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Monetary Policy at the Zero Lower Bound: Revelations from the Summary of Economic Projections

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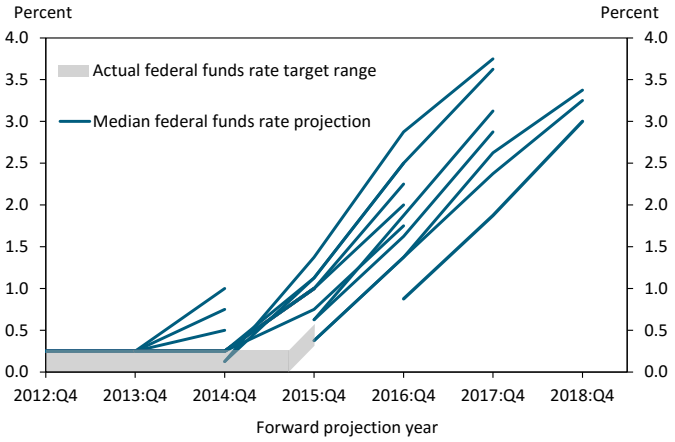
We use the FOMC's Summary of Economic Projections to estimate a policy reaction funtion that describes the relationship between FOMC participants' projections of the federal funds rate target and their projections of inflation and unemployment. We find the relationship is data dependent and systematic, meaning the funds rate projections were not on a pre-set path. Moreover, we find that the relationship is generally consistent with the FOMC's actual policy responses before the zero lower bound period. Projections of liftoff from the effective lower bound during this period were not realized due primarily to lower-than-expected inflation.

In 2012, the Federal Open Market Committee added the federal funds rate to its quarterly Summary of Economic Projections (SEP). Since then, FOMC participants—including Federal Reserve Board governors and Bank presidents—have repeatedly projected the funds rate target would rise in conjunction with projected increases in inflation and declines in unemployment. However, the federal funds rate remained at its effective lower bound until December 2015.

Chart 1 shows FOMC participants repeatedly projected an upward trajectory for the funds rate target, while the actual funds rate remained in the 0 to 25 basis point range from December 2008 to December 2015. Each solid line represents the median of projections for the federal funds rate made at an FOMC meeting associated with a SEP report.

Chart 1: Projected versus actual federal funds rate target



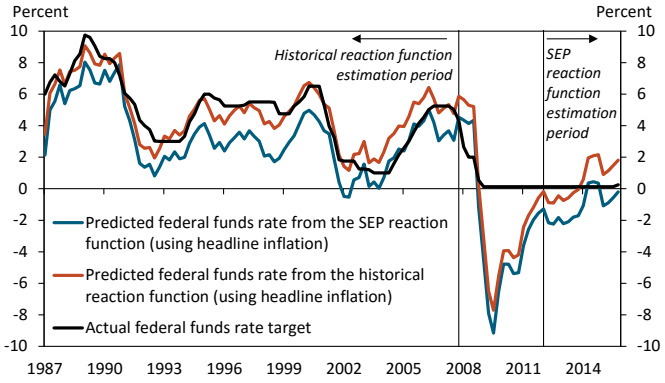
Sources: Federal Reserve Board, FRED, Summary of Economic Projections, and Haver Analytics.

Although the SEP's various projections of liftoff from the zero lower bound did not materialize, the SEP still provides financial markets and the public valuable information about policymakers' outlook for the economy and their views about policy. In particular, because the SEP is based on each Committee participant's view of "appropriate" monetary policy rather than an unconditional forecast, the SEP can reveal information about participants' policy reaction function—that is, how policymakers generally move their policy instrument in response to economic conditions.

Estimating such a reaction function from actual data is impossible after 2012, as the funds rate target remained at its effective lower bound until December 2015. However, *projections* for the funds rate were not consistently fixed at the effective lower bound, allowing us to estimate a regression model using the SEP's median federal funds rate projection and the midpoints of the central tendencies of participants' projections for inflation and unemployment from January 2012 to March 2016.[1]

Results from the regression show that the median SEP projection moves in a systematic and statistically significant manner in response to changes in projected inflation and unemployment.[2] Moreover, the response of the projected funds rate to projected inflation is more than one-for-one, suggesting Committee participants anticipated the real federal funds rate would rise, other things equal, as inflation increased. In many macroeconomic models, this property is required for the stabilization of inflation around its longer-run target (Taylor). In addition, the SEP reaction function shows a strong, countercyclical response to unemployment, suggesting Committee participants anticipated the funds rate would rise as unemployment decreased.[3]

Chart 2: Federal funds rate and predicted rate from the SEP reaction function



Sources: BEA, BLS, Federal Reserve Board, FRED, Philadelphia Fed, SEP, Haver Analytics, and authors' calculations.

The projected increases in the funds rate target are generally consistent with actions the FOMC took before the effective lower bound became a binding constraint on monetary policy. Chart 2 shows the prescriptions from the estimated SEP policy reaction function (blue line), plugging in the actual real-time data on inflation and unemployment instead of their projected values, as well as the actual target funds rate (black line) from 1987:Q1 to 2015:Q4. In other words, the blue line shows how the Committee might have moved the target funds rate had it known the actual path of inflation and unemployment and behaved as the SEP reaction function describes.

From 2008 to 2015, the SEP reaction function prescribes a negative funds rate (except for a brief period in 2014 when it prescribes a funds rate of about 0.4 percent). Given the constraint of the zero lower bound, the SEP reaction function in practice calls for setting the funds rate at the lower bound, which is where the FOMC actually targeted the funds rate over this period. From 2000 to 2008, the SEP prescriptions also closely match the actual path of the funds rate, indicating the SEP reaction function accurately describes the behavior of the FOMC over this period. In contrast, from 1987 to 1999, the SEP reaction function prescribes a lower federal funds rate than the FOMC actually targeted. In this period, the Committee pursued a somewhat less accommodative policy than the SEP suggests.

