/1999	Laurence H. Meyer	Governor		5	4	1.111111
4/16/1999	Alan Greenspan	Chairman	yes	0	0	1
4/22/1999	Laurence H. Meyer	Governor		8	3	1.454545
4/22/1999	Edward M. Gramlich	Governor		3	3	1
4/26/1999	Laurence H. Meyer	Governor		0	1	0
4/29/1999	Alan Greenspan	Chairman	yes	1	0	2
5/6/1999	Alan Greenspan	Chairman	yes	0	2	0
5/13/1999	Alice M. Rivlin	Vice Chair	yes	0	0	1
5/13/1999	Alice M. Rivlin	Vice Chair	yes	0	0	1
6/1/1999	Alice M. Rivlin	Vice Chair	yes	0	0	1
6/2/1999	Alan Greenspan	Chairman	yes	0	0	1
6/3/1999	Laurence H. Meyer	Governor		0	0	1
6/10/1999	Roger W. Ferguson, Jr.	Governor		0	1	0
6/10/1999	Alan Greenspan	Chairman	yes	0	0	1
6/14/1999	Laurence H. Meyer	Governor		0	0	1

continued on next page

Table A.7: **Speeches by FOMC members (continued)**

Continued from previous page.

Date	Speaker with link	Role	Chair	# Hawks	# Doves	Net Index
6/16/1999	Edward M. Gramlich	Governor		1	0	2
6/22/1999	Roger W. Ferguson, Jr.	Governor		0	0	1
7/29/1999	Roger W. Ferguson, Jr.	Governor		0	0	1
8/27/1999	Alan Greenspan	Chairman	yes	0	0	1
9/8/1999	Alan Greenspan	Chairman	yes	0	0	1
9/8/1999	Laurence H. Meyer	Governor		7	3	1.4
9/9/1999	Roger W. Ferguson, Jr.	Governor		0	0	1
9/15/1999	Edward M. Gramlich	Governor		0	0	1
9/16/1999	Edward W. Kelley, Jr.	Governor		0	0	1
9/17/1999	Alan Greenspan	Chairman	yes	0	0	1
9/17/1999	Edward M. Gramlich	Governor		0	0	1
9/21/1999	Roger W. Ferguson, Jr.	Governor		2	1	1.333333
9/27/1999	Laurence H. Meyer	Governor		0	0	1
9/27/1999	Alan Greenspan	Chairman	yes	0	0	1
9/28/1999	Roger W. Ferguson, Jr.	Governor		0	0	1
9/30/1999	Alan Greenspan	Chairman	yes	0	0	1
10/1/1999	Laurence H. Meyer	Governor		0	0	1
10/6/1999	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
10/11/1999	Alan Greenspan	Chairman	yes	0	0	1
10/12/1999	Laurence H. Meyer	Governor		4	6	0.8
10/14/1999	Alan Greenspan	Chairman	yes	0	0	1
10/15/1999	Alan Greenspan	Chairman	yes	0	0	1
10/19/1999	Alan Greenspan	Chairman	yes	0	0	1
10/28/1999	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
10/28/1999	Alan Greenspan	Chairman	yes	2	0	2
11/2/1999	Alan Greenspan	Chairman	yes	1	0	2
11/4/1999	Edward M. Gramlich	Governor		1	1	1
11/15/1999	Alan Greenspan	Chairman	yes	0	0	1
11/30/1999	Laurence H. Meyer	Governor		4	3	1.142857
12/15/1999	Laurence H. Meyer	Governor		0	0	1
1/7/2000	Roger W. Ferguson, Jr.	Vice Chair		4	0	2
1/13/2000	Edward M. Gramlich	Governor		1	1	1

continued on next page

Table A.7: **Speeches by FOMC members (continued)**

Continued from previous page.

Date	Speaker with link	Role	Chair	# Hawks	# Doves	Net Index
1/13/2000	Alan Greenspan	Chairman	yes	4	2	1.333333
1/14/2000	Laurence H. Meyer	Governor		0	0	1
1/20/2000	Laurence H. Meyer	Governor		1	0	2
2/3/2000	Laurence H. Meyer	Governor		0	0	1
2/17/2000	Roger W. Ferguson, Jr.	Vice Chair		1	1	1
2/23/2000	Laurence H. Meyer	Governor		0	1	0
2/25/2000	Laurence H. Meyer	Governor		0	0	1
3/3/2000	Laurence H. Meyer	Governor		6	1	1.714286
3/6/2000	Alan Greenspan	Chairman	yes	1	0	2
3/6/2000	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
3/7/2000	Edward M. Gramlich	Governor		0	0	1
3/8/2000	Alan Greenspan	Chairman	yes	1	0	2
3/13/2000	Edward M. Gramlich	Governor		0	0	1
3/22/2000	Alan Greenspan	Chairman	yes	0	0	1
3/30/2000	Edward W. Kelley, Jr.	Governor		0	0	1
4/5/2000	Alan Greenspan	Chairman	yes	3	0	2
4/6/2000	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
4/7/2000	Alan Greenspan	Chairman	yes	1	0	2
4/10/2000	Alan Greenspan	Chairman	yes	0	0	1
4/11/2000	Alan Greenspan	Chairman	yes	0	0	1
4/12/2000	Laurence H. Meyer	Governor		25	2	1.851852
4/14/2000	Alan Greenspan	Chairman	yes	0	0	1
4/14/2000	Edward M. Gramlich	Governor		0	0	1
4/17/2000	Edward M. Gramlich	Governor		0	0	1
4/20/2000	Edward M. Gramlich	Governor		1	1	1
4/27/2000	Alan Greenspan	Chairman	yes	1	0	2
5/4/2000	Alan Greenspan	Chairman	yes	0	0	1
5/4/2000	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
5/9/2000	Roger W. Ferguson, Jr.	Vice Chair		5	1	1.666667
5/11/2000	Roger W. Ferguson, Jr.	Vice Chair		0	1	0
5/12/2000	Roger W. Ferguson, Jr.	Vice Chair		0	1	0
5/18/2000	Alan Greenspan	Chairman	yes	0	0	1

continued on next page

Table A.7: **Speeches by FOMC members (continued)**

Continued from previous page.

