Congressional Budget Office
Nonpartisan Analysis for the U.S. Congress

Approaches to Estimating the Noncyclical Rate of Unemployment

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For information about the conference, see https://tinyurl.com/msxy359y.

CBO’s Estimates of the Noncyclical Rate of Unemployment

The Congressional Budget Office defines the noncyclical rate of unemployment as the rate of unemployment arising from all sources except fluctuations in aggregate demand.

CBO estimates that prices were roughly stable when the unemployment rate gap—the actual unemployment rate minus the noncyclical rate—was closest to zero and the economy was not in recession. CBO currently estimates that the unemployment rate gap was zero in the fourth quarter of 2005 (2005:Q4).

For subsequent quarters, CBO currently estimates the noncyclical rate of unemployment by holding unemployment rates constant at their 2005:Q4 values for 516 demographic groups (defined by sex, education, age, and race), accounting for changes in labor force shares over time and calculating an overall weighted average each quarter.

How CBO Uses the Noncyclical Rate of Unemployment

For the longer term, CBO's estimates of the noncyclical rate of unemployment anchor its projection of the unemployment rate, which is a factor used to project output.

CBO uses contemporaneous and previous values of the unemployment rate gap as cyclical indicators in its macroeconomic forecasting models of key variables over the near term, including the following:

- The federal funds rate and the 3-year and 10-year Treasury note rates;
- Selected types of inflation—employment costs, shelter services, energy services, food at home, services other than food away from home or medical services; and
- Labor force participation.

Historical estimates of the unemployment rate gap are used as explanatory factors to predict those key variables. That gap is also used in modeling how the state of the economy changes the economic effects of policies that alter work incentives.

For an overview of CBO's projection methods, see Robert W. Arnold, *How CBO Produces Its 10-Year Economic Forecast*, Working Paper 2018-02 (Congressional Budget Office, February 2018), www.cbo.gov/publication/53537.

An Alternative Approach

CBO is exploring alternative approaches for estimating the noncyclical rate of unemployment.

One alternative approach, presented here, links to estimates of unemployment rates associated with no inflationary pressure and accounts for influences of factors other than demographics.

- The approach anchors the analysis to four calendar quarters when the overall average stable-price unemployment rate gap was roughly zero: 1988:Q2, 1995:Q1, 2004:Q1, and 2017:Q1.
- In those four quarters, the model uses observed unemployment rates as “noisy” observations of an otherwise unobserved trend.
- This anchors the trend to observed unemployment rates for each of 16 demographic groups in periods when the labor market was estimated to be in balance.

