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Adjustments to some long-term parameters of the staff judgmental forecast

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I. Introduction

In this Tealbook, the staff made three changes to its longer-run conditioning assumptions for the judgmental forecast. First, the long-run growth rate of GDP was reduced from 1.9 percent to 1.7 percent. Second, the long-run equilibrium real federal funds rate was lowered from 1 percent to ¾ percent. Finally, the long-run term premium on 10-year Treasury securities was reduced from 50 to 40 basis points. This memo provides the background for these changes.

II. Changes to long-run growth assumptions

Our new assumption for GDP growth in the long run of 1.7 percent is largely informed by the recent surprisingly dismal performance of productivity growth and by a new set of estimates from John Fernald.[1] Fernald (2016) judges that long-term GDP growth will be held down relative to pre-crisis norms by demographics and educational attainment. Smaller increases in educational attainment will likely reduce the contribution of improvements in labor quality to the growth in GDP per hour, while demographic factors imply that the labor force will only grow about ½ percent per year and hence also hold down GDP growth. Fernald's point estimate for long-run GDP growth is 1.6 percent, a view that is consistent with growth of GDP per quality-adjusted hour of about 0.9 percent—the average during the period 1973-1995.

For us, recent demographic developments have largely not been surprising. On the other hand, productivity growth has persistently underperformed our expectations. For example, over the four quarters ending in 2016:Q2, output per hour in the business sector is currently estimated to have *declined* 0.4 percent, whereas one year ago at this time, we were expecting it to *increase* about 2¼ percent.

[1] John G. Fernald (2016), "Reassessing Longer-Run U.S. Growth: How Low?" San Francisco Fed Working Paper 2016-18.

Our new long-run growth assumption puts us back in the lower part of the range of opinions of external forecasters. Robert Gordon's views are similar to, if not more pessimistic than, those of Fernald (2016). Some recuperation of productivity growth from its recent dismal pace will have to occur if our assumption is to prove accurate; in particular, we assume that GDP per hour will increase about 1.2 percent per year in the long run, faster than the ½ percent per year average of the past five years. On the other hand, productivity growth consistent with our assumption would be only about in line with the average over the past decade.

III. Changes to the long-run equilibrium real federal funds rate

Our new long-run equilibrium real federal funds rate (r*) stands at ¾ percent—down ¼ percentage point from the level assumed in the July 2016 Tealbook. This adjustment reflects several considerations. First, our estimate is informed by estimates from staff econometric models. The Laubach and Williams model currently estimates an equilibrium real rate of 0.2 percent, while the latest available estimate from another staff model—that of Johannsen and Mertens—stands at 1 percent.[2] In addition, according to many macroeconomic models, the adjustment we made to our lower long-run growth assumptions implies a reduction in the equilibrium real federal funds rate, although quantifying the link between long-run growth and r* is difficult.[3] Related research by Gagnon, Johannsen, and Lopez-Salido (2016) argues that changes in the demographic characteristics of the U.S. population have reduced the equilibrium real interest rate since the 1980s.[4] They conclude that demographic factors will continue to put downward pressure on the equilibrium real interest rate and judge that r* will fall below ½ percent at the end of this decade and beyond as shown in Exhibit 1. Our judgmentally set

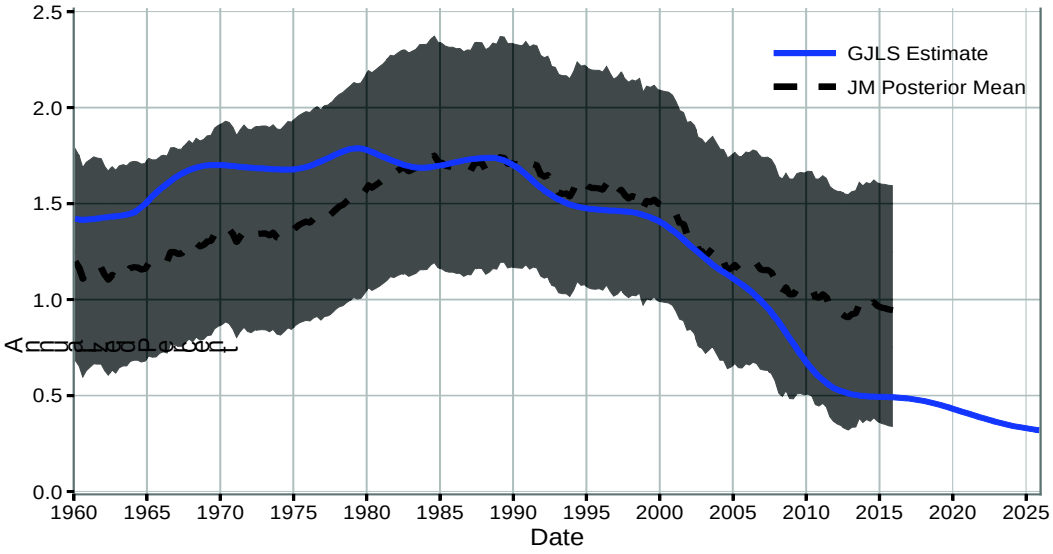
[2] For the latest estimate of the Laubach and Williams model, see http://www.frbsf.org/economic-research/economists/john-williams/Laubach_Williams_updated_estimates.xlsx. The Johannsen and Mertens model is documented in Benjamin K. Johannsen and Elmar Mertens (2016), "The Expected Real Interest Rate in the Long Run: Time Series Evidence with the Effective Lower Bound", FEDS Notes. Washington: Board of Governors of the Federal Reserve System, February 9, http://dx.doi.org/10.17016/2380-7172.1703

