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Unemployment Rate Benchmarks

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The gap between the unemployment rate and a benchmark rate often serves as a guidepost for policymakers assessing the current state of the economy as it relates to the pursuit of both maximum employment and price stability. A benchmark rate of unemployment may be invoked to indicate the degree of economic slack and inflationary pressures in the short and medium run or to provide a guide for normal economic activity in the longer run. To this end, policymakers and academics have made use of various measures of unemployment rate benchmarks, under many names.² The goal of this memo is to offer a taxonomy for unemployment rate benchmarks, facilitating the use of a common set of terms for assessments of economic conditions and deliberations among policymakers.

We propose two broad categories of unemployment rate benchmarks that could be viewed as consistent with the Committee’s policy objectives:

1. A longer-run unemployment rate (LRU): The rate of unemployment that is expected to prevail after the economy has fully adjusted to business cycle shocks.
2. A stable-price unemployment rate (SPU): The rate of unemployment such that there are no upward or downward pressures on price inflation apart from those stemming from underlying inflation or arising from supply shocks.³

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2. For example, Rogerson (1997) compiles a list of terms from the literature that include “structural,” “long-run,” “frictional,” “average,” “equilibrium,” “normal,” “full-employment,” “steady-state,” “efficient,” and “natural.”

3. Our use of “stable-price” in this definition is not meant to literally refer to a zero rate of inflation.

Section 1 describes these two categories in detail and discusses the relationship between them. Briefly, the gap between the unemployment rate and the LRU is an indicator of the cyclical position of the economy, while the SPU is the rate of unemployment at which there is no cyclical pressure on price inflation. Persistent forces that affect the underlying structure of the economy, such as the changing demographics of the workforce or market structure, will affect both LRU and SPU benchmarks. Transitory factors relevant for price pressures, such as cyclical changes in the composition of the labor force or temporary labor market policies like the emergency extension of unemployment benefits, will affect only the SPU, thereby driving a temporary wedge between the two benchmarks. The resulting wedge may be sizable and persist long enough to be relevant for monetary policy.

Section 2 describes several prominent measures of unemployment rate benchmarks used within the System and elsewhere and attempts to map them into our broad categories. The benchmark unemployment rate used in the Tealbook is best described as an SPU. All Reserve Banks look at measures that can be classified as LRUs, while some Reserve Banks also look at measures that can be classified as SPUs.

Section 3 discusses some potential benefits and costs associated with the scenario in which the unemployment rate is running below the LRU but above the SPU—that is, lower than thought to be sustainable in the longer run but not low enough to bring inflation back up to the Committee’s inflation objective over the next several years. When assessing potential costs and benefits, it is important to consider which ones conflict with attaining the dual mandate and which ones do not.

1. Broad categories of unemployment rate benchmarks

Longer-run unemployment rate

The **longer-run unemployment rate (LRU)** is the rate of unemployment that is expected to prevail after the economy has fully adjusted to business cycle shocks. The LRU is largely determined by nonmonetary factors and evolves with the changing

structure and dynamics of the economy, but need not correspond to the Federal Reserve’s statutory mandate of achieving maximum employment.⁴

Of course, identifying “business cycle” shocks is challenging because it requires taking a stand on the nature and persistence of the driving forces. Thus, in practice, any particular measure of an LRU will depend on the economic framework used to inform it. These frameworks fall, broadly speaking, into two categories: reduced-form or statistical models, and structural models.

In reduced-form or statistical models, the LRU is often estimated by a long-horizon forecast or by extracting a low-frequency trend. A common approach is to build estimates of the LRU up from the typical, or trend, rates of unemployment for different groups.⁵ This approach can be used to explicitly incorporate information on past and expected longer-lasting compositional changes in the labor force due to factors such as demographics, industrial and occupational structure, and educational attainment.

Structural models can more directly inform how specific changes to the economy and to labor market functioning would affect the rate of unemployment expected to prevail in the longer run. For example, a search and matching model of the labor market, which assumes frictions in matching the unemployed with job openings, would predict that a secular decline in worker bargaining power would put downward pressure on the LRU.⁶ By contrast, greater difficulty in matching workers and jobs, possibly due to a persistent rise in the mismatch of skills and job requirements, would put upward pressure

4. Indeed, the Committee’s Statement on Longer-Run Goals and Monetary Policy Strategy does not specify a fixed goal for maximum employment, and unemployment is only one of a wide range of indicators taken into consideration.

