

## Will Inflation Remain Low?

BY YIFAN CAO AND ADAM SHAPIRO

The well-known Phillips curve suggests that future inflation depends on current and past inflation and a measure of economic slack or resource utilization. Using the unemployment gap to measure slack, a simple Phillips curve currently predicts that inflation will remain quite low through 2015. Two variations of the model, which impose a higher anchor for inflation expectations or focus only on a short-term unemployment gap, still predict that inflation will remain low, albeit higher than implied by the basic model.

Over the past two years, inflation has remained persistently low. As measured by the core personal consumption expenditures price index (core PCEPI), which excludes volatile energy and food prices, annual inflation has been below the Federal Reserve's 2% target since April 2012. Given the recent path of inflation, a natural question to consider is how likely it is to remain low in the future. Recent research using financial market forecasts (Bauer and Christensen 2014) shows that inflation will remain low going forward. In this *Economic Letter*, we examine the outlook for inflation using model-based forecasts.

We rely on the well-known Phillips curve model and examine its implications for inflation over the next two years. In its most basic form, this model posits that inflation depends on past inflation and a measure of slack in the overall economy. We show that a basic Phillips curve implies that inflation is likely to remain low over the next two years.

As with any forecasting model, the basic Phillips curve is sensitive to the assumptions inherent in its underlying structure. The basic model has very few components and leaves out several potentially important determinants of inflation. Indeed, over the years, numerous extensions to the basic Phillips curve framework have incorporated additional factors that are likely to affect the dynamics of inflation. In this *Economic Letter*, we focus on two simple extensions that are potentially important to the current inflation outlook.

The first extension incorporates anchored inflation expectations with the constraint that long-run inflation eventually returns to the Fed's inflation target of 2% (see Williams 2006, Stock and Watson 2010, and Cogley, Primiceri, and Sargent 2010). The second extension uses an alternative measure of economic slack that excludes the long-term unemployed and focuses on the short-term unemployed (see Gordon 2013, Rudebusch and Williams 2014, and Watson 2014). A Phillips curve model that incorporates these two extensions predicts a path for inflation that is still low but is higher than implied by the basic model.

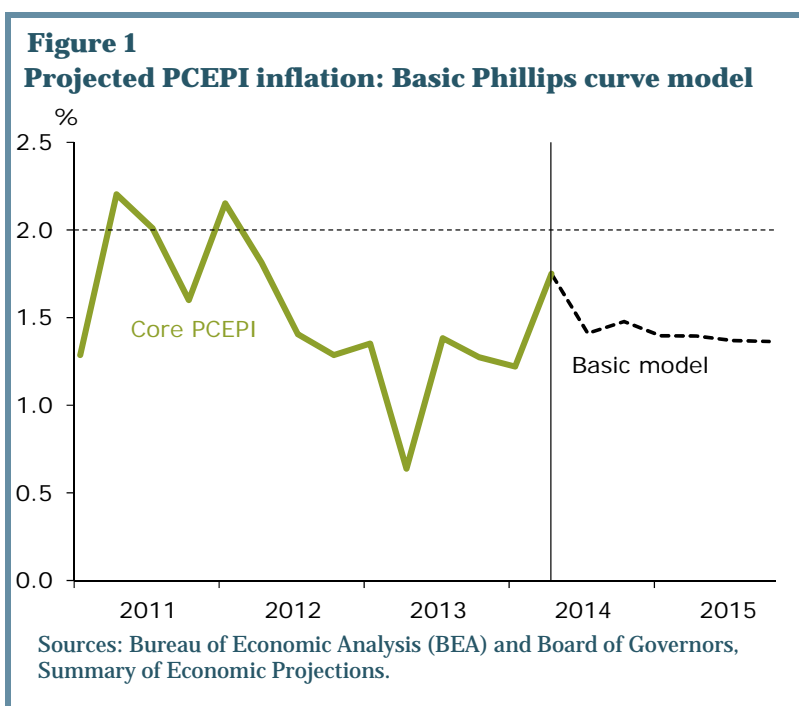
### **The basic Phillips curve model**

The Phillips curve framework is based on the premise that, during times of economic prosperity when overall demand rises higher than overall supply in the economy, there will be increasing pressure to push

prices up. By contrast, during times of economic distress when demand falls relative to supply, there is a downward pressure on prices. The model therefore suggests that inflation depends on some indicator of unused productive capacity in the economy, or “slack.” While there are numerous measures of slack, a popular choice among economists is a measure referred to as the unemployment gap. This gap is defined as the difference between the level of the current unemployment rate and what the unemployment rate should be if the economy were operating at its full capacity. This latter measure is referred to as NAIRU, or the non-accelerating inflation rate of unemployment, and an estimate of it is produced by the Congressional Budget Office. The underlying intuition is that, when the economy is in distress, the unemployment rate will lie above NAIRU.

