Should U.S. Monetary Policy Have a Ternary Mandate?

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Abstract

This paper examines the role of financial instability concerns in setting monetary policy. We first provide a simple loss function that includes financial stability. We then empirically examine whether monetary policy is set in a way consistent with that model. The empirical investigation is based on word counts for terms related to financial instability appearing in FOMC meeting transcripts. This provides a direct measure of the intensity of financial instability concerns in the context of monetary policy because the associated discussion of financial stability issues occurs in FOMC deliberations which are focused on the conduct of monetary policy. We find that financial instability terms do appear frequently in FOMC deliberations and fluctuate substantially over time. Moreover, we show that the word counts of terms related to financial instability do influence monetary policy decisions, after controlling for Federal Reserve staff forecasts of inflation and unemployment. Thus, when it comes to financial instability concerns, not only do FOMC meeting participants talk the talk, but they also walk the walk.

*We thank Emily Freeman and Peggy Gilligan for exceptional research assistance. The views expressed are our own and do not necessarily reflect those of the Federal Reserve Bank of Boston, the Federal Reserve System, or the Federal Open Market Committee.

I. Introduction

The Federal Reserve (the Fed) is considered to be an "independent" central bank in the sense of having independence to choose how to implement monetary policy, not to choose the goals of monetary policy. The explicit goals of monetary policy, the dual mandate of stable prices and full employment, are Congressionally mandated. Although the creation of the Federal Reserve was, in part, a response to repeated episodes of financial instability, achieving financial stability is not a formal monetary policy goal mandated by Congress. Even so, many would argue that during the recent financial crisis, and perhaps at other times in the more distant past, monetary policy may have reacted to concerns about financial instability. Thus, an important question is whether the Fed should pursue, or in fact is implicitly pursuing, a third mandate related to financial stability. Alternatively, Fed responses to potential or actual episodes of financial instability may arise directly from concerns that financial instability might impact the outcomes for its mandated policy goals for inflation and/or employment in the future. This issue takes on added relevance and importance given the current discussions about imposing limitations on how to implement monetary policy.

The 2008 financial crisis renewed interest in how financial stability risks should be addressed by central banks. In the United States, the Dodd-Frank Act provided a new Financial Stability Oversight Council to both monitor financial stability trends and to designate systemically important financial institutions. The provisions of Dodd-Frank highlighted that an important goal of the regulatory changes was to reduce the probability that systemically important institutions failed. Other countries increased their focus on financial stability as well. For example, in the United Kingdom a new Financial Policy Committee was created as part of the central bank to focus on financial stability issues. Unlike in the United States, the committee was given explicit powers to enhance the achievement of financial stability goals, with tools such as the loan-to-value and debt-to-income ratios.

This paper empirically examines the interplay between financial stability and monetary policy. While a great deal of evidence suggests that the FOMC reacts to deviations from full employment and the inflation target, how should, and does, the Fed react to potential or actual episodes of financial instability? Should financial instability be thought of only as something that impedes the attainment of the inflation and employment goals over time, or does society directly care about financial stability for other reasons?

Thus, we examine adding a third mandate to the Federal Reserve goals to explicitly consider financial instability concerns. After providing some background on the role of financial instability considerations relevant for guiding monetary policy, the next section provides the theoretical implications of explicitly including a role for financial stability in the equations underlying the Taylor rule, including adding financial stability as a third mandate. With these additions, simple Taylor rules are not sufficient, since monetary policy authorities must consider financial instability risks in considering the appropriate setting of monetary policy. The next section then examines whether a simple Taylor rule that implies little role for financial instability is consistent with conversations the FOMC has when setting interest rates. This is done by looking at Federal Reserve transcripts of monetary policy meetings to ascertain whether financial stability concerns significantly enter monetary policy deliberations. We then estimate simple Taylor-rule based Federal Reserve reaction functions and find that financial instability concerns do appear to influence the setting of the federal funds rate. This is consistent with a third mandate, although future work will need to distinguish whether this reflects other factors, such as concerns with tail events, that might impact future values of the dual mandate variables. This also implies that simple Taylor rules meant to capture monetary policy setting are flawed if they ignore how financial instability concerns are manifested in the setting of interest rates. The final section provides some conclusions.

II. Background

While there recently has been renewed interest in the role of financial stability in achieving the goals of central banks, this is not a new concern. In fact, financial stability concerns were important factors in the creation of the Federal Reserve in 1913. The need for a central bank in the United States had its impetus in the financial panic of 1907. The Federal Reserve was given the power to "furnish an elastic currency," which, among other things, gave the Federal Reserve the power to offset seasonal or macroeconomic shocks to the economy that could disrupt credit availability. The Federal Reserve was also given powers for "more effective supervision of banking," reflecting the important role that bank failures had played during earlier financial panics. Notably, there were no explicit macroeconomic goals set, partly reflecting the focus on financial stability and the nascent understanding of how monetary policy tools influenced the economy.

Over the years, as we improved our understanding of how monetary policy tools influenced the macroeconomy, the primary focus shifted to macroeconomic goals. For example, during the economic and financial upheaval of the 1930s, Congress reorganized the structure of the FOMC as the importance of the FOMC's role in the macroeconomy was beginning to be recognized. Subsequently, this increased focus on macroeconomic goals led to a change in the Federal Reserve Act in 1977 which required the Federal Reserve to "promote effectively the goals of maximum employment, stable prices, and moderate long-term rates." This was the genesis of the dual mandate, whereby the Federal Reserve is focused on achieving macroeconomic outcomes regarding stable prices (more recently interpreted as an explicit 2 percent inflation target) and maximum employment (typically interpreted as the nonaccelerating inflation rate of unemployment, the NAIRU, or the natural rate of unemployment).

Despite the general shift in focus toward macroeconomic goals, the degree of attention directed toward financial stability fluctuated, tending to rise during periodic episodes of financial turmoil. For example, on October 19, 1987, Black Monday resulted in the Dow Jones average declining by 22.6 percent. The Federal Reserve announced that it "affirmed today its readiness to serve as a source of liquidity to support the economic and financial system." In addition, Bernanke (1990) notes that the Fed provided substantial encouragement to banks to lend on customary terms, including to broker-dealers, in an effort to stabilize the payments system and financial markets by preventing financial "gridlock." The FOMC conducted conference calls every day in October after Black Monday. In addition, the stock market crash was actively discussed at the November 3, 1987, FOMC meeting, with a particular focus on financial stability. For example, Chairman Greenspan stated, "Financial markets have been so inherently unstable, just looking at the variations in volume and prices." A reading of that FOMC transcript makes clear that concerns with financial instability were particularly important for the monetary policy deliberations at that time.

While financial instability concerns appear in the FOMC transcripts during periods of financial turbulence, the prevailing view during the period of the Great Moderation was that monetary policy should not react to financial pressures, but should respond if large financial market movements impact variables relevant for the dual mandate. This view was captured by Bernanke and Gertler (2001) who argued that "Asset prices become relevant only to the extent they may signal potential inflationary or deflationary forces."