Date	Speaker with link	Role	Chair	# Hawks	# Doves	Net Index
5/22/2000	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
5/25/2000	Alan Greenspan	Chairman	yes	0	0	1
5/26/2000	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
5/31/2000	Laurence H. Meyer	Governor		0	0	1
6/1/2000	Laurence H. Meyer	Governor		0	0	1
6/6/2000	Laurence H. Meyer	Governor		11	5	1.375
6/13/2000	Alan Greenspan	Chairman	yes	1	1	1
7/11/2000	Alan Greenspan	Chairman	yes	0	0	1
7/12/2000	Alan Greenspan	Chairman	yes	0	0	1
8/25/2000	Alan Greenspan	Chairman	yes	0	1	0
8/31/2000	Laurence H. Meyer	Governor		0	0	1
9/15/2000	Roger W. Ferguson, Jr.	Vice Chair		0	1	0
9/18/2000	Alan Greenspan	Chairman	yes	0	0	1
10/11/2000	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
10/16/2000	Alan Greenspan	Chairman	yes	0	0	1
10/19/2000	Laurence H. Meyer	Governor		15	3	1.666667
10/19/2000	Alan Greenspan	Chairman	yes	0	1	0
10/19/2000	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
10/20/2000	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
10/24/2000	Laurence H. Meyer	Governor		2	3	0.8
10/31/2000	Roger W. Ferguson, Jr.	Vice Chair		3	0	2
11/14/2000	Alan Greenspan	Chairman	yes	0	0	1
11/20/2000	Alan Greenspan	Chairman	yes	0	0	1
11/21/2000	Edward M. Gramlich	Governor		0	0	1
12/5/2000	Alan Greenspan	Chairman	yes	2	0	2
12/6/2000	Edward M. Gramlich	Governor		0	0	1
12/6/2000	Roger W. Ferguson, Jr.	Vice Chair		6	1	1.714286
12/8/2000	Alan Greenspan	Chairman	yes	0	0	1
1/12/2001	Roger W. Ferguson, Jr.	Vice Chair		4	4	1
1/25/2001	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
2/14/2001	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
2/15/2001	Laurence H. Meyer	Governor		0	0	1

continued on next page

Table A.7: **Speeches by FOMC members (continued)**

Continued from previous page.

Date	Speaker with link	Role	Chair	# Hawks	# Doves	Net Index
2/20/2001	Edward M. Gramlich	Governor		2	5	0.571429
2/27/2001	Roger W. Ferguson, Jr.	Vice Chair		1	1	1
3/5/2001	Laurence H. Meyer	Governor		0	0	1
3/7/2001	Alan Greenspan	Chairman	yes	0	0	1
3/9/2001	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
3/15/2001	Laurence H. Meyer	Governor		0	0	1
3/23/2001	Edward M. Gramlich	Governor		0	0	1
3/27/2001	Alan Greenspan	Chairman	yes	0	0	1
3/28/2001	Laurence H. Meyer	Governor		1	1	1
4/5/2001	Edward M. Gramlich	Governor		0	0	1
4/5/2001	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
4/6/2001	Alan Greenspan	Chairman	yes	0	0	1
4/19/2001	Roger W. Ferguson, Jr.	Vice Chair		0	3	0
4/19/2001	Edward M. Gramlich	Governor		0	0	1
4/26/2001	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
4/27/2001	Alan Greenspan	Chairman	yes	1	1	1
5/10/2001	Alan Greenspan	Chairman	yes	1	1	1
5/10/2001	Laurence H. Meyer	Governor		0	0	1
5/17/2001	Laurence H. Meyer	Governor		0	0	1
5/18/2001	Alan Greenspan	Chairman	yes	0	0	1
5/21/2001	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
5/21/2001	Laurence H. Meyer	Governor		1	2	0.666667
5/24/2001	Laurence H. Meyer	Governor		6	0	2
5/24/2001	Alan Greenspan	Chairman	yes	5	2	1.428571
6/6/2001	Laurence H. Meyer	Governor		9	3	1.5
6/11/2001	Edward M. Gramlich	Governor		0	0	1
6/14/2001	Roger W. Ferguson, Jr.	Vice Chair		4	0	2
6/20/2001	Alan Greenspan	Chairman	yes	0	0	1
6/20/2001	Edward M. Gramlich	Governor		1	0	2
6/28/2001	Alan Greenspan	Chairman	yes	0	0	1
6/28/2001	Alan Greenspan	Chairman	yes	1	1	1
7/17/2001	Laurence H. Meyer	Governor		0	10	0

continued on next page

Table A.7: **Speeches by FOMC members (continued)**

Continued from previous page.

Date	Speaker with link	Role	Chair	# Hawks	# Doves	Net Index
7/18/2001	Roger W. Ferguson, Jr.	Vice Chair		0	1	0
8/3/2001	Edward M. Gramlich	Governor		0	0	1
8/31/2001	Alan Greenspan	Chairman	yes	1	0	2
8/31/2001	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
9/4/2001	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
10/11/2001	Alan Greenspan	Chairman	yes	0	0	1
10/12/2001	Laurence H. Meyer	Governor		0	1	0
10/15/2001	Laurence H. Meyer	Governor		0	0	1
10/16/2001	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
10/23/2001	Alan Greenspan	Chairman	yes	0	0	1
10/23/2001	Edward M. Gramlich	Governor		0	0	1
10/24/2001	Alan Greenspan	Chairman	yes	0	0	1
10/26/2001	Alan Greenspan	Chairman	yes	0	0	1
11/8/2001	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
11/8/2001	Edward M. Gramlich	Governor		0	0	1
11/13/2001	Alan Greenspan	Chairman	yes	0	1	0
11/27/2001	Laurence H. Meyer	Governor		4	4	1
11/30/2001	Edward M. Gramlich	Governor		2	3	0.8
11/30/2001	Alan Greenspan	Chairman	yes	0	0	1
12/3/2001	Alan Greenspan	Chairman	yes	0	0	1
12/5/2001	Laurence H. Meyer	Governor		0	0	1
12/18/2001	Laurence H. Meyer	Governor		0	0	1
1/8/2002	Roger W. Ferguson, Jr.	Vice Chair		0	1	0
1/10/2002	Alan Greenspan	Chairman	yes	0	0	1
1/11/2002	Alan Greenspan	Chairman	yes	0	1	0
1/16/2002	Roger W. Ferguson, Jr.	Vice Chair		1	6	0.285714
1/16/2002	Laurence H. Meyer	Governor		2	5	0.571429
1/16/2002	Alan Greenspan	Chairman	yes	0	0	1
1/18/2002	Edward M. Gramlich	Governor		0	0	1
2/7/2002	Mark W. Olson	Governor		0	0	1
2/8/2002	Mark W. Olson	Governor		0	0	1
2/20/2002	Edward M. Gramlich	Governor		5	0	2

continued on next page

Table A.7: **Speeches by FOMC members (continued)**

Continued from previous page.