5. For examples of this approach, see Tasci (2012), Aaronson and others (2015), Barnichon and Mesters (2018), Berge and Nekarda (2018), Crump and others (2019), Hornstein and Kudlyak (2019), and Tüzemen (2019).

6. Models of equilibrium unemployment, pioneered by Diamond, Mortensen, and Pissarides in the late 1970s and early 1980s, provide a classical theory of unemployment and contrast with the prevailing Keynesian and disequilibrium theories of the time. See Petrosky-Nadeau and Wasmer (2017) for a review of the evolution of this class of models for both policy and business cycle analysis. See also Daly and others (2012) for an application to estimating trends in the LRU.

on the LRU in this framework. Finally, structural models may provide insights into the welfare costs and benefits of periods with unemployment deviating from the LRU.

Stable-price unemployment rate

The gap between the unemployment rate and the LRU is an indicator of the cyclical position of the economy.⁷ But monetary policymakers also need gauges of cyclical pressures on price inflation, and the gap between the unemployment rate and the LRU is not necessarily the relevant benchmark for making this assessment. Indeed, to the extent that inflation reflects the influence of cyclical factors expected to disappear in the longer run, such as variation in firms' markups or changes in labor force participation and composition, an alternative benchmark would need to take these into account.

The **stable-price unemployment rate (SPU)** is the rate of unemployment such that there are no upward or downward pressures on price inflation apart from those stemming from underlying inflation or arising from supply shocks. Informally, the SPU is the rate of unemployment at which there is no cyclical pressure on inflation. Underpinning this definition are two notions: first, that inflation is sensitive to the cyclical position of the economy; and second, that the unemployment rate relative to the SPU captures the relevant cyclical contributions to price determination from domestic labor and product markets.⁸

In practice, a Phillips curve equation is the central framework for determining the SPU. Thus, a particular estimate of the SPU will depend on which supply shocks are accounted for in the specification and, more broadly, on the assumed nature of the inflation process. There is no consensus in the literature on how to accommodate supply

7. Indeed, Aaronson and others (2012) argue that the unemployment rate is the best single indicator of labor market conditions in most situations and explore some situations in which it is not. Fallick and Rudd (2012) provide a general discussion of assessing slack in the economy.

8. Instead of unemployment alone, some have advocated for looking at the ratio of job vacancies to unemployment, a measure of labor market tightness that captures the demand for labor as well as its supply. Recent research has generalized these types of empirical measures to account for variation in the availability of potential new hires and the intensity with which employers seek to fill their jobs; see Abraham and Haltiwanger (2019) and Faberman and others (2019). The taxonomy described in this memo could be adapted to these measures as well.

shocks in the Phillips curve. Common specifications seek to remove inflation movements resulting from certain types of cost shocks, such as changes in relative prices for energy and imports. There is less agreement on how to treat changes in trend productivity growth, which would tend to affect the tradeoff between unemployment and price inflation (at least temporarily). Unless these sorts of productivity-related influences explicitly enter in the Phillips curve specification, they could instead appear as movements in the SPU.⁹

Regarding the assumed nature of the inflation process, a common approach is to assume that inflation fluctuates around a long-run trend that is, in turn, tied down by well-anchored inflation expectations; this appears to provide a good empirical characterization of inflation dynamics since the late 1990s.¹⁰ By “well-anchored inflation expectations” we mean that the public’s long-run expectations about inflation are largely invariant to the state of the economy—in particular to cyclical movements in inflation or the inflationary effects of supply shocks. Absent any other shocks—and as long as inflation expectations remain well anchored—a temporary rise in unemployment above the SPU will push inflation below its longer-run expected level; inflation will remain at this lower level as long as the unemployment gap persists, but it will return to its longer-run expected level once unemployment returns to the SPU.

