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ABSTRACT

This paper uses evidence from the Federal Open Market Committee's Summary of Economic Projections to show that US monetary policymakers have objectives over unemployment and inflation outcomes that are not well-approximated through a conventional quadratic loss function. Rather, policymakers derive material costs (benefits) from overshooting (undershooting) their long-run inflation and unemployment goals. The trade-off between the resultant downward tilts in unemployment and inflation played a key role in shaping the evolution of monetary policy choices since the Great Recession.

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1 Introduction

Monetary policy decisions are risky decisions. Easing monetary policy pushes up inflation and down on unemployment. But these effects occur only with a lag, and so their ultimate desirability is uncertain. Thus, the upward pressure on inflation could, depending on the nature of macroeconomic shocks, transpire in a future marked by above-target inflation or in a future marked by below-target inflation. Easing now is actually only desirable if the latter event occurs. How do monetary policymakers take this kind of risk (regarding either inflation or unemployment) into account in making their choices?

The standard answer among modelers in both academic and policy settings is that policymakers account for this risk through quadratic loss functions that are the expectation of squares of unemployment/inflation gaps (between medium-run outcomes and long-run targets). In this paper, I re-consider this conventional wisdom using data from the Federal Open Market Committee (FOMC)'s Summary of Economic Projections (SEP). As I explain in the next section, these projections can be seen as capturing the medium-run and long-run inflation/unemployment goals of FOMC participants. I show that these data are largely inconsistent with the assumption of quadratic loss. Instead, policymakers' projections typically imply that their objective functions have an additional non-quadratic loss term that assigns extra costs (benefits) from overshooting (undershooting) their long-run inflation and unemployment targets in the medium-run.

Tightening or easing monetary policy has conflicting effects on these extra non-quadratic unemployment and inflation losses. The data from the SEP implies that this trade-off is a key factor in understanding the FOMC's monetary policy choices. The downward (hawkish) inflation tilt is a critical factor in understanding policymaking by the Bernanke Fed. The (dovish) downward unemployment tilt is critical factor in understanding policymaking by the Yellen Fed. The Powell Fed's choices have been shaped by both kinds of considerations.

The policy relevance of objective function (a)symmetry has, in fact, long been recognized by the FOMC. In terms of inflation, the minutes from the October 2014 FOMC meeting state that " ... there was widespread agreement that inflation moderately above the Committee's 2 percent goal and inflation the same amount below that level were equally costly ...". This "pro-symmetry" perspective was later more formally adopted as part of the FOMC's monetary policy strategy in January 2016. However, we shall see that, as of 2022, the FOMC still struggles with its implementation.[1]

In terms of unemployment, the FOMC formally announced in August 2020 that its policy decisions would henceforth be informed by assessments of "*shortfalls* of employments from its maximum level". This announcement formalized the FOMC's view that its objective over unemployment was tilted downward. However, we shall see that, long before this official announcement, most FOMC participants' assessments of optimal monetary policy were already informed by this perspective.[2]

I close with some preliminary thoughts about how these results can be used to build better models of central banks.

2 The Summary of Economic Projections

The baseline data for this paper are drawn from the Summary of Economic Projections (SEP). This section provides a brief description of that data source.[3]

The SEP is a survey of FOMC meeting participants (the governors of the Federal Reserve System and the twelve Reserve Bank presidents). It collects their forecasts of the evolution of inflation and unemployment over the next two to three years, and (beginning in April 2009) their long-run forecasts for inflation and unemployment. But these are not forecasts in the usual sense of the word, as they are not conditioned on the policymaker's outlook for how the FOMC will choose monetary policy. Rather, each participant is asked to base their

[1]This challenge is nothing new. In the October 2014 meeting (in which the majority of the FOMC spoke in favor of a symmetric objective function with respect to inflation), Kocherlakota (2014, p. 196) noted that "sometimes it's hard to see that strong endorsement of symmetry in all of the communications that are coming out of the Committee."

[2]At a much earlier date, Kocherlakota (2014, p. 197) suggested a similar change to the FOMC's communication about its long run goals and strategies.

[3]See also Board of Governors of the Federal Reserve System (2023b) and links therein.

submission to the SEP on their own individual assessment of appropriate monetary policy. As a result, each participant's projections for inflation and unemployment actually describe the medium-run and long-run *targets* for those variables that he or she is aiming to achieve using the tools of monetary policy.

The SEP is collected at four FOMC meetings per year, and the Fed publicly releases a high-level summary of the participants' projections after each of these meeting. However, the Fed does not release individual-level projections for five years.[4] As a result, there is data on individual-level projections for the years 2009-17, but not for the years 2018-22 (the Powell years).

There is another quirk associated with the public disclosure of the SEP. Until 2016, the identities of the policymakers associated with the individual-level projections were hidden for *ten* years, not just for five. Hence, the public data only contains the name of the policymaker who made a given individual-level projection for the years 2009-12, and for the years 2016-17. (In January 2024, the FOMC will release individual-level projections, together with names of the associated policymakers, for the years 2013 and 2018.)

The timing of the SEP during the calendar year has evolved over the course of the past decade. From 2009-12, the SEP was conducted at the regularly scheduled January, April, June, and October/November meetings. Then, in 2013, the FOMC decided to change the timing of the SEP to the March, June, September, and December meetings.[5]

Finally, there is a built-in discontinuity in terms of the projection horizon in the SEPs. In the first half of a year (before July 1), the SEP contains fourth quarter projections for that year and the next two years. The SEPs in the second half of a year (after July 1) contain fourth quarter projections for that year and the next three years. So, there is a one-year jump in the ultimate projection in mid-year. I choose to place this discontinuity at the end

[4] More precisely, like the FOMC transcripts, all of the individual-level projections from year n are released in early in January of year $(n+6)$. This timing ensures that projections made late in year n only released with a five plus year lag.

[5] This change took place in mid-year, so that there are five SEPs in 2013 (January, April, June, September, and December). Also, because of Covid, there was no SEP conducted in March 2020.

of the calendar year. Thus, in any year n, I report projections for the fourth quarter of year $(n+2)$. This creates a one-year jump in the projection horizon from the last meeting of year n to the first meeting of year $(n+1)$.

3 Theory

This section describes a model of asymmetries in policymaker objective functions and their impact on projections made under appropriate monetary policy. The proofs of all propositions are in an Appendix.

3.1 Model

I consider a monetary policymaker who can choose interest rates or asset purchases. (For now, I abstract from the possibility of constraints on monetary stimulus. I return to this issue in Section 4.2.2.) Through these choices, the policymaker can influence the probabilistic outcomes of the unemployment rate over the medium run (next two to three years). Those realizations for unemployment in turn translate through a (stochastic) Phillips curve relationship into inflation outcomes.

Mathematically, the policymaker can use their tools at date t to freely choose any positive mean unemployment rate $\bar{u}_t$, so that the realized unemployment rate over the medium run is given by:

$$u_t = \bar{u}_t + \varepsilon.$$

Here, ε is a mean zero random variable with density f_t that has a support that is bounded from below by $-\bar{u}_t$. Note that the unemployment risk f_t is allowed to vary over time.

The realized unemployment rate u_t then translates into an inflation rate over the medium run according to a Phillips curve:

$$(\pi_t - \pi_t^*) = -\lambda_t(u_t - u_t^*) + \chi_t + \eta$$

Here, π_t^* represents the long-run inflation target for the policymaker, and u_t^* represents their long-run unemployment rate target. The parameter λ_t is positive, and will be called the slope of the Phillips curve. The parameter χ_t is a Phillips curve shifter that is known to the policymaker at date t. The variable η is a random shifter with conditional density $g_t(.|\varepsilon)$, such that g_t has mean zero for all ε.

The policymaker's choice of mean unemployment rate $\bar{u}_t$ thus implies a mean inflation rate $\bar{\pi}_t$ that is given by:

$$\bar{\pi}_t = \pi_t^* - \lambda_t(\bar{u}_t - u_t^*) + \chi_t$$

The realized inflation rate in two to three years is:

$$\pi_t = \bar{\pi}_t + \eta'$$

Here, $\eta' \equiv (\eta - \lambda\varepsilon)$ is a mean zero random variable with a probability density function h_t (which is implied by the densities f_t and g_t).

The long-run inflation target π_t^* and long-run unemployment rate target u_t^* are both embedded in the Phillips curve. The idea here is that the inflation target π_t^* will be pinned down by policymaker/central bank/legislative preferences (in practice, typically at 2%). Then, the policymaker's imputed unemployment rate target u_t^* is determined by a "unshocked" Phillips curve (in which $\chi_t = 0$ and the variance of η is zero).