Date	Speaker with link	Role	Chair	# Hawks	# Doves	Net Index
2/27/2002	Roger W. Ferguson, Jr.	Vice Chair		2	6	0.5
2/28/2002	Alan Greenspan	Chairman	yes	0	1	0
2/28/2002	Susan Schmidt Bies	Governor		3	0	2
3/1/2002	Edward M. Gramlich	Governor		0	0	1
3/4/2002	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
3/4/2002	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
3/7/2002	Edward M. Gramlich	Governor		0	0	1
3/12/2002	Mark W. Olson	Governor		0	0	1
3/13/2002	Alan Greenspan	Chairman	yes	0	0	1
3/21/2002	Susan S. Bies	Governor		1	3	0.5
3/26/2002	Mark W. Olson	Governor		0	0	1
3/26/2002	Alan Greenspan	Chairman	yes	0	0	1
4/8/2002	Edward M. Gramlich	Governor		0	0	1
4/22/2002	Alan Greenspan	Chairman	yes	0	0	1
4/30/2002	Mark W. Olson	Governor		0	0	1
5/2/2002	Edward M. Gramlich	Governor		0	0	1
5/3/2002	Alan Greenspan	Chairman	yes	0	0	1
5/9/2002	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
5/10/2002	Alan Greenspan	Chairman	yes	0	0	1
5/11/2002	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
5/13/2002	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
5/17/2002	Mark W. Olson	Governor		0	0	1
5/21/2002	Mark W. Olson	Governor		0	0	1
5/21/2002	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
5/31/2002	Mark W. Olson	Governor		0	0	1
6/10/2002	Susan S. Bies	Governor		0	0	1
6/11/2002	Susan S. Bies	Governor		1	3	0.5
6/20/2002	Susan S. Bies	Governor		0	0	1
7/5/2002	Edward M. Gramlich	Governor		0	0	1
7/8/2002	Mark W. Olson	Governor		0	0	1
7/26/2002	Mark W. Olson	Governor		0	0	1
8/30/2002	Alan Greenspan	Chairman	yes	2	1	1.333333

continued on next page

Table A.7: **Speeches by FOMC members (continued)**

Continued from previous page.

Date	Speaker with link	Role	Chair	# Hawks	# Doves	Net Index
9/25/2002	Alan Greenspan	Chairman	yes	0	0	1
9/25/2002	Alan Greenspan	Chairman	yes	0	0	1
9/25/2002	Alan Greenspan	Chairman	yes	0	0	1
9/28/2002	Susan S. Bies	Governor		1	2	0.666667
10/1/2002	Susan S. Bies	Governor		1	0	2
10/3/2002	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
10/7/2002	Alan Greenspan	Chairman	yes	0	0	1
10/8/2002	Susan S. Bies	Governor		1	0	2
10/9/2002	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
10/15/2002	Ben S. Bernanke	Governor		12	2	1.714286
10/16/2002	Roger W. Ferguson, Jr	Vice Chair		2	3	0.8
10/16/2002	Roger W. Ferguson, Jr	Vice Chair		0	0	1
10/16/2002	Edward M. Gramlich	Governor		0	0	1
10/22/2002	Mark W. Olson	Governor		0	0	1
10/23/2002	Alan Greenspan	Chairman	yes	0	0	1
10/24/2002	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
10/29/2002	Alan Greenspan	Chairman	yes	0	0	1
11/7/2002	Susan S. Bies	Governor		0	0	1
11/7/2002	Edward M. Gramlich	Governor		0	0	1
11/8/2002	Ben S. Bernanke	Governor		2	0	2
11/12/2002	Alan Greenspan	Chairman	yes	0	1	0
11/12/2002	Roger W. Ferguson, Jr.	Vice Chair		0	7	0
11/12/2002	Roger W. Ferguson, Jr.	Vice Chair		0	1	0
11/12/2002	Mark W. Olson	Governor		0	0	1
11/12/2002	Susan S. Bies	Governor		0	1	0
11/18/2002	Mark W. Olson	Governor		0	0	1
11/18/2002	Alan Greenspan	Chairman	yes	0	0	1
11/19/2002	Alan Greenspan	Chairman	yes	0	0	1
11/20/2002	Roger W. Ferguson, Jr.	Vice Chair		1	0	2
11/21/2002	Ben S. Bernanke	Governor		1	1	1
11/22/2002	Donald L. Kohn	Governor		1	1	1
12/13/2002	Susan S. Bies	Governor		0	0	1

continued on next page

Table A.7: **Speeches by FOMC members (continued)**

Continued from previous page.