[3] The positive relationship between the equilibrium real interest rate and long-run output growth holds in the neoclassical growth model. For related recent empirical work, see Sylvain Leduc and Glenn D. Rudebusch (2014), "Does Slower Growth Imply Lower Interest Rates?", FRBSF Economic Letter 2014-33, and by Kevin J. Lansing (2016), "Projecting the Long-Run Natural Rate of Interest", FRBSF Economic Letter 2016-25.

[4] Gagnon, Johannsen and Lopez-Salido (2016), "Why Are the U.S. Interest Rates So Low? The Role of Demographics," use an overlapping generations model to study how real interest rates react to observed and projected demographic changes in the United States. They match fertility, mortality, population, family structure, and labor-force participation over time and find that the model predicts current low levels of real interest rates because of the aging of the baby boom and concomitant demographic changes, along with increased life expectancy.

value of ¾ percent lies in between the estimates of Gagnon, Johannsen, and Lopez-Salido and Johannsen and Mertens and somewhat above that of Laubach and Williams.

Exhibit 1: Estimated Trends in Real Interest Rates[5]



Note: The solid blue line is the estimated real interest rate from ongoing staff work by Gagnon, Johannsen, and Lopez-Salido. The black dashed line is the posterior mean of the estimated expected real interest rate in the longer run, reported by Johannsen and Mertens (2016), and the shaded area represents a 50 percent uncertainty band.

A second consideration in making the change to the long run equilibrium funds rate is the continued low level of long-term bond yields.[6] The 10-year nominal yield has fallen 69 basis points (bps) since the beginning of 2016, and the 5-to-10 year forward rate has declined by 87 bps over the same period. Most of the decline in long-term nominal yields is attributable to a decline in real yields, as the TIPS counterparts of the nominal yields have declined by about the same amount. While some of this decline may be driven by the term premium, we are taking some signal from low long-term bond yields for the long-run equilibrium real interest rate.

[5] We thank Benjamin K. Johannsen for providing materials on equilibrium real rate from the model by Gagnon, Johannsen, and Lopez-Salido (2016).
[6] Since long bond yields are not part of the information set of the Laubach and Williams model, long bond rates provide new information relative to that model.

Third, the reduction we made to r* is also partly informed by the one-sided forecast errors in the staff projection for long bond yields over the last several years. Past staff projections had assumed that those longer-dated yields would rise fairly quickly; these increases have not materialized.

IV. Changes to the long-run term premium for ten-year treasury securities

As just noted, long-term Treasury yields have come in notably below our projections for quite some time. In addition to the expectations-hypothesis component discussed in the previous section, we judge that this forecast error was driven partly by the fact that we had expected many of the factors depressing term premiums to be fairly transitory. However, according to our models, the term premium has remained negative, counter to our expectations. We made an initial reassessment of our view about term premiums in the April Tealbook, when we lowered the assumed path of the term premium over the projection period as well as our assumption for its long-term value: compared to the March Tealbook, the long-run value was lowered in April from 80 basis points to 50 basis points. Even after that revision, term premium estimates have continued to come in well below our projections.

As described in a box in the July Tealbook ("The Decline of Long-Term Treasury Yields since the Start of the Year"), domestic and international factors—including continued risks to the global growth outlook and accommodative monetary policy stances abroad, which may boost the demand for holding U.S. Treasury securities—appear to continue to depress term premiums.