The basic Phillips curve describes the behavior of current inflation as a function of the past unemployment gap and past inflation. We estimate this model using data going back to 1985. We then use the parameters from our estimates to project future inflation, assuming that the unemployment gap follows some specified future path. We assume that the unemployment rate for the second quarter of 2014 will be 6.3%, as measured in May 2014, and thereafter it will move at a steady pace toward 5.55% by the end of 2015, which is the average unemployment rate projection from the Fed’s most recent Summary of Economic Projections (Board of Governors 2014).

Figure 1 depicts actual inflation, measured by the annualized quarterly change in core PCEPI and the projection for inflation using the basic Phillips curve model. The basic model implies inflation is very persistent and projects core PCEPI inflation will remain below 2% through the end of 2015.



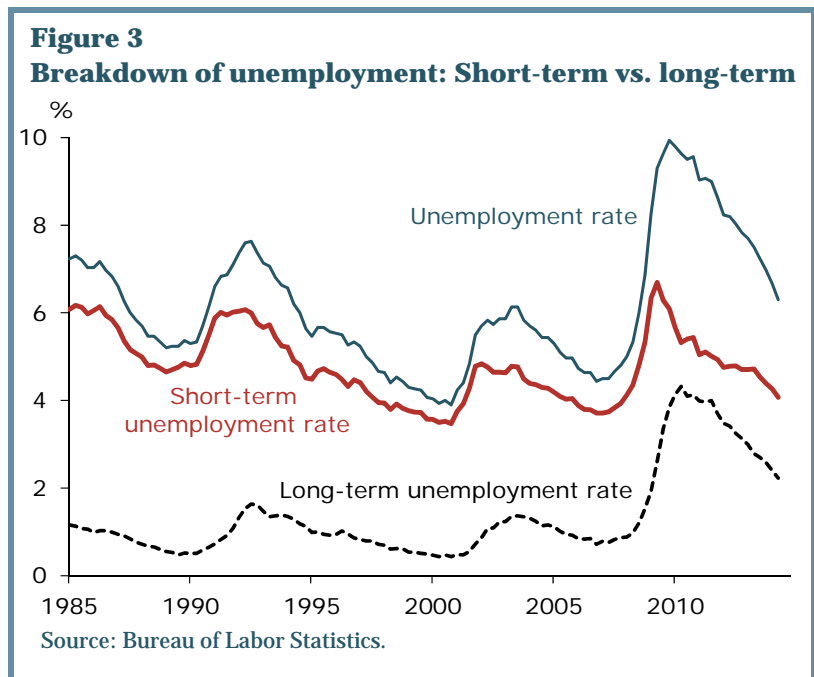
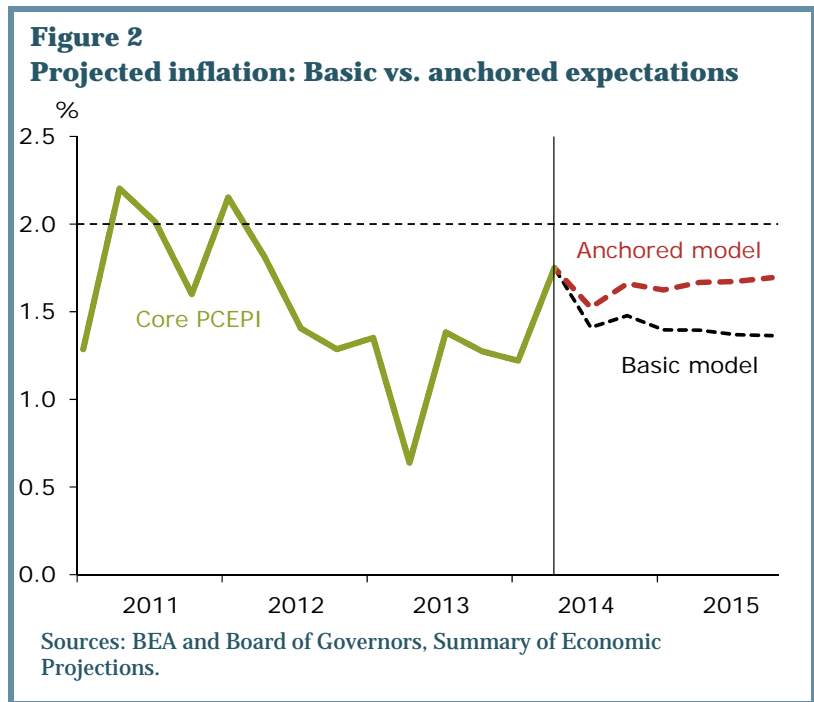
### Extensions to the basic model

The basic Phillips curve is a parsimonious model and therefore leaves out a myriad of different variables that may affect the path of inflation. Indeed, throughout the past few decades, economists have extended the basic Phillips curve in a host of different ways. Looking at these variations can help give some insights into how certain components can change the outlook for future inflation. For this *Economic Letter*, we consider two simple extensions of the model that are particularly relevant given the current situation.