Date	Speaker with link	Role	Chair	# Hawks	# Doves	Net Index
12/13/2002	Mark W. Olson	Governor		1	0	2
12/19/2002	Alan Greenspan	Chairman	yes	1	1	1
1/4/2003	Edward M. Gramlich	Governor		1	4	0.4
2/3/2003	Ben S. Bernanke	Governor		2	5	0.571429
2/5/2003	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
2/6/2003	Mark W. Olson	Governor		0	0	1
2/11/2003	Susan Schmidt Bies	Governor		3	0	2
2/12/2003	Roger W. Ferguson, Jr	Vice Chair		1	2	0.666667
2/21/2003	Ben S. Bernanke	Governor		1	3	0.5
2/27/2003	Susan Schmidt Bies	Governor		0	0	1
2/28/2003	Donald L. Kohn	Governor		10	8	1.111111
3/4/2003	Alan Greenspan	Chairman	yes	0	0	1
3/7/2003	Alan Greenspan	Chairman	yes	0	0	1
3/13/2003	Mark W. Olson	Governor		0	0	1
3/24/2003	Donald L. Kohn	Governor		2	1	1.333333
3/25/2003	Ben S. Bernanke	Governor		2	5	0.571429
3/28/2003	Alan Greenspan	Chairman	yes	0	0	1
4/3/2003	Alan Greenspan	Chairman	yes	0	0	1
4/4/2003	Alan Greenspan	Chairman	yes	0	0	1
4/7/2003	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
4/9/2003	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
4/9/2003	Alan Greenspan	Chairman	yes	0	0	1
4/10/2003	Mark W. Olson	Governor		0	0	1
4/24/2003	Edward M. Gramlich	Governor		0	0	1
4/24/2003	Ben S. Bernanke	Governor		1	0	2
4/28/2003	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
5/7/2003	Susan Schmidt Bies	Governor		0	0	1
5/8/2003	Alan Greenspan	Chairman	yes	0	0	1
5/13/2003	Alan Greenspan	Chairman	yes	0	0	1
5/16/2003	Roger W. Ferguson, Jr.	Vice Chair		0	2	0
5/22/2003	Mark W. Olson	Governor		2	1	1.333333
5/30/2003	Susan Schmidt Bies	Governor		0	0	1

continued on next page

Table A.7: **Speeches by FOMC members (continued)**

Continued from previous page.

Date	Speaker with link	Role	Chair	# Hawks	# Doves	Net Index
5/31/2003	Ben S. Bernanke	Governor		0	3	0
6/10/2003	Donald L. Kohn	Governor		0	0	1
6/10/2003	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
6/11/2003	Susan Schmidt Bies	Governor		0	0	1
6/11/2003	Roger W. Ferguson, Jr.	Vice Chair		1	2	0.666667
6/11/2003	Ben S. Bernanke	Governor		0	0	1
6/13/2003	Edward M. Gramlich	Governor		2	0	2
6/16/2003	Susan Schmidt Bies	Governor		0	0	1
6/17/2003	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
6/20/2003	Donald L. Kohn	Governor		0	0	1
6/26/2003	Mark W. Olson	Governor		0	0	1
7/23/2003	Ben S. Bernanke	Governor		1	3	0.5
8/7/2003	Susan Schmidt Bies	Governor		0	0	1
8/10/2003	Susan Schmidt Bies	Governor		0	0	1
8/18/2003	Edward M. Gramlich	Governor		0	0	1
8/29/2003	Alan Greenspan	Chairman	yes	0	0	1
9/4/2003	Edward M. Gramlich	Governor		0	0	1
9/4/2003	Ben S. Bernanke	Governor		0	2	0
9/22/2003	Mark W. Olson	Governor		0	0	1
9/24/2003	Donald L. Kohn	Governor		14	0	2
9/26/2003	Alan Greenspan	Chairman	yes	0	0	1
10/1/2003	Edward M. Gramlich	Governor		0	1	0
10/2/2003	Ben S. Bernanke	Governor		6	5	1.090909
10/8/2003	Susan Schmidt Bies	Governor		4	2	1.333333
10/8/2003	Roger W. Ferguson, Jr.	Vice Chair		0	1	0
10/8/2003	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
10/9/2003	Edward M. Gramlich	Governor		0	0	1
10/17/2003	Ben S. Bernanke	Governor		0	0	1
10/17/2003	Donald L. Kohn	Governor		0	1	0
10/24/2003	Ben S. Bernanke	Governor		1	0	2
10/29/2003	Alan Greenspan	Chairman	yes	0	0	1
10/31/2003	Susan Schmidt Bies	Governor		1	0	2

continued on next page

Table A.7: **Speeches by FOMC members (continued)**

Continued from previous page.

Date	Speaker with link	Role	Chair	# Hawks	# Doves	Net Index
11/6/2003	Alan Greenspan	Chairman	yes	0	2	0
11/6/2003	Ben S. Bernanke	Governor		1	3	0.5
11/13/2003	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
11/14/2003	Edward M. Gramlich	Governor		0	0	1
11/20/2003	Alan Greenspan	Chairman	yes	0	1	0
11/21/2003	Roger W. Ferguson, Jr.	Vice Chair		0	2	0
11/22/2003	Mark W. Olson	Governor		0	0	1
12/2/2003	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
12/11/2003	Alan Greenspan	Chairman	yes	0	0	1
1/3/2004	Alan Greenspan	Chairman	yes	3	2	1.2
1/3/2004	Ben S. Bernanke	Governor		3	1	1.5
1/3/2004	Ben S. Bernanke	Governor		0	0	1
1/4/2004	Ben S. Bernanke	Governor		3	2	1.2
1/4/2004	Roger W. Ferguson, Jr.	Vice Chair		1	0	2
1/7/2004	Donald L. Kohn	Governor		3	1	1.5
1/13/2004	Alan Greenspan	Chairman	yes	0	0	1
1/14/2004	Ben S. Bernanke	Governor		0	0	1
1/26/2004	Alan Greenspan	Chairman	yes	0	0	1
11/19/2004	Alan Greenspan	Chairman	yes	1	0	2
12/2/2004	Ben S. Bernanke	Governor		0	0	1
12/7/2004	Susan Schmidt Bies	Governor		0	0	1
2/4/2004	Susan Schmidt Bies	Governor		0	0	1
2/19/2004	Susan Schmidt Bies	Governor		1	0	2
2/20/2004	Ben S. Bernanke	Governor		1	2	0.666667
2/20/2004	Alan Greenspan	Chairman	yes	0	1	0
2/23/2004	Alan Greenspan	Chairman	yes	2	1	1.333333
2/25/2004	Edward M. Gramlich	Governor		2	1	1.333333
2/25/2004	Susan Schmidt Bies	Governor		0	0	1
2/26/2004	Susan Schmidt Bies	Governor		5	4	1.111111
2/26/2004	Ben S. Bernanke	Governor		0	1	0
2/27/2004	Mark W. Olson	Governor		0	0	1
2/27/2004	Alan Greenspan	Chairman	yes	0	0	1

continued on next page

Table A.7: **Speeches by FOMC members (continued)**

Continued from previous page.

