Estimating Central Bank Preferences Combining Topic and Scaling Methods

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Abstract

Scholars often use Federal Open Market Committee (FOMC) votes to estimate the preferences of central bankers. However, rarely do committee members on the FOMC cast dissenting votes. This article demonstrates the usefulness of using what central bankers say in FOMC meetings rather than how they vote to better measure central bank preferences. Using automated text analysis tools and scaling methods, we develop a new measure of central bank preferences on the FOMC leading up to the financial crisis (2005 - 2008).

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1 Introduction

Fed watching is the art of trying to discern drama from business as usual. Federal Open Market Committee (FOMC) members rarely disagree publicly, so Fed watchers must work with carefully hedged communications and ambiguous statements. Fed watching, it is argued, is more of an art than a science. In this paper, we show how to uncover the dissent lying behind the committee's public-facing consensus. By modeling the things that central bankers say to estimate central bankers' preferences, we show how the art of Fed watching can include a little more science.

Previous measures of central bank preferences often depend on the analysis of committee member voting. On the Federal Open Market Committee (FOMC) there are 19 committee members. At any given meeting, 12 of the 19 committee members decide whether or not to change interest rates– specifically, the federal funds rate. FOMC members can vote either to raise, lower, or keep the funds rate the same. Well before members cast their vote, FOMC members are provided with the "Bluebook," which is drafted by the Board of Governors in Washington D.C. Contained in the "Bluebook," is additional information about how the U.S. economy is performing gathered by the staff of the Board of Governors. Using this information as well as "in house" information provided by their own research staff, FOMC committee members cast two votes. The first vote is the member's position on changes to the federal funds rate, which is the key interest rate that the FOMC uses to control the economy. The second vote is whether, or which, textual policy statement the member prefers. [1]

While it seems natural that by examining central bankers voting behavior we can uncover something about central bankers preferences, and therefore something about policy, unfortunately, there are a number of issues with using FOMC voting data to make inferences about individual members' preferences. First, most of the time, members on the FOMC vote for "maintaining" the federal funds rate. As a result, voting rarely offers new information and is heavily biased towards

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[1]http://www.federalreserve.gov/monetarypolicy/files/FOMC20080130bluebook20080124.pdf

the status quo. Second, dissenting votes are rare. Thornton and Wheelock (2014) reports that between 1948 and 2014 there was only one dissenting vote cast, on average, per FOMC meeting. Between 2005 to 2008, the period we consider in this paper, there are just 6 dissenting votes, representing just two percent of all votes cast (Authors' calculations). Thus, while each member has the right to vote according to his or her own preferences, decision making most often occurs by consensus.

The lack of overt disagreement, as measured by either changes to the federal funds rate or dissents in voting, provides researchers with very little information about the underlying preferences of central bankers. Similarly, when we move from static to dynamic preferences– or measuring changes in preferences over time– voting records provide even less information about what central bankers want and how what they want changes over time.

In this paper, we present a new measure of central bank preferences for members on the FOMC leading up to the financial crisis. We construct a measure of FOMC preferences using what FOMC members *say* rather than what they finally *do* in meetings. Using FOMC meeting transcripts, we use statistical topic modeling to extract representations – essentially lotteries over words and phrases – of the concepts of unemployment, output and inflation. Starting from the assumption that central bankers make interest rate decisions based on the trade-off between inflation versus unemployment and output, we use the topics that central bankers talk about to develop a positional measure of central bank preferences.

This new measure of central bank preferences shows much larger variation in central bank preferences between actors and over time than differences that we would observe if we used only voting data. We show that central bankers (at least on the FOMC) not only have different preferences but also that their preferences evolve over time. While recent work in political science helps explain why central bankers have different preferences (Adolph, 2013; Hallerberg and Wehner, 2013; Havrilesky and Gildea, 1991; Schonhardt-Bailey, 2013), this paper puts together topic and positional analysis to generate new estimates of their positions. One of our key contributions is to

offer preference estimates for all FOMC members, regardless of whether or not they are scheduled to vote in any particular meeting.

The rest of the paper is organized as follows: The next section reviews the literature on central bank preferences – why central bankers have preferences and where they come from. It also shows variation, or lack thereof, in FOMC voting over time. The following section discusses our data and the measurement approach that we use to generate new estimates of central bank preferences. We then compare our estimates from speech with qualitative evidence on voting preferences and indicate where the estimates are similar and where they differ. The final section concludes and makes some suggestions for future research.

2 Central Bank Preferences

The individuals that sit on the FOMC are mandated by U.S. Congress to fulfill three goals: maximum employment, stable prices, and moderate long-term interest rates. Although all members on the FOMC are responsible for the same mandate, committee members have different preferences. A useful ranking of central bank preferences is based on their *inflation preferences* - or how sensitive policymakers are to increases in inflation. Borrowing terms used to describe people's appetite for war, people that worry more about inflation are called *Inflation Hawks* whereas those that worry less about inflation are called *Inflation Doves*. Ranking individual central bank members according to their preferences along a single common dimension, "how much do I care about inflation relative to output and unemployment," is important as it allows researchers to compare preferences across actors and also over time. The fact that the members have such a mandate also provides theoretical motivation for using a low dimensional structure to understand members' preferences over a wide variety of apparently disparate policy topics.