In light of the incoming data and recent developments in financial markets, we now assess that the factors holding down the 10-year term premium will be more persistent than we had previously assumed. This reassessment led us to lower the long-run assumption for the 10-year Treasury term premium in the September Tealbook from 50 to 40 basis points.[7]

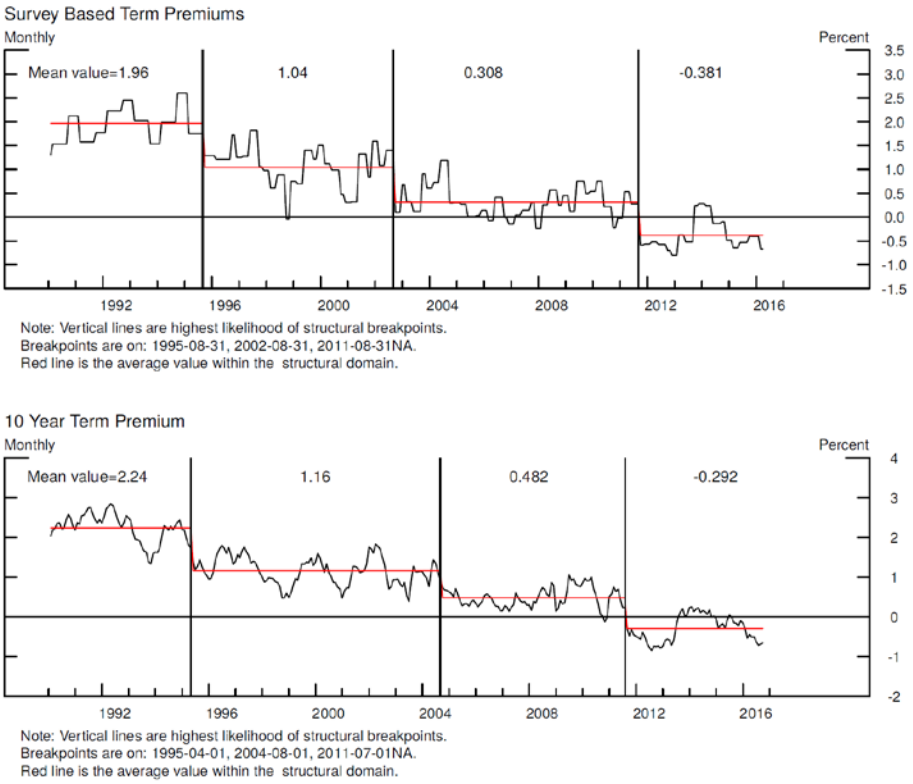
This new assumption falls in the middle of the range of different estimates of long-run averages of term premiums, whereas our assumption in the July Tealbook was closer to the top of that range. For instance, Exhibit 2 shows that, for the period prior to the zero-lower bound (2004-

[7] Similarly, we also reduced the term premium over the medium term.

2011), the average of the estimated term premium based on the Blue Chip survey (top panel of Exhibit 2) is 30 basis points, while the estimate based on the Kim-Wright model (bottom panel of Exhibit 2) is about 50 basis points.[8]

Taking into account the downward revisions in our current forecast, we project that term premiums will increase about 85 basis points from the current quarter to 2019:Q4. Based on the Li-Wei model,[9] slightly more than half of the projected increase in term premiums in our projection is associated with the normalization of the Federal Reserve balance sheet, with the remaining portion being associated with the waning of other factors depressing term premiums.[10]

Exhibit 2: Estimates of the long-run term premium in 10-year Treasury yields



[8] Exhibit 2 suggests that the average level of the term premium appears to have experienced structural downshifts. We assume that the long-term value of the term premium is the most recent stable average prior to the zero-lower bound period.

[9] See "Term Structure Modeling with Supply Factors and the Federal Reserves' Large-Scaled Asset Purchase Program", by Canlin Li and Min Wei, International Journal of Central Banking, March 2013.

[10] As in the July Tealbook, we assume that the SOMA portfolio will remain at its current level until the third quarter of next year and then begin to contract as the proceeds from maturing assets are no longer reinvested.

V. Implications for the medium-term forecast

The reduction in the long-run equilibrium federal funds rate implies a mechanical change in the path of the time-varying intercept in the interest rate rule underlying the medium term forecast. This intercept was introduced in the June 2016 Tealbook and assumed to rise linearly from zero to 100 basis points (the long-run r* at the time) by the end of 2018. We now assume the intercept will rise linearly over that time period to 75 basis points.

A separate judgment involves whether to allow the reductions in the long-run equilibrium real federal funds rate and long-run term premiums to boost the medium-term forecast for real activity. This time, we have not allowed the rate adjustments to boost the outlook for activity, based on the judgment that the rate changes reflect a revised view about the yields that are required to generate growth in line with its potential: Aggregate demand is weaker than we thought previously; therefore, lower rates will be required to support output growing in line with its potential. In this interpretation, the emergence of lower rates is a sign of weakness, not a harbinger of strength.