Date	Speaker with link	Role	Chair	# Hawks	# Doves	Net Index
3/1/2004	Mark W. Olson	Governor		0	0	1
3/2/2004	Alan Greenspan	Chairman	yes	0	0	1
3/2/2004	Ben S. Bernanke	Governor		13	2	1.733333
3/12/2004	Alan Greenspan	Chairman	yes	0	1	0
3/17/2004	Alan Greenspan	Chairman	yes	0	1	0
3/25/2004	Alan Greenspan	Chairman	yes	0	0	1
3/25/2004	Donald L. Kohn	Governor		6	0	2
3/26/2004	Edward M. Gramlich	Governor		0	0	1
3/26/2004	Donald L. Kohn	Governor		0	0	1
3/27/2004	Ben S. Bernanke	Governor		0	0	1
3/30/2004	Ben S. Bernanke	Governor		2	3	0.8
3/31/2004	Edward M. Gramlich	Governor		2	1	1.333333
4/1/2004	Ben S. Bernanke	Governor		0	0	1
4/1/2004	Donald L. Kohn	Governor		8	1	1.777778
4/8/2004	Roger W. Ferguson, Jr.	Vice Chair		3	0	2
4/15/2004	Ben S. Bernanke	Governor		1	2	0.666667
4/16/2004	Alan Greenspan	Chairman	yes	0	0	1
4/16/2004	Ben S. Bernanke	Governor		0	0	1
4/22/2004	Susan Schmidt Bies	Governor		5	4	1.111111
4/22/2004	Ben S. Bernanke	Governor		4	4	1
4/23/2004	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
4/23/2004	Ben S. Bernanke	Governor		4	4	1
4/26/2004	Mark W. Olson	Governor		0	0	1
4/26/2004	Susan Schmidt Bies	Governor		0	0	1
4/27/2004	Alan Greenspan	Chairman	yes	0	0	1
4/27/2004	Susan Schmidt Bies	Governor		0	0	1
5/5/2004	Mark W. Olson	Governor		0	2	0
5/6/2004	Susan Schmidt Bies	Governor		0	0	1
5/6/2004	Alan Greenspan	Chairman	yes	2	0	2
5/6/2004	Mark W. Olson	Governor		0	0	1
5/13/2004	Alan Greenspan	Chairman	yes	0	0	1
5/14/2004	Edward M. Gramlich	Governor		2	1	1.333333

continued on next page

Table A.7: **Speeches by FOMC members (continued)**

Continued from previous page.

Date	Speaker with link	Role	Chair	# Hawks	# Doves	Net Index
5/17/2004	Roger W. Ferguson, Jr.	Vice Chair		0	1	0
5/17/2004	Susan Schmidt Bies	Governor		0	0	1
5/19/2004	Susan Schmidt Bies	Governor		0	0	1
5/20/2004	Edward M. Gramlich	Governor		0	0	1
5/20/2004	Ben S. Bernanke	Governor		1	0	2
5/20/2004	Alan Greenspan	Chairman	yes	0	0	1
5/21/2004	Edward M. Gramlich	Governor		1	1	1
5/22/2004	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
6/3/2004	Susan Schmidt Bies	Governor		0	0	1
6/4/2004	Donald L. Kohn	Governor		5	2	1.428571
6/8/2004	Alan Greenspan	Chairman	yes	1	0	2
6/10/2004	Mark W. Olson	Governor		0	0	1
6/15/2004	Mark W. Olson	Governor		0	2	0
6/21/2004	Ben S. Bernanke	Governor		0	1	0
6/22/2004	Susan Schmidt Bies	Governor		0	0	1
6/24/2004	Edward M. Gramlich	Governor		0	0	1
7/7/2004	Roger W. Ferguson, Jr.	Vice Chair		1	1	1
7/15/2004	Susan Schmidt Bies	Governor		4	1	1.6
7/16/2004	Susan Schmidt Bies	Governor		0	0	1
7/21/2004	Roger W. Ferguson, Jr.	Vice Chair		1	0	2
8/12/2004	Edward M. Gramlich	Governor		0	0	1
8/12/2004	Susan Schmidt Bies	Governor		0	0	1
8/27/2004	Alan Greenspan	Chairman	yes	0	1	0
9/10/2004	Edward M. Gramlich	Governor		0	0	1
9/16/2004	Edward M. Gramlich	Governor		1	2	0.666667
9/28/2004	Susan Schmidt Bies	Governor		0	0	1
9/30/2004	Susan Schmidt Bies	Governor		5	1	1.666667
10/4/2004	Ben S. Bernanke	Governor		0	0	1
10/5/2004	Alan Greenspan	Chairman	yes	0	0	1
10/6/2004	Roger W. Ferguson, Jr.	Vice Chair		5	1	1.666667
10/7/2004	Roger W. Ferguson, Jr.	Vice Chair		2	0	2
10/7/2004	Ben S. Bernanke	Governor		1	2	0.666667

continued on next page

Table A.7: **Speeches by FOMC members (continued)**

Continued from previous page.