As is typical, a policymaker's objective function includes a loss based on expected squared deviations from their long-run inflation target and expected squared deviations from their long-run unemployment rate target. What is novel is that the objective function includes an additional benefit for large undershoots and an additional loss for large overshoots.

Thus, the policymaker's objective function over inflation realizations is given by:

$$-\theta_{\pi t}(\pi_t - \pi_t^*)^2/2 + \Phi_{\pi t} B_\pi(\pi_t - \pi_t^*)$$

where $\theta_{\pi t} > 0$, and $\Phi_{\pi t} \geq 0$. Here, B_π is a function such that:

$$\begin{aligned} B_\pi(0) = B'_\pi(0) = &B''_\pi(0) = 0 \\ B'''_\pi(x) &< 0 \text{ for all } x \\ \Phi_{\pi t} B''_{\pi t}(x) - \theta_{\pi t} &< 0 \text{ for } x < 0 \end{aligned} \tag{1}$$

The restrictions on the level and first two derivatives of B_π ensure that the policymaker's objective function near zero is dominated by the standard quadratic component. However, the second component matters for larger values of $|x|$. The negativity of the third derivative of B_π implies that:

$$\begin{aligned} B_\pi(x) &< 0 \text{ if } x > 0 \\ B_\pi(x) &> 0 \text{ if } x < 0 \\ B'_\pi(x) &< 0 \text{ if } x \neq 0 \end{aligned}$$

The function B_π represents a loss when $x > 0$ and represents a benefit when $x < 0$. The restriction (1) implies that the policymaker's objective is concave.

Similarly, the policymaker's objective function over unemployment rate realizations is given by:

$$-\theta_{ut}(u_t - u_t^*)^2/2 + \Phi_{ut} B_u(u_t - u_t^*)$$

where $\theta_{ut} > 0$, $\Phi_{ut} \geq 0$, and B_u is a function such that:

$$B_u(0) = B'_u(0) = B''_u(0) = 0$$
$$B'''_u(x) < 0 \text{ for all } x$$
$$-\theta_{ut} + \Phi_{ut} B''_u(x) < 0 \text{ for } x < 0$$

Here, the policymaker receives a positive benefit $B_u(x)$ whenever unemployment is below target by $-x$ and endures a negative cost $B_u(x)$ whenever unemployment is above target by x. Overall, the policymaker's objective function will be said to be *skewed downward* with respect to inflation if $\Phi_{\pi t} > 0$ and with respect to unemployment if $\Phi_{ut} > 0$.

The policymaker's choice problem can now be summarized as follows. They seek to choose $\bar{u}_t$ so as to maximize:

$$-0.5 \int_{-\bar{u}_t}^{\infty} \theta_{ut}(\bar{u}_t + \varepsilon - u_t^*)^2 f_t(\varepsilon) d\varepsilon + \Phi_{ut} \int_{-\bar{u}_t}^{\infty} B_u(\bar{u}_t + \varepsilon - u_t^*) f_t(\varepsilon) d\varepsilon$$
$$-0.5 \int_{-\infty}^{\infty} \theta_{\pi t}(\bar{\pi}_t + \eta' - \pi_t^*)^2 + \Phi_{\pi t} \int_{-\infty}^{\infty} B_\pi(\bar{\pi}_t + \eta' - \pi_t^*) h_t(\eta') d\eta'$$

subject to the constraint that:

$$(\bar{\pi}_t - \pi_t^*) = -\lambda_t(\bar{u}_t - u_t^*) + \chi_t.$$

This problem has the first order condition:

$$0 = -\theta_{ut}(\bar{u}_t - u_t^*) + \Phi_{ut} \int_{-\bar{u}_t}^{\infty} B'_u(\bar{u}_t + \varepsilon - u_t^*) f_t(\varepsilon) d\varepsilon \tag{2}$$
$$+\lambda_t \theta_{\pi t}(\bar{\pi}_t - \pi_t^*) - \lambda_t \Phi_{\pi t} \int_{-\infty}^{\infty} B'_\pi(\bar{\pi}_t + \eta' - \pi_t^*) h_t(\eta') d\eta'$$

where we have made use of the restrictions that ε and η' both have mean zero. Define:

$$\omega_t^u = -\Phi_{ut} \int_{-\bar{u}_t}^{\infty} B'_u(\bar{u}_t + \varepsilon - u_t^*) f_t(\varepsilon) d\varepsilon \geq 0$$
$$\omega_t^\pi = -\lambda_t \Phi_{\pi t} \int_{-\infty}^{\infty} B'_\pi(\bar{\pi}_t + \eta' - \pi_t^*) h_t(\eta') d\eta' \geq 0.$$

These represent *endogenous downshifters* to unemployment and inflation. The derivatives B'_u and B'_π are both negative except at zero. Hence, the former downshifter is positive if and only if the policymaker's objective is skewed downward with respect to unemployment ($\Phi_{ut} > 0$) and the latter is positive if and only if the policymaker's objective is skewed downward with respect to inflation.[6]

Given these endogenous downshifters, we can write a policymaker's optimal projections for unemployment and inflation as:

$$(\bar{u}_t - u_t^*) = \frac{\lambda_t \theta_{\pi t} \chi_t + \omega_t^\pi - \omega_t^u}{\theta_{ut} + \lambda_t^2 \theta_{\pi t}} \tag{3}$$
$$(\bar{\pi}_t - \pi_t^*) = \frac{\theta_{ut} \chi_t - \lambda_t \omega_t^\pi + \lambda_t \omega_t^u}{\theta_{ut} + \lambda_t^2 \theta_{\pi t}} \tag{4}$$

As is standard, the (exogenous) Phillips curve shifter χ_t is partially absorbed into both unemployment and inflation projections. However, the policymaker's projections are also shaped by the difference $(\omega_t^\pi - \omega_t^u)$ between the two downshifters. If the difference is large and positive, then the policymaker's extra cost (benefit) from the risk of high (low) inflation is leading them to choose a negative inflation gap and positive unemployment gap. If the difference is large and negative, the policymaker's extra cost (benefit) from the chance of high (low) realized unemployment is leading them to choose a negative unemployment gap and a positive inflation gap.

[6] The analysis in the remainder of the paper actually only requires that $B'_\pi(x) < 0$ almost everywhere. Hence, I could have allowed the second non-quadratic component to simply be a negative linear function (as modeled, for example, in Gali (2015, Chapter 5). The formulation in this paper is intended to capture my alternative perception that the downward skewness is driven primarily by policymakers' reactions to large deviations from target.

3.2 Symmetric Objectives: Qvigstad's Criterion

This subsection considers the characteristics of optimal projections when $\Phi_{ut} = \Phi_{\pi t} = 0$, so that there is no downward skewness in the inflation or unemployment objectives.

In this case, (3)-(4) imply that:

$$\frac{(\bar{u}_t - u_t^*)}{(\bar{\pi}_t - \pi_t^*)} = \frac{\lambda_t \theta_{\pi t}}{\theta_{ut}}. \tag{5}$$

It follows immediately that the sign of $(\bar{u}_t - u_t^*)$ and the sign of $(\bar{\pi}_t - \pi_t^*)$ must be the same. This characterization - that optimal projections must have gaps with the same sign - is known as Qvigstad's criterion.[7] We shall see that it is often violated by FOMC projections, which implies the existence of downward skewness toward inflation or unemployment.

3.3 Color-Coding Projections

In this section, I use the general model (with asymmetries) to partition observed policymaker projections for inflation and unemployment into five different color-coded subsets. The elements of the partition differ in terms of what the relevant projections imply about the skewnesses of the unemployment and inflation loss functions. The subsets' colors are meant to suggest how "cold' (purple and blue) or "hot" (red or orange) the economy is running.

3.3.1 Purple Projections

The purple projections are a situation in which the economy is running cold in terms of both inflation and unemployment. The projections satisfy the following conditions:

- the projected unemployment rate $\bar{u}_t$ is weakly above target u_t^*.
- the projected inflation rate $\bar{\pi}_t$ is weakly below target π_t^*.
- one of the above inequalities is strict

[7] See Qvigstad (2006) and Yellen (2012).

Notice that a purple projection doesn't satisfy the Qvigstad criterion. The following proposition shows that the purple projections then imply that the policymaker's objective function must be skewed downward with respect to inflation.