However, as a result of the financial crisis, there has been significant recognition that the ability of the Fed to react to adverse shocks post-crisis may be constrained. With the United States and most central banks in developed countries at the zero lower bound, it is possible that monetary policy may not be capable of offsetting the full contractionary effects of a large adverse shock, real or financial. This raises the possibility that monetary policy and regulatory policy need to be more responsive to a buildup of financial pressures and to react more forcefully when faced with significant financial imbalances. In fact, given the social costs of bank failures, the large fiscal costs associated with trying to offset the shocks, and the income inequality impact generated by a large financial shock and the subsequent policy response, one could argue that central banks should return to considering financial stability as a central bank mandate, a position consistent with the concerns about financial instability that were a key consideration underlying the founding of the Federal Reserve.

Hence, the recent financial crisis raises the question of whether financial stability should be an independent third mandate of monetary policy. In what sense should monetary policymakers care "independently" about financial stability, and how does that affect the conduct of monetary policy? Is there any evidence that the Fed has included financial instability concerns in its reaction function? And if so, can we distinguish between financial stability being a third, independent mandate compared with being incorporated into monetary policy considerations merely due to the effect of financial instability on the longer-run path of inflation and employment?

If financial stability is independently in the objective function of the Fed, then it has to be clearly articulated why. The additional costs that became more apparent during the financial crisis from political uncertainty, fiscal expenditures, and widespread bailouts certainly make it credible that it should be a third mandate. Moreover, the widespread public outcry associated with the assistance given to large financial firms and the Congressional reaction, for example through the limitations on the Fed's ability to offset financial shocks to markets and financial intermediaries in the future embedded in the Dodd-Frank Act, highlight why the Fed might place independent weight on avoiding episodes of financial instability. However, it may be that the Fed's sensitivity to financial instability captures concerns about inflation and unemployment should a tail event occur. That is, it is not concerns about the current unemployment and inflation values that it captures, but rather concern with future values of these variables. It is also possible that financial instability directly affects unemployment and inflation, but this impact is not well captured by simple monetary policy reaction functions.

III. Tailoring the Taylor Rule to Incorporate Financial Instability Considerations

In the simple monetary policy reaction function based on the dual mandate, financial stability has no explicit role. Changes to interest rates are determined by shocks to aggregate demand and inflation, and the central bank minimizes the loss function by reacting to these shocks in a way consistent with a simple Taylor rule. While this may seem an extreme simplification of monetary policy decision making, this type of simple formulation is quite prevalent in the macroeconomics literature and in modeling strategies for Federal Reserve reaction functions.

A relatively simple version of the Taylor rule can be easily derived from minimizing a simple loss function:

$$\underset{r}{Min} \;\; \Gamma\left(Y_t - Y^*\right)^2 + \Phi\left(\pi_t - \pi^*\right)^2$$

$$st. \quad Y_t = \alpha_0 + \alpha_1 r_t + \eta_t$$

$$\pi_t = \beta_0 + \beta_1 (Y_t - Y^*) + \varepsilon_t \quad \textit{Well anchored Expectations} \Rightarrow \beta_0 = \pi^*$$

The two constraints sketch out a simplified model of the economy. Aggregate demand depends on the interest rate and a shock, η – an IS curve. Inflation, when inflation expectations are well-anchored at the target, depends on the deviations of output from its long-run equilibrium level – the Phillips curve. Minimizing the above loss function, subject to the above two constraints, produces an equation describing central bank monetary policy behavior that is not unlike a simple Taylor rule:

$$r_t = \mathrm{A} - \left(\frac{\Gamma\alpha_1 + \Phi\alpha_1\beta_1}{\Gamma\alpha_1^2 + \Phi\alpha_1^2\beta_1^2}\right)\eta_t - \left(\frac{\Phi\alpha_1\beta_1}{\Gamma\alpha_1^2 + \Phi\alpha_1^2\beta_1^2}\right)\varepsilon_t$$

The interest rate depends on deviations from full employment and inflation shocks. The positive effects of η_t and ε_t make sense, given that α_1 is negative, and β_1, Γ, and Φ are each positive. Contained in A is the equilibrium real rate as well as the inflation target. Hence, when both shocks equal zero, the funds rate is set equal to the "equilibrium" nominal rate. While many bells and whistles have been added to this simple structure in the literature, the basic conclusion remains the same: monetary policy depends on the deviation of the economy from the desired values of the two goal variables in the dual mandate.

This paper examines how the model of central bank behavior may differ from the simple Taylor rule specification outlined above. The financial crisis and the ensuing deep recession and slow recovery have caused many to wonder about the simplicity of the above model. Specifically, this paper considers the possibility that the objective function shown above is incomplete because it says nothing about financial stability concerns. Thus, the remainder of the paper will investigate the implications for Fed behavior, and the interest rate reaction function, of a more complicated objective function. In particular, we derive an alternative expression for interest rate determination with financial stability included as a third mandate, highlighting that financial stability should play an integral role in setting interest rates. With this addition, shocks to financial stability and changes in bank regulations impact the interest rate being set by the monetary authority.

The addition of a ternary mandate for the Fed has important implications for not just the proper setting of monetary policy, but also for the tools that are available and appropriate for monetary policy. To begin, the objective function is expanded to include deviations of financial instability from its optimal level:

$$\underset{r,\mathrm{R^C}}{Min}\ \Gamma\left(Y_t - Y^*\right)^2 + \Phi\left(\pi_t - \pi^*\right)^2 + \mathrm{K}(FI_t - FI^*)^2$$

The addition of this third term in the loss function could, and has, led to much debate in the profession.

The essence of the debate revolves around why a central bank would care about financial instability independent of its effects on inflation and output. The recent financial crisis drives home quite clearly why that may be the case. The public in many countries, as well as in the United States, have made it quite clear that cleaning up the damage after a financial crisis is not palatable. Taxpayers have revealed a strong preference not to bear the costs stemming from a systemic financial crisis. Specifically, “bailing out” systemically important institutions is not an income transfer they are comfortable making, and the public would like to avoid such transfers in the future. There are many ways to try to avoid these bailouts, but unless all risk is wrung out of the system, taxpayers will always potentially be on the hook when a systemically important event occurs. And, in fact, wringing all of the risk out of the system is not what most prefer. For example, extremely high capital ratios for banks may remove most of the risk of the need for bailouts, but it makes it very difficult to obtain a loan. For this reason, a quadratic term makes sense because it may be costly to have too much as well as too little financial stability. However, an additional cost to the central bank having this third mandate is the concern that the focus will become too diffuse or that the central bank will become too powerful. Such concerns have been reflected in some of the Dodd-Frank restrictions on the Fed’s powers.

The new objective function now acknowledges the central bank’s role as an important regulator of the financial system. An instrument is added to the central bank’s arsenal of weapons, here represented by R^C – regulation by the central bank. Hence, how exactly the financial system interacts with the macroeconomy further complicates a discussion of a more complete policy function. What sort of tradeoffs can be made? That depends on the constraints the model imposes on the minimization exercise.