Date	Speaker with link	Role	Chair	# Hawks	# Doves	Net Index
10/7/2004	Alan Greenspan	Chairman	yes	0	0	1
10/8/2004	Ben S. Bernanke	Governor		0	1	0
10/8/2004	Roger W. Ferguson, Jr.	Vice Chair		0	2	0
10/14/2004	Ben S. Bernanke	Governor		1	0	2
10/15/2004	Donald L. Kohn	Governor		1	0	2
10/15/2004	Alan Greenspan	Chairman	yes	0	0	1
10/19/2004	Alan Greenspan	Chairman	yes	0	0	1
10/21/2004	Ben S. Bernanke	Governor		6	2	1.5
10/21/2004	Susan Schmidt Bies	Governor		0	0	1
10/23/2004	Susan Schmidt Bies	Governor		4	0	2
10/26/2004	Roger W. Ferguson, Jr.	Vice Chair		1	0	2
10/29/2004	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
11/5/2004	Susan Schmidt Bies	Governor		0	0	1
11/15/2004	Mark W. Olson	Governor		4	1	1.6
11/18/2004	Susan Schmidt Bies	Governor		0	0	1
1/6/2005	Donald L. Kohn	Governor		0	0	1
1/7/2005	Ben S. Bernanke	Governor		0	0	1
1/7/2005	Roger W. Ferguson, Jr.	Vice Chair		1	5	0.333333
1/9/2005	Donald L. Kohn	Governor		2	0	2
1/12/2005	Roger W. Ferguson, Jr.	Vice Chair		3	2	1.2
1/18/2005	Susan Schmidt Bies	Governor		5	1	1.666667
1/19/2005	Ben S. Bernanke	Governor		7	4	1.272727
1/27/2005	Roger W. Ferguson, Jr.	Vice Chair		3	2	1.2
2/4/2005	Alan Greenspan	Chairman	yes	0	0	1
2/6/2005	Alan Greenspan	Chairman	yes	0	0	1
2/7/2005	Susan Schmidt Bies	Governor		0	0	1
2/11/2005	Ben S. Bernanke	Governor		0	3	0
2/24/2005	Ben S. Bernanke	Governor		7	4	1.272727
2/28/2005	Mark W. Olson	Governor		0	0	1
3/2/2005	Edward M. Gramlich	Governor		0	1	0
3/8/2005	Ben S. Bernanke	Governor		7	5	1.166667
3/10/2005	Alan Greenspan	Chairman	yes	2	0	2

continued on next page

Table A.7: **Speeches by FOMC members (continued)**

Continued from previous page.

Date	Speaker with link	Role	Chair	# Hawks	# Doves	Net Index
3/10/2005	Ben S. Bernanke	Governor		5	3	1.25
3/11/2005	Alan Greenspan	Chairman	yes	1	0	2
3/14/2005	Susan Schmidt Bies	Governor		0	0	1
3/18/2005	Alan Greenspan	Chairman	yes	0	0	1
3/30/2005	Ben S. Bernanke	Governor		0	0	1
3/31/2005	Susan Schmidt Bies	Governor		0	0	1
4/5/2005	Alan Greenspan	Chairman	yes	0	0	1
4/8/2005	Alan Greenspan	Chairman	yes	0	0	1
4/14/2005	Donald L. Kohn	Governor		11	0	2
4/14/2005	Ben S. Bernanke	Governor		5	3	1.25
4/18/2005	Susan Schmidt Bies	Governor		7	1	1.75
4/20/2005	Roger W. Ferguson, Jr.	Vice Chair		5	2	1.428571
4/21/2005	Edward M. Gramlich	Governor		0	0	1
4/22/2005	Donald L. Kohn	Governor		11	3	1.571429
4/27/2005	Roger W. Ferguson, Jr.	Vice Chair		0	2	0
5/5/2005	Alan Greenspan	Chairman	yes	0	0	1
5/12/2005	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
5/15/2005	Alan Greenspan	Chairman	yes	0	0	1
5/16/2005	Mark W. Olson	Governor		0	0	1
5/17/2005	Susan Schmidt Bies	Governor		0	0	1
5/19/2005	Alan Greenspan	Chairman	yes	3	0	2
5/19/2005	Susan Schmidt Bies	Governor		0	0	1
5/19/2005	Mark W. Olson	Governor		0	0	1
5/20/2005	Donald L. Kohn	Governor		1	2	0.666667
5/20/2005	Alan Greenspan	Chairman	yes	1	1	1
5/26/2005	Edward M. Gramlich	Governor		0	1	0
5/26/2005	Susan Schmidt Bies	Governor		0	0	1
5/27/2005	Roger W. Ferguson, Jr.	Vice Chair		4	0	2
6/3/2005	Edward M. Gramlich	Governor		0	0	1
6/3/2005	Mark W. Olson	Governor		1	0	2
6/6/2005	Alan Greenspan	Chairman	yes	1	0	2
6/7/2005	Susan Schmidt Bies	Governor		1	0	2

continued on next page

Table A.7: **Speeches by FOMC members (continued)**

Continued from previous page.

Date	Speaker with link	Role	Chair	# Hawks	# Doves	Net Index
6/8/2005	Susan Schmidt Bies	Governor		0	0	1
6/14/2005	Susan Schmidt Bies	Governor		1	0	2
6/15/2005	Donald L. Kohn	Governor		0	0	1
6/23/2005	Mark W. Olson	Governor		0	0	1
7/21/2005	Donald L. Kohn	Governor		0	0	1
8/26/2005	Alan Greenspan	Chairman	yes	2	1	1.333333
8/27/2005	Donald L. Kohn	Governor		1	3	0.5
8/27/2005	Alan Greenspan	Chairman	yes	1	0	2
9/16/2005	Mark W. Olson	Governor		1	0	2
9/24/2005	Roger W. Ferguson	Vice Chair		0	0	1
9/26/2005	Susan Schmidt Bies	Governor		0	0	1
9/26/2005	Alan Greenspan	Chairman	yes	2	1	1.333333
9/27/2005	Alan Greenspan	Chairman	yes	0	0	1
9/28/2005	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
9/29/2005	Donald L. Kohn	Governor		1	2	0.666667
10/11/2005	Donald L. Kohn	Governor		1	2	0.666667
10/12/2005	Alan Greenspan	Chairman	yes	0	0	1
10/12/2005	Susan Schmidt Bies	Governor		1	0	2
10/12/2005	Mark W. Olson	Governor		2	2	1
10/13/2005	Mark W. Olson	Governor		2	2	1
10/17/2005	Alan Greenspan	Chairman	yes	2	1	1.333333
10/18/2005	Roger W. Ferguson, Jr.	Vice Chair		15	0	2
10/19/2005	Donald L. Kohn	Governor		14	3	1.647059
10/26/2005	Alan Greenspan	Chairman	yes	0	0	1
10/27/2005	Alan Greenspan	Chairman	yes	0	0	1
11/3/2005	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
11/7/2005	Mark W. Olson	Governor		0	0	1
11/14/2005	Alan Greenspan	Chairman	yes	1	0	2
11/15/2005	Mark W. Olson	Governor		0	0	1
11/15/2005	Roger W. Ferguson, Jr.	Vice Chair		5	1	1.666667
11/28/2005	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
11/29/2005	Roger W. Ferguson, Jr	Vice Chair		1	0	2

continued on next page

Table A.7: **Speeches by FOMC members (continued)**

Continued from previous page.