Proposition 1. *Suppose that a policymaker's projection is purple. Then the inflation downshifter ω_t^π is greater than the unemployment downshifter ω_t^u, and the policymaker's objective function for inflation is skewed downwards ($\Phi_{\pi t} > 0$).*

A shock to χ_t shifts the unemployment and inflation gaps in the same direction. To move the unemployment gap upward, while pushing the inflation gap downward, the difference $(\omega_t^\pi - \omega_t^u)$ must be positive. But this can only happen if the policymaker perceives an extra cost (benefit) from high (low) inflation ($\Phi_{\pi t} > 0$).

Purple projections could also be the result of a policymaker with a symmetric objective who faces a binding constraint on monetary policy easing. I will consider this possibility in some detail in Section 4.2.2, but ultimately dismiss its relevance.

3.3.2 Blue Projections

The blue projections represent a situation in which the economy is running cold with respect to unemployment, but running hot with respect to inflation. The projections satisfy the following two conditions:

- the unemployment rate $\bar{u}_t$ is strictly above target u_t^*
- the inflation rate is rate $\bar{\pi}_t$ is strictly above target π_t^*.

A blue projection is consistent with Qvigstad's criterion. Accordingly, the following proposition shows that a blue projection can be viewed as optimal by a policymaer with a purely quadratic objective that assigns sufficient weight to unemployment gaps relative to inflation gaps.

Proposition 2. *Suppose the projection is blue. There exists $(\chi_t, \theta_{\pi t}, \theta_{ut})$ such that the projection is optimal for a policymaker for whom $\Phi_{\pi t} = \Phi_{ut} = 0$. If the projection is blue and it* *is known that:*

$$\frac{\theta_{\pi t}}{\theta_{ut}} < \frac{(\bar{u}_t - u_t^*)}{\lambda_t(\bar{\pi}_t - \pi_t^*)},$$

then $(\omega_t^\pi - \omega_t^u) > 0$ *and the policymaker's objective is skewed downward with respect to inflation* $(\Phi_{\pi t} > 0)$.

Given a blue projection, the policymaker could reduce their quadratic loss by easing monetary policy if the unemployment gap is sufficiently large relative to the inflation gap. The policymaker foregoes that improvement in their objective because they have an extra cost (benefit) from above-target (below-target) inflation.

3.3.3 Green Projections

The green projections represent a situation in which the unemployment rate and the inflation rate are both projected to be at target:

$$\bar{u}_t = u_t^* \text{ and } \bar{\pi}_t = \pi_t^*$$

A green projection implies that either the policymaker's objective functions over inflation and unemployment are either both symmetric or both skewed.

Proposition 3. *Suppose the projection is green. Then:*

$$\chi_t = 0 \textit{ and } \omega_t^\pi = \omega_t^u.$$

The policymaker makes a green projection if $\chi_t = 0$ and the risks of inflation/unemployment overshooting are viewed as balanced.

3.3.4 Orange Projections

Orange projections represent a situation in which the economy is running hot with respect to unemployment, but cold with respect to inflation. The projections satisfy the following two conditions:

- the unemployment rate $\bar{u}_t$ is strictly below target u_t^*
- the inflation rate is rate $\bar{\pi}_t$ is strictly below target π_t^*.

An orange projection is consistent with Qvigstad's criterion. Accordingly, the following proposition shows that an orange projection can be viewed as optimal by a policymaer with a purely quadratic objective that assigns sufficient weight to unemployment gaps relative to inflation gaps.

Proposition 4. *Suppose the projection is orange. There exists* $(\chi_t, \theta_{\pi t}, \theta_{ut})$ *such that the projection is optimal for a policymaker for whom* $\Phi_{\pi t} = \Phi_{ut} = 0$. *If the projection is orange and it is known that:*

$$\frac{(u_t^* - \bar{u}_t)}{\lambda_t(\pi_t^* - \bar{\pi}_t)} > \frac{\theta_{\pi t}}{\theta_{ut}}$$

then $(\omega_t^u - \omega_t^\pi) > 0$ *and the policymaker's objective is skewed downward with respect to unemployment* $(\Phi_{ut} > 0)$.

Given an orange projection in which the unemployment gap is large relative to the inflation gap, the policymaker's quadratic loss can be reduced by *tightening* monetary policy so as to bring the unemployment rate closer to target. The policymaker is foregoing that option because they perceive an additional benefit (cost) from lower (higher) unemployment.

3.3.5 Red Projections

The policymaker's projections are red if they imply that the economy is running hot in terms of both unemployment and inflation. Specifically, a red projection satisfies the following conditions:

- the projected unemployment rate $\bar{u}_t$ is weakly below target u_t^*.
- the projected inflation rate $\bar{\pi}_t$ is weakly below target π_t^*.

- one of the above inequalities is strict

Notice that a red projection does not satisfy the Qvigstad criterion. The following proposition shows that a red projection implies that that the policymaker's objective function must be skewed downward with respect to unemployment.

Proposition 5. *Suppose that the projection is red. Then the unemployment downshifter ω_t^u is larger than the inflation downshifter ω_t^π, and the objective function for unemployment is downwardly skewed ($\Phi_{ut} > 0$).*

3.3.6 Summary

This section partitions all possible policymaker projection pairs for unemployment and inflation into five subsets labelled purple, blue, green, orange, and red. The purple (red) projections imply that the policymaker's objective is skewed downward with respect to inflation (unemployment). The blue projections imply that the policymaker's objective can be quadratic, but only if it puts sufficiently more weight on inflation deviations compared to unemployment deviations. Similarly, the orange projections imply that the policymaker's objective can be quadratic, but only if it puts sufficiently more weight on inflation deviations compared to unemployment deviations.

3.4 Bounding the Relative Weights in the Quadratic Loss Function

Propositions 2 and 4 have conditions that are based on the relative weights ($\frac{\theta_{\pi t}}{\theta_{ut}}$) on inflation/unemployment gaps in the policymaker's quadratic loss component. Different modelers have used a range of relative weights. In a recent paper, Bernanke, et al. (2019) use an objective that puts equal weights on squared inflation gaps and output gaps. However, Okun's Law tells us that output gaps tend to be about twice as large in absolute value as unemployment gaps. Hence, Bernanke, et al. (2019)'s formulation translates into a policymaker objective that puts about four times as much weight on squared unemployment gaps than on squared inflation gaps.

Evans (2011) emphasizes this same point about Okun's Law. He argues that a conservative central banker (of the kind that Rogoff (1985) had in mind) would focus more on inflation than the above weighting would allow. Evans (2011) instead uses a model that in which the central bank's loss function puts *equal* weight on squared unemployment gaps and on squared inflation gaps.

Finally, in the Tealbook[8] Part B (June 2016), the FOMC staff considers a range of possible objectives. They treat a quadratic loss function that puts five times as much weight on squared inflation gaps as on squared unemployment gaps as being one kind of inflation-conscious extreme.

With all of the above in mind, I will (slightly arbitrarily) treat 3 as an upper bound on $(\frac{\theta_{\pi t}}{\theta_{ut}})$ in the remainder of the analysis.

4 Data Analysis

This section applies the results from Section 3 to the SEP described in Section 2 to reach conclusions about the objective functions of US monetary policymakers.

4.1 The US Macroeconomy (2009-2022)

This subsection provides a quick refresher on the behavior of US macroeconomic variables and monetary policy choices over the past fourteen years.

4.1.1 Inflation and Unemployment

Figure 1 depicts the quarter-to-quarter behavior of the rate of increase in core Personal Consumption Expenditure (PCE) inflation relative to the prior year. (I use core PCE inflation for two (standard) reasons. First, the Federal Open Market Committee's long-run annual inflation target is in terms of PCE inflation. Second, over the medium run, the FOMC tends

[8]Tealbook Part B consists of the supporting materials prepared by staff for the policy discussion within the FOMC meeting.

to focus on core inflation as a way to "look through" purely transitory fluctuations due to gasoline prices.) Figure 1 shows that core PCE inflation ran below, or at most very slightly above, the FOMC's current inflation target of 2% for most of this period. But in 2021, core PCE inflation rose sharply and remains well above the 2% target.

Figure 2 depicts the quarter-to-quarter behavior of the civilian unemployment rate. The unemployment was in double digits in late 2009, and fell only slowly to pre-Great Recession levels (around 4.5%) in early 2017. It then continued to fall until late 2019, before shooting upwards during the early phase of the Covid pandemic in spring 2020. But the unemployment rate recovered rapidly (in less than two years) from that shock to return to pre-Covid levels throughout 2022.