The equations describing the model have become a bit more complicated in order to incorporate the possible role of financial instability in the economy. The IS curve representing aggregate demand in the model,

$$Y_t = \alpha_0 + \alpha_1 r_t + \alpha_2 (FI_t - FI^*) + \alpha_3 R_t + \eta_t ,$$

has been changed slightly. FI represents the risks coming from potential financial instability. Hence, an increased risk of financial instability, caused by, for example, asset prices rising above fundamental values, may have a positive effect on demand, $\alpha_2 > 0$, emanating from a wealth effect on consumers or through stimulating firm investment. The variable R represents regulation used by the government and the central bank to control financial instability risks. The higher the regulation, the tighter are credit conditions, $\alpha_3 < 0$. These regulations could include stricter capital standards, more extreme stress test scenarios, or various macroprudential policies.

The inflation equation is unchanged:

$$\pi_t = \beta_0 + \beta_1 (Y_t - Y^*) + \varepsilon_t \qquad \textit{where } \beta_0 = \pi^* \textit{ when expectations are well anchored}$$

The addition of three more variables requires three more equations defining their movement:

$$FI_t = \delta_0 + \delta_1 R_t + \delta_2 (P_t^A - P_F^A) + \lambda_t \qquad \textit{where } P_F^A \equiv \textit{fundamental value}$$

$$R_t = \overline{R} + R^C + \xi_t$$

$$P_t^A = \rho_0 + \rho_1(r_t - r^*) + \mu_t \qquad where\ \rho_0 = P_F^A$$

The risk of financial instability depends on the degree of regulation, the more highly regulated are financial intermediaries, the lower the risk of financial instability, $\delta_1 < 0$. In addition, due to the risk of financial instability that can be caused by the popping of asset bubbles, as asset prices rise beyond their fundamentals, the risk of instability increases, $\delta_2 > 0$. The central bank has some control over that risk, however. The degree of regulation depends on the exogenous regulations set by the fiscal authorities, $\overline{R}$, and on the financial regulations that the central bank can control, R^C. Finally, the last equation attempts to capture the risks from "reaching for yield" that have been widely discussed in the context of concerns about excessively easy monetary policy. This is a risk from monetary policy that does not play out through inflation and output directly, but through the increase in the risk of financial instability. One might expect these factors to be most relevant during boom periods or when the economy is stuck at the zero lower bound. Of course, asset bubbles can occur due to non-monetary factors, which would be reflected in $\rho_{0.}$ Positive values would reflect asset bubbles, while negative values may reflect depressed values that occur in the middle of a severe recession or financial crisis. One could also expand the P^A equation to include a role for regulation, in particular macroprudential regulation, in leaning against the buildup of asset price bubbles.

Solving the maximization of policy subject to these constraints produces more complicated solutions for the policy interest rate and the degree of regulation by the central bank:

$$r_t = A + B R^C{}_t + C\eta_t + D\varepsilon_t + F\lambda_t + G\xi_t + H\mu_t$$

$$R^C{}_t = K + L r_t + M\eta_t + N\varepsilon_t + P\lambda_t + S\xi_t + T\mu_t$$

What is crucial here is that the central bank attempts to accomplish its goals by jointly using its two instruments (r and R^C). The key results are:

$$\frac{\delta r_t}{\delta R^C{}_t} < 0 \ \text{and} \ \frac{\delta R^C{}_t}{\delta r_t} < 0$$

Hence, in order to achieve an optimal policy setting for the macroeconomy, a shock that causes regulatory policymakers to raise R^C will cause the monetary policy authorities to reduce the policy interest rate below what it otherwise would be, and a shock that causes policymakers to raise the policy interest rate will cause the central bank policymakers in their role as regulators to react by decreasing R^C below what it would otherwise be. That is, the optimal policy mix incorporates a tradeoff between conventional monetary policy and regulatory policy so that they should not be set independently. Essentially, when the goals conflict, say when a shock to stock prices causes an increase in asset prices beyond fundamental values, the Fed will tend to tighten regulations and lower the policy interest rate. Solving the two equations simultaneously provides a much more complicated expression for r_t and $R^C{}_t$, with deviations from long-run values of r and R^C being caused by macroeconomic shocks:

$$r_t = \Gamma + \mathrm{X}\eta_t + \Delta\varepsilon_t + \mathrm{E}\lambda_t + \Lambda\xi_t + \mathrm{O}\mu_t$$

$$R^C{}_t = \mathrm{I} + \Theta\eta_t + \Sigma\varepsilon_t + \Upsilon\lambda_t + \Omega\xi_t + \Psi\mu_t$$

where the coefficients of the policy rules in these two equations are functions of the coefficients from the prior system of two equations above.

While recognizing the nature of the tradeoffs faced by a central bank with responsibilities for both monetary policy and regulatory policy, or even a central bank that does not set regulatory policy but can only react to changes imposed by a separate regulatory authority, is important, the focus of this paper will be more limited. Our empirical analysis will focus on the extent to which the FOMC has in the past reacted to financial instability concerns in setting monetary policy.

IV. An Empirical Measure of Financial Instability Concerns

A very simple way to test the highly restrictive model usually estimated in the simple Taylor rule framework would be to see how often financial stability issues were discussed at FOMC meetings, whose purpose is to set interest rates. Under the restrictive assumptions of simple Taylor rules, there would be little need to have explicit financial stability discussions at the FOMC meetings, since focusing on aggregate demand and inflation shocks would capture the relevant information for policymakers.

This can be more directly examined using the FOMC meeting transcripts. The verbatim transcripts of FOMC meetings are available with a five-year lag, which at this point is through the end of 2009. We examine all FOMC transcripts from 1982 through 2009. The beginning of the regression sample, 1987, coincides with the first FOMC meeting in the calendar year in which Chairman Greenspan began his tenure. While we present the word counts from the FMOC meeting transcripts through the end of 2009, the regression analysis sample ends with the last FOMC meeting in 2008 when the federal funds rate hit the zero lower bound.

Table 1 provides the number of mentions of key words that might be related to financial instability concerns that appear in the FOMC meeting transcripts. The word search indicates that words associated with financial instability concerns are mentioned prominently at particular FOMC meetings. Words such as “bust,” “crisis” and “volatility” appear quite frequently, with each of these words mentioned more than 500 times. A reading of the transcripts indicates that financial instability concerns clearly are discussed, with the mentions appearing most frequently during periods of financial turbulence.

Figure 1 shows the time series of mentions of words related to financial instability concerns. Because there was a special staff presentation on housing bubbles at the June 2005 FOMC meeting in which words related to financial instability were mentioned very frequently, we cap the word count for that meeting at the maximum that occurred in other FOMC transcripts so that the pattern for the other FOMC meetings is more apparent. The figure shows many fewer mentions of financial instability terms at the beginning of the sample. However, starting in 1997 with the Asian crisis, the average mentions of financial instability issues appear to step up before drifting down somewhat in the 2000s and then stepping up again as we headed into the financial crisis. The time series seems to indicate heightened attention to financial instability concerns during times that ex post were periods of significant financial turbulence.

