The Fed's Mistake

BY ADAM OZIMEK AND MICHAEL FERLEZ

In December 2015, the Federal Reserve raised interest rates above the zero lower bound for the first time in seven years. Over the next 2½ years, six more hikes occurred, bringing the target range of the federal funds rate to 1.75% to 2% by June 2018. Although each hike has come with considerable debate both within and outside of the Fed, there has been little attempt to look back with hindsight and data to judge whether these decisions appear correct in retrospect. This analysis will provide that retrospect and argue that the Fed in fact raised rates too quickly.

Importantly, this analysis will predominantly rely on the Fed's own projections. Specifically, the consistent downward revisions of the long-run unemployment rate in the Federal Open Market Committee's Summary of Economic Projections are implicit admissions of a mistake. Indeed, though there has been too little retrospective analysis of the path of rate hikes, comments from Minneapolis Fed President Neel Kashkari support the general conclusion that the Fed's incorrect beliefs had monetary policy consequences:

"Members of the FOMC (including me) now believe that both the neutral real interest rate (the interest rate that neither stimulates nor contracts the economy) and the natural rate of unemployment (the rate that represents maximum employment) are lower than we had realized in prior year…The implication of these revisions, admittedly with the benefit of hindsight, is that monetary policy was less accommodative than we previously thought."[1]

In addition, in recent comments Fed Chair Jerome Powell concluded that "policy was less accommodative than thought at the beginning of normalization".[2]

Yet despite some recognition that the labor market was less tight than the Fed thought, and that policy was less accommodative, there has been little discussion of whether interest rates were as a result increased too quickly, and what the consequences of this error were. It is difficult to argue that the path of rates that was chosen based on mistaken key assumptions was nevertheless optimal. If, as Kashkari argues, monetary policy was less accommodative than the Fed previously believed, this strongly suggests it was less accommodative than it should have been.

This analysis will examine what the path of rates should have been given what we now know about the state of the economy of the last few years. Two alternative scenarios will be considered: the optimal rate path when the long-run unemployment rate is 4.45%, and the optimal rate path when the long-run unemployment rate is 3.9%.

Using the Moody's Analytics U.S. Macro Model, we then illustrate the impact on real GDP, unemployment and employment of the Fed's mistake in failing to follow the optimal rate path.

Why this matters

The Federal Reserve responded quickly and aggressively to the Great Recession. In addition to performing its role as lender of last resort and injecting liquidity into the financial system, the Fed lowered interest rates to zero relatively quickly and additional accommodation was accomplished via quantitative easing and forward guidance. However, although the Fed deserves praise for preventing a far worse outcome, we cannot let this prevent us from asking a crucial question: Could the Fed have done better?

To begin, it is important to distinguish between an ex ante mistake and an ex post mistake. An ex post mistake by the Fed would be to argue the following:

Based on all of the information available today, the Fed made a mistake in past rate-setting.

An ex ante mistake by the Fed, in contrast, would be to argue the following:

Based on the information available at the time, the Fed made a mistake in past rate-setting.

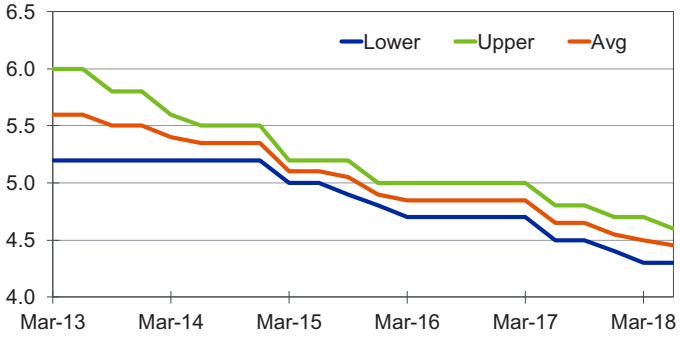
The overall focus of this analysis will be on establishing an ex post mistake, specifically, that subsequent data have revealed that the Fed raised rates too fast. The distinction is crucial, because an ex ante mistake is potentially avoidable while an ex post mistake may not be. Suggesting an ex ante mistake would be a far greater criticism of the Fed because this would imply that the Fed could have in practice done a better job, and that it made an error of judgment that

1 https://medium.com/@neelkashkari/my-take-on-inflation-578aa5b6dc14

2 https://www.federalreserve.gov/newsevents/speech/files/powell20180824a.pdf

Chart 1: Long-Run Rate Falls

FOMC long-run unemployment rate forecast, %



Sources: Federal Reserve, Moody's Analytics

harmed the economy. However, an ex post mistake is still consequential to establish. In particular, it is essential for establishing accurate economic history. Getting this economic history right matters for several reasons.