4.1.2 Monetary Policy Timeline

This paper is about the evolution of the policy objectives of the Federal Reserve, and is not about the evolution of its settings of its policy tools. However, it is useful to keep the latter in mind while interpreting the former. Accordingly, in this subsection, I sketch the evolution of monetary policy from 2009-2022.

Figures 3 and 4 depict the quarterly evolution of the effective funds rate ("the interest rate") and Federal Reserve asset holdings. The following page has a related timeline of events.

US Monetary Policy Timeline, 2009-2022

In April 2009, Bernanke is chair (as he has been since January 2006). Thereafter:

- **April 2009-May 2013**: Interest rates are at the effective lower bound. There are sporadic bouts of easing through asset purchases and forward guidance.
- **May 2013-October 2015**: Interest rates are at the effective lower bound. There are sporadic bouts of tightening through asset purchase reductions and changes to forward guidance.
  - **February 2014: Yellen becomes chair**.
- **December 2015-July 2019:** Sporadic and gradual interest rate increases.
  - **February 2018: Powell becomes chair**.
- **July 2019-January 2020:** Gradual easing of monetary policy via interest rate reductions.
  - **February 2020**: Covid hits the US.
- **March 2020-March 2022**: Dramatic easing of monetary policy, as interest rates are lowered and kept at the effective lower bound. Massive asset purchases. There is aggressive use of pro-inflation forward guidance.
- **March 2022-January 2023**: Rapid tightening of monetary policy, as interest rates are increased are sharply. There is aggressive use of anti-inflation forward guidance.

4.2 The Bernanke Fed (2009-2013)

In this subsection, we analyze the FOMC's two-year-ahead projections for April 2009 through December 2013 (Bernanke's last meeting in which the FOMC issued a SEP). During most of this period of time, the US was either in a recession or in the throes of a painfully slow recovery. We shall see that the Bernanke Fed projections imply that policymakers' objective functions were skewed downward with respect to inflation.

4.2.1 Inflation Downward Skewness

Table 1 describes the median SEP two-year-ahead projections[9] for the various meetings from April 2009-December 2013. They are all coded purple, meaning that the projections can only be rationalized with a downwardly skewed inflation objective.

Figure 5 depicts the (relatively limited) heterogeneity underlying these medians. Until December 2012, the projections are either purple or blue. The blue projections are potentially consistent with an inflation objective that is not downwardly skewed. However, suppose as argued in Section 3.4 that the policymaker's quadratic loss function puts no more than three times as much weight on inflation deviations as on unemployment deviations. The numerical entries in Table 2 then show that the projections imply that there is downward inflation skew through 2012.

In 2013, there is more heterogeneity. However, purple projections are still clearly dominant. One or two policymakers' projections are coded red at each meeting, implying that their objective functions with respect to *unemployment* are skewed downward. (This finding does not rule out the possibility that they also have downward inflation skewness. But in that case, the unemployment shifter is larger than the inflation downshifter.)

The final rows of Table 1 and Figure 5 include a three-year-ahead projection from December 2013 to the fourth quarter of 2016. This is to afford a sharper comparison to the March

[9]Throughout this section, I use the term "two-year-ahead projections" to refer to projections in calendar year n about the fourth quarter of year $(n + 2)$. For SEPs conducted early in a calendar year, the relevant horizon is closer to three years than two.

2014 two-year-ahead projection at the beginning of the Yellen Fed. The median projection is purple (although the gap are small). However, there is considerably more heterogeneity than earlier in the Bernanke Fed: nearly half of the policymakers have projections that are coded green, orange or red rather than purple.

4.2.2 Absence of Binding Constraints

Suppose a policymaker faces restrictions or non-economic costs on easing further. That policymaker might find that their appropriate monetary policy choices would give rise to a purple projection (above-target unemployment and below-target inflation). Can we interpret the purple projections during the 2009-13 time frame in this light?

The evidence strongly suggests otherwise. It is true that the FOMC's typical instrument was constrained: the fed funds rate was at the effective lower bound throughout this period. However, at any time, the FOMC could have chosen (and sporadically did) choose to expand its holdings of long-term assets so as to lower their yields. Moreover, the FOMC consistently communicated its intentions to raise interest rates when the unemployment rate was considerably elevated. This was especially so in the 2009-10 period (Kocherlakota (2017)). But, even as late as December 2013, the FOMC's median two-year-ahead projection for the fed funds rate was above 0.5%, while at the same time its median two-year-ahead projection for the unemployment rate was near 6%.

Here's the simplest way to describe the considerable possibilities for easing that were available to the FOMC during this 2009-13 period. Its actual policy strategy turned out to be one of keeping the fed funds rate below 0.5% until the last meeting of 2016. At that date, the FOMC's (median) two-year-ahead projection was that the unemployment rate would be 4.5% and inflation would be at target. It could always have provided (potentially a lot!) more easing in the 2009-2013 time frame by communicating what was eventually its true "willing to wait until the unemployment rate is well below 5%" strategy to the public.

4.3 The Yellen Fed (2014-17)

Table 2 describes the median two-year-ahead projections from the Yellen Fed SEPs (March 2014-December 2017). In all but three meetings, the median inflation projection is at target. At most of those "inflation at target" meetings, the median unemployment rate projection is below its projected long-run level. This combination implies that the median Yellen Fed projection is based on an unemployment objective function that is skewed downward. At the other "inflation at target" meetings, the median unemployment rate projection is at its long-run level. These green meetings are ones in which the median Yellen Fed projection is balancing the extra benefit from low unemployment outcomes against the extra cost from the elevated inflation outcomes.

Figure 6 describes the heterogeneity in projections at each Yellen Fed meeting. The heterogeneity is considerable in the first six meetings (March 2014-June 2015). There is no clear evidence in these projections that the majority of policymakers have unemployment objectives that are downwardly skewed. However, in the next ten meeting, the projections are largely either orange or red. Moreover, in the orange-coded meetings, the policymakers' projections also imply objective functions with downward skewness with respect to unemployment, unless policymakers' quadratic loss functions weight inflation misses more than three times as much as unemployment misses.

4.4 Panel (2009-12, 2016-17)

Figure 7 constructs of panel of color-coded projections for policymakers using information from April 2009-December 2012, and from March 2016-December 2017. It makes the following points.

First, in the 2009-12 period, policymakers' projections are purple and so are consistently reflective of downward inflation skewness. The one exception is Charles Plosser, whose projections were blue until early 2012.. However, his blue projections must also be a product of downward inflation skewness unless his baseline quadratic loss function puts at least five times as much weight on inflation deviations as on unemployment deviations.

Second, in the Yellen Fed period, most policymakers' projections are orange or red. The red projections imply that policymakers' objective functions are downwardly skewed with respect to unemployment. (They may also be downwardly skewed with respect to inflation, but the unemployment downshifter is larger than the inflation downshifter.)

The orange projections in the Yellen Fed period are potentially consistent with non-skewed objectives. However, with one exception (Tarullo), the majority of each policymakers' projections in 2016-17 satisfy at least one of two properties:

- they are red
- they are orange with numerical entries larger than 3.

The numerical entries are the (minimal) weighting on inflation gaps relative to unemployment gaps needed in a quadratic objective to rationalize the projection in the absence of skewness. (As the Table notes, the entries are based on a Phillips curve slope of -1/3 and would be larger with a flatter Phillips curve.) Given the discussion of relative weights in Section 3.4, any projection that satisfies either of these properties should be seen as reflecting downward skewness with respect to unemployment.

Most importantly: over the full period, the following ten policymakers made both purple and red projections: Bullard, Dudley, Evans, George, Lacker, Lockhart, Powell, Rosengren, Williams, and Yellen. These policymakers seem to have both inflation and unemployment skewness in their objective functions. Their policy choices imply that their inflation-unemployment downshifter difference $(\omega_t^\pi - \omega_t^u)$ was positive for meetings in the 2009-12 period and was negative for meetings in 2016-17 period. Of policymakers who submitted projections during both periods of time, only Tarullo had purple projections without also having red projections at other meetings. No policymaker had a red projection at any meeting without having purple projections at other meetings.

4.5 The Powell FOMC (2018-22)

I close by discussing the projections for the Powell FOMC. There is some need for caution, as the Federal Reserve has so far only released high-level summary statistics[10] for these SEPs. Nonetheless, the median projections do provide valuable information about Committee intentions.