Relationship between the LRU and SPU

Relevant changes to the underlying structure of the economy that are expected to persist in the longer run will affect both the LRU and the SPU. However, certain kinds of temporary factors can influence the SPU, thereby driving a wedge between the two

9. See Ball and Mankiw (2002).

10. The assumption of anchored inflation expectations is probably not reasonable before the late 1990s, when survey measures of longer-term inflation expectations appear to be less stable. Under those circumstances, a more appropriate empirical inflation specification might be a so-called accelerationist Phillips curve, in which the *change* in the inflation rate is related to the level of the unemployment rate. In this specification, the SPU is generally referred to as the nonaccelerating inflation rate of unemployment, or NAIRU, because temporary deviations of unemployment from the NAIRU push inflation permanently higher or lower.

An additional practical consideration that attends estimation of empirical inflation equations is whether there is a nonlinear relationship between inflation and the unemployment rate gap; for some recent investigations of this topic, see Aaronson and others (2016); Babb and Detmeister (2017); Hooper, Mishkin, and Sufi (2019); and Ashley and Verbrugge (2019).

benchmarks. If the wedge between the SPU and LRU were expected to persist for several years, policymakers might view the appropriate benchmark for the current setting of monetary policy to be different from their estimates of the longer-run unemployment rate. That said, in the long run the Committee achieves its inflation objective, and so unemployment would be equal to the SPU and the LRU.

Examples of transitory shocks that could drive a wedge between the SPU and the LRU include temporary changes in the following: desired markups or labor market functioning, trend productivity growth, and government policies that affect labor supply. A cyclical rise in firms' desired price markup causes the SPU to increase relative to the LRU.¹¹ An acceleration in trend productivity could lead to robust job creation without cost and inflationary pressures, thereby lowering the SPU relevant for current price pressures relative to the LRU.¹² A transitory increase in the degree of mismatch between the skill requirements of jobs and the skills of job seekers will increase the SPU relative to the LRU, as would a temporary extension of unemployment benefits.¹³

2. Selected measures of unemployment rate benchmarks

This section describes several prominent unemployment rate benchmarks, noting where we would place them in our taxonomy. We first consider measures used within the System; namely, in the FOMC's Summary of Economic Projections (SEP), in the Tealbook, and by the various Reserve Banks. We then describe measures reported by the Congressional Budget Office (CBO), those obtained from dynamic stochastic general equilibrium (DSGE) models, estimates from state-space models, and measures reported

11. In general, changes in the transmission of labor costs to pressures on prices will move the SPU. That is, the SPU entering a Phillips curve implicitly folds in cyclical price pressures from sources apart from those related to labor costs.

12. The late 1990s is a recent example of a period with robust productivity growth, low rates of unemployment, and moderate price inflation. Indeed, Crump and others (2019) and Petrosky-Nadeau and Valletta (2019) show estimates of the SPU falling relative to the LRU and remaining below it until the start of the Great Recession.

13. Barnichon and Figura (2010) document a large movement in so-called matching efficiency during the Great Recession, which they attribute to a significant change in the composition of the pool of job seekers. See also Yellen (2016) and Hall and Schulhofer-Wohl (2018).

in surveys of professional forecasters. (A table in the appendix provides recent estimates for many of the measures we discuss here.)

FOMC’s Summary of Economic Projections

The SEP reports estimates of a longer-run unemployment rate, which is described as the rate “. . . to which a policymaker expects the economy to converge over time—maybe in five or six years—in the absence of further shocks and under appropriate monetary policy.” This description sounds most consistent with the LRU in our taxonomy.

The Tealbook

The benchmark unemployment rate in the Tealbook, which the Board’s staff calls the “natural rate of unemployment,” is a judgmental estimate that we think is best categorized as an SPU.¹⁴ In addition to being informed by the behavior of price and wage inflation, the Tealbook’s estimate is informed by structural factors affecting the labor market, such as changes in the demographic and educational composition of the workforce, as well as by transitory factors, such as temporary extensions of unemployment insurance benefits or changes in the efficiency of matching job seekers and job vacancies.

The Tealbook’s inflation framework assumes that longer-run inflation expectations have been well anchored since the late 1990s, albeit at a level consistent with an underlying PCE price inflation rate of 1.8 percent.¹⁵ In other words, the Board’s staff judges that if expectations remain stable, inflation would converge to 1.8 percent when unemployment is at its natural rate and there are no other shocks affecting inflation.¹⁶ Given that estimate of underlying inflation, unemployment must run persistently below the Tealbook’s natural rate in order to generate enough upward

14. Fallick and Rudd (2012) is the most recent memo that describes in detail the various types of analysis that the Board’s staff considers when determining the natural rate of unemployment.