The word count of financial instability terms strongly indicates that FOMC members often spend a significant amount of time raising financial instability concerns during monetary policy discussions. This would seem to indicate that the simple Taylor rule formulation that does not consider financial instability concerns does not capture the actual behavior of monetary policymakers. This hypothesis is more formally tested in the next section.

V. Does the FOMC Respond to Financial Instability Concerns?

The previous section documents that the FOMC often discusses financial stability issues. However, is the interest rate policy altered by that discussion? If so, can that response be explained by a third financial stability mandate, or is any response simply incorporated in the responses to the forecasts of inflation and output that have themselves already assimilated the effects of potential financial instability concerns on inflation and output?

In this section, we examine the Fed's past performance during episodes of potential, or actual, financial instability in the context of an estimated Taylor rule that is augmented with a measure of financial instability. Empirically, the first step is identifying periods of financial instability, something that is particularly complicated when the instability episode is relatively mild or short-lived, possibly due to monetary policy reactions.

The simple Taylor rule derived in the first section provides a natural starting point for the empirical work. The simple Taylor rule includes a constant term and the deviations of inflation and real output from their target values to determine the appropriate setting for the federal funds rate. Because the Greenbook (now renamed the Tealbook) did not consistently provide forecasts for the GDP gap in the early years of our sample, we rely instead on forecasts of the unemployment rate, which can be related to the output gap through Okun's Law. We estimate a simple Taylor rule with the federal funds rate (FFR) being determined by a constant term, the lagged federal funds rate (to allow for interest rate smoothing), the forecast of the inflation rate, the forecast of the unemployment rate, and a measure of financial instability. This specification absorbs the target inflation rate (in recent years explicitly stated as 2 percent) and the target unemployment rate (the nonaccelerating inflation rate of unemployment, NAIRU) into the constant term.[1]

$$FFR_t = a_0+a_1FFR_{t-1}+a_2PFA_t+a_3URF4_t+a_4FIW_t+e_t$$

The constant term reflects the values of the equilibrium interest rate and the targets for inflation and unemployment rates, and is expected to be positive. FFR_{t-1} is the lagged federal funds rate which allows for interest rate smoothing, with its estimated coefficient expected to be positive but less than one. PFA is the average Board staff inflation forecast over the next year. The forecast is taken from the Tealbook for each FOMC meeting. We use an inflation series that is spliced together in an attempt to capture which series the Fed was targeting at the time. The Core CPI is used until October 26, 2005. From December 7, 2005, we use the Core PCE. We use the core measure to limit the volatility embedded in the headline inflation rates emanating from temporary supply shocks. The expected coefficient is positive. URF4 is the Board staff unemployment rate (U3) four-quarter-ahead forecast from the Tealbook for each

[1] A simple formulation of the Taylor rule in its basic form is $FF_t = r^* + \pi_t + 0.5(\pi_t - 2) - (u_t - u^*)$, where *FF* is the federal funds rate, *r** is the estimated value of the equilibrium real rate, π is the inflation rate, u is the unemployment rate, and u* is the natural rate of unemployment. This example of a simple policy rule relates the federal funds rate to current inflation relative to a 2 percent target and the unemployment rate relative to the natural rate of unemployment. Such simple monetary policy rules rely on significant assumptions, including that r* and u* are fixed. Assuming interest rate smoothing and grouping terms assumed to be constant generates our empirical equation.

FOMC meeting. The estimated coefficient is expected to be negative. Note that if the staff forecasts are efficient, all relevant information about financial instability concerns that impacts the unemployment and inflation rates over the next year should be incorporated in the forecasts. Thus, if financial instability is not treated as an independent third mandate, but enters only through its effects on inflation and economic activity, the role of financial instability and regulation in the constraint equations should be captured by the inflation and unemployment rate forecasts.

FIW is the financial instability word count from the FOMC meeting transcripts, using words such as crisis and instability as described earlier. If the FOMC behaved as described by Bernanke and Gertler (2000), with monetary policy responding to financial instability concerns by reacting to bubbles only after they had burst, then the estimated coefficient on FIW would be zero. An alternative hypothesis is that the FOMC will react strongly to financial instability concerns because financial instability will cause failures of financial institutions, fiscal problems, and an inability for monetary policy to react strongly when interest rates hit the zero lower bound. This would be the case in which financial instability is in the Fed's utility function. If the FOMC primarily responds to negative financial shocks, then the coefficient will be negative and may be larger in absolute value during periods when the economy is already experiencing financial instability. If so, the FOMC may respond more aggressively during periods of heightened financial instability. A third hypothesis is that the FOMC acts preemptively to prevent bubbles. For example, the FOMC may choose tighter policy if it feels that asset bubbles are being created as asset prices rise above their fundamental values, perhaps because investors are "reaching for yield." In this case, FIW would have a positive estimated coefficient, and one might expect the largest impact to be during periods when the economy is booming. Thus, the context in which a financial instability term is mentioned is key for determining its expected effect.

To examine these possibilities, we estimate the adjusted Taylor rule that includes FIW over "bust" and "boom" subsamples, as well as over the full sample, using several alternative indicators to select the bust and boom subsamples. We also explore separately counts for mentions of specific financial institutions. Because we find no statistically significant relationship for the specific-institution mention count, we do not report results using that measure, focusing instead only on the results for the FIW measure of financial instability terms.

Our measure of financial instability sidesteps the problems associated with identifying a good indicator of the financial instability concerns by participants in the FOMC meetings.[2] Rather than basing the measure on specific events or financial data and having to speculate that they enter the concerns of FOMC participants, we obtain a direct measure of mentions that actually appear in FOMC discussions, and thus likely influence the thinking of FOMC participants when it comes time for them to make their decisions about the appropriate stance of monetary policy. Thus, word counts taken directly from FOMC meeting transcripts are particularly well suited for explaining the behavior of the FOMC. Our measure of financial instability concerns are thus correlated with periods when the FOMC was itself noticing, and in fact remarking on in the transcript, potential or actual problems in financial markets.

[2] At this stage, we have not yet had time to look at each individual word mention to place it in context. Until we do so, we are temporarily using indicator variables to classify word counts for individual FOMC meetings into bust or boom observations.

We first explore whether the simple Taylor rule without including our measure of heightened financial instability concerns appears to miss the actual funds rate path during periods that might be associated with financial instability. Figure 2 contains the residuals from estimating the simple Taylor rule without including FIW, measured as the actual federal funds rate minus the predicted rate from this Taylor rule. Thus, a positive value indicates that the actual federal funds rate was above that predicted by the simple Taylor rule, while a negative value indicates a federal funds rate below that predicted by the Taylor rule. The figure also includes for comparison the FIW word counts, as well as recession shading and indicators of specific events that one might associate with financial stability concerns.

Figure 2 does show that word counts tend to be elevated around events that many would have construed as generating a financial stability concern and are associated with large misses in the Taylor Rule. For example, the Black Monday event referenced earlier was associated with a high financial instability word count and an overprediction by the Taylor rule. Events that show a similar pattern include the Russian crisis/LTCM period and the period around the financial crisis. This indicates that at least during periods of adverse financial shocks, monetary policy appears to be more accommodative than implied by a simple Taylor rule based on Federal Reserve staff forecasts for inflation and unemployment.