Table 3 contains the median two-year-ahead projections for inflation and unemployment for each Powell FOMC meeting. The first two (pre-Covid) years of meetings are all coded red. These choices can only be rationalized through an objective friction that is downwardly skewed with respect to unemployment.

In March 2020, with the onset of Covid, the FOMC did not release an SEP. In the remainder of 2020, the FOMC's median projections are all coded purple. This coding reflects the kind of downward skewness with respect to inflation that we saw earlier under Bernanke.[11] This skewness in its objective seems contrary to the formal adoption of inflation symmetry in January 2016.

The color coding flips to red in 2021, so that the FOMC's objective is now exhibiting the same downward skewness toward unemployment as it did before Covid. This downward skewness was formally adopted as an FOMC principle in 2020.

Beginning in June 2022, the Powell FOMC has been aiming for above-target inflation and above-target unemployment. These are the first median projections that we have seen that are coded blue. They are consistent with the FOMC's potentially having a symmetric objective with respect to inflation. However, the high numerical cutoffs for the last two SEP meetings of 2022 suggest that the projections are being driven by at least some downward skewness with respect to inflation.

[10] The individual-level projections underlying the 2018 SEPs will be released in January 2024. We will not see the more interesting individual-level projections from the Covid era until January 2026 and January 2027.

[11] But, just as we saw earlier with the Bernanke FOMC, the Powell FOMC could eased further simply by communicating what proved to be its true policy reaction function. Thus, Powell suggested during the December 2020 press conference that the FOMC would initiate its first lift-off when "inflation was reaching 2 percent and on track to exceed 2 percent." In fact, the FOMC waited until PCE core inflation was nearly *5 percent* before raising rates above the effective lower bound in March 2022.

5 Conclusions

I close with some preliminary thoughts about the implications of the above findings for modeling central banks.

The paper treats the additional cost (benefit) of overshooting (undershooting) as a black box. However, it is possible to gain some insight into the Federal Reserve's thinking about this non-quadratic component through its verbal communications. In terms of inflation, it seems likely that this term captures a two-stage risk. In the first stage, above-target inflation could lead "inflation to become unmoored" (Bernanke (2011, p. 14)) or "inflation to become entrenched" (Powell (2022)). In the second stage, central bankers are concerned about the follow-up need to bring down inflation expectations through a harsh Volckerian recession. As Bernanke (2011, p. 14) says, "the cost of that in terms of employment loss in the future, as we had to respond to that, would be quite significant." This composite risk is also oft-discussed in academic circles, but is not part of benchmark models of monetary policy.

In terms of low unemployment, the Federal Reserve views the additional benefit B_u as representing the potentially large gains from a "hot" labor market for demographic groups (such as Black people) who face barriers to employment (Brainard (2020)). Benchmark macroeconomic models in the academic world currently entertain no possibilities of this kind.

Appendix

This appendix contains the proofs of Propositions 1-5.

Proof of Proposition 1

Suppose that the downshifter difference $(\omega_t^\pi - \omega_t^u) \leq 0$. Then, since $\bar{u}_t \geq u_t^*$, the optimality condition (3) implies that:

$$\lambda_t \theta_{\pi t} \chi_t \geq (\omega_t^u - \omega_t^\pi) \geq 0$$

Since $\bar{\pi}_t \leq \pi_t^*$, the optimality condition (4) implies that:

$$0 \geq \theta_{ut}\chi_t + \lambda_t(\omega_t^u - \omega_t^\pi) \geq (\theta_{ut}\lambda_t^{-1}\theta_{\pi t}^{-1} + \lambda_t)(\omega_t^u - \omega_t^\pi) \geq 0$$

Hence, $\omega_t^u - \omega_t^\pi = 0$. But this means $(\bar{u}_t - u_t^*)$ has the same sign as $(\bar{\pi}_t - \pi_t^*)$, which is a violation of the projection being purple. It follows that $(\omega_t^\pi - \omega_t^u) > 0$ and that $\Phi_{\pi t} > 0$.

Proof of Proposition 2

Define:

$$\chi_t = (\bar{\pi}_t - \pi_t^*) + \lambda_t(\bar{u}_t - u_t^*)$$
$$\theta_{\pi t} = \frac{1}{\lambda_t}(\frac{\bar{u}_t - u_t^*}{\bar{\pi}_t - \pi_t^*})$$
$$\theta_{ut} = 1$$

Given this specification of $(\chi_t, \theta_{\pi t}, \theta_{ut})$, $(\bar{u}_t, \bar{\pi}_t)$ satisfy the first order conditions

$$(\bar{u}_t - u_t^*) = \frac{\lambda_t \theta_{\pi t} \chi_t}{\theta_{ut} + \lambda_t^2 \theta_{\pi t}} \tag{6}$$

$$(\bar{\pi}_t - \pi_t^*) = \frac{\theta_{ut} \chi_t}{\theta_{ut} + \lambda_t^2 \theta_{\pi t}} \tag{7}$$

and so are optimal for a policymaker for whom $\Phi_{\pi t} = \Phi_{ut} = 0$.

In terms of the second part of the Proposition, the Phillips curve implies that:

$$\chi_t = (\bar{\pi}_t - \pi_t^*) + \lambda_t(\bar{u}_t - u_t^*) > 0$$

when the projection is blue. It then follows from the optimality conditions (3) and (4) that:

$$\frac{(\bar{u}_t - u_t^*)}{(\bar{\pi}_t - \pi_t^*)} = \frac{\lambda_t \theta_{\pi t} \chi_t + \omega_t^\pi - \omega_t^u}{\theta_{ut} \chi_t - \lambda_t \omega_t^\pi + \lambda_t \omega_t^u} \tag{8}$$

We shall prove the contrapositive. Suppose that $\omega_t^\pi \leq \omega_t^u$. Then (8) implies that:

$$\frac{(\bar{u}_t - u_t^*)}{(\bar{\pi}_t - \pi_t^*)} \leq \frac{\lambda_t \theta_{\pi t} \chi_t}{\theta_{ut} \chi_t} = \frac{\lambda_t \theta_{\pi t}}{\theta_{ut}}$$

This proves the proposition.

Proof of Proposition 3

Suppose the projection is green. Then:

$$\lambda_t \theta_{\pi t}^H \chi_t = \omega_t^u - \omega_t^\pi$$

$$\theta_{ut}^H \chi_t = \lambda_t(\omega_t^\pi - \omega_t^u)$$

It follows that $\chi_t = 0$ and $\omega_t^u = \omega_t^\pi$.

Proof of Proposition 4

Define:

$$\chi_t = (\bar{\pi}_t - \pi_t^*) + \lambda_t(\bar{u}_t - u_t^*)$$
$$\theta_{\pi t} = \frac{1}{\lambda_t}(\frac{\bar{u}_t - u_t^*}{\bar{\pi}_t - \pi_t^*})$$
$$\theta_{ut} = 1$$

Given this specification of $(\chi_t, \theta_{\pi t}, \theta_{ut})$, $(\bar{u}_t, \bar{\pi}_t)$ satisfy the first order conditions

$$(\bar{u}_t - u_t^*) = \frac{\lambda_t \theta_{\pi t} \chi_t}{\theta_{ut} + \lambda_t^2 \theta_{\pi t}} \tag{9}$$
$$(\bar{\pi}_t - \pi_t^*) = \frac{\theta_{ut} \chi_t}{\theta_{ut} + \lambda_t^2 \theta_{\pi t}} \tag{10}$$

and so are optimal for a policymaker for whom $\Phi_{\pi t} = \Phi_{ut} = 0$.

In terms of the second part of the proposition, the Phillips curve implies that:

$$\chi_t = (\bar{\pi}_t - \pi_t^*) + \lambda_t(\bar{u}_t - u_t^*) < 0$$

when the projection is orange. It then follows from the optimality conditions (3) and (4) that:

$$\frac{(u_t^* - \bar{u}_t)}{(\pi_t^* - \bar{\pi}_t)} = \frac{-\lambda_t \theta_{\pi t} \chi_t - \omega_t^\pi + \omega_t^u}{-\theta_{ut} \chi_t + \lambda_t \omega_t^\pi - \lambda_t \omega_t^u} \tag{11}$$

We shall prove the contrapositive. Suppose that $(\omega_t^u - \omega_t^\pi) \leq 0$. Then, (11) implies that:

$$\frac{(u_t^* - \bar{u}_t)}{(\pi_t^* - \bar{\pi}_t)} \leq \frac{-\lambda_t \theta_{\pi t} \chi_t}{-\theta_{ut} \chi_t} = \frac{\lambda_t \theta_{\pi t}}{\theta_{ut}}.$$

The proposition follows.