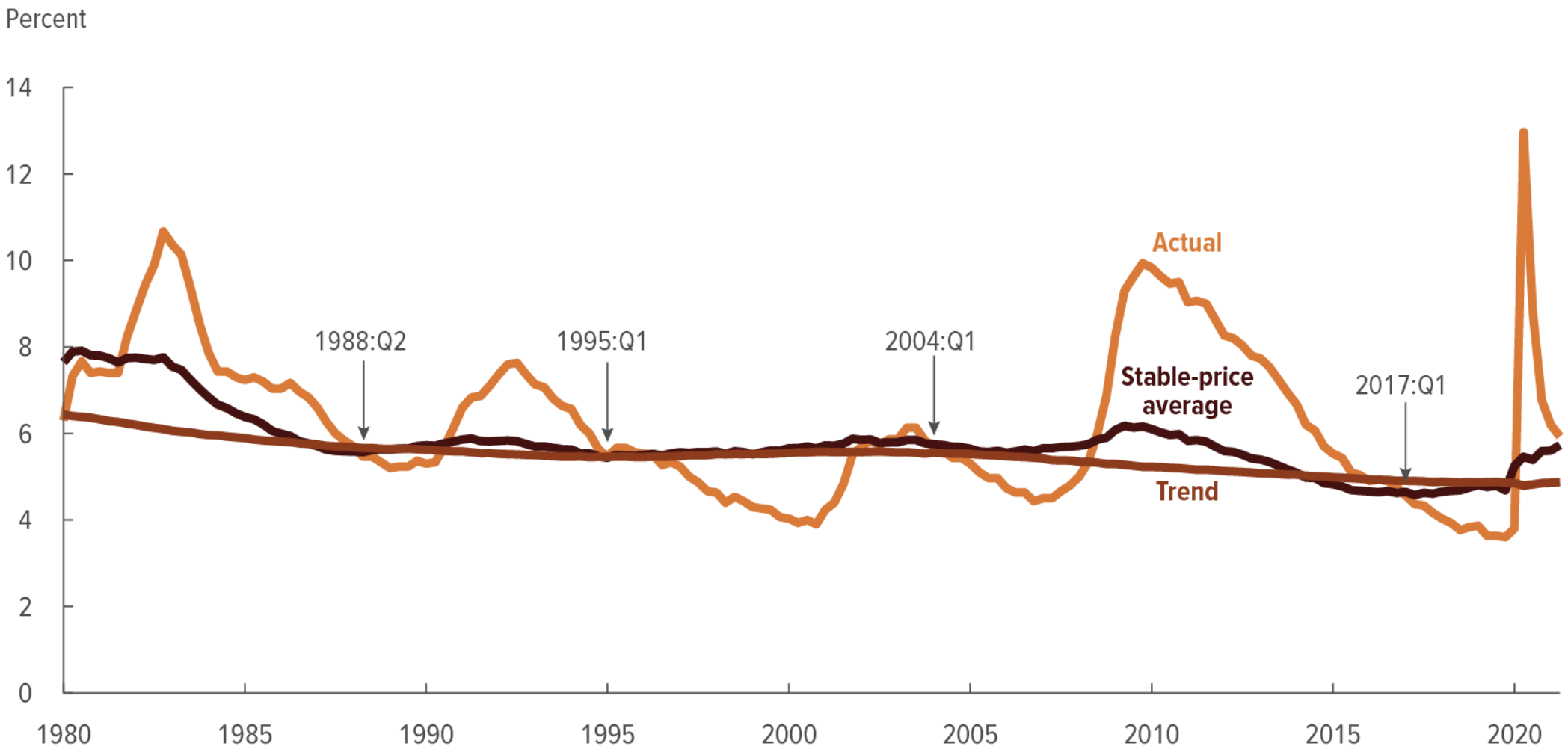
Average Stable-Price Unemployment Rates

The periods when the labor market was in balance were identified as times (outside of recessions) when the unemployment rate roughly equaled the average of stable-price unemployment rates estimated in the following two papers:

- Richard Crump, Stefano Eusepi, Marc Giannoni, and Ayşegül Sahin. 2022. "The Unemployment-Inflation Trade-Off Revisited: The Phillips Curve in COVID Times" (draft, JME-SNB-SCG Conference 2022: "Inflation: Expectations & Dynamics," October 2022), https://tinyurl.com/52d97f3d.

- Brandyn Bok, Richard Crump, Christopher Nekarda, and Nicolas Petrosky-Nadeau. 2023. *Estimating Natural Rates of Unemployment: A Primer*, Working Paper 2023-25 (Federal Reserve Bank of San Francisco, August 2023), https://doi.org/10.24148/wp2023-25.

Unemployment Rates for the Overall Labor Force



State-Space Model For Trend-Cycle Decomposition

To help account for demographic changes over a 30-year horizon in forecasts, the model uses **16 groups** (defined by sex, education, and age) denoted by **i**.

Time in calendar quarters is denoted by **t**.