Table 2 presents regression results that explore the extent to which FIW, the word counts from the FOMC meeting transcripts, provide an additional contribution to the explanation of the actual path of the federal funds rate beyond that provided by the contributions of the Board staff inflation and unemployment rate forecasts contained in the Tealbook. The first column contains the results from estimating the Taylor rule specification excluding FIW used to obtain the Taylor rule deviations from the actual federal funds rate shown in Figure 2. The estimated coefficients each have the anticipated sign and are statistically significant at the 1 percent confidence level – forecasts of inflation above its target raise the funds rate, and forecasts of the unemployment rate above the NAIRU lower the funds rate.

The second column in the table adds FIW, which has been scaled to be in units of 100 words (i.e., divided by 100) so that its estimated coefficient will be in the same range as the other estimated coefficients for presentation purposes. Consistent with the impressions given by Figure 2 that the FOMC appears to react to adverse financial shocks, the estimated coefficient on FIW is negative and statistically significant at the 1 percent confidence level. Moreover, the coefficient suggests a meaningful effect. If the word count in the FOMC transcript related to financial instability concerns increases by 100 (the word count ranges from 2 to 141 in our sample), the federal funds rate would be 45 basis points lower than otherwise after controlling for the staff forecasts of inflation and unemployment, or alternatively, with the most common 25 basis point change in the federal funds rate being associated with a change of 55 in the word count. Thus, the FOMC appeared to not only talk the talk about financial instability concerns, but also to walk the walk, acting on those concerns rather than confining its actions to the more narrow concerns about its explicit dual mandate. Moreover, the negative sign on the estimated FIW coefficient for the full sample suggests that when the FOMC does mention financial instability terms, it tends to be in the context of having an adverse effect on the economy. That is, the FOMC appears to be reacting after adverse shocks hit rather than proactively reacting to mitigate the buildup of financial imbalances that could cause an asset price bubble, the subsequent bursting of which could have severe adverse effects on the economy.

To allow for such differential FOMC responses that may vary depending on the degree and nature of the financial instability risks present in the economy, we attempt to distinguish between the "lean" versus "clean" responses. As financial imbalances build up in the economy, such as an asset price bubble, to the extent that the FOMC responded, one would expect the FOMC to tighten monetary policy (raise the funds rate) to lean against the bubble. On the other hand, when a financial crisis hits the economy, such as the bursting of an asset bubble, one would expect the FOMC to ease policy (reduce the funds rate) to clean up the mess. While we recognize the potential for the sign of the FIW coefficient to switch depending on the context of the financial instability concerns, we have not yet had time to attempt to classify each of our identified word mentions in the FOMC transcripts into "boom" or "bust" concerns.

In the interim, we use several alternative indicators to classify FOMC meetings into boom and bust categories. While selecting a specific threshold is somewhat arbitrary, we designate the quintiles at either end of the distributions of our indicator variables as the boom and bust quintiles, with the remaining three quintiles designated as the "middle." Of course, such a symmetric treatment may not be appropriate, given that, much like recessions and recoveries, busts tend to be sharper and shorter, while an asset price bubble may build up slowly over an extended time period. Still, by using a set of alternative indicators, we can obtain a sense of the robustness of the results from these imperfect measures.

We consider three alternative indicators of boom and bust subsamples. The first measure is the average Baa-Aaa yield spread for the month prior to the FOMC meeting. The second indicator is the percentage change in the S&P 500 index for the year ending in the month prior to the FOMC meeting. The final indicator is the change in the Board staff's unemployment rate forecast for the current quarter from the Tealbook. The change is calculated from four meetings prior to the current FOMC meeting to the current FOMC meeting, which is roughly a six-month horizon.

The final three columns of Table 2 contain the results from estimating the adjusted Taylor rule for the bust, middle and boom subsamples using the Baa-Aaa yield spread indicator. When this interest rate spread is very large (the bust subsample), the perceived risk of corporate defaults is high. In such instances, the FOMC may be relatively more responsive to financial instability concerns. Alternatively, when the spread is very narrow, the perceived risk of corporate defaults is low, and the FOMC may be less responsive to financial instability concerns. In fact, a very low spread may increase concerns about investors "reaching for yield," causing the financial instability word count to be positively rather than negatively related to the federal funds rate.

Column 3 contains the results for the subsample composed of the upper quintile of the Baa-Aaa interest rate spread observations. The estimated FIW effect is approximately one and a half times the size of the effect for the full sample shown in column 2 and remains significant at the 1 percent confidence level. This suggests that when the risks of financial instability are elevated, the FOMC tends to ease policy more forcefully to offset risks associated with actual or potential adverse outcomes for financial markets and the economy. For the middle subsample, the estimated effect of FIW remains negative and is significant at the 5 percent confidence level, but is less than half the size (in absolute value) of that for the bust subsample. Finally, for the boom subsample, the estimated FIW effect is positive and significant at the 5 percent confidence level. This positive effect is consistent with concerns about financial stability switching to leaning against potential emerging asset price bubbles in boom periods.

Interestingly, it is not just the financial instability word count that has an estimated coefficient that differs across subsamples. The estimated coefficients on both the unemployment forecasts and the inflation forecasts vary somewhat across the three subsamples. This suggests that the simple Taylor rule that assumes policy coefficients are stable over the business cycle may miss how the FOMC actually reacts. During bust periods, the estimated FOMC reaction to unemployment rate forecasts appears to be relatively larger (in absolute value), while the estimated FOMC reaction to the inflation forecast appears to be relatively larger in boom periods. Such a pattern would be consistent with the FOMC shifting the relative weights toward their employment mandate and away from their price stability mandate during bust periods, and shifting the relative weights in the opposite direction during booms.

Table 3 contains the results for the bust and boom subsamples based on the two other alternative indicators. Column 1 contains the full sample results from column 2 of Table 3 for reference. The second and third columns contain the estimates for the bust subsamples, while the last two columns contain the results for the boom subsamples. Note that the boom subsamples and the bust subsamples for the alternative indicator variables are not identical, since in each instance they are based on the distribution of values for that indicator variable for the 1987-2008 sample period.

For the bust subsamples for both the percentage change in the S&P 500 index and the change in the unemployment rate forecasts, FIW has a negative estimated coefficient that is significant at the 1 percent confidence level. Moreover, the magnitudes of the estimated FIW coefficients are of a similar magnitude to that for the Baa-Aaa yield spread bust subsample, although somewhat smaller (in absolute value). For the boom subsample for the percentage change in the S&P 500 index, we obtain a positive estimated coefficient for FIW that is only slightly larger than that for the yield spread and just misses being significant at the 10 percent level. However, for the boom subsample based on the change in the unemployment rate forecast, the estimated coefficient on FIW is negative and insignificant.