Proof of Proposition 5

Suppose that $\omega_t^u \leq \omega_t^\pi$. Then, since $\bar{\pi}_t \geq \pi_t^*$, the optimality condition (4) implies that:

$$\theta_{ut}\chi_t \geq \lambda_t(\omega_t^\pi - \omega_t^u) \geq 0.$$

Since $\bar{u}_t \leq u_t^*$, the optimality condition (3) implies that:

$$0 \geq \lambda_t\theta_{\pi t}\chi_t + (\omega_t^\pi - \omega_t^u) \geq (\lambda_t^2(\frac{\theta_{\pi t}}{\theta_{ut}}) + 1)(\omega_t^\pi - \omega_t^u)$$

It follows that $\omega_t^\pi - \omega_t^u = 0$. But this means $(\bar{u}_t - u_t^*)$ has the same sign as $(\bar{\pi}_t - \pi_t^*)$, which is a violation of the projection being red. It follows that $\omega_t^\pi < \omega_t^u$ and $\Phi_{ut} > 0$.

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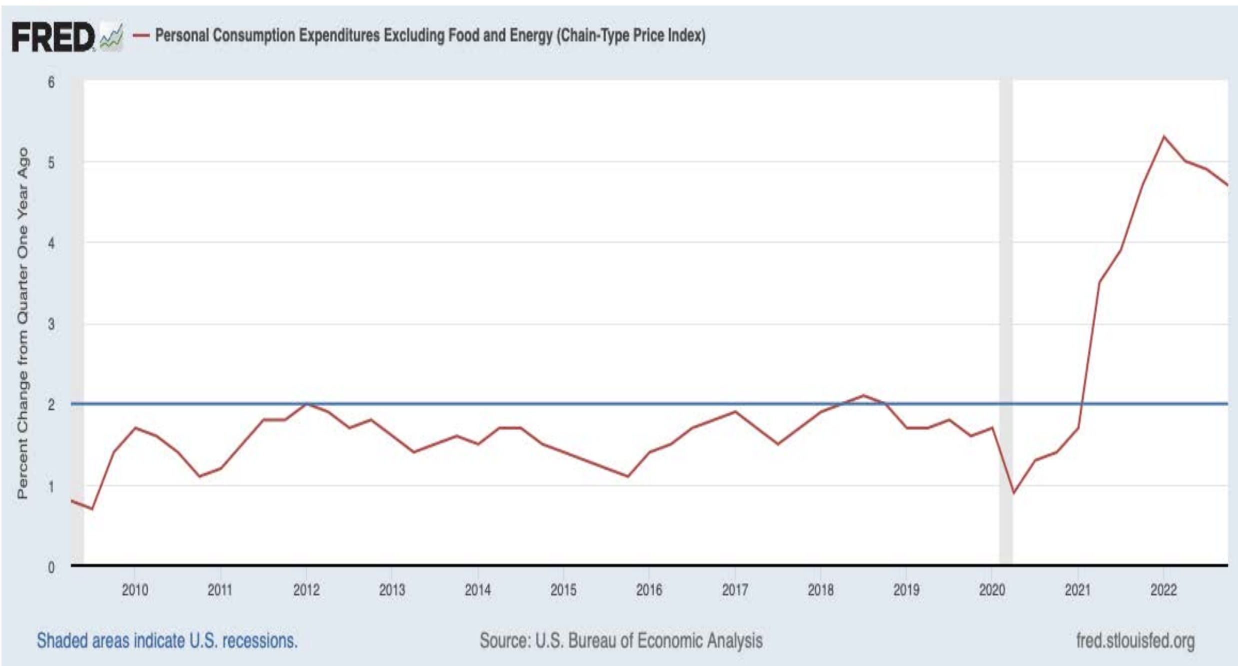
Figure 1: PCE Core Inflation Rate from 2nd Quarter 2009-4th Quarter 2022

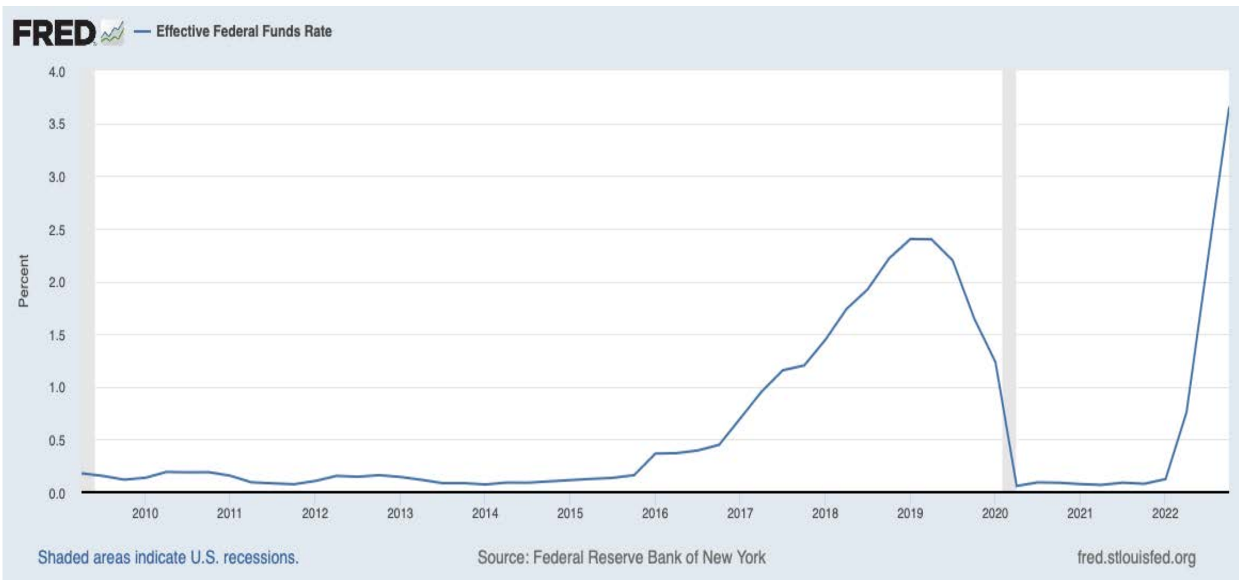


The data source is the US Bureau of Economic Analysis (2023).

Figure 2: Unemployment Rate from 2nd Quarter 2009-4th Quarter 2022

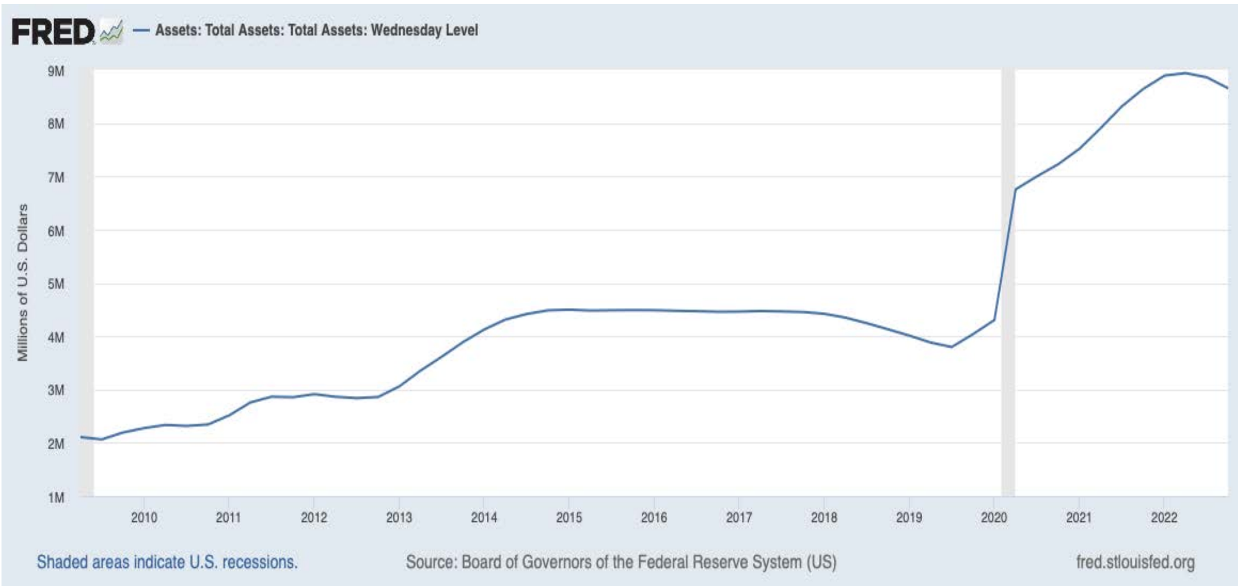
The data source is the U.S. Bureau of Labor Statistics (2023).