Date	Speaker with link	Role	Chair	# Hawks	# Doves	Net Index
11/30/2005	Susan Schmidt Bies	Governor		1	0	2
12/2/2005	Alan Greenspan	Chairman	yes	0	0	1
12/2/2005	Alan Greenspan	Chairman	yes	0	0	1
12/5/2005	Mark W. Olson	Governor		0	0	1
12/6/2005	Susan Schmidt Bies	Governor		0	0	1
12/14/2005	Alan Greenspan	Chairman	yes	0	0	1
1/18/2006	Susan Schmidt Bies	Governor		2	1	1.333333
2/2/2006	Susan Schmidt Bies	Governor		1	0	2
2/6/2006	Ben S. Bernanke	Chairman	yes	0	0	1
2/23/2006	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
2/24/2006	Ben S. Bernanke	Chairman	yes	4	2	1.333333
2/24/2006	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
3/3/2006	Roger W. Ferguson, Jr.	Vice Chair		21	1	1.909091
3/8/2006	Ben S. Bernanke	Chairman	yes	0	0	1
3/10/2006	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
3/13/2006	Mark W. Olson	Governor		0	0	1
3/16/2006	Donald L. Kohn	Governor		4	0	2
3/20/2006	Ben S. Bernanke	Chairman	yes	1	5	0.333333
3/29/2006	Susan Schmidt Bies	Governor		0	0	1
3/31/2006	Susan Schmidt Bies	Governor		0	0	1
3/31/2006	Roger W. Ferguson, Jr.	Vice Chair		0	0	1
4/3/2006	Randall S. Kroszner	Governor		0	0	1
4/5/2006	Ben S. Bernanke	Chairman	yes	0	0	1
4/6/2006	Randall S. Kroszner	Governor		0	1	0
4/10/2006	Mark W. Olson	Governor		0	0	1
4/10/2006	Susan Schmidt Bies	Governor		0	0	1
4/13/2006	Donald L. Kohn	Governor		14	1	1.866667
4/13/2006	Mark W. Olson	Governor		3	1	1.5
4/17/2006	Roger W. Ferguson, Jr.	Vice Chair		0	2	0
4/20/2006	Ben S. Bernanke	Chairman	yes	0	0	1
4/27/2006	Donald L. Kohn	Governor		0	1	0
4/28/2006	Susan Schmidt Bies	Governor		0	0	1

continued on next page

Table A.7: **Speeches by FOMC members (continued)**

Continued from previous page.

Date	Speaker with link	Role	Chair	# Hawks	# Doves	Net Index
5/3/2006	Ben S. Bernanke	Chairman	yes	0	0	1
5/4/2006	Susan Schmidt Bies	Governor		2	0	2
5/11/2006	Donald L. Kohn	Governor		0	0	1
5/16/2006	Ben S. Bernanke	Chairman	yes	0	0	1
5/16/2006	Susan Schmidt Bies	Governor		0	0	1
5/16/2006	Mark W. Olson	Governor		0	0	1
5/18/2006	Ben S. Bernanke	Chairman	yes	0	0	1
5/18/2006	Donald L. Kohn	Governor		0	1	0
5/24/2006	Randall S. Kroszner	Governor		0	0	1
5/25/2006	Mark W. Olson	Governor		1	0	2
6/5/2006	Ben S. Bernanke	Chairman	yes	3	0	2
6/6/2006	Susan Schmidt Bies	Governor		0	0	1
6/9/2006	Ben S. Bernanke	Chairman	yes	0	0	1
6/12/2006	Ben S. Bernanke	Chairman	yes	0	0	1
6/12/2006	Mark W. Olson	Governor		0	0	1
6/12/2006	Susan Schmidt Bies	Governor		0	0	1
6/13/2006	Ben S. Bernanke	Chairman	yes	0	0	1
6/14/2006	Susan Schmidt Bies	Governor		2	0	2
6/15/2006	Ben S. Bernanke	Chairman	yes	10	0	2
6/15/2006	Randall S. Kroszner	Governor		2	1	1.333333
6/16/2006	Donald L. Kohn	Governor		1	3	0.5
6/16/2006	Randall S. Kroszner	Governor		2	1	1.333333
7/4/2006	Susan Schmidt Bies	Governor		0	0	1
7/6/2006	Donald L. Kohn	Vice Chair		1	1	1
7/18/2006	Kevin Warsh	Governor		2	0	2
8/25/2006	Ben S. Bernanke	Chairman	yes	0	0	1
8/31/2006	Ben S. Bernanke	Chairman	yes	1	4	0.4
9/1/2006	Ben S. Bernanke	Chairman	yes	0	0	1
9/11/2006	Donald L. Kohn	Vice Chair		0	0	1
9/27/2006	Randall S. Kroszner	Governor		6	3	1.333333
10/4/2006	Ben S. Bernanke	Chairman	yes	1	0	2
10/4/2006	Donald L. Kohn	Vice Chair		5	3	1.25

continued on next page

Table A.7: **Speeches by FOMC members (continued)**

Continued from previous page.