The estimated coefficients in Table 3 for the forecast variables are qualitatively similar to the corresponding estimates in Table 2, with the exception of that for the inflation forecast for the boom subsample based on the change in the unemployment rate forecast. This difference in the results for the subsamples based on the change in the unemployment rate forecast may be related to the unemployment rate being a real sector measure, while the other two indicators are financial sector variables. Still, the three alternative approaches to designating bust and boom subsamples provide a very similar picture. The funds rate does generally respond to inflation and unemployment rate forecasts as expected. Importantly, particularly during the bust quintile subsamples, the estimated effect of FIW is larger than for the full sample and significant at the 1 percent confidence level. Thus, simple Taylor rules that ignore financial instability concerns appear to be missing how the FOMC actually behaves during periods of potential or actual financial instability.

One possible explanation for our results indicating that FIW does add explanatory power to our adjusted Taylor rule regressions is that financial instability impacts inflation and unemployment in ways that are not captured in the forecast, perhaps because the Board staff forecasts are not using the financial stability information efficiently. To address this concern, we construct adjusted inflation and unemployment rate forecasts that do allow FIW to be fully incorporated into the forecasts. The estimated coefficient on FIW when using these adjusted forecasts captures the effect of FIW above and beyond its effect operating through the (adjusted) forecasts. A finding that FIW maintains its statistical significance in the presence of these adjusted forecasts would provide additional evidence consistent with the FOMC behaving as if financial stability is a third mandate.

The adjusted forecasts are constructed as the fitted value from regressions based on a moving window. The dependent variable (either the unemployment rate or the inflation rate) is regressed on a constant term, the corresponding Tealbook forecast, and FIW as the explanatory variables. We use the set of moving-window regressions rather than a single regression based on the full sample period to avoid allowing information from FIW subsequent to an FOMC meeting to affect the estimated coefficients used to construct the adjusted forecast for that FOMC meeting. That is, we estimate the regression up to a specific FOMC meeting and use the fitted value for that meeting as the adjusted forecast. We then extend the sample to the next meeting and repeat the regression to obtain the adjusted forecast for that meeting.

To avoid losing the observations at the beginning of our sample, we use data for the five years prior to the beginning of our sample. Thus, for the first FOMC meeting in 1987, the regression estimates are based on only five years of data. We then extend the sample one meeting at a time until we have a full 10 years of data. At that point, we implement a moving window of length 10 years by deleting the oldest FOMC meeting from our sample as we add the new FOMC meeting.[3] We chose not to extend the initial window before 1982 to limit the extent to which our estimates are affected by the Volcker disinflation period.

Table 4 contains the results using the adjusted forecasts for the unemployment and inflation rates for the full sample and for the bust, middle, and boom subsamples based on the Baa-Aaa spread. For comparison, the table displays the results using the Tealbook forecasts and the adjusted forecasts side-by-side. Comparing the first two columns, while the estimated coefficient for FIW is somewhat smaller (in absolute value) using the adjusted forecasts, it remains significant at the 1 percent confidence level. Thus, after incorporating FIW directly into the unemployment rate and inflation rate forecasts, FIW continues to have a statistically significant effect, consistent with the FOMC treating financial stability as a third mandate. Columns 3 and 4 show that for the bust subsample, the point estimates for FIW are virtually unchanged. For the middle subsample, FIW has a slightly smaller (in absolute value) estimated coefficient that is now significant only at the 10 percent level. For the boom subsample, the FIW estimated coefficient is slightly larger and remains significant at the 5 percent level. Thus, the

[3] Alternatively, one could simply extend the sample period by one observation for each subsequent regression, keeping the beginning of the sample fixed at the beginning of 1982, so that the estimation sample period grows by one observation each time rather than having a fixed 10-year window. Such a specification produced qualitatively similar results in the adjusted Taylor rule regressions. We present the moving-window results because we prefer minimizing the influence of the Volcker disinflation episode on the results.

overall results with the adjusted forecasts are qualitatively quite similar to those with the Tealbook forecasts, suggesting that the original results are not due to the Tealbook forecasts not fully incorporating the information contained in FIW.

VI. The Way Ahead

While our results are strongly suggestive that the FOMC often behaves as if monetary policy has a third mandate, our evidence is not yet definitive. We have not yet cleanly ruled out a number of alternative explanations for why the FOMC is responding to financial instability concerns. We plan to further refine our FIW measure by categorizing the context (bust or bubble) of the financial instability term mentions, as well as whether the mentions are by FOMC members or contained in Board staff presentations. This will allow us to directly classify the mentions of the financial instability terms into bust and bubble categories rather than having to rely on external (to the FOMC) indicators of the nature of the potential concerns.

Other considerations concern Taylor rules more generally. There might be more nuanced reasons why we care about financial instability which overlap with issues concerning the Taylor rule. Those reasons might have to do with risk aversion on the part of the Fed, with our financial instability measure capturing elements of the risk environment that an implicit risk-neutral Taylor rule misses. Is it possible that the failure of simple Taylor rules to account for nonlinearities in relationships or the higher moments of the forecasts of the dual mandate variables accounts for the significance of our financial instability measure? For example, is the FOMC reacting to tail risk?

VII. Conclusion

Central banks are increasing the attention they pay to financial stability issues in the wake of the financial crisis. Many central banks include financial stability discussions in regular reports, and in the United Kingdom, the Bank of England has an explicit structure and tools now in place to address financial stability issues. While financial stability issues were important at the time of the founding of the Federal Reserve, the connection between financial stability and monetary policy in the United States remains controversial.

We show that with a relatively simple adjustment to a common quadratic loss function for the central bank that financial instability should be considered in monetary policy decisions. In a simple model that allows financial instability to be included in the utility function for monetary policy, financial instability concerns become relevant for the setting of monetary policy. Thus, there are reasons to believe that financial stability should be an explicit consideration of monetary policymakers. The model also suggests that regulatory/supervisory policy and monetary policy should be more integrated, a topic we intend to address in a future paper.

We next examine whether there is evidence that the FOMC does alter monetary policy to reflect financial instability concerns. We document that terms related to financial instability are frequently mentioned in the transcripts of FOMC meetings. These mentions do tend to occur most frequently during periods of financial turbulence. If financial instability concerns were irrelevant to setting the funds rate, it would seem odd that such topics receive such attention at FOMC meetings. Simple Taylor rules that assume financial instability should not be in the loss function or in constraints seem at variance with these frequent mentions.

While the model provides an example in which financial stability should be considered in setting monetary policy, is it? We find evidence that frequent mentions of financial instability terms at the FOMC, particularly during bust periods, result in a statistically significant reduction in the funds rate relative to that implied by a simple Taylor rule based on Federal Reserve staff forecasts of inflation and unemployment rates, indicating that simple Taylor rules estimated during periods of financial instability may significantly miss actual FOMC behavior. Moreover, we obtain qualitatively similar results when we adjust the Tealbook forecasts to more fully incorporate our financial instability measure, consistent with the significant financial instability effect is not due to the Tealbook forecasts inefficiently incorporating this information.

In addition, this paper highlights why a simple policy rule is not likely to capture actual FOMC behavior. Coefficients on inflation and unemployment forecasts do seem to change during periods of financial instability, in addition to the FOMC responding independently to the financial instability concerns. Following a simple policy rule that does not reflect this behavior would not capture how the monetary policy loss function has been addressed by monetary policy.