Figure 3: Effective Federal Funds Rate



The data source is the Federal Reserve Bank of New York (2023).

Figure 4: Total Federal Reserve Assets



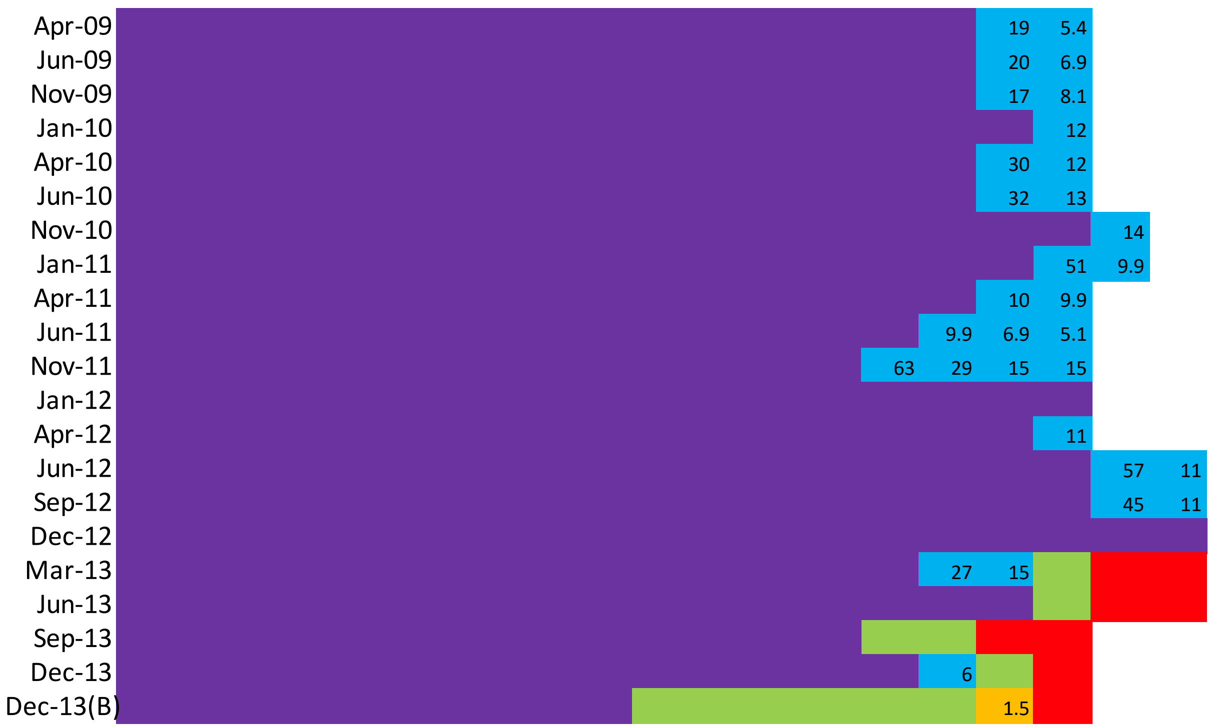
The data source is the Board of Governors of the Federal Reserve System (US) (2023).

Table 1: Median Projections from the Bernanke Fed

Meeting Date	UR	Inflation	Long-Run UR
April 2009	8.1	1.3	5.0
June 2009	8.6	1.2	5.0
November 2009	8.3	1.3	5.0
January 2010	7.0	1.5	5.0
April 2010	7.0	1.4	5.0
June 2010	7.2	1.3	5.0
November 2010	8.0	1.3	5.3
January 2011	7.0	1.4	5.3
April 2011	7.0	1.5	5.5
June 2011	7.1	1.6	5.4
November 2011	8.1	1.6	5.4
January 2012	7.3	1.8	5.5
April 2012	7.0	2.0	5.5
June 2012	7.4	1.9	5.5
September 2012	7.2	2.0	5.5
December 2012	7.0	1.9	5.5
March 2013	6.2	2.0	5.5
June 2013	6.0	1.9	5.4
September 2013	6.0	1.8	5.4
December 2013	5.9	1.8	5.4
December 2013 (3 years ahead)	5.5	1.9	5.4

These are median projection (from the SEP) for the fourth quarter unemployment rate (UR) two years ahead, the fourth quarter-to-fourth quarter PCE core inflation rate (inflation) two years ahead, and the long-run unemployment rate (long-run UR). (The median projection for the long-run core PCE inflation rate is 2% at every meeting.) All entries are coded purple, as discussed in the text, implying that the collective FOMC objective function is skewed downward with respect to inflation. All medians are based on author's calculations.

Figure 5: Projection Heterogeneity for April 2009-December 2013



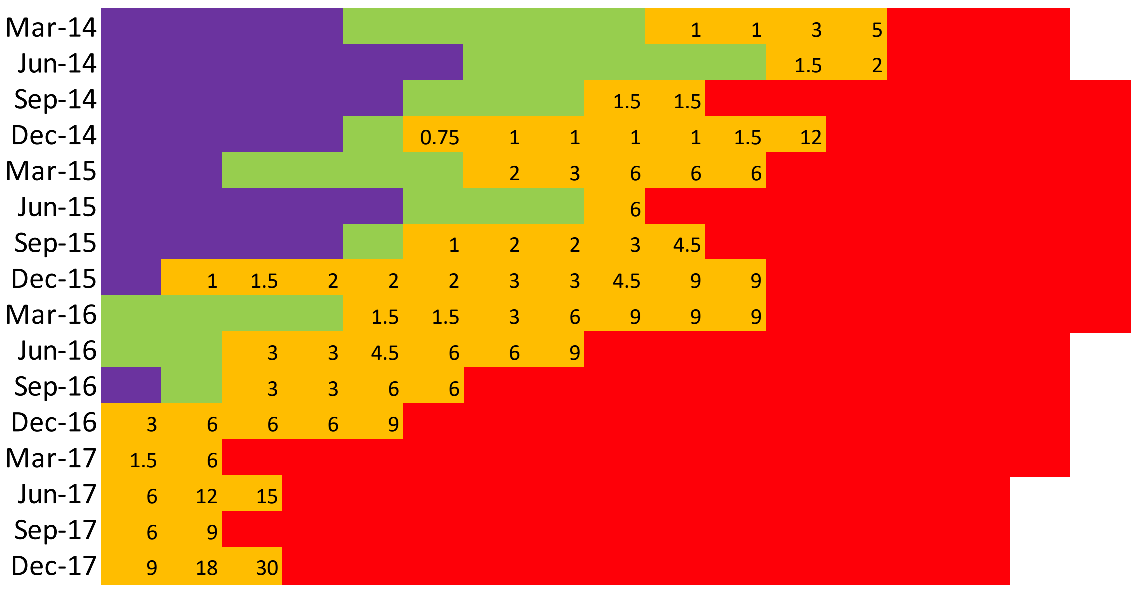
For each meeting, the participants' two-year-ahead projections are color-coded as described in the text, and then represented in a heat-map in order from coldest (purple) to hottest (red). The policymaker's objective is known to be skewed upward with respect to inflation if 1) the projection is purple OR 2) if the projection is blue and the policymaker's relative weighting of inflation deviations to unemployment deviations is below the numerical entry. The policymaker's objective is known to be skewed downward with respect to unemployment if 1) the projection is red OR 2) if the projection is orange and the policymaker's relative weighting of inflation deviations to unemployment deviations is below the numerical entry. The Phillips curve slope is assumed to be -1/3. A flatter Phillips curve would lead to larger values for the numerical entries in the table. December 13(B) represents projections for the year 2016, to allow for a better comparison with the Yellen projections.

