

## BOARD OF GOVERNORS OF THE FEDERAL RESERVE SYSTEM

DIVISION OF RESEARCH AND STATISTICS

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**Date:** December 5, 2014  
**To:** Federal Open Market Committee  
**From:** Stephanie Aaronson, Jean-Philippe Laforte, and Dennis Mawhirter  
**Subject:** The relationship between unemployment rate rises and recessions

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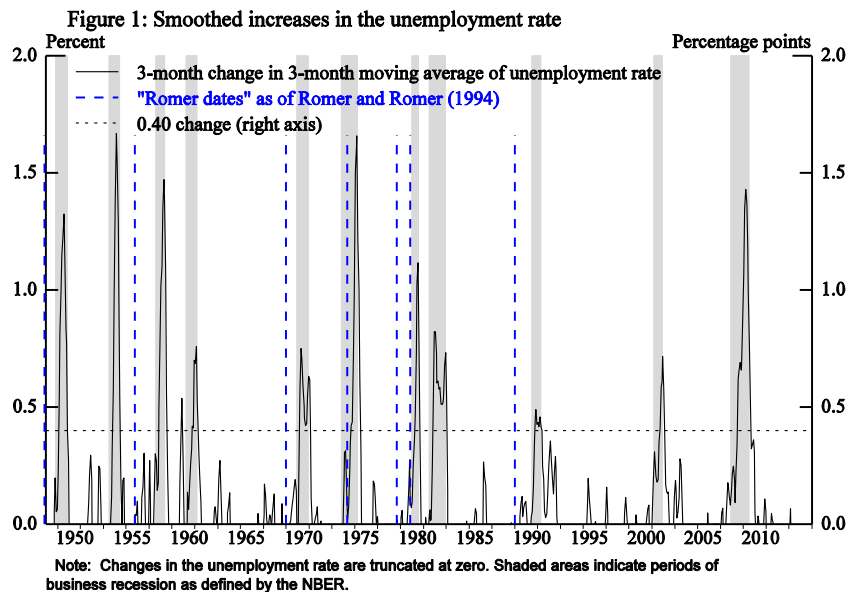
The SEP projections submitted in conjunction with the September 2014 FOMC meeting indicated that several participants expected the unemployment rate to undershoot its natural rate in 2016 or 2017. At the same time, SEP projections for inflation tended to be close to 2.0 percent in 2017. The possibility that the unemployment rate will undershoot its natural rate, even as inflation approaches the Committee's target, raises the question of whether monetary policy would be able to return the unemployment rate from below to its natural rate without causing a recession. In this memo we try to shed some light on this question by examining how past episodes of unemployment rate increases have related both to periods of monetary policy tightening and recessions. We also present results from stochastic simulations of the FRB/US and EDO models that quantify how the probability of entering a recession changes when the unemployment rate undershoots the natural rate.

To preview the findings, we find that, historically, an increase in the unemployment rate of more than 0.4 percentage point over a three-month period has always been followed by a recession. However, most of these episodes coincided with periods in which the FOMC was attempting to bring down inflation, and so the recession was probably purposefully induced. There are fewer cases in which the unemployment rate rose and the economy entered a recession outside of periods of deliberate monetary tightening. In addition we identify a few cases of monetary policy tightening not aimed at bringing down inflation that did not result in large unemployment rate increases or recessions. Our simulations indicate that in an economic environment similar to the one the staff is projecting, if the unemployment rate were to undershoot its natural rate and then rise

gradually, in line with the scenario envisaged in the July Tealbook projection, the probability of a recession would increase, but only moderately.

### Historical Evidence

The conventional wisdom holds that unemployment rate increases of  $\frac{1}{4}$  percentage point or more are always associated with a recession. We begin by verifying this stylized fact. Smoothing the data to eliminate some of the noise, we find that increases in the 3-month moving average of the unemployment rate of more than 0.4 percentage point over a 3-month period have always shortly preceded or coincided with an NBER-dated recession. As illustrated in Figure 1, there were 11 such incidents between the late 1940s and now.<sup>1</sup> The situation is more ambiguous for slightly smaller increases in the unemployment rate. In 11 cases, an increase in the 3-month moving average of the unemployment rate of at least 0.3 percentage point preceded or coincided with a recession; however, in 2 cases an increase in the unemployment rate of that size was not followed by a recession.



We next examine the link between these recessions and monetary policy. We first compare the timing of the unemployment rate increases with monetary policy contractions identified by Romer and Romer.<sup>2</sup> The data in Table 1 show that all of the Romer dates

<sup>1</sup> Increases in the unemployment rate of 0.4 percentage point over a 3-month period were frequently followed by additional increases of that magnitude during the same downturn. For the purposes of this exercise, we count just the initial increase.

<sup>2</sup> Christina D. Romer and David H. Romer. 1989. "Does Monetary Policy Matter? A New Test in the Spirit of Friedman and Schwartz." *NBER Macroeconomics Annual* 4: 121-170 and Christina D. Romer and David

were followed by an increase in the smoothed unemployment rate of more than 0.4 percentage point over a 3-month period as well as by an NBER-dated recession, although the lag was protracted following the 1955, 1978, and 1988 tightenings.

<b>Table 1</b>			
<b>Unemployment Increases, Monetary Policy Contractions, and Recessions</b>			
Romer Date	Increase in unemployment rate $\geq 0.4$ pp	NBER-dated recession	Months between Romer date and increase in unemployment rate $\geq 0.4$ pp.
1947m10	1949m2	1948m11	16
1955m9	1957m11	1957m8	26
1968m12	1970m3	1969m12	15
1974m4	1974m9*	1973m11	5
1978m8	1980m4	1980m1	20
1979m10	1980m4	1980m1	6
1988m12	1990m10	1990m7	22

\* This Romer-dated tightening actually occurred in the middle of a recession.

The monetary contractions identified by the Romer dates account for six or seven of the nine post-war recessions through the early 1990s, depending on whether the 1981 recession is attributed to the 1979 tightening. There was no Romer date associated with either the 1953 or 1960 recession.

A related question is whether all monetary tightening cycles—even those intended to slow the economy only modestly—result in recessions. A study by New York Fed staff examined the outcomes of 14 monetary tightening cycles between 1955 and 2006.<sup>3</sup> These events include tightenings that are not identified as Romer dates. They find that 11 of the 14 tightenings in their sample were severe enough to be associated with a higher unemployment rate sometime within the subsequent 24 months, and 10 [of those 11] were associated with NBER recessions. (The three tightening cycles not associated with a higher unemployment rate—according to the metric used by the New York staff—were those that ended in August 1971, August 1984, and April 1995.) The lone tightening cycle that was associated with an increase in the unemployment rate but not an NBER

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H. Romer. 1994. “Monetary Policy Matters.” *Journal of Monetary Economics* 34-1: 75-88. These dates are described by the authors as episodes in which the Federal Reserve acted to fight inflation by attempting to “induce a recession”.

<sup>3</sup> Adrian, Tobias and Arturo Estrella, “Monetary Policy Tightening Cycles and the Predictability of Economic Activity,” Federal Reserve Bank of New York Staff Reports, no. 397, October 2009.

recession was the cycle that ended in November 1966.<sup>4</sup>

This historical record suggests that the task of raising the unemployment rate back up to its natural rate, if it were to undershoot, would be quite tricky. In the next section we provide some quantitative estimates of the probability of a recession conditional on a period of rising unemployment rates, such as that featured in the July Tealbook.

### Recession Probabilities During Periods of Rising Unemployment

To assess the probability of entering a recession during a period in which the unemployment rate is brought back to its natural rate from below, we perform stochastic simulations using two models with forecasts reported in the Tealbook: the FRB/US model and the EDO model. As baseline forecasts for these stochastic simulations, we use the October and July Tealbook judgmental projections because they embody different views about whether the unemployment rate will undershoot. In the October Tealbook, the judgmental forecast anticipated the unemployment rate to reach its natural rate by 2017:Q2 and then to remain there, while GDP was projected to grow at the rate of potential GDP thereafter. In contrast, in the July Tealbook, the unemployment rate was projected to fall to almost  $\frac{3}{4}$  percentage point below its natural rate by 2017:Q2 and then to increase by 30 basis points over the subsequent two years. The unemployment rate was only projected to reach its natural rate over a much longer time. Meanwhile, real GDP was projected to grow at an average pace of  $1\frac{1}{2}$  percent,  $\frac{1}{2}$  percentage point below that of potential GDP.<sup>5</sup> As we shall show, even the October baseline forecast (which did not feature any increase in the unemployment rate) is associated with a substantial probability of recession (defined here informally as two consecutive quarters of declines in GDP). That baseline probability is not the object of our interest here; instead, we focus on the *increase* in the probability of recession in the July Tealbook forecast (which featured a small rise in the unemployment rate) relative to the probability of recession under the October Tealbook baseline.

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<sup>4</sup> In their paper, Adrian and Estrella find that the best predictor of whether a monetary policy tightening will be followed by a recession is the term spread, which they find is low in episodes when there is an increase in the unemployment rate and high in episodes when there is not.

<sup>5</sup> Our simulations attempt to quantify how much more likely it is that GDP, following shocks to the economy, will decline for two consecutive quarters, our definition of a recession, when it is assumed that on average it rises at a pace of about  $1\frac{1}{2}$  percent instead of 2 percent.

Characterizing the stochastic nature of the economy using the FRB/US model, under the October Tealbook baseline, we estimate a 22 percent chance that the economy will fall into recession between 2017:Q2 (when the unemployment rate reaches its natural rate) and 2019:Q2. The odds of a recession over that period increase by 12 percentage points to 34 percent under the July Tealbook baseline.

In EDO, the odds of a recession over 2017:Q3-2019:Q2 under the October Tealbook scenario are larger, at 41 percent. However, the increase in the odds of a recession from an episode of rising unemployment and weaker growth is smaller than in FRB/US, about 8 percentage points, leaving the recession probability under the July Tealbook scenario at 49 percent.

Thus, according to either model, there will be an appreciable risk of recession if the Committee is able to guide the unemployment rate to its natural rate and then cause it to flatten out from there. According to these two models, the risk of recession will be somewhat greater if the unemployment rate falls modestly below its natural rate and then the Committee attempts to guide it back to its natural rate; however, the increment to the probability of recession will be modest.

We should note some caveats to this analysis. First, the choice of a two-year window is somewhat arbitrary (ultimately, as the end period is pushed further away, the probability of a recession is bound to converge to one). Nonetheless, a two-year period seems reasonable to us as it corresponds to a period over which not only the unemployment rate rises the most quickly, but also we observe the most pronounced differentials in GDP growth between the two projections. Second, the simulations were run under the assumptions that the shocks hitting the economy are normally distributed and independent across time. It is probable that these assumptions do not adequately characterize the economy around and during recessionary episodes—times that are likely to be associated with shocks that can be exceptionally large and/or whose volatility is time-varying.<sup>6</sup> Finally, although the stochastic simulations are based on the same methodology as is used to calculate the confidence intervals reported in the Risk and Uncertainty section

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<sup>6</sup> One interpretation of this caveat is that the differentials in probabilities reported earlier may actually overstate the implications of the differences, including those about monetary policy, between the two Tealbook projections. Hypothetically, if only sufficiently large shocks cause a recession then a recessionary episode will occur as they hit the economy, irrespectively of which Tealbook projection is used as baseline, and hence the chance of a recession will be the same.

of the Tealbook, the reliability of their estimates of the risk of recession over an extended period remains an open question.