Chart 2 also shows an estimated historical reaction function (orange line) based on actual real-time data on the federal funds rate, inflation, and unemployment from 1987:Q1 to 2007:Q4.[4] The historical reaction function is an empirical description of how the FOMC responded to data on inflation and unemployment before the federal funds rate hit the zero lower bound. From 1987 to 2000, prescriptions from this rule closely match the actual path of the funds rate but call for a less accommodative policy than prescribed by the SEP reaction function. Similarly, from 2001 to 2015, the historical reaction function prescribes a less accommodative policy than the SEP reaction function. While both reaction functions prescribe negative rates from 2008 to 2013, the historical reaction function prescribes a less negative rate. Moreover, in 2014, the historical reaction function calls for liftoff from the effective lower bound with the funds rate reaching a high

of 2 percent; in contrast, the SEP reaction function prescribes a zero rate while the actual target range remained at 0 to 0.25 percent.

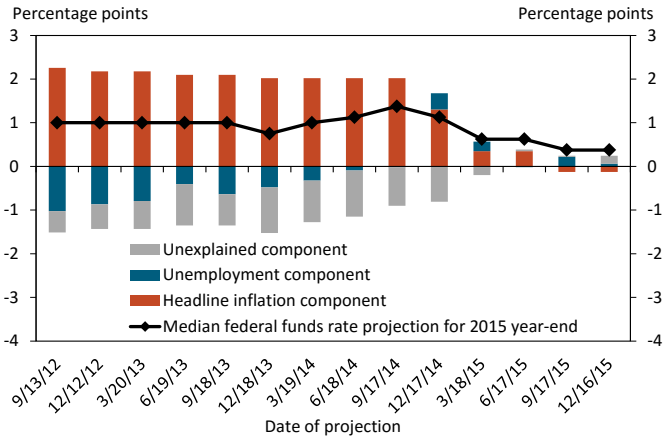
The main reason the SEP reaction function differs from the historical reaction function is its estimate of the long-run equilibrium federal funds rate—the funds rate associated with inflation at its target and unemployment at its natural or full-employment rate. We estimate an equilibrium funds rate of 4 percent in the historical reaction function compared with 2.4 percent in the SEP reaction function. The lower equilibrium rate in the SEP reaction function may be related to structural changes in the economy such as slower trend productivity growth and slower growth in the labor force.

In addition to using the SEP reaction function to understand the systematic relationship between the projected funds rate and projected economic conditions, we can also use it to help explain why the FOMC repeatedly projected a liftoff from the effective lower bound that failed to materialize. In particular, we decompose the missed projections into three components. The first component is the projection error for inflation times the coefficient on inflation in the estimated SEP reaction function. The second component is the projection error for the unemployment gap times the coefficient on the unemployment gap in the SEP reaction function. And the third component is the unexplained difference between the actual federal funds rate and the prescription from the SEP reaction function fitted with actual data on unemployment and inflation.

The decomposition shows that the primary contributor to projections that the federal funds rate would move off its effective lower bound was that participants repeatedly over-projected inflation. Missed projections for unemployment and unexplained deviations from the SEP reaction function played smaller roles.

Chart 3 shows the decomposition of projection errors for the federal funds rate at the end of 2015 made at FOMC meetings from September 2012 to December 2015. The orange bars represent the inflation component of the projection error, the blue bars represent the unemployment gap component, and the gray bars represent the unexplained component. Together, these components add up to the difference between the projected federal funds rate in the SEP—shown by the black line—and the midpoint of the actual federal funds rate target range (13 basis points)—shown by the gray band. Inflation was overestimated for almost of all the projections, contributing to overestimates of the projected federal funds rate. The unemployment gap component played a relatively small role, while the unexplained component pushed the projected federal funds rate down over most of the period.

Chart 3: SEP projection errors for the federal funds rate at the end of 2015



Sources: BEA, BLS, Federal Reserve Board, FRED, SEP, Haver Analytics, and authors' calculations.

In conclusion, although the projections in the SEP have proved to be consistently wrong—due largely to overestimates of inflation—they do provide information about the FOMC's implicit reaction function. For example, they show a systematic, planned response of the federal funds rate target to projected increases in inflation and projected declines in unemployment. Moreover, the estimated response function is similar to how policy responded to inflation and unemployment from 2001 to December 2008, when policy became constrained by the zero lower bound.

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[1] We use a Tobit regression to account for the censoring of observations at the effective lower bound. See Kahn and Palmer for details.

[2] Feroli and others estimate a similar reaction function from the SEP. Their results are similar to those we report.

[3] These results are reported in Kahn and Palmer, Table 1.

[4] These results are reported in Kahn and Palmer, Table 2.

References

Feroli, Michael, David Greenlaw, Peter Hooper, Frederic S. Mishkin, and Amir Sufi. 2016. "Language after Liftoff: Fed Communication away from the Zero Lower Bound," report prepared for the 2016 U.S. Monetary Policy Forum, February 26.

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George A. Kahn is a vice president and economist at the Federal Reserve Bank of Kansas City. Andrew Palmer is a research associate at the bank. For more, see "Monetary Policy at the Zero Lower Bound: Revelations from the FOMC's Summary of Economic Projections," Economic Review, forthcoming. The views expressed are those of the authors and do not necessarily reflect the positions of the Federal Reserve Bank of Kansas City or the Federal Reserve System.