Table 2: Median Projections from the Yellen Fed

Meeting Date	UR	Inflation	Long Run UR	Cutoff Ratio
March 2014	5.3	2.0	5.4	
June 2014	5.2	2.0	5.2	
September 2014	5.2	2.0	5.2	
December 2014	5.1	1.8	5.2	1.5
March 2015	5.0	2.0	5.0	
June 2015	5.0	2.0	5.0	
September 2015	4.8	1.9	4.9	3
December 2015	4.7	1.9	4.9	6
March 2016	4.5	2.0	4.8	
June 2016	4.6	2.0	4.8	
September 2016	4.5	2.0	4.8	
December 2016	4.5	2.0	4.8	
March 2017	4.5	2.0	4.7	
June 2017	4.2	2.0	4.6	
September 2017	4.1	2.0	4.6	
December 2017	3.9	2.0	4.6	

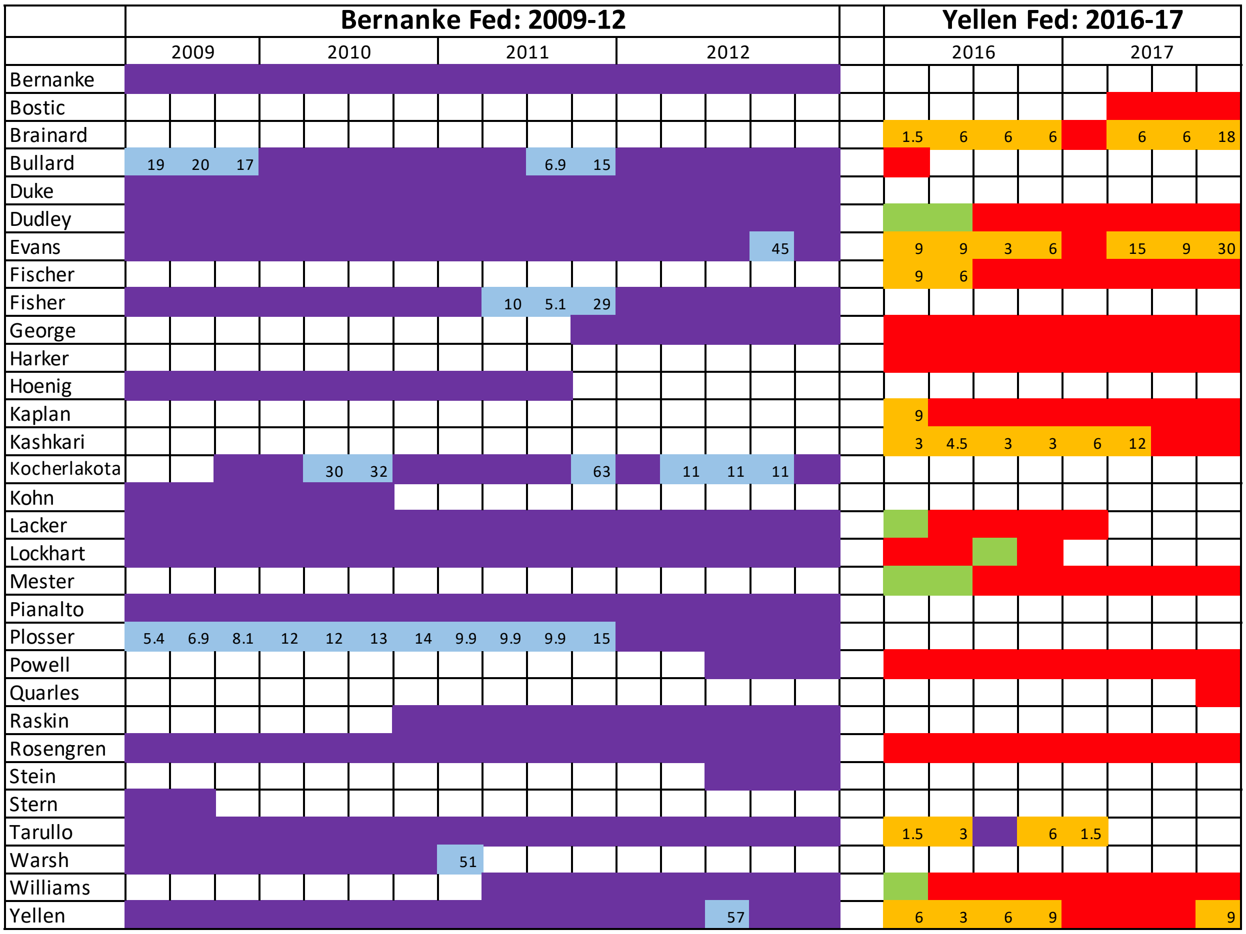
These are median projections (from the SEP) for the fourth quarter unemployment rate (UR) two years ahead, the fourth quarter-to-fourth quarter PCE core inflation rate (inflation) two years ahead, and the long-run unemployment rate (long-run UR). (The median projection for the long-run core PCE inflation rate is 2% at every meeting.) They are color-coded as described in the text. The FOMC's objective is known to be skewed downward with respect to unemployment if 1) the projection is red OR 2) if the projection is orange and the FOMC's relative weighting of inflation deviations to unemployment deviations is below the cutoff ratio. The Phillips curve slope is assumed to be -1/3. A flatter Phillips curve would lead to larger values for the cutoffs in the table. The medians are based on the author's calculations for meetings through December 2015 and are included in the post-meetings thereafter.

Figure 6: Projection Heterogeneity for 2014-17



For each meeting, the participants' two-year-ahead projections are color-coded as described in the text and then represented in a heat-map in order from coldest (purple) to hottest (red). The policymaker's objective is known to be skewed downward with respect to inflation if the projection is purple. The policymaker's objective is known to be skewed downward with respect to unemployment if 1) the projection is red OR 2) if the projection is orange and the policymaker's relative weighting of inflation deviations to unemployment deviations is below the numerical entry. The Phillips curve slope is assumed to be -1/3. A flatter Phillips curve would lead to larger values for the numerical entries in the table.

Figure 7: A Panel of FOMC Participants' Projections



For each meeting at which they submitted projections, a policymaker's projection is coded as purple, blue, green, orange and red (as described in the text). The policymaker's objective is known to be skewed downward with respect to inflation if 1) the projection is purple OR 2) if the projection is blue and the policymaker's relative weighting of inflation deviations to unemployment deviations is below the numerical entry. The policymaker's objective is known to be skewed downward with respect to unemployment if 1) the projection is red OR 2) if the projection is orange and the policymaker's relative weighting of inflation deviations to unemployment deviations is below the numerical entry. The Phillips curve slope is assumed to be -1/3. A flatter Phillips curve would lead to larger values for the numerical entries in the table.

Blank spaces mean that the listed policymaker did not submit a full set of projections for the relevant meeting. (James Bullard attended meetings after March 2016 but did not submit long-run projections after that date.) As discussed in Section 2, there are no data available yet for 2013-15. The table omits First Vice Presidents who served temporarily as FOMC participants in the absence of a regional Bank President.

Table 6: Median Projections from the Powell Fed

Meeting Date	UR	Inflation	Long-Run UR	Cutoff Ratio
March 2018	3.6	2.1	4.5	
June 2018	3.5	2.1	4.5	
September 2018	3.5	2.1	4.5	
December 2018	3.6	2.0	4.4	
March 2019	3.9	2.0	4.3	
June 2019	3.8	2.0	4.2	
September 2019	3.8	2.0	4.2	
December 2019	3.6	2.0	4.1	
June 2020	5.5	1.7	4.1	
September 2020	4.6	1.8	4.1	
December 2020	4.2	1.9	4.1	
March 2021	3.5	2.1	4.0	
June 2021	3.5	2.1	4.0	
September 2021	3.5	2.2	4.0	
December 2021	3.5	2.3	4.0	
March 2022	3.6	2.3	4.0	
June 2022	4.1	2.3	4.0	1
September 2022	4.4	2.3	4.0	4
December 2022	4.6	2.5	4.0	3.6

These are median projections (from the SEP) for the fourth quarter unemployment rate (UR) two years ahead, the fourth quarter-to-fourth quarter PCE core inflation rate (inflation) two years ahead, and the long-run unemployment rate (long-run UR). (The median projection for the long-run core PCE inflation rate is 2% at every meeting.) They are color-coded as described in the text. The FOMC's objective is known to be skewed downward with respect to unemployment if the projection is red. It is known to be skewed downward with respect to inflation if 1) the projection is purple OR 2) if the projection is blue and the FOMC's relative weighting of inflation deviations to unemployment deviations is below the cutoff ratio. The Phillips curve slope is assumed to be -1/3. A flatter Phillips curve would lead to larger values for the cutoffs.