First, when the Fed faces similar uncertainty in the future, looks back at the decision to start raising rates in 2015, and judges that the path of monetary policy turned out to be optimal, such an assessment will offer support for raising rates. If instead the Fed looks back and sees that the path was sub-optimal, such an assessment will offer a cautionary tale. For example, in a recent speech, Powell noted that the FOMC's recent approach "has been shaped" by the experience of the late 1990s, when Alan Greenspan "prevailed" over other FOMC members who wanted to raise rates when the unemployment rate fell below the real-time estimate of long-run unemployment. If Greenspan had not "prevailed," and the Fed had raised rates, it would be important to recognize this as a mistake for the same lesson to be available to policymakers today.[3]

Second, getting the economic history right is also important for understanding the effects of monetary policy on the economy. In particular, less than optimally accommodative monetary policy over the last few years becomes one possible culprit for below-target inflation. If instead it was appropriately accommodative, then below-target inflation may suggest that monetary policy's effect on inflation has weakened.

Finally, economic history has potential consequences for current policymaking. For example, one version of an adjusted Taylor rule suggests that current rates should be set to make up for past deviations of the federal funds rate from the optimal rate path. To do this requires understanding if such deviations occurred, which in turn requires understanding the ex post optimal rate path.

In addition to getting an accurate reading of economic history, identifying an ex post mistake matters because this is a prerequisite for establishing an ex ante mistake. While a thorough debate on whether the Fed's misjudgment of the unemployment rate gap was avoidable is beyond the scope of this analysis, understanding first whether policy was ex post optimal will tell us whether we should have that debate at all. If policy was optimal, then there is no scope for an error of judgment. If it was not optimal, debate over the judgment error should occur.

Measuring the Fed's error

A key input into the Fed's decision-making is its estimate of the size of the unemployment gap, the difference between the current unemployment rate and the rate that is sustainable in the long run. Fed officials focus on this because maximum employment is one of the Fed's dual mandates, and because the unemployment gap partly reflects how far the economy is from its potential. It is unfortunate that the unemployment rate gap is a consequential input for monetary policy, because the Fed has consistently underestimated the gap since the beginning of the recovery following the Great Recession.

It is easy to demonstrate the Fed's consistent underestimate of the unemployment rate gap using its changing beliefs about long-run unemployment as reflected in the Summary of Economic Projections. These projections, published four times a year, show what FOMC participants see as "the most likely to prevail in the current year and the subsequent two years as well as over the longer run." The long run is defined as "the rates…to which a policymaker expects the economy to converge over time—maybe in five or six years—in the absence of further shocks and under appropriate monetary policy."

Consider, for example, how the Fed's belief about the size of the unemployment rate gap at the time of the first rate hike has evolved as a result of its falling long-run unemployment rate estimate. In December 2015, when the Fed began to hike rates, the long-run unemployment rate projection from the SEP was 4.9%.[4] The actual unemployment rate at that time was 5%, which implies that the Fed believed that the unemployment rate gap was 0.1 percentage point when it started raising rates.

In the SEP projections released since this first rate hike, the Fed has steadily lowered the estimate of the long-term unemployment rate, to 4.45% today (see Chart 1). The downward revisions occur for both the upper and lower central tendencies, which are the range excluding the three highest and lowest observations. This reflects an underestimate of the amount of labor market slack among both the more hawkish and more dovish wings of the FOMC. The trend is also clear for the average, which is the mean of the central tendencies and more closely reflects the consensus.

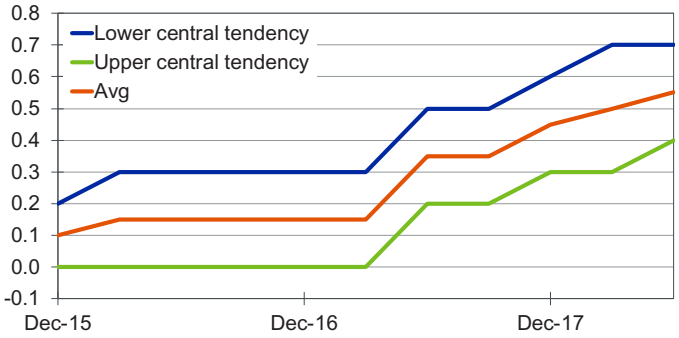
This downward revision is consequential because it is equivalent to revising the unemployment rate gap up. The current Fed estimate of the long-run unemployment rate implies that in December 2015 the gap was 0.55 percentage point instead of 0.1. In other words, the downward revision of the long-run unemployment rate has increased by a factor of five the FOMC's own estimate of the unemployment gap at the time it began to raise rates (see Chart 2). Again, this is true

3 https://www.federalreserve.gov/newsevents/speech/files/powell20180824a.pdf

4 We utilize the average of the upper and lower central tendency, which is available for a longer time-period than the median.