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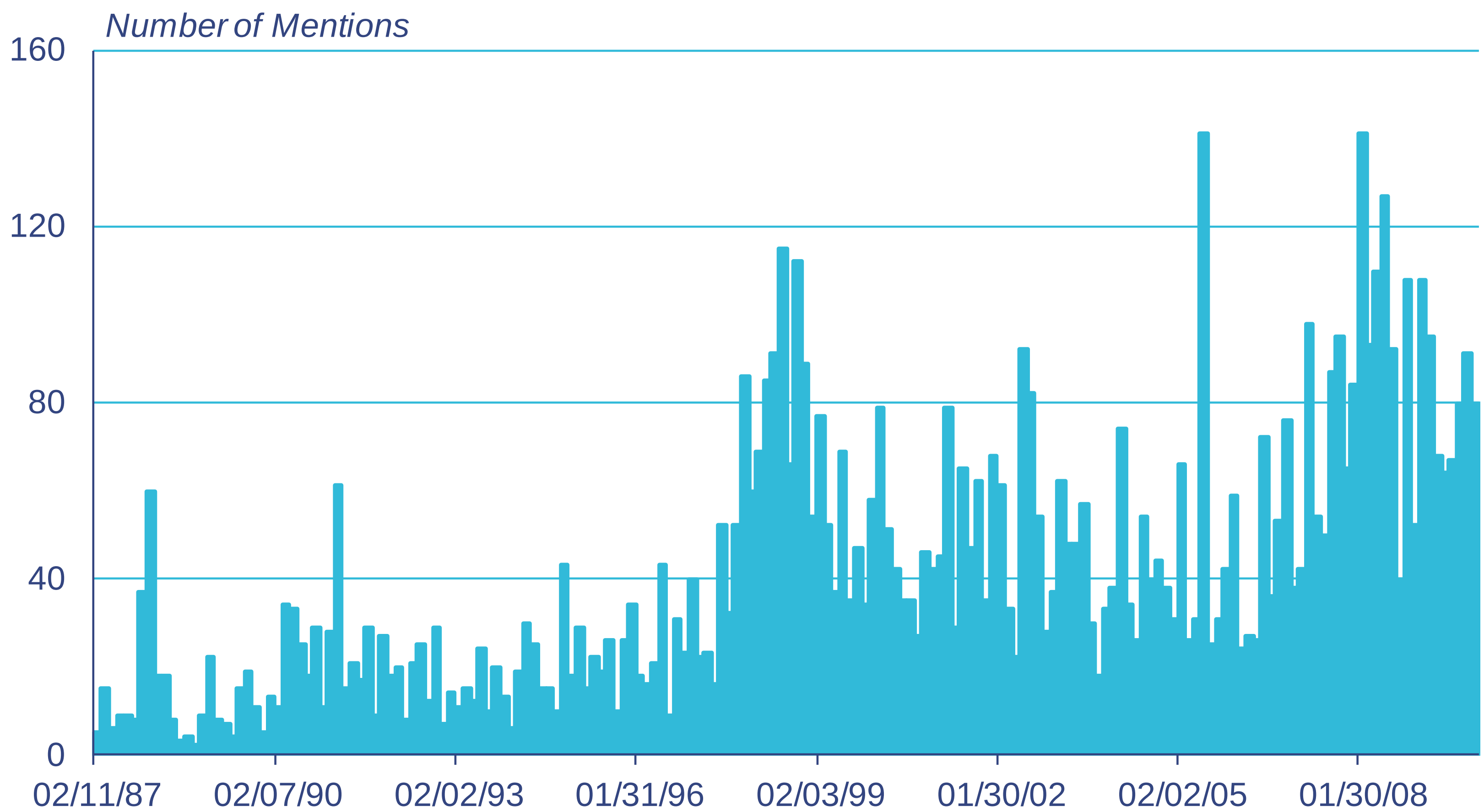
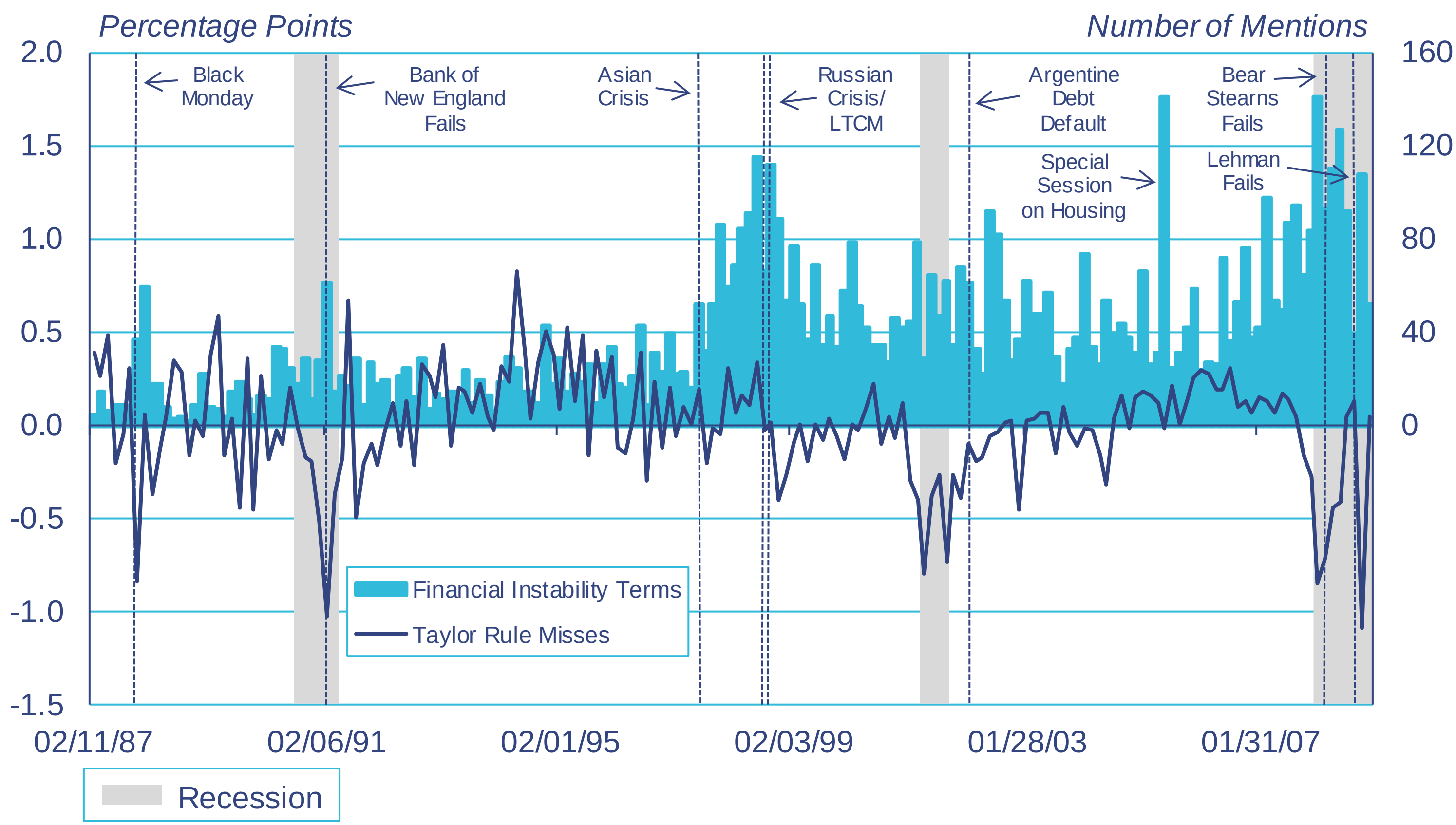
Figure 1: Count of Financial Instability Terms in FOMC Meeting Transcripts



