COMMENTS ON “A UNIFIED APPROACH TO MEASURING $u^*$”

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The goal of this paper by Richard Crump, Stefano Eusepi, Marc Giannoni, and Aysegul Sahin (CEGS) is to estimate the natural rate of unemployment, or $u^*_t$, in the postwar period. The authors combine two measurement approaches, one based on detailed data on flows into and out of unemployment for many demographic groups, and the other on the traditional Phillips curve relationship and data on aggregate unemployment, inflation and inflation expectations. The paper provides three main takeaways. First, $u^*_t$ is estimated to be around 4% in 2018. Second, $u^*_t$ appears to have been trending down since the late 1980s. Third, this downward trend is due to the secular decline in the separation rate, which, in turn, was caused by the increased labor force attachment of women, the decline in job destruction and reallocation intensity, and the dual aging in the labor market of workers and firms. Overall, this paper is an impressive piece of work with crucial policy implications. The most obvious of them is that the current low level of unemployment is roughly sustainable in terms of inflation, given that it is similar to the estimated natural rate and the unemployment gap is thus close to zero.

I will organize my comments around two main points. I will first try to unpack the estimates of $u^*_t$ presented by CEGS, to shed light on their essential drivers. My conclusion will be that data on inflation expectations seem crucial for the measurement of $u^*_t$ in the paper. In contrast, the detailed labor market flow data play a less central role for the measurement of $u^*_t$, although they are of course crucial for the interpretation of its secular trend. I will then analyze the implications of this unpacking exercise for the New-Keynesian Phillips curve, which seems in better shape than what some recent critics have suggested.

1. What Drives the CEGS Estimate of $u^*_t$?

The baseline estimate of $u^*_t$ provided by CEGS has three key features: (i) $u^*_t$ has been trending down since the 1980s; (ii) it is approximately equal to 4% in 2018; and (iii) the uncertainty around its path is sizable, but not overwhelming. My objective here is to

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understand what ingredients of the CEGS’s complex empirical model are essential to these findings. To this end, I will present a battery of \( u_t^* \) estimates, obtained using a sequence of progressively more complex models, the last of which corresponds to the CEGS baseline model.

**Model 1.** The starting point of my unpacking exercise is the traditional backward-looking Phillips curve,

\[
\pi_t - \pi^* = \gamma (\pi_{t-1} - \pi^*) - \kappa (u_t - u_t^*) + s_t.
\]

According to this “Triangle model” (Gordon, 1977 and 2013), deviations of inflation (\( \pi_t \)) from its target value (\( \pi^* \)) depend on an inertial term, a “demand factor” represented by the gap between unemployment (\( u_t \)) and its natural rate (\( u_t^* \)), and a supply shock (\( s_t \)). In the estimation, \( u_t^* \) is treated as an unobservable variable and modeled as a random walk process, to capture the idea that its movements are very persistent. Like CEGS, I assume that the unemployment gap and the supply shock follow an AR(2) and an AR(1) process respectively, although these two assumptions are not crucial for the results. Figure 1.1.a presents the implied estimate of \( u_t^* \), which is quite different from the baseline estimate of CEGS: \( u_t^* \) is relatively stable over time, it is approximately equal to 6% in 2018, and the uncertainty around its path is large. 1

**Model 2.** I will now augment model 1 with all the ingredients of the CEGS baseline setup, adding these components one at a time to understand their specific role. The first step in this direction consists of turning the backward-looking Phillips curve of equation (1.1) into a more modern New-Keynesian forward-looking Phillips curve, based on sticky wages and indexation to past and steady-state inflation:

\[
\pi_t - \pi^* = \gamma (\pi_{t-1} - \pi^*) - \kappa E_t \sum_{j=0}^{\infty} \beta^j (u_{t+j} - u_{t+j}^*) + s_t.
\]

The main new feature of (1.2) is that inflation depends on the expected present discounted value of the future unemployment gaps, and not just on the current level of this gap, as in (1.1). However, this change has a relatively minor impact on the measurement of \( u_t^* \), as evident from comparing figure 1.1.b to 1.1.a.

1All the estimates in this comment are obtained using the same priors for the parameters also appearing in the CEGS paper, and the same data.
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Figure 1.1. Estimates of $u^*_t$ based on model 1 (a), model 2 (b), model 3 (c), and model 4 (d).

Model 3. The next step in the direction of the CEGS model is to introduce time variation in the inflation target. More precisely, $\pi^*$ in (1.2) is replaced by $\pi^*_t$, which is modeled as a random walk to capture the low frequency hump-shaped behavior of inflation during the 1970s and 1980s. The role of this modification, however, is also relatively marginal, resulting again in nearly unchanged estimates of $u^*_t$ relative to model 1 and 2 (figure 1.1.c).

Model 4. Moving on, I now estimate the model by also using data on short- and long-term inflation expectations. As in CEGS, these data are equated to the short- and long-term forecasts of inflation implied by the model, up to a measurement error. These survey data help pin down the level of the time-varying inflation target, $\pi^*_t$, among other things. Notice
that the implied estimate of $u^*_t$, presented in figure 1.1.d, is now quite different from the
previous ones: $u^*_t$ clearly trends down starting in the 1980s, it is close to 4% in 2018, and
its uncertainty is lower. Overall, the path of $u^*_t$ is quite similar to the baseline estimate of
CEGS, suggesting that the use of data on inflation expectations is a crucial component of
their empirical model.