The observed unemployment rate is the sum of unobserved components	$u_{i,t} = m_{i,t} + \theta_i x_t + w_{i,t}$
The trend component	$m_{i,t} = m_{i,t-1} + g_{i,t}$
A first-order autoregressive innovation to the trend	$g_{i,t} = \alpha g_{i,t-1} + \varepsilon_{i,t}$
The common cyclical component—a stationary second-order autoregressive process	$x_t = \beta_1 x_{t-1} + \beta_2 x_{t-2} + \omega_{i,t}$
A first-order autoregressive idiosyncratic component	$w_{i,t} = \rho w_{i,t-1} + \delta_{i,t}$

Related Literature

The alternative approach is most closely based on the following work:

- Andreas Hornstein and Marianna Kudlyak, *Aggregate Labor Force Participation and Unemployment and Demographic Trends*, Working Paper 2019-07 (Federal Reserve Bank of San Francisco, February 2019), https://doi.org/10.24148/wp2019-07.

The decomposition of the trends and cycles in this approach uses estimation methods similar to those used by Crump, Eusepi, Giannoni, and Sahin (2022) and in work by:

- Ufuk Devrim Demirel and James Otterson, “Quantifying the Uncertainty of Long-Term Macroeconomic Projections,” *Journal of Macroeconomics*, vol. 75, Article 103501 (March 2023), https://doi.org/10.1016/j.jmacro.2023.103501.

Estimation Process

The approach uses the Kalman filter to jointly estimate values for the trend component, $m_{i,t}$, and the common cyclical component, x_t, using data for four groups of people ages 25 to 54:

- Women who are college graduates or have some college education;
- Men who are college graduates or have some college education;
- Women who are high school graduates or have less education; and
- Men who are high school graduates or have less education.

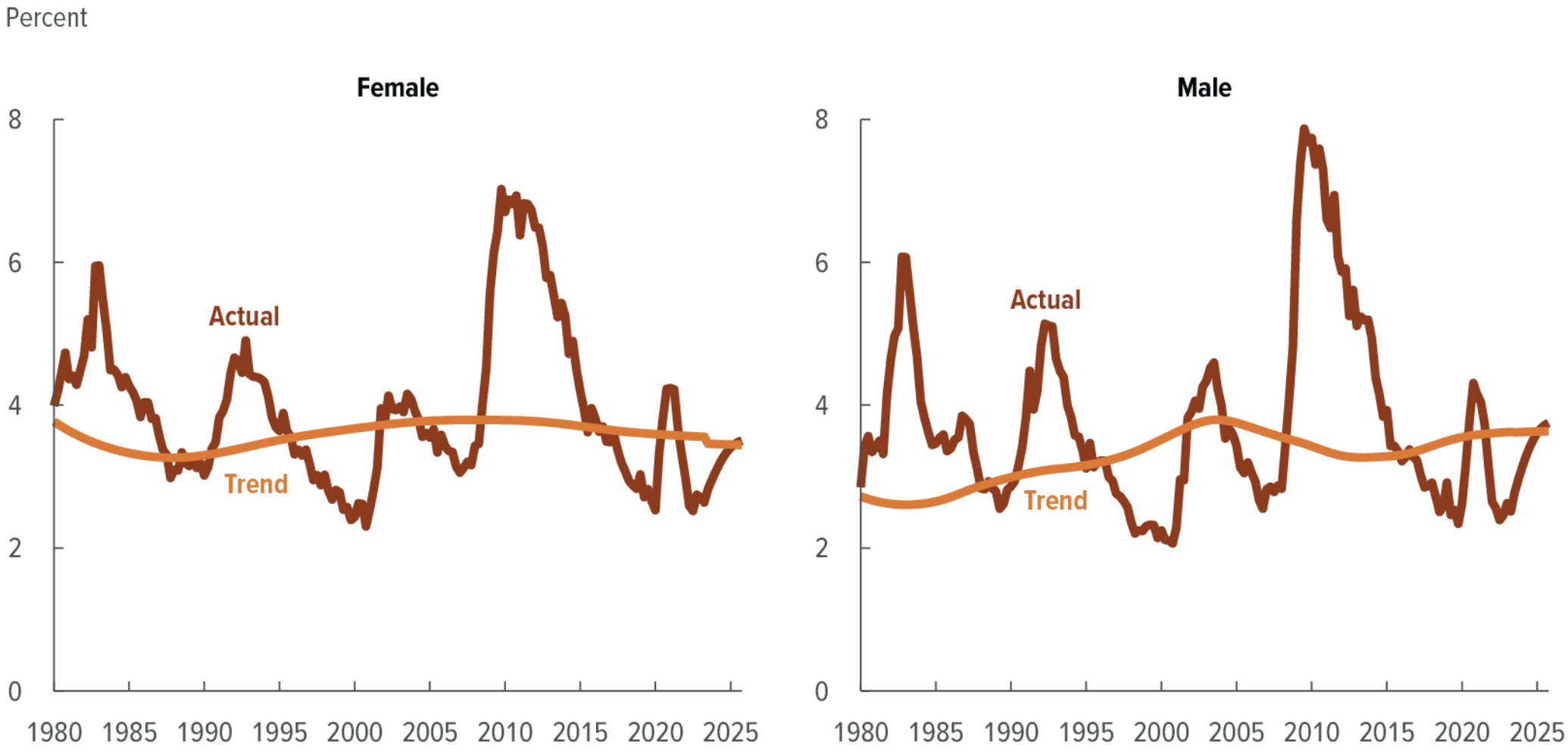
The Kalman smoother generates fitted values for the cyclical component.