15. For background on the Tealbook’s price inflation framework, see Detmeister, Laforte, and Rudd (2014).

16. See Svensson (2015) for a discussion of the unemployment costs of misses on the inflation target.

pressure on prices to achieve 2 percent inflation over the medium term.¹⁷ Although this level of the unemployment rate (absent other shocks) would yield a steady rate of inflation at the FOMC’s target, by construction it represents a level of resource utilization that generates continuous upward pressure on inflation; therefore, it would not be appropriate to call it an SPU.

Measures used by Reserve Banks

All of the Reserve Banks consider at least one measure that is best described as an LRU. In addition, five Banks also consider measures that can be categorized as SPUs. Several Banks also noted that they monitor estimates from surveys of professional forecasters.

The Federal Reserve Banks of New York, Richmond, Atlanta, Minneapolis, and San Francisco rely on multiple measures for their policy discussions, with at least one SPU and one LRU. Many emphasized that SPU measures were helpful for assessing cyclical pressures on price inflation.

The Federal Reserve Banks of Boston, Philadelphia, Cleveland, Chicago, St. Louis, Kansas City, and Dallas primarily utilize measures that are best described as LRUs.¹⁸ Many in this group assess the longer-run unemployment rate by evaluating trends in labor market outcomes for different groups and then adjusting a baseline measure to account for the past and expected future paths of these trends.

Congressional Budget Office

The CBO defines its natural rate of unemployment as “the rate [of unemployment] that arises from all sources other than fluctuations in demand associated

17. Using the framework described in a box in the July 2019 Tealbook, and incorporating the staff’s latest estimate that the natural rate in recent quarters was 4.4 percent, the unemployment rate consistent with 2 percent inflation is currently 3.2 percent.

18. The Federal Reserve Bank of St. Louis assesses the economy in terms of regimes. In our view, its framework has an LRU concept—the model’s steady state—within each regime.

with business cycles.”¹⁹ The CBO publishes two measures, a “long-run” and a “short-run” natural rate, though in practice the estimates are identical until 2008.

In our assessment, the CBO’s measures are hybrids of our two broad concepts. From 1948 to the mid-1980s, both of the CBO’s natural rates would seem to be versions of an SPU, as they are derived from a Phillips curve framework that uses the unemployment rate of married men as a single summary indicator of resource utilization. From the mid-1980s forward, the CBO’s long-run natural rate is an LRU because it evolves based on changes in the relative size and potential labor force participation rates of different groups (defined according to age, sex, education, and race). The long-run estimate is anchored to 2005, a period in which the CBO judges the labor market to have been roughly at its maximum sustainable level. The CBO’s short-run natural rate estimate is best characterized as an SPU, because it rises during the Great Recession to reflect extensions of unemployment insurance benefits and increases in mismatch and then falls back to the long-run estimate in 2014 when the influences of these factors are assumed to have returned to normal.²⁰

Dynamic stochastic general equilibrium models with unemployment

Some macroeconomic models designed more specifically for the study of monetary policy—New Keynesian DSGE models with frictions in the setting of nominal prices and wages, for instance—have incorporated a labor market featuring unemployment. In these models, the LRU corresponds to the steady-state rate of unemployment, while the SPU is defined in different ways. In many instances, the model’s dynamics are solved as an approximation around the steady state, and the SPU in the model’s Phillips curve is the steady-state rate of unemployment; in other words, the SPU and the LRU are identical.²¹ Another approach is to define the SPU as the rate of unemployment that would result if wages and prices were fully flexible. In this case, the

19. Shackleton (2018) is the most recent publication describing the CBO’s natural rate.

20. Although the CBO’s long-run natural rate also exhibits an apparent transitory increase, we still consider it to be an LRU, as the CBO attributes those movements to *permanent* effects of the Great Recession, such as the erosion of skills and stigma that can result from long-term unemployment.

21. See, for example, Ravenna and Walsh (2008) and Galí (2011).

SPU will move with transitory shocks to the economy that alter the level of activity that would occur if wage and price setting were frictionless.²²

State-space models

Because an unemployment rate benchmark is not observable, a common approach is to model it as a latent process within a larger state-space model. These models can be divided naturally into the two categories of our taxonomy. Models that estimate LRUs typically focus on trends in the labor market—for example, using data on labor market gross flows or disaggregated unemployment rates—and do not use information on price or wage inflation.²³

There are also a number of state-space models that estimate versions of an SPU, insofar as the latent trend in unemployment is informed by data on price inflation, wage inflation, or both (typically through the inclusion of some type of Phillips curve relation).²⁴ Finally, a few recent models estimate both an LRU and an SPU. In these models, detailed labor market information informs an estimate of the LRU, while data on inflation and inflation expectations inform the variation of the SPU around the estimated LRU.²⁵

Professional forecasters

Estimates of unemployment rate benchmarks are also available from professional forecasters. In the case of the Survey of Professional Forecasters, we see this estimate as corresponding to the SPU category, as respondents are queried specifically about their estimate of a NAIRU. For other surveys, such as the Blue Chip Economic Indicators or the Survey of Primary Dealers, a variety of forecast horizons are included in the survey.²⁶ Long-horizon forecasts from these surveys would be classified as LRUs, as the forecast

22. See, for example, Gertler, Sala, and Trigari (2008); Galí, Smets, and Wouters (2012).

23. Examples of models estimating LRUs include Tasci (2012) and Hornstein and Kudlyak (2019).

24. Examples of models estimating SPUs include King, Stock, and Watson (1995); Laubach (2001); Fleischman and Roberts (2011); Gordon (2013); Lubik and Matthes (2015); and the SS-PF model reported in the Tealbook.

25. Berge and Nekarda (2018), Crump and others (2019), and Petrosky-Nadeau and Valletta (2019).

26. Blue Chip also occasionally includes a special question asking for respondents' estimates of a NAIRU. The most recent survey with such a question was in April 2019.

horizon is either far in the future (for example, the five-year average beginning six to seven years in the future) or explicitly designated as the “longer run.”

3. Risks associated with unemployment below LRU but above SPU

In general, there are potential costs and benefits associated with the unemployment rate deviating persistently from a benchmark rate, beyond the risks of undesirable inflation outcomes or the unanchoring of inflation expectations.²⁷ This section focuses on the scenario where the unemployment rate is below the level thought to prevail in the longer run, but not low enough to bring inflation back up to the Committee’s inflation objective over the next several years.

In some structural models, an unemployment rate below the LRU is associated with various inefficiencies. For example, it might result in inefficient allocation of effort across work versus other endeavors such as human capital building, job search, and leisure.²⁸ These do not necessarily compromise attaining the Federal Reserve’s dual-mandate objectives, and so it is not clear what role they should play in monetary policy deliberations. However, there are other potential costs associated with unemployment below the LRU that arguably do have dual-mandate implications. For example, unemployment that is too low for too long could lead to excessive risk-taking in financial markets or could distort incentives in favor of short-term economic gains at the expense of longer-run investments.²⁹

27. Aaronson and others (2016) and Aaronson and others (2019) provide an in-depth treatment of potential costs and benefits.

28. For empirical evidence on how school enrollment may change in response to a tight labor market, see Laeven and Popov (2016); Charles, Hurst, and Notowidigdo (2018); or Cascio and Narayan (2019).

29. For example, unemployment running below the LRU may coincide with excessive borrowing by households or firms, or excessively compressed risk premiums in asset markets. Alternatively, unemployment persistently below the LRU could lead businesses to misjudge the sustainability of the current level of economic activity, with the result that they postpone investments (such as maintenance, reorganization of production, or research and development) that would be beneficial in the longer run. Outcomes such as these might occur, for example, because agents overweight the recent past relative to the historical norm and thus over-extrapolate recent economic performance.

Similarly, in some structural models, low unemployment may provide longer-run benefits over and above the likely short-term benefits it affords to many individuals.³⁰ For example, a tight labor market might raise labor force attachment (by creating more stable employment relationships), create incentives for firms to introduce training programs for workers, and improve job matches to better align worker and firm preferences.³¹ Moreover, these benefits might accrue especially to disadvantaged groups or regions.³² Arguably, these benefits are covered by the statutory mandate.³³ Alternatively, improvements in productivity might result from investments in labor-saving technologies.