In our first exercise, we examine how much a credible Fed inflation target would affect the inflation forecast generated by the Phillips curve. Specifically, we impose a restriction that steady-state core PCEPI inflation lies at the Fed’s perceived inflation target, currently 2%. This is equivalent to assuming that, on average, consumers and firms believe that future inflation is “well anchored” around the Fed’s inflation target level (see Williams 2006). The assumption is reasonable if firms are forward-looking, setting prices based on expectations of future demand and cost, and incorporating the Fed’s explicit inflation target.

Figure 2 depicts this Phillips curve model that imposes inflation expectations anchored at the Fed’s target, alongside the basic model projection. The modified projection is slightly higher, but still lies below 2% by the end of 2015. This slow movement of inflation from its current level, even assuming anchored expectations at 2%, highlights the strong persistence of inflation implied by the data and the model. Generally, most models of inflation dynamics agree on this key trait, that is, inflation moves sluggishly over time.

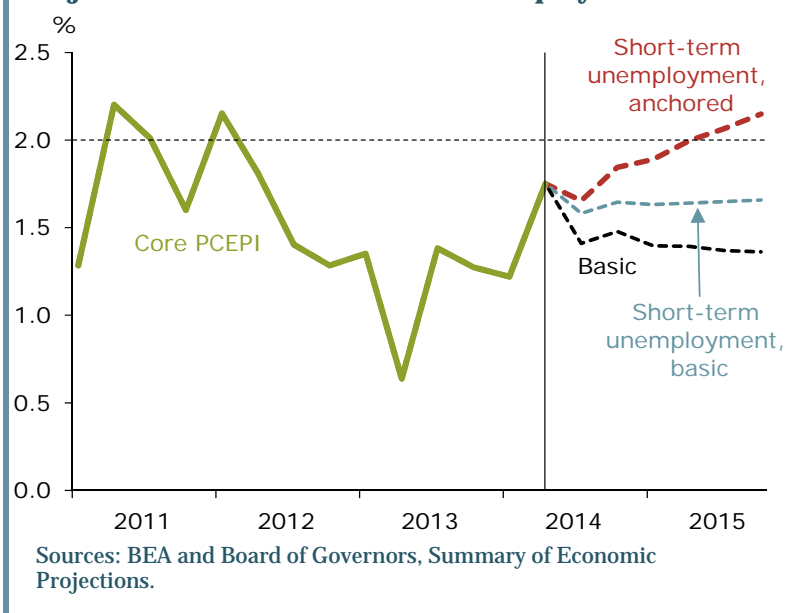
In our second exercise, we alter the measure of slack used in the Phillips curve inflation forecast. The years since the most recent recession have been marked not just by higher overall unemployment, but also by different durations of unemployment taking divergent paths. As Figure 3 shows, the short-term unemployment rate, defined as the number of people out of work for less than 27 weeks divided by the labor force, has dropped precipitously since the most recent recession ended. In terms of the short-term unemployed, the economy is back to its historical average. By contrast, the long-term unemployment rate has remained elevated. As Robert Gordon (2013) and Mark Watson (2014) recently pointed out, these long-term unemployed may be exerting less upward pressure on wages and prices than the short-term unemployed. For instance, this may be the case if firms compete more for potential employees who have only recently become unemployed than for those whose skills may have eroded or who may otherwise be scarred by prolonged unemployment.



For this exercise, we alter our measure of economic slack to account for this dichotomy. Rather than using overall unemployment, we focus on the short-term unemployed. Specifically, we create a short-term unemployment gap measure by gauging how monthly rates over the 1985 to 2014 sample period deviate from the average short-term unemployment rate.

Figure 4 shows that the projections for inflation using the short-term unemployment gap exceed the projections of the basic model using the overall unemployment gap. If we also impose well-anchored inflation expectations, inflation rises at a relatively fast pace, surpassing 2% by the end of 2015. The reason for the higher inflation projection is that, in terms of the short-term unemployment rate, there is currently little economic slack. In fact, the short-term unemployment rate projects excess demand over the next two years, which implies strong upward pressure on prices.

**Figure 4**  
**Projected inflation: Short-term unemployment as slack**



## Conclusion

Inflation, as measured by the core PCEPI, currently stands below the Fed's 2% target. A simple empirical Phillips curve implies that inflation will remain relatively low in the near future. Estimating just how low depends a great deal on the assumptions in the model. We test two specific variations to the basic model, altering the measure of slack and the assumptions about inflation expectations. We find that these variations produce some higher projections for future inflation. However, it is difficult to prove that any one specification of the model is the true one. Instead, examining the effects of various specifications can be instructive in exploring how various factors affect forecasts of inflation.

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