Sources: Federal Reserve Board, FOMC

Figure 2: Taylor Rule Misses and Count of Financial Instability Terms in FOMC Meeting Transcripts

FOMC Meetings, February 11, 1987 – December 15, 2008



Note: Taylor Rules Misses are the Federal Funds Rate minus the fitted value generated by the Taylor Rule.

Sources: Federal Reserve Board, FOMC, NBER, Haver Analytics

Table 1: Financial Instability Term Word Counts

Sample 1987-2009

Financial Instability Terms	**# of Mentions**
A/anxiety	102
A/asset prices	281
B/bubble*	328
B/burst	87
B/bust	982
CDS	103
C/collapse	204
C/crash	93
C/credit constrained	2
C/crises	89
C/crisis	657
C/crunch	292
E/equities	169
E/equity prices	436
E/equity values	47
F/financial stability	86
F/froth	30
H/house prices*	407
H/housing prices*	195
I/illiquidity	37
I/instability	149
I/irrational exuberance	9
LDC	22
L/lending standards	70
L/liquidity issues	20
L/liquidity problems	18
Loan Officer	45
M/market correction	47
M/market distress	4
P/panic	101
PE / price to earnings/ price-to-earnings	10
R/regulation	150
S/stock market	1210
S/stock prices	314
S/supervision	97
V/volatility	853

* This term spiked in June 2005 due to a special report on housing bubbles. The June 2005 data point is interpolated in the dataset used for the regression analysis.

Table 2: Adjusted Taylor Rule Estimation

Sample 1987-2008

	Full Sample	Full Sample	Bust[1]	Middle[2]	Boom[3]
C	1.292 (.000)	1.807 (.000)	1.653 (.040)	1.648 (.000)	0.174 (.724)
FFR(-1)	0.861 (.000)	0.866 (.000)	0.752 (.000)	0.848 (.000)	0.812 (.000)
URF4	-0.288 (.000)	-0.316 (.000)	-0.313 (.006)	-0.313 (.000)	-0.156 (.050)
PFA	0.322 (.000)	0.255 (.000)	0.447 (.022)	0.306 (.000)	0.574 (.000)
FIW/100		-0.454 (.000)	-0.668 (.001)	-0.305 (.024)	0.363 (.043)
Adjusted R^2	0.981	0.984	0.987	0.986	0.968
Log Likelihood	-35.080	-22.504	-6.039	-4.748	10.216
Observations	176	176	35	106	35

[1] Bust is defined as the top quintile of observations within the full sample of the Baa-Aaa spread.
[2] Middle is defined as the middle three-fifths of observations within the full sample of the Baa-Aaa spread.
[3] Boom is defined as the bottom quintile of observations within the full sample of the Baa-Aaa spread.
The p-values are in parentheses below the estimated coefficients.

Table 3: Adjusted Taylor Rule Bust and Boom Subsamples

Sample 1987-2008		**Bust**[1]		**Boom**[2]	
	Full Sample	Yrly % Δ S&P500	Δ UR	Yrly % Δ S&P500	Δ UR
C	1.807 (.000)	1.759 (.003)	1.194 (.054)	0.876 (.051)	1.051 (.090)
FFR(-1)	0.866 (.000)	0.715 (.000)	0.751 (.000)	0.837 (.000)	0.932 (.000)
URF4	-0.316 (.000)	-0.376 (.000)	-0.241 (.012)	-0.240 (.004)	-0.196 (.084)
PFA	0.255 (.000)	0.546 (.000)	0.415 (.001)	0.399 (.001)	0.183 (.105)
FIW/100	-0.454 (.000)	-0.474 (.010)	-0.585 (.002)	0.340 (.104)	-0.205 (.339)
Adjusted R^2	0.984	0.990	0.980	0.982	0.979
Log Likelihood	-22.504	0.473	-4.951	5.585	-2.115
Observations	176	35	35	35	35

[1] Bust is defined as the bottom quintile of observations within the full sample for the S&P 500 measure, and the top quintile for the Δ UR measure.

[2] Boom is defined as the top quintile of observations within the full sample for the S&P 500 measure, and the bottom quintile for the Δ UR measure.

The p-values are in parentheses below the estimated coefficients.

Table 4: Adjusted Taylor Rule with Adjusted Forecast

Sample: 1987-2008

	Full Sample (Tealbook Forecast)	Full Sample (Adjusted Forecast)	Bust[1] (Tealbook Forecast)	Bust[1] (Adjusted Forecast)	Middle[2] (Tealbook Forecast)	Middle[2] (Adjusted Forecast)	Boom[3] (Tealbook Forecast)	Boom[3] (Adjusted Forecast)
C	1.807 (.000)	1.560 (.000)	1.653 (.040)	1.515 (.015)	1.648 (.000)	1.816 (.000)	0.174 (.724)	0.514 (.257)
FFR(-1)	0.866 (.000)	0.880 (.000)	0.752 (.000)	0.893 (.000)	0.848 (.000)	0.845 (.000)	0.812 (.000)	0.826 (.000)
URF4	-0.316 (.000)	-0.323 (.000)	-0.313 (.006)	-0.258 (.003)	-0.313 (.000)	-0.414 (.000)	-0.156 (.050)	-0.204 (.021)
PFA	0.255 (.000)	0.310 (.000)	0.447 (.022)	0.228 (.314)	0.306 (.000)	0.431 (.000)	0.574 (.000)	0.505 (.000)
FIW/100	-0.454 (.000)	-0.314 (.001)	-0.668 (.001)	-0.663 (.001)	-0.305 (.024)	-0.253 (.072)	0.363 (.043)	0.382 (.033)
Adjusted R^2	0.984	0.983	0.987	0.985	0.986	0.986	0.968	0.966
Log Likelihood	-22.504	-24.855	-6.039	-8.220	-4.748	-6.375	10.216	9.093
Observations	176	176	35	35	106	106	35	35

[1] Bust is defined as the top quintile of observations within the full sample of the Baa-Aaa spread.

[2] Middle is defined as the middle three-fifths of observations within the full sample of the Baa-Aaa spread.

[3] Boom is defined as the bottom quintile of observations within the full sample of the Baa-Aaa spread.

The p-values are in parentheses below the estimated coefficients.