Chart 2: Dec 2015 Unemployment Gap

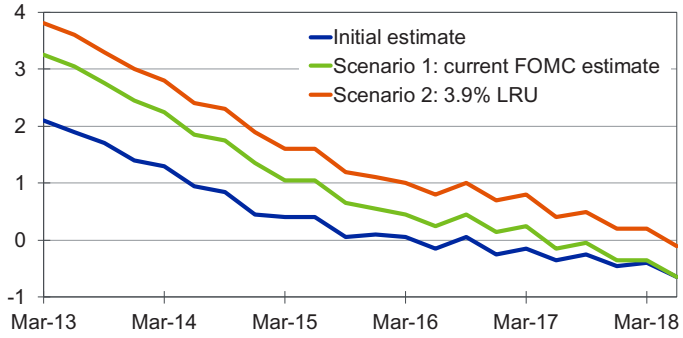
Implied FOMC estimate, ppt



Sources: Federal Reserve, Moody's Analytics

Chart 3: Unemployment Gap Revised Up

Unemployment rate gaps, ppt



Sources: Federal Reserve, BLS, Moody's Analytics

whether one uses the upper or lower central tendencies, or the average.

While this is a significant error in its own right, the Fed's most recent estimate of LRU is most plausibly just an upper bound. An alternative assumption is that the Fed will continue to revise LRU downward, and that the current unemployment rate of 3.9% will be the eventual LRU projection embraced by the Fed. In this case, the unemployment rate gap at the time of the first rate hike was 1.1 percentage points instead of 0.1.

The assumption that the LRU will continue to be revised downward is consistent with the pattern over the past few years, and is further supported by recent statements from Powell that indicate a strong possibility that LRU will continue to fall. As the best estimates of the long-run unemployment rate fall, the magnitude of the Fed's ex ante error will continue to grow.

As a result, this analysis will rely on two scenarios for the unemployment rate gap. Scenario 1 assumes the Fed's current 4.45% estimate of the long-run unemployment rate is correct, and Scenario 2 assumes that the correct estimate of the long-run unemployment rate is the current rate, 3.9%. It is important to note Scenario 2 is hardly a lower bound on the LRU, as the long-run rate could be below the current unemployment rate.

The extent of the Fed's error over time can be estimated using these two scenarios, the initial estimate of LRU, and the actual unemployment rate. Table 1 shows the initial unemployment gap estimate and the size of the gap under the two scenarios at the time of every FOMC rate hike decision.

Importantly, Scenario 1 estimates of the Fed's error require no outside judgment other than its own. Using only changes in its beliefs over time demonstrates a significant error. Because Scenario 1 is based on the assumption that its current estimate is correct, this error declines in magnitude over time and shrinks to zero in the most recent period. In other words, Scenario 1 assumes that in June 2018, the FOMC's estimate is by definition correct.

Alternatively, Scenario 2 shows that if the current estimate is not correct, the mismeasurement of the unemployment rate is large and ongoing. Instead of 0.65 percentage point below long-run unemployment, Scenario 2 suggests that when the June 2018 FOMC meeting took place the economy was only 0.1 percentage point below the long-run rate of 3.9%. This illustrates that even Scenario 2 is a conservative estimate: It is far from obvious that the unemployment rate is at or below its long-run level. If the real LRU is below 3.9%, the Fed's error is even larger (see Chart 3).