4. Conclusions

This memo proposed two broad categories of unemployment rate benchmarks for monetary policy, the longer-run unemployment rate (LRU) and the stable-price unemployment rate (SPU). The LRU is the rate expected to prevail after the economy has fully adjusted to business cycle shocks. The SPU is the rate of unemployment such that there are no upward or downward pressures on price inflation apart from those stemming from underlying inflation or arising from supply shocks—that is, the rate such that there is no cyclical pressure on price inflation. In many situations, the two concepts will naturally coincide. For example, both measures change over time in response to structural changes in the economy, such as those related to demographics, industrial and occupational structure, or educational attainment. In addition, the SPU can change in response to certain *transitory* economic shocks—such as shocks to labor market functioning, trend productivity, desired markups, and temporary government policy changes that affect labor supply—causing the SPU to deviate from the LRU.

In practice, these unemployment rate benchmarks, like the other “stars” of monetary policy, are not directly observed and are difficult to infer even with the benefit

30. For empirical evidence on whether the benefits of a tight labor market persist, see Fallick and Krolikowski (2018); Fleischman, Gallin, and Smith (2018).

31. See, for example, Akerlof, Rose, and Yellen (1988); Devereux (2002).

32. Okun (1973) is an early analysis of the benefits to a “high pressure” economy. See also Katz and Krueger (1999), Aaronson and others (2019), Weingarden (2017), and Cajner and others (2017).

33. See the Full Employment and Balanced Growth Act of 1978.

of hindsight—and harder still in real time. This presents a challenge because there are benefits and costs associated with persistent deviations of the unemployment rate from its benchmarks.³⁴ The most salient risks that we see at present are that unemployment is not sufficiently low to generate sustained inflationary pressure, possibly leading to a decline in long-run inflation expectations, but low enough to result in a buildup of financial imbalances or distort macroeconomic outcomes.

Appendix

Table A: Estimates of Selected Benchmark Unemployment Rates

<i>Measure</i>	<i>Date of estimate</i>	<i>Category</i>	<i>Estimate (percent)</i>	<i>Period for estimate</i>
1. Summary of Economic Projections, longer-run unemployment rate, median	Sept. 2019	n.a.	4.2	n.a.
2. Tealbook, natural rate of unemployment	Sept. 2019	SPU	4.4	2019:Q4
3. Tealbook, unemployment consistent with 2 percent inflation	Sept. 2019	n.a.	3.2	2019:Q4
4. Congressional Budget Office, long run	Aug. 2019	LRU	4.6	2019:Q4
5. Congressional Budget Office, short run	Aug. 2019	SPU	4.6	2019:Q4
6. SS-PF state-space model	Oct. 2019	SPU	4.6	2019:Q2
7. Berge and Nekarda (2018)	Oct. 2019	LRU	4.5	2019:Q2
8. Berge and Nekarda (2018)	Oct. 2019	SPU	4.4	2019:Q2
9. Crump and others (2019)	July 2019	LRU	4.5	2018:Q3
10. Crump and others (2019)	July 2019	SPU	4.0	2018:Q3
11. Petrosky-Nadeau and Valletta (2019)	June 2019	SPU	4.1	2019:Q1
12. Tüzemen (2019)	Sept. 2019	LRU	4.5	2019:Q4
13. Survey of Professional Forecasters, NAIRU, median	Sept. 2019	SPU	4.1	2019:Q3
14. Blue Chip Economic Indicators, unemployment rate forecast, mean	Oct. 2019	LRU	4.1	2026–30
15. Blue Chip Economic Indicators, NAIRU, median	Apr. 2019	SPU	4.2	n.a.
16. Survey of Primary Dealers, longer-run unemployment rate, median	Sept. 2019	LRU	4.2	n.a.

34. The long-run framework memo to the FOMC in July 2019 by Ajello and others concludes that it is likely preferable to err on the side of lower estimates of an SPU. The memo argues that the costs from assuming an SPU that is too high, which would induce a more restrictive policy stance to ward off inflationary pressures, are greater than assuming a lower value to the SPU in a low interest rate environment with zero-lower-bound concerns.

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