Model 5. The final ingredient of the CEGS model is the assumption that $u^*_t$ cannot
permanently deviate from the secular trend of the unemployment rate ($\bar{u}_t$). In particular,
CEGS rewrite $u^*_t$ as

$$u^*_t = (u^*_t - \bar{u}_t) + \bar{u}_t,$$

where $\bar{u}_t$ is measured independently using disaggregated labor market flow data, and the
term in parentheses—the distance between natural and secular unemployment—is assumed
to follow an AR(1) process. I estimate this model using CEGS’s exact measure of $\bar{u}_t$, and
present the implied estimate of $u^*_t$ in figure 1.2. By construction, this estimate is identical
to CEGS’s “inflation-only” estimate of $u^*_t$.

It is important to notice that the evolution of $u^*_t$ in figure 1.2 is overall similar to the path
of $u^*_t$ displayed in figure 1.1.d. A possible interpretation of this finding is that disaggregated
labor market flow data are not terribly useful to estimate $u^*_t$, because they do not drasti-
cally change our view about the time-series behavior of this variable. This interpretation,
however, would probably be too literal and a bit naive. A more compelling view is that this
consistency result—the fact that aggregate data on unemployment, inflation and inflation
expectations deliver estimates of natural unemployment in line with its secular trend—is
remarkable, and provides an important external validation of the traditional Phillips curve
framework.

2. IMPLICATIONS FOR THE NEW-KEYNESIAN PHILLIPS CURVE

The New-Keynesian Phillips curve has recently been criticized because inflation fell little
relative to the increase in unemployment during the Great Recession, the so-called “missing
disinflation” phenomenon (e.g. Hall, 2011). However, as stressed by Coibion and Gorod-
nichenko (2015), Del Negro et al. (2016) and Carvalho et al. (2017), this somewhat puzzling
behavior of inflation can be explained by the fact that inflation expectations were well an-
chored during the same period. By this logic, the explicit use of inflation survey data should
robustify inference in the context of the New-Keynesian Phillips curve, and improve the estimation of $u^*_t$, which is exactly what the previous empirical results show.

To understand why these survey data play such a crucial role, let $\pi_t^*$ replace $\pi^*$ in the New-Keynesian Phillips curve (1.2), and rewrite this equation as

$$(2.1) \quad \pi_t - \gamma \pi_{t-1} - (1-\gamma) \pi_t^* - \beta E_t \left[ \pi_{t+1} - \gamma \pi_t - (1-\gamma) \pi_{t+1}^* \right] = -\kappa (u_t - u_t^*) + \bar{s}_t,$$

for $t = t+1$, to make explicit the dependence of inflation on its expected future value. The use of data on short- and long-term inflation expectations makes the variables $E_t \pi_{t+1}$ and $\pi_t^*$ observable, up to some measurement error. As a consequence, it becomes easier for the econometrician to isolate the relationship between the left- and the right-hand side of (2.1), and to more precisely estimate the slope coefficients $\kappa$ and the natural rate $u_t^*$. Furthermore, when using data on inflation expectations, inference about $\kappa$ becomes also surprisingly stable over time.  

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$^2$The term $\bar{s}_t$ is equal to $(1 - \rho_s) s_t$, where $\rho_s$ is the autocorrelation of the supply shock.

Figure 1.2. Estimate of $u_t^*$ based on model 5.
To illustrate this point, figure 2.1.a presents the evolution of $u_t^*$ according to model 4, when this model is estimated using only post-1990 data. Notice that the implied path of $u_t^*$ is remarkably similar to the one based on the full-sample estimation of the same model, plotted in figure 1.1.d.

It is important to realize, however, that this powerful role of inflation expectation data in the estimation of the Phillips curve also comes with a disadvantage. The cost is the sensitivity of the estimate of $u_t^*$ to the exact measurement of inflation expectations, which is notoriously difficult. For example, figure 2.1.b plots the time series of long-term inflation expectations used for the estimation of model 4 (and the baseline model of CEGS). These
expectations appear to be “upward biased,” as agents systematically expect inflation in the long run to be higher than current inflation. Given that these survey data effectively pin down the level of $\pi_t^*$, this implies that actual inflation is almost always below target. In turn, this explains why the unemployment gap is almost always positive in figure 2.1.a.

To illustrate the sensitivity of $u_t^*$ to the measurement of inflation expectations, figure 2.2.a plots the implied evolution of $u_t^*$ when I re-estimate the model on post-1990 data, using a modified long-term inflation expectation series that is artificially set to 2% after year 2000 (figure 2.2.b). The figure makes clear that the estimate of $u_t^*$ would shift considerably in this counterfactual scenario, implying a substantially negative unemployment gap in 2018. This finding suggests that the Phillips curve is still relatively flat, despite being estimated quite robustly due to the explicit use of data on inflation expectations.

REFERENCES

Carvalho, Carlos, Stefano Eusepi, Emmanuel Moench and Bruce Preston (2017): “Anchored inflation expectations,” mimeo.


Figure 2.2. Post-1990 estimate of $u_t^*$ based on model 4 (a) obtained using actual inflation data and artificial data on inflation expectations (b).