Those fitted values are used as data when separately estimating the values for the trend component for the 12 other demographic groups, reducing the dimension of the estimated system to enhance its stability.

Estimates of θ, the Sensitivity to the Common Cyclical Component

Education	Age	Female	Male
Postgraduate	55+	0.57	0.22
	25–54	0.25	0.24
College graduate or some college	55+	0.41	0.50
	25–54	0.45	0.60
	16–24	0.58	0.80
High school graduate or less	55+	0.45	0.71
	25–54	0.69	1.00
	16–24	2.89	1.98

Unemployment Rates for College Graduates or People With Some College Education, Ages 25 to 54



Trend Unemployment Rate, 2023:Q2

		Female		Male	
Education	Age	Trend rate (percent)	Labor force share	Trend rate (percent)	Labor force share
Postgraduate	55+	2.8	0.02	2.6	0.02
	25–54	1.9	0.05	1.9	0.06
College graduate or some college	55+	3.2	0.05	3.4	0.07
	25–54	3.6	0.15	3.6	0.19
	16–24	5.4	0.02	7.9	0.03
High school graduate or less	55+	3.8	0.03	4.2	0.05
	25–54	6.8	0.10	6.0	0.09
	16–24	14.4	0.04	14.5	0.04

Work in Progress

CBO continues to assess the usefulness of this alternative approach for estimating the noncyclical rate of unemployment.

The agency's next steps include evaluating:

- The usefulness of incorporating estimates of the common cyclical component into CBO's model of potential labor force participation;
- The predictive power, in CBO's macroeconomic forecasting equations, of overall unemployment rate gap estimates generated with this approach; and
- The compatibility of long-term trend unemployment rate projections anchored by stable-price unemployment rates with other aspects of CBO's long-term projections.

About This Presentation

This presentation was prepared to enhance the transparency of the work of the Congressional Budget Office and to encourage external review of that work. In keeping with CBO's mandate to provide objective, impartial analysis, the presentation makes no recommendations.

Devrim Demirel, Edward Gamber, and Jeffrey Kling prepared the presentation with guidance from Robert Arnold and Richard DeKaser.

Mark Doms reviewed the presentation, Scott Craver edited it, and R. L. Rebach created the tables and figures. The document is available at www.cbo.gov/publication/59690.

CBO seeks feedback to make its work as useful as possible. Please send comments to communications@cbo.gov.