Date	Speaker with link	Role	Chair	# Hawks	# Doves	Net Index
10/11/2006	Susan Schmidt Bies	Governor		0	0	1
10/12/2006	Frederic S. Mishkin	Governor		1	0	2
10/16/2006	Ben S. Bernanke	Chairman	yes	0	0	1
10/17/2006	Susan Schmidt Bies	Governor		2	0	2
11/1/2006	Ben S. Bernanke	Chairman	yes	1	0	2
11/2/2006	Susan S. Bies	Governor		2	1	1.333333
11/3/2006	Donald L. Kohn	Vice Chair		0	0	1
11/10/2006	Ben S. Bernanke	Chairman	yes	0	1	0
11/16/2006	Randall S. Kroszner	Governor		0	2	0
11/21/2006	Kevin Warsh	Governor		0	0	1
11/28/2006	Ben S. Bernanke	Chairman	yes	3	5	0.75
11/30/2006	Susan Schmidt Bies	Governor		0	0	1
12/1/2006	Ben S. Bernanke	Chairman	yes	0	0	1
12/1/2006	Donald L. Kohn	Vice Chair		1	1	1
12/15/2006	Ben S. Bernanke	Chairman	yes	0	1	0
1/5/2007	Ben S. Bernanke	Chairman	yes	0	0	1
1/8/2007	Donald L. Kohn	Vice Chair		3	3	1
1/11/2007	Susan Schmidt Bies	Governor		2	0	2
1/17/2007	Frederic S. Mishkin	Governor		10	0	2
1/18/2007	Susan Schmidt Bies	Governor		3	1	1.5
2/6/2007	Ben S. Bernanke	Chairman	yes	0	0	1
2/21/2007	Donald L. Kohn	Vice Chair		0	0	1
2/26/2007	Susan Schmidt Bies	Governor		0	0	1
3/2/2007	Ben S. Bernanke	Chairman	yes	1	3	0.5
3/5/2007	Randall S. Kroszner	Governor		0	0	1
3/5/2007	Kevin Warsh	Governor		1	0	2
3/6/2007	Ben S. Bernanke	Chairman		0	0	1
3/9/2007	Randall S. Kroszner	Governor		0	2	0
3/9/2007	Donald L. Kohn	Vice Chair		1	0	2
3/12/2007	Randall S. Kroszner	Governor		5	2	1.428571
3/22/2007	Randall S. Kroszner	Governor		0	0	1
3/22/2007	Donald L. Kohn	Vice Chair		0	0	1

continued on next page

Table A.7: **Speeches by FOMC members (continued)**

Continued from previous page.

Date	Speaker with link	Role	Chair	# Hawks	# Doves	Net Index
3/23/2007	Frederic S. Mishkin	Governor		0	7	0
3/30/2007	Ben S. Bernanke	Chairman	yes	0	1	0
4/10/2007	Frederic S. Mishkin	Governor		3	11	0.428571
4/11/2007	Ben S. Bernanke	Chairman	yes	0	0	1
4/20/2007	Frederic S. Mishkin	Governor		2	2	1
4/25/2007	Ben S. Bernanke	Chairman	yes	0	0	1
4/26/2007	Frederic S. Mishkin	Governor		0	0	1
5/1/2007	Ben S. Bernanke	Chairman	yes	1	0	2
5/10/2007	Randall S. Kroszner	Governor		0	0	1
5/15/2007	Ben S. Bernanke	Chairman	yes	0	0	1
5/15/2007	Randall S. Kroszner	Governor		0	0	1
5/16/2007	Donald L. Kohn	Vice Chair		0	0	1
5/16/2007	Randall S. Kroszner	Governor		1	1	1
5/17/2007	Ben S. Bernanke	Chairman	yes	1	0	2
5/22/2007	Ben S. Bernanke	Chairman	yes	0	0	1
5/23/2007	Randall S. Kroszner	Governor		0	0	1
5/24/2007	Frederic S. Mishkin	Governor		1	3	0.5
6/1/2007	Randall S. Kroszner	Governor		5	1	1.666667
6/5/2007	Ben S. Bernanke	Chairman	yes	1	0	2
6/5/2007	Kevin Warsh	Governor		0	0	1
6/14/2007	Randall S. Kroszner	Governor		0	0	1
6/15/2007	Ben S. Bernanke	Chairman	yes	2	0	2
6/23/2007	Frederic S. Mishkin	Governor		0	0	1
7/10/2007	Ben S. Bernanke	Chairman	yes	4	8	0.666667
7/12/2007	Randall S. Kroszner	Governor		0	0	1
8/1/2007	Randall S. Kroszner	Governor		0	0	1
8/31/2007	Ben S. Bernanke	Chairman	yes	2	1	1.333333
9/1/2007	Frederic S. Mishkin	Governor		0	1	0
9/6/2007	Randall S. Kroszner	Governor		0	0	1
9/10/2007	Frederic S. Mishkin	Governor		0	1	0
9/11/2007	Ben S. Bernanke	Chairman	yes	2	0	2
9/21/2007	Donald L. Kohn	Vice Chair		1	4	0.4

continued on next page

Table A.7: **Speeches by FOMC members (continued)**

Continued from previous page.

Date	Speaker with link	Role	Chair	# Hawks	# Doves	Net Index
9/21/2007	Kevin Warsh	Governor		0	1	0
9/21/2007	Frederic S. Mishkin	Governor		0	0	1
9/24/2007	Ben S. Bernanke	Chairman	yes	0	0	1
9/27/2007	Frederic S. Mishkin	Governor		2	4	0.666667
9/28/2007	Frederic S. Mishkin	Governor		1	1	1
10/5/2007	Donald L. Kohn	Vice Chair		1	0	2
10/5/2007	Kevin Warsh	Governor		0	1	0
10/11/2007	Randall S. Kroszner	Governor		0	2	0
10/12/2007	Ben S. Bernanke	Chairman	yes	0	0	1
10/12/2007	Donald L. Kohn	Vice Chair		0	2	0
10/15/2007	Ben S. Bernanke	Chairman	yes	1	1	1
10/19/2007	Ben S. Bernanke	Chairman	yes	0	1	0
10/20/2007	Frederic S. Mishkin	Governor		7	2	1.555556
10/22/2007	Randall S. Kroszner	Governor		0	0	1
10/26/2007	Frederic S. Mishkin	Governor		10	4	1.428571
11/5/2007	Frederic S. Mishkin	Governor		4	4	1
11/5/2007	Randall S. Kroszner	Governor		0	0	1
11/6/2007	Ben S. Bernanke	Chairman	yes	0	0	1
11/7/2007	Kevin Warsh	Governor		0	3	0
11/13/2007	Randall S. Kroszner	Governor		0	0	1
11/14/2007	Ben S. Bernanke	Chairman	yes	0	1	0
11/16/2007	Randall S. Kroszner	Governor		2	3	0.8
11/28/2007	Donald L. Kohn	Vice Chair		1	2	0.666667
11/29/2007	Ben S. Bernanke	Chairman	yes	0	0	1
11/29/2007	Frederic S. Mishkin	Governor		2	6	0.5
11/30/2007	Randall S. Kroszner	Governor		0	0	1