Why the error matters

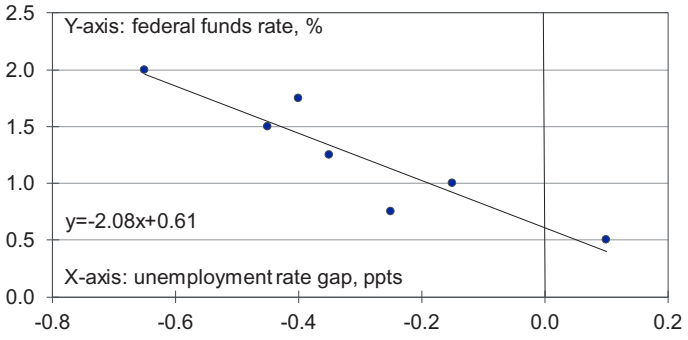
It is clear from comparing past projections to the current one that the Fed made a numerically significant error in underestimating the amount of labor market slack

Table 1: FOMC Decisions Since December 2015

Date	Federal funds rate	FOMC votes	Unemployment rate	Fed's initial long-run unemployment rate	Fed's initial unemployment rate gap	Scenario 1: Unemployment rate gap	Scenario 2: Unemployment rate gap
15-Dec	0.25%–0.50%	10-0	5.00	4.90	0.10	0.55	1.10
16-Dec	0.50%–0.75%	10-0	4.60	4.85	-0.25	0.15	0.70
17-Mar	0.75%–1.00%	9–1	4.70	4.85	-0.15	0.25	0.80
17-Jun	1.00%–1.25%	8–1	4.30	4.65	-0.35	-0.15	0.40
17-Dec	1.25%–1.50%	7–2	4.10	4.55	-0.45	-0.35	0.20
18-Mar	1.50%–1.75%	8–0	4.10	4.50	-0.40	-0.35	0.20
18-Jun	1.75%–2.00%	8–0	3.80	4.45	-0.65	-0.65	-0.10

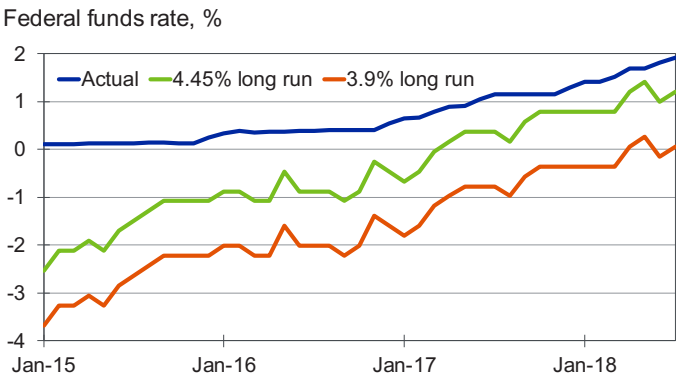
Source: Moody's Analytics

Chart 4: Federal Funds Rate Mapping



Sources: Federal Reserve, BLS, Moody's Analytics

Chart 5: Revealed Preference Fed Path



Sources: Federal Reserve, BLS, Moody's Analytics

over the past few years. How consequential this error was depends upon on how the error maps to monetary policy decisions. We utilize two approaches to demonstrate how the Fed might have differed the path of federal funds rates if it had not underestimated labor market slack: a revealed preference approach and a rules-based approach.

Revealed preference

From the Fed's actual decisions and long-run projections from when it made those decisions, we map expected unemployment rate gaps to federal funds rates. This mapping shows where the Fed thought rates should be conditional on what it thought the unemployment rate gap was. We can use this information to construct a counterfactual federal funds rate using the same mapping but with the correct estimates of the unemployment rate gap (see Chart 4).

For example, one way to say when the Fed should have started hiking rates is by looking at what it thought the unemployment rate gap was when it started hiking and then seeing at what point in time the economy actually reached that gap. When the Fed implemented the first rate hike in 2015, the unemployment rate gap was 0.1 percentage point. However, the current estimate of the long-run unemployment rate implies that the Fed now believes that we did not reach a 0.1-percentage point unemployment rate gap until March 2017. This suggests that if the Fed thought rates should lift above zero only once the gap was at 0.1 percentage point, then based on what it knows now, it should not have started raising rates until early 2017.

Alternatively, if the Fed had lowered its long-run estimate to the current unemployment rate of 3.9%, then the economy did not reach the 0.1 unemployment rate gap threshold until spring 2018.

We can use this general approach more systematically using the linear relationship between the Fed's believed gap and the federal funds rate shown in Chart 4. The coefficient of -2.08 allows us to construct counterfactuals rate paths using Scenario 1 (4.45%) and Scenario 2 (3.9%) assumptions about long-term unemployment rates.

The results, shown in Chart 5, illustrate the Fed's revealed preferences for a mapping of the expected unemployment gap to interest rates in which the optimal path of interest rates was significantly slower. If the Fed believed the first rate hike should have come when the unemployment rate gap was at 0.1 percentage point, then using its own current estimate of LRU, the first rate hike came two years too early. If the long-run unemployment estimate continues to fall to 3.9%, the first rate hike should have waited until 2018.