If members of the FOMC are all tasked with the same objective, why do central bankers have different preferences? Recent studies help identify the determinants of central bank pref-

erences. First, the appointment process seems to matter; Hallerberg and Wehner (2013) find that left leaning politicians appoint central bankers with more economics training than right leaning leaders. Second, central bankers have their own career histories, career goals, and career objectives; Havrilesky and Gildea (1991) show that prior employment in the financial services sector is more likely to create conservative –interest rate tightening– central bankers whereas public service employment is associated with lower interest rates. Adolph (2013) also finds that central bankers are motivated by personal career objectives and past employment histories; he shows that variation in past job experience and future career goals help explain variation in central bank preferences. Schonhardt-Bailey (2013) shows that hallway conversations as well as explicit deliberation allows central bankers to influence and persuade their colleagues. Finally, central bankers may also represent particular geographical constituencies, such as their home district in the case of the Federal Reserve System [2] or their national country of origin such as member state specific characteristics within the European Central Bank system (Meade, 2005; Meade and Sheets, 2005).

When considering the preferences of U.S. central bankers, we mean those individuals that are tasked to take decisions on changing interest rates on the FOMC, or the 19 FOMC participants (7 Governors and 12 Reserve Bank presidents) mentioned earlier. Importantly, not all members on the FOMC vote at any given meeting. At every meeting, voting members include seven members from the Board of Governors, the New York Federal Reserve Bank President, and four Bank Presidents from the Federal Reserve System. The Bank Presidents rotate in their voting, with a Bank President sitting on rotation (on schedule to vote) for a year.[34] Consequently, at every meeting there is always a smaller number of FOMC members on cycle to vote than there are FOMC participants. But even if, in a particular meeting, the Bank President of Atlanta is not on cycle to vote, he is still expected to contribute to the meeting by speaking. Importantly this peculiar institutional feature, means that

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[2]The Federal Reserve System (FRS) is a system of 12 regional banks and a Board of Governors

[3]The origins of this peculiar voting rule (7 from the Board and 5 from the Regional Banks) dates back to a 1935 Congressional decision on the structure of the FOMC.

[4]http://www.philadelphiafed.org/education/teachers/resources/day-in-life-of-fomc/

even when members all vote the same, speeches can be used to estimate variations in members' positions. Also important is that, in contrast to voting, FOMC committee transcripts and speech data represents a full population sample of speeches and opinions and is therefore less subject to the selection problems that plague legislative speech analysis. For example, in legislative speech, party discipline and limited speaking time can affect who gets to speak and what is said (Proksch and Slapin, 2014).

In addition to only having observations on votes for a sub-sample of the population at any meeting, another concern with vote data is that not all FOMC members have the same propensity to dissent from the policy consensus. Gerlach-Kristen and Meade (2010), for example, find that dissenting votes on the FOMC depend on length of tenure, the intensity of opposition on the FOMC at any given time, Board member status, and economic variables. In fact, members tend towards consensual policymaking most of the time; during Greenspan's Chairmanship (August 11, 1987 - January 31, 2006) there are only 82 dissenting votes cast and during Bernanke's tenure, (February 1, 2006 to January 31, 2014) there are only 48 dissenting votes cast (Thornton and Wheelock, 2014). Substantively, this means that, under the last two Chairs, dissents account for less than 10 percent of all votes. Furthermore, such a small number of dissents characterizes the entire history of the Fed. In over 50 years of FOMC deliberations, there is, on average, less than one official dissenting vote per FOMC meeting, with periods before 1980 having greater expressed official dissent than the voting behavior that we observe after the 1980s.

A lack of disagreement in votes, especially in the most recent period, means that scholars must look elsewhere for helpful information in constructing central bankers' preferences. One fruitful approach is examining what central bankers say instead of what central bankers do. As alluded to above, there are numerous benefits in using speech data. First and most importantly, dissent is more likely in speech than in voting. In one empirical study, Meade and Stasavage (2008) find that non-voting members on the FOMC are more likely to show disagreement in speech than in voting and that this is especially true when the FOMC member is not on cycle to vote. In other words,

those members on the committee not voting are more likely to dissent in any given meeting. This provides some evidence that speech data is less affected by selection problems. Second, and as mentioned above, those on the FOMC have the right, and are expected to speak even when they are not voting. Again, this means that speech is observed for the full population at every meeting whereas only a truncated sub-sample of FOMC decision makers is observed voting at any given meeting.

In summary, the FOMC's peculiar rules, dating back to a 1935 Act of Congress, mean that Bank Presidents only get to vote on a rotating schedule but can, and indeed are expected to contribute to discussion in every FOMC meeting. Moreover their contributions are elicited systematically by the Chair through a process called "taking the rounds," where individual committee members are called on to make speeches. The process of calling on all members removes the worst effects of sample selection. Not only does speech generate more and richer information on preferences than voting, but also central bankers are much more likely to express dissent in speech than in voting.

The rest of this paper discusses the theoretical underpinnings of our measurement strategy and presents individual and over time estimates for members on the FOMC between 2005 and 2008.

3 Estimating Central Bank Preference

3.1 The Taylor Rule

The Taylor rule is a simple approximation for estimating what central bankers *should do* given changes in the economy. Taylor's rule is a formula developed by Stanford economist John Taylor. The original rule provides an aggregate policy recommendation for changing the federal funds rate as economic conditions, namely output and inflation, change over time (Taylor, 1993). Importantly, the Taylor rule explicitly models changes *that should be made* in the federal funds rate in a response

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to changes in inflation (deviations from target) and changes in output (the output gap). [5] The formula for the Taylor rule is given by equation (1),

$$r = \pi + \frac{1}{2}(y) + \frac{1}{2}(\pi - 2) + 2 \tag{1}$$

where r is the federal funds rate, π is the rate of inflation over the previous 4 quarters, and y is the percent deviation of real GDP to target GDP. Importantly, the Taylor rule, or some derivation of the Taylor rule, is used as a guideline in most central banks. The Board of Governors and the research staff at regional Federal Reserve Banks consult with FOMC members about projections from Taylor rule estimates and policymakers are equipped with economic projections from different Taylor rule specifications. For example, Appendix B in the 2008 "Bluebook" presents 6 scenarios of the future economy, 3 of which are based on some derivative of the Taylor rule. [6][7]

The Taylor rule expresses a linear trade-off between inflation and output/unemployment, of the form $r = \beta_0 + \beta_1\pi + \beta_2 y$ where $\beta_0 = 1$, $\beta_1 = 1.5$ and $\beta_2 = 0.5$. Expressed as a trade-off between inflation and output concerns we can represent the balance of an individual member's considerations built into the rule by $\log \frac{\beta_1}{\beta_2} \approx 1$. The interpretation is that an individual has an unique and symmetrical measure of proportional emphasis of inflation versus output sensitivity.[8] In order to be consistent with the ideal point point literature, where point predictions are scaled on a single left right dimension, we use inflation sensitivity β_1 as the numerator and β_2 as the

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[5]For the rest of the paper we refer to output/unemployment so as to capture either the Taylor rule or the Phillips Curve. Interestingly, the topics that we uncover with the topic model all relate to inflation and output rather than inflation and unemployment which suggests that the Taylor Rule is a better theoretical foundation than alternative approaches such as the Phillips Curve. The lack of unemployment specific topics in the FOMC is also found in Young and Gandrud (2013)

[6]http://www.federalreserve.gov/monetarypolicy/files/FOMC20080130bluebook20080124.pdf

[7]Even when there is uncertainty about the true model of the economy, the Taylor rule delivers good outcomes in a variety of models. This means that it provides a useful guidance for policymaking and therefore a useful guide to estimating the preferences of policymakers.

[8]The Taylor rule implies that deviation from the inflation target is $\beta_1/\beta_2 = 3$ times more important than the output gap.

denominator. This naturally scales members that are more sensitive to inflation to the right of zero positions as "Inflation Hawks" and those to the left of the zero position as "Inflation Doves."

The original Taylor rule, as an aggregate normative policy rule, does not allow for the possibility that each individual member may have different levels of sensitivities. If we allow for variation across individuals, we can then estimate rather than stipulate β_1 and β_2 for all members. What this means is that we can position individual members on a scale representing different values of their trade-off. This allows us to systematically locate "Inflation Doves" on the left of the scale, "Inflation Hawks" on the right, and to locate other actors between.

The differential sensitivity of FOMC committee members to inflation and output changes are, of course, unobserved. With informative voting, we might be able to infer positions (Clinton, Jackman and Rivers, 2004). Since votes are relatively uninformative in the context of FOMC committee meetings, however, we need to look elsewhere for information. We show how to get relative emphasis from the proportion of words spent speaking about inflation topics versus output topics. We model the counts of words and phrases in the inflation and output topics respectively as $[c_1, c_2] \sim \text{Binomial}(p_1; N)$ where $p_i = P(c_1 \mid N)$ and $N = c_1 + c_2$. Topics not related to inflation or output can be ignored because they give no information about β_1/β_2.

Interpreting unobserved terms in the logistic regression model is an implementation of the "logit scaling" model. Logit scaling models are used, for example, in legislative ideal point estimation from manifesto text (Lowe et al., 2011). Logit scaling models are actually a two-category special case of a very general class of count data scaling models first developed by Goodman 1985. These models were rediscovered by political scientists (Slapin and Proksch, 2008) for scaling text (see Lowe, 2013, for details).

Clearly there are other systematic determinants of the proportion p_1 of speech on these topics. Although more elaborate models are certainly possible, we capture shared external shocks to committee rhetoric by adding meeting random effects. We assume that speakers' positions are also exchangeable and model them as draws from a population of committee members. These effects

provide our position estimates.

In the analyses below we first fit this model assuming that speaker positions do not change. After this, we examine over time changes in individual preferences. We pay particular attention to important members on the FOMC such as Greenspan, Bernanke, Giethner, and Yellen. Finally, we also show changes in estimated positions for FOMC members that voted against consensus at the end of 2006.

3.2 Estimating Topics using Words and Word Phrases

The unit of analysis is a "speaker-meeting." We construct the "speaker-meeting" by concatenating all speaker contributions per FOMC meeting between February 2005 and December 2007.

We use an n-gram topic model (Wang, Mccallum and Wei, 2007) to estimate the topics that central bankers talk about in FOMC meetings. The n-gram topic model is an extension of Latent Dirichlet Allocation (LDA Blei, Ng and Jordan, 2003) that allows for word phrases in addition to words. This is important because n-gram topic models can account for economic phrases such as "core inflation" and "price elasticity," which would otherwise be returned as "price," and "elasticity" using LDA approaches. Because many of the topics that FOMC members discuss reference underlying economic theories and concepts, the use of topic phrases is particularly helpful for organizing and classifying topics.

as in all topic models, a topic is modeled as a probability distribution or lottery over words and phrases. Fitting the model involves learning which topics tend to generate which words, and simultaneously inferring for each document the balance of topics being expressed within it. We use the topic-word and topic-phrase associations to identify and validate inferred topics and we use the estimated balance of topics within each speaker-meeting document as our data.

The Gibbs sampler used to fit the model draws from the posterior distribution of topic assignments within each document. Rather than normalize these counts to proportions, we use the counts directly as data for the measurement strategy. For example, this allows us to be more certain of

the topic balance – and therefore ultimately position – of of the document that has 75 inflation related words and 25 output/unemployment related words than we are a document that has 15 inflation related words and 5 unemployment/output related words, despite their having the same topic proportions.

Once we have an estimate of our topic words and topic phrases, we use these words and phrases to hand classify those topics that fit into the two variable Taylor rule– inflation and output/unemployment. Topics that are related to inflation are assigned as inflation and topics that are related to either output or unemployment are assigned as output/unemployment. The remaining topics are discarded.

In order to make sure that the results from the n-gram model that we use to extract topics are robust to different model choices, we run the n-gram model for different numbers of topics. Running the topic model for $\{5, 10, 25, 50\}$ topics, we find that $K = 25$ topics are sufficient to identify the relevant elements required by the Taylor rule. From our estimated 25 topics, we finally keep 4 topics – three covering different aspects of output and unemployment and one on inflation. It is important to note that this topic aggregation strategy will work well when K is relatively large, so that we have a larger number of relatively small but precisely estimated to aggregate. Many authors, (e.g. Chang et al., 2009) find that statistical measures of overall model fit are negatively correlated with substantive interpretability, so researchers may need to decide which to prioritize. We prefer models with good representation of our two core theoretical concepts.

To give a sense of what words and phrases are estimated to be generated by the topics we label output and inflation, we show the most likely five words and most likely five phrases associated with each topic:

- **Output/Unemployment:** productivity, compensation, energy, measured, hour, market psychology, large trucks, filter estimate, price elasticity, weekend strains

- **Inflation:** inflation, percent, year, time, don, basis points, core inflation, monetary policy,

inflation expectations, energy prices

Allowing n-grams to be generated by topics provides considerable help for experts attempting to identify which concept is captured by a topics. This is also helped by the fact that FOMC members work with a shared technical vocabulary. A pure 'bag of words' approach, such as a LDA, would make topic interpretation much more ambiguous and possibly compromise measurement validity.

One potential problem with the topic model approach is that words and word phrases do not, in themselves, provide insight into the underlying direction that committee members want inflation to move. It maybe more precise, therefore, to say that our model estimates how *much* members talk about inflation vs output/unemployment while assuming that those talking about inflation are talking about its dangers rather than its possible advantages. Currently, we assume that inflation words signify "Inflation Hawks" and output words signify 'Inflation Doves." In the case study section that follows the quantitative section, we show how our measure fits alongside with expressed preferences based on a reading of FOMC committee transcripts.

4 Results and Discussion

In this section we present results from combining the topic model and the scaling model and discuss our findings. A sub-sample of FOMC member ideal points are shown in Figure 1. We also examine the over time preferences of a sub-section of FOMC members. We find a number of important similarities and differences when compared to members' expressed dissents. Finally, we also report estimates of our shock parameters. The shock parameter estimates do a reasonably good job tracking changes in volatility over the course of the sample period. Also interesting is that confidence intervals of the dynamic preference estimates get wider during the crisis. These findings provide some evidence that our method is able to track changes in economic volatility with relatively good accuracy. FOMC members themselves recognize the impact of uncertainty on their ability to make policy. For example, in January 2007, Chair Bernanke said, "Our goal has

been, in some sense, to achieve a soft landing, and the question is whether we have missed the airport." (FOMC Meeting minutes, January 2007)

Figure 1 shows the estimates of a sub-sample of FOMC member ideal points. Each individual's estimate is a point prediction of their relative inflation preferences from a mixed model treating speakers as a draw from a wider population of central bankers, each with their own intercept, and controlling for the date of the meeting. The position of each speaker's intercept on the x-axis measures the degree of inflation aversion: that is, how willing a central banker is to forgo an increase in economic activity for a reduction in inflation, with those on the left hand side being relatively more *Inflation Dovish* than those *Inflation Hawkish* types on the right hand side.

The results are interesting in that they confirm previous measures of central bank estimates while still offering some new insights. The first surprise is that using speech data, Presidents Lacker (Richmond) and Plosser (Philadelphia) are estimated as having much more moderate inflation preferences than if we were to only consider their voting behavior. Lacker expressed official dissent of policy decisions a number of times during his tenure at the Fed. In 2006, for example, Lacker dissented in the August, September, October, and December meetings. In these meetings, the FOMC decided to keep interest rates the same whereas Lacker voted for additional interest rate tightening. Similarly, Plosser frequently dissents in favor of tighter monetary policy. The relatively high number of voting dissents would, using voting data, make estimates for both Lacker and Plosser relatively Hawkish. Our position estimates from topics, however, places Plosser just to the right of the center opinion, with Lacker squarely in the middle.[9]

Another interesting finding is that President Giethner is estimated as very Hawkish and significantly more Hawkish than both Chairman Bernanke and also Chairman Greenspan. This is important for two reasons. First, as President of the New York Fed, Giethner is perhaps more likely to represent the interests of the financial sector than other bank presidents; this suggests

[9]One important omission here is that we currently assume that central bankers are expressing their sincere as opposed to strategic topic preferences in their language. Future research should therefore try to disentangle any differences in sincere and strategic topics that may be currently entangled in the estimates of topic proportions.
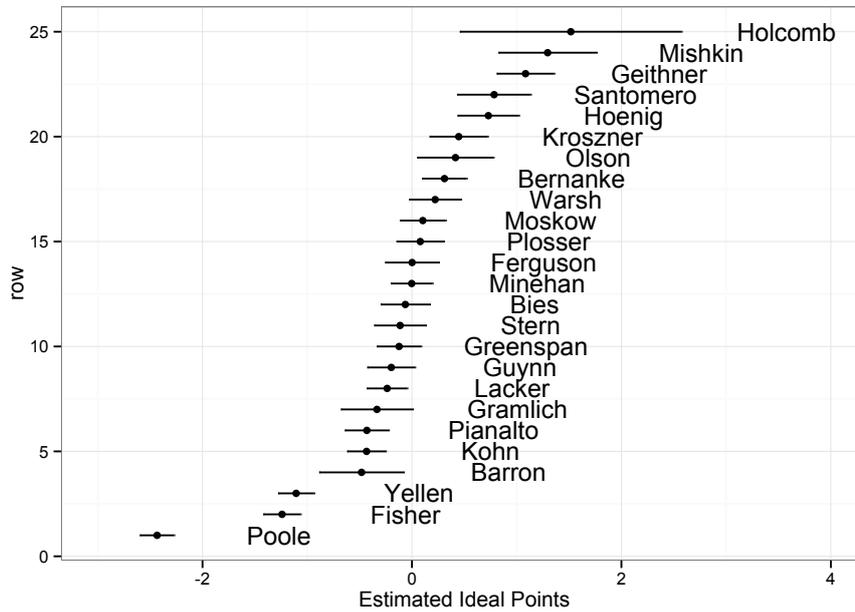
Figure 1: Estimated Fixed Ideal Point from Speech

some evidence that constituency effects matter. Second, the New York Federal Reserve Bank President always votes on the FOMC; this means that during his tenure at the FOMC, there was always an "Inflation Hawk" voting at every meeting.

Lastly, Chairman Greenspan straddles the middle position when compared against his two successors, Chairman Bernanke and Chair Yellen. Surprisingly, Bernanke is estimated as relatively more inflation adverse than either Greenspan or Yellen, whereas unsurprisingly, Yellen is estimated as more Dovish.

Do these fixed-point positional estimates really uncover noticeable differences in individual's inflation preferences as expressed in FOMC meetings? While the next section presents qualitative evidence from the FOMC, consider a couple of examples. Starting as early as February 2005, members on the FOMC debated whether or not the FOMC should adopt a numerical inflation target. Additionally, members were also asked to articulate their own perceptions of inflationary risks facing the U.S. economy. Moving from those members that we classify as relatively more

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"Inflation Dovish" to those members that we classify as relatively more "Inflation Hawkish," we find supportive evidence. For example, we find that both Yellen and Kohn suggested that while they were willing to consider a numerical inflation target, it was their belief that the committee needed to very clear articulate the dual mandate of inflation stability and maximum employment. What this means is that these two members wanted to emphasize output/unemployment in addition to inflation. Yellen, for instance, stated that she would be willing to accept a 1.5% target for core inflation, however, she also said that she thought "such a policy might be the first step along a slippery slope that ultimately undermines the Committee's mandate for maximum employment, as well as broader financial stability." Kohl, meanwhile, stated that he felt that inflation risks facing the U.S. economy were "on balance," implying that he did not see inflation as a major risk. During the same meeting, Hoenig suggested that he thought that inflation risk were much higher, mentioning that he expected core inflation to increase, and mentioning the phrases "inflation risks" and "increasing risk of inflation" a number of times in his speech. Similarly, Greenspan argued that he felt that people were "underestimating the potential inflation pickup." This suggests that Greenspan is more inflation adverse than the others. Such a ranking in individual's inflation preferences, from left to right, implies that Yellen and Kohl are Dovish and Greenspan and Hoenig are more Hawkish. While this is only illustrative evidence, it does also suggest that not only do FOMC members spend a significant time debating inflation during meetings, but also that committee members' appetites or sensitivities to "inflation risks" vary in accordance to estimated preferences recovered using the topic and scaling methods presented here.

While the ideal point estimates are interesting, they represent just a snapshot of a member's preferences and do not show how member's positions change over time. This is especially important for the people that switch from FOMC member to the Chair position, such as Bernanke and Yellen. Therefore, Figure 2 shows the estimated changes in FOMC member positions over time for a selection of members. The estimate where Bernanke is a horizontal line leading up to 2006 is when he is absent in the transcripts. In 2006, he changes role, going from "Mr. Bernanke" in

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the meeting minutes to "Chairman Bernanke." Interestingly, when Bernanke is appointed, according to our measure, he immediately becomes more centrist. Current Chair Yellen is consistently lower (more dovish) on inflation than Bernanke but both members, as expected, trend in the same direction over time. Unfortunately, however, due to the sample's time restriction, we cannot say whether or not Yellen moderates her position upon taking over the role of Chair.
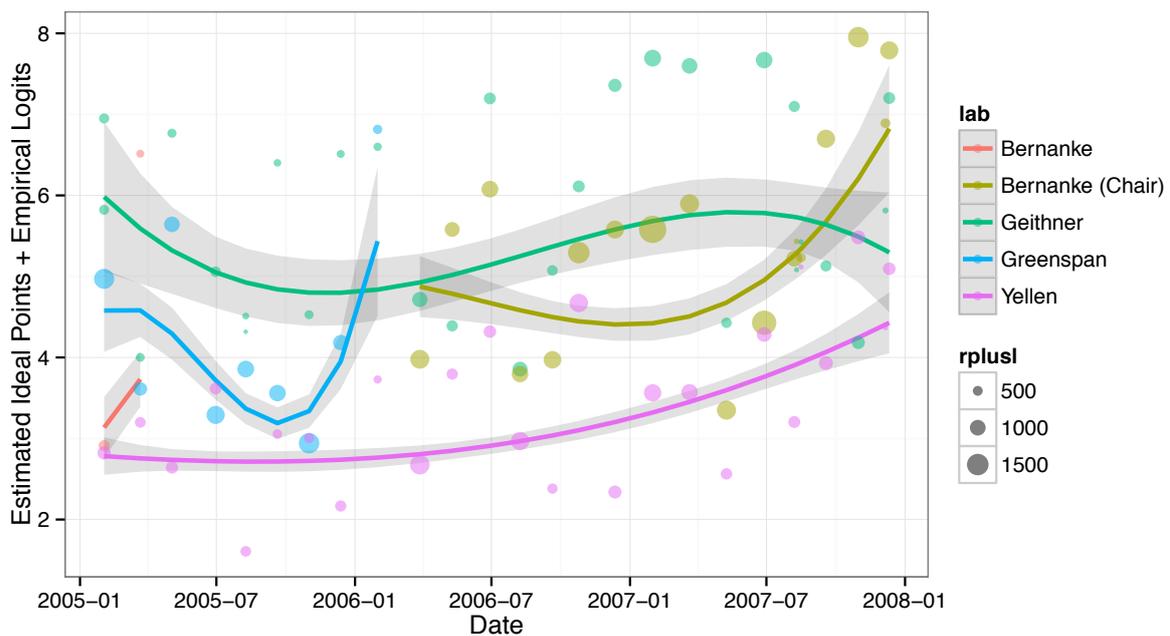

Figure 2: Estimated Dynamics of over-time changes in Preferences a Sample of FOMC Committee Members

Figure 2 shows that both Yellen and Bernanke became more "Inflation Hawkish," with an significant uptake in their estimated inflation aversion around midyear 2007. One way to see whether or not our measure is actually tracking changes in the relative weights these individuals place on inflation is to compare our estimates with inflation statements in the meeting transcripts. Below, we show verbatim inflation statements made by both Yellen and Bernanke for the 5 meetings in late 2007.

June 27-28 Meeting

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Yellen: Risks to inflation are also significant

Bernanke: Risks to inflation to the upside and remain the predominant concern

August 7 Meeting

Yellen: There is downside pressure on inflation

Bernanke: Risks to inflation remain on the upside

September 18 Meeting

Yellen: I lowered my inflation forecast slightly

Bernanke: I see less upside risk. I think the slowing that we are likely to see will probably remove some of the upside risk that we have been concerned about. But, I don't dismiss inflation risks by any means, and we know that policy changes can work through expectations as well as resource pressures, and so I consider that to be a serious concern

October 30-31 Meeting

Yellen: Inflation news has continued to be favorable but some upside risk has become prominent

Bernanke: If you wanted to be defensive about inflation, you could point out that the movement in oil prices and the dollar and so on is in part due to our actions. But it is also due to a lot of other things [...] That said, I share with Governor Warsh the concern that the visibility of these indicators day after day in financial markets and on television screens has a risk of affecting inflation psychology. I do worry about that. I think we should pay attention to that. So I do think that is a concern, and we obviously need to take it into consideration in our policies, in our statements, and in our public remarks.

December 11 Meeting

Yellen: [D]ata on the core measure continues to be favorable. Wage growth remains moderate, and the recent downward revisions to hourly compensation have relieved some worries there. Inflation expectations remain contained. As I mentioned, I expect some labor market slack to develop, and this should offset any, in my view, modest inflationary pressures from past increases in energy and import prices and help keep core PCE price inflation below 2 percent. Continued increases in energy and import prices pose some upside risk to the inflation outlook, but there are also downside risks to inflation associated with a weakening economy and rising unemployment.

Bernanke: With respect to inflation– again, people made these points as well– it is unfortunate that we do have some instability, some risks there. We saw some stabilization of the dollar over the past six weeks. That is obviously not exogenous. It depends on our behavior and our communication. I think oil prices depend also to some extent on our policy, directly or indirectly. We will be seeing some ugly near-term inflation numbers with oil price increases, which we hope will move out of the data shortly, but we're not sure. So obviously we have to watch that.

The most striking feature of the inflation discussion throughout this period is that, over the course of the 4 meetings, the meeting time spent on discussing inflation increases. If the proportion of time spent talking about inflation is a good proxy for greater inflation aversion, then the meeting transcripts move in the same direction as our estimates. Additionally, it is clear from speeches that, in all meetings, Bernanke is more Hawkish than Yellen. Again, this also corresponds to the estimates that we present in Figure 2.

One final estimate that we recover from our model is an estimate of shocks to the economy. We plot the m_t term over time. We see that there is a general trend over time in increasing shocks to the economy. As we will see in the qualitative section that follows, the US housing market began to collapse as early as the beginning of 2007. It is possible that Figure 3 picks up the lead-up and
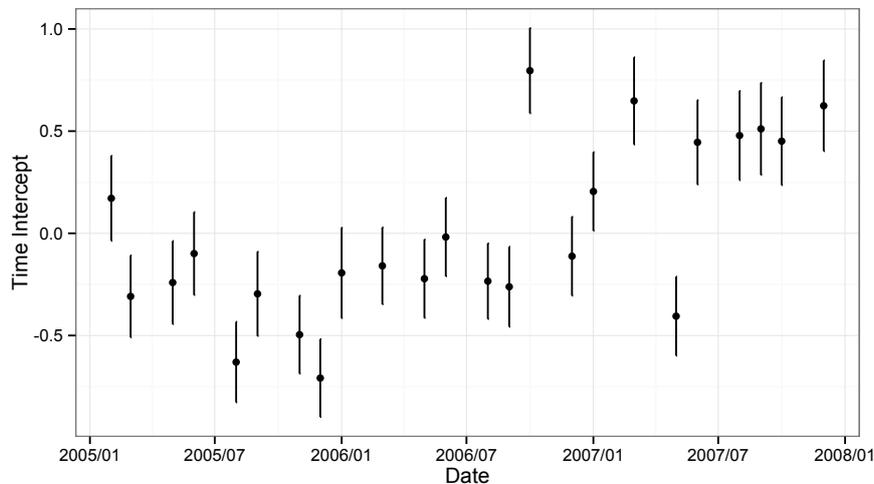
Figure 3: Estimated Shocks to the Economy

the collapse of the U.S. housing market. Again, such a finding gives us further confidence that what we are indeed uncovering with our estimates are substantive differences in preferences based on topics meanwhile accounting for changes in the evolution of the U.S. economy.

5 A Look inside the FOMC Meetings

During 2005, members on the FOMC gradually increased interest rates by 25 basis points each meeting. Committee members and the media sometimes refer to the gradual increase in interest rates at each meeting as following a "measured pace." The internal debate on the FOMC during this time concerns differences in opinions about the location of the neutral rate. The neutral monetary rate, or natural rate, is the federal funds rate that neither stimulates nor restrains economic growth. With the exception of hurricane Katrina, where both Olson (Board of Governors) and also Poole (St. Louis) ask to keep the federal funds rate the same, the 2005 meetings are uncontroversial. FOMC members generally consent to the measured pace increase in interest rates over the period and the internal debate on the committee focuses on disputes about where the ideal policy rate

target actually is.

At the start of 2006, the U.S. economy is doing well. During this period, committee members intensify their discussion about the committee's own uncertainty. One way that they decide to tackle this is to stress in their policy statements that future policy decisions will be "data driven" (a phrase that that is echoed in the statements almost 10 years later). As mid-year approaches, however, the housing market slows down and shocks to oil and food prices increase. Committee members start to express greater concerns about inflation risks. The uptick in concerns about inflation corresponds with an uptick in relatively more hawkish positions illustrated in Figure 3.
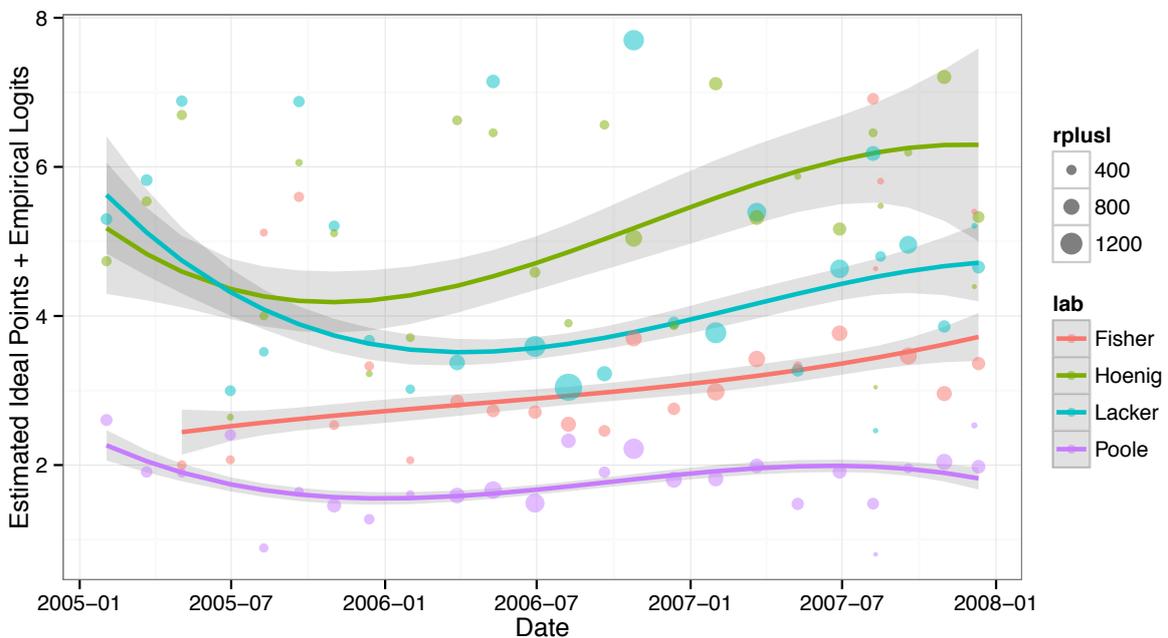

Figure 4: Estimated Over Time Ideal Points for Dissenters

Come August 2006, the committee finally decides to pause their measured pace increases in interest rates. Proposing the pause is Hoenig (Kansas), who, as we saw previously, is generally considered Hawkish. FOMC members Poole (St. Louis) and Fisher (Dallas) dispute the pause; in fact, they want, instead, an increase in interest rates of 50 basis points in May. Other members that want to a continuation of increasing interest rates include Lacker, Minehan, Moskow and Plosser.

These members want to continue raising the federal funds rate 25 basis points. Lacker publicly dissents with his vote in this meeting and continues to dissent in voting over the course of the next 4 meetings. Both Lacker and Poole dissent in September's meeting, and by October, Lacker remains the only dissenting voice. Lacker, in his final dissent in a series of dissents, pushes for a marginally higher federal funds rate in the December meeting whereas all other members are content to wait and see what will happen in the following year.

This evidence provides us with a inflation ranking with Lacker on the far right. How does this fit with our dynamic ideal point estimates? Our estimates place Hoenig as becoming increasingly inflation adverse starting as early as 2006. Using the methodology that we present here, we also find that for most of the period, while Lacker's preferences are estimated as inflation Hawkish, he is actually less extreme in speech than he is in votes. The fact that we see a more moderately positioned Lacker is interesting as this is exactly where we would expect to see differences.

In early 2007, the committee continues to pause. By August, the committee is increasingly worried that problems in the housing market are serious. Another problem that they are worried about is increasing energy prices and inflation. After two emergency conference calls, in late August 2007, the FOMC starts to act with its first of many cuts to the federal funds rate. It is here that, for the first time, members utter the the word "crisis" in the meeting transcripts.

The deterioration of the housing market, an increase in macroeconomic risks, and a depressing forecast of future growth means that the committee cuts the Federal funds rate by 50 basis points. Lacker and Fisher both suggest that the interest rate cut should only be 25 points in the September meeting. At the next meeting, Hoenig, Rosengren, Fisher, and Plosser all argue against the 25 basis point cut and insist that the committee should hold. In December, Hoenig and Plosser continue to recommend a hold. These expressed dissents continue to put both Plosser and Hoenig further on the Hawkish side with an uptick in inflation at the end of the year. Figure 4 shows not only the uptick but also the increase in uncertainty during this time.

On the left hand side, Kroszner, Mishkin and Yellen strongly support further interest rate cuts.

Rosengren also strongly prefers a cut of 50 basis points. Those members expressing support for a 50 basis cut include Yellen and Lockhart. The other members support the recommendation of 25 basis points cut.

In summary, during this time, we see a lot of variability in FOMC member's voting positions, which corresponds to our increase in uncertainty estimates in Figure 2. Whereas before, members were less concerned with inflation risks, at the start of 2007, inflation concerns pick up. By the end of the year, the housing market crisis is quickly becoming a financial crisis, and members have differing opinions. Some members, such as Rosengren become more Dovish, whereas others, like Hoenig become more Hawkish. At the end of 2007, uncertainty is higher and concerns about inflation risks are even higher. At the close of the year, a conference call in early December discusses the quickly unraveling crisis and members talk about alternative policy measures such as a reduction in the primary credit rate, the establishment of a term credit facility, and a term auction facility to attend to the pressures in credit markets. This discussion sets the stage for the extraordinary policy measures undertaken by the FOMC in 2008 as a response to the financial crisis.

6 Conclusion

This article demonstrates the utility in combining text as data and scaling methods to estimate the ideal point positions of economic policymakers when voting records are uninformative. In this article, we develop a new and powerful way to estimate central bank preferences on the FOMC based on topics of speech. Our major contribution is that we offer an estimate that is not based on voting behavior but instead, is based on what people say in FOMC meetings. By using textual information as data to help scale central bankers' preferences, this paper makes a number of important and exciting new discoveries.

We show that measures of central bank preferences that depend only on voting behavior may

actually over-emphasize the extremity of the positions taken by dissenting voters. For example, most expert surveys and other voting-based studies estimate President Lacker as an extreme Hawk. When we estimate Lacker's positions using our method, however, we find that Lacker's position is more moderate. One fruitful item for further research, therefore, is to further examine the relationship between dissenting in speech and dissenting in votes.

This paper shows the utility of bringing together n-gram topic models with positional analysis. In doing so, we believe that we provide a better estimate of what FOMC members want and show how what they want changes over time. In addition to presenting a way to use speeches and meeting conversations as textual data for estimating FOMC preferences, our results also provide some important policy implications for central banking. Starting in 2015, the Governing Council of the European Central Bank will shift to voting on rotation, modeled after the Federal Reserve System. In this paper, we exploit the fact that committee members who are not on rotation to vote are still able to express their opinions in speech and are perhaps even more likely to dissent than members not on schedule to vote. If an individual does dissent by voting and dissents a number of times, such as the sequence of Lacker's dissenting votes in 2006, attention to only votes can actually overemphasize extremeness in the committee member's preferences. Instead of looking at what committee members do, we look at what committee members say. By doing so, we find that Lacker is less Hawkish than researchers and Fed watchers may believe. As central bankers face incentives and constraints to behave in ways that both express dissent and repress dissent, we hope that this paper warns those interested in uncovering central bankers' preferences to think more critically about how expressed preferences are measured.

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