Monetary policy rules

A second approach to estimating how the Fed's mistake impacted rates is to consider monetary policy rules, which prescribe a rate path for the Fed based on various economic factors. One criticism of monetary policy rules is that they fail to incorporate the full complexity or range of relevant considerations utilized in FOMC decision-making. However, simple rules illustrate the general way the Fed looks at monetary policy, and "can serve as useful benchmarks for facilitating monetary policy deliberations and communications," as former Chair Janet Yellen argued in a 2012 speech.

For example, in that 2012 speech Yellen illustrated how forward guidance for federal funds rates would likely respond to two possible changes in the outlook: (1) an unexpectedly strong recovery, and (2) an unexpectedly weak recovery. To do this, she utilized a "balanced approach" version of the Taylor rule[5]:

$$R_t = 2 + \pi_t + 0.5(\pi_t - 2) + 1.0Y_t$$
$$Y_t = 2.3(5.6-U_t)$$

Where R is the federal funds rate, π is inflation, and Y is the output gap. The output gap in turn is defined by an Okun's law coefficient of 2.3, an estimate of long-term unemployment rate of 5.6%, and unemployment rate U_t. While Yellen utilized this balanced approach Taylor rule to illustrate how the prescribed federal funds rate path would change in response to alternative forecasts of U_t, it is also possible to use this to show the effect of changes in the long-term unemployment rate.

First, combining the above equations and defining U* as the long-term unemployment

5 Yellen argues that by placing greater weight on resource slack than the original Taylor rule, this version is "more consistent with following a balanced approach to promoting our dual mandate".

rate yields the following unemployment gap balanced approach Taylor rule.

$$R_t = 2 + \pi_t + 0.5(\pi_t - 2) + 2.3(U^* - U_t)$$

Importantly, while monetary policy rules like this are necessarily quite simple, one can make this formulation much more flexible and broad to include many of the complexities usually excluded in simple rules.

$$R_t = f_t(\pi_t) + 2.3(U^* - U_t) + g_t(e_t)$$

Here e represents a residual vector that captures factors not included directly in monetary policy rule. This could include but is not limited to financial market conditions, expectations of future shocks, global uncertainty, fiscal policy, and additional labor market slack. In addition, the flexible functional forms $f_t()$ and $g_t()$ allow the Fed to react in time varying and non-linear ways to inflation and other factors.

Clearly such a rule is so flexible as to be of no practical use in rate-setting, but taking the derivative of R_t with respect to U* allows us to show how changes in the unemployment gap affect changes in interest rates while holding all else equal.

$$dR_t/dU^* = 2.3$$
$$dR_t = 2.3\ dU^*$$

Importantly, the complexity of the Fed's actual decision-making process and the presence of factors not considered in the simple rule do not undermine estimates derived using the derivative with respect to U*. Focusing on changes in the rate path caused by changes in long-term unemployment significantly reduces the assumptions required. We do not require that other factors do not matter nor that the Fed follows a simple rule. Rather, the mapping of the unemployment rate gap to rates can be approximated as linear and other factors not considered are exogenous to the unemployment rate gap. Specifically, we assume:

$$Cov(U^*, e) = 0$$
$$Cov(U^*, \pi) = 0$$

While the exogeneity assumption is unlikely to fully hold in the real world, the most plausible failures will cause the effects of the Fed's mistake to be underestimated using this approach. The factor not included in the simple rule that is most likely to be correlated with the unemployment rate gap is wider labor market slack. However, it is unlikely that the Fed underestimated the unemployment gap and overestimated other labor market slack. Instead, it likely underestimated both, meaning that the assumption of exogeneity is conservative in that it likely underestimates the extent of the Fed's error.

Likewise, a bigger unemployment gap and therefore output gap are likely to cause the Fed to expect less, not more inflationary pressures. As a result, any failures in the assumption of $Cov(U^*, \pi) = 0$ are likely to cause this exercise to again underestimate the effects of the Fed's errors.

The assumption of linearity could potentially fail, but it is worth noting that in Chart 4 above, to date the Fed has demonstrated a highly linear relationship between its expectations of the unemployment rate gap and the federal funds rate. In fact, the coefficient of 2.08 is remarkably close to the 2.3 coefficient preferred by Yellen.

Altogether, the assumptions are balanced in favor of underestimating the Fed's error, and the approach is one used by the Fed itself in judging how similar changes would map to monetary policy. Using the derivative of the monetary policy rule and the actual path of federal funds, we can show how the change in LRU in Scenario 1 and Scenario 2 would map to different rate paths. Specifically, we estimate R_s, the optimal rate path under scenario s, by adding the actual federal funds rate R^*_t to the change in R implied by the derivative of the monetary policy rule and to the difference between the initial estimate of long-run unemployment, U*, and the estimate under scenario s, U_s.

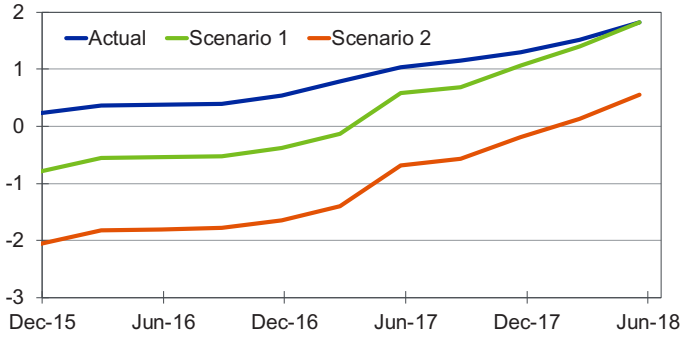
$$R_s = R^*_t + 2.3dU^*$$
$$R_s = R^*_t + 2.3(U_s - U^*)$$

Consistent with the above analysis, this approach suggests that rates were increased significantly sooner than they would have been had the Fed more accurately estimated long-run unemployment. Most conservatively, if the Fed's initial estimates of long-run unemployment were where they are today, the Fed would not have begun increasing rates above the zero lower bound until June 2017. If instead the correct long-run unemployment rate is 3.9%, as in Scenario 2, then rate hikes should not have begun sooner than March 2018 (see Chart 6).

Whether one uses the Fed's revealed preferences, or the monetary policy rule preferred by the previous Fed chair, it is clear that the underestimate of the unemployment rate gap maps to significantly different paths of monetary policy. This analysis considered two methods of mapping to policy and two scenarios for long-run unemployment. Using these alternative approaches and assumptions, the first rate hike should have occurred from two to just more than three years later than it did.

Chart 6: Monetary Policy Rule Fed Path

Implied federal funds rate path



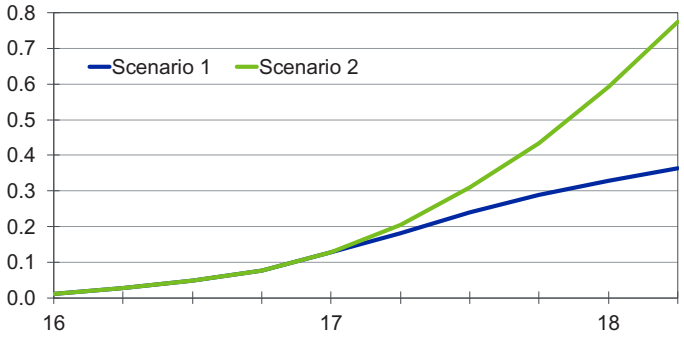
Sources: Federal Reserve, Moody's Analytics

The economic consequences

The Moody's Analytics U.S. Macro Model was used to investigate the consequences of failing to raise rates at the path prescribed

Chart 7: Lower Rates, Higher Real GDP

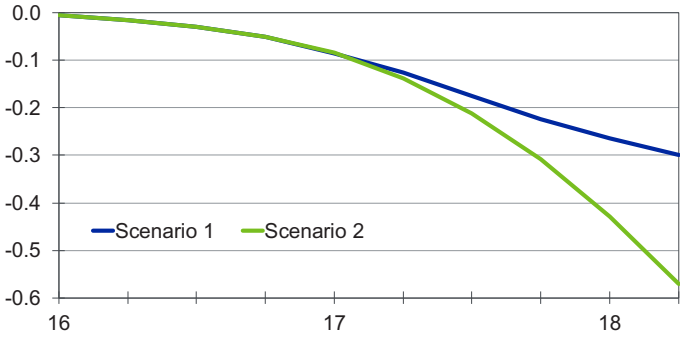
Effect on real GDP of optimal funds rate path, %



Sources: Federal Reserve, Moody's Analytics

Chart 8: Lower Rates and Unemployment

Effect on unemployment of optimal funds rate path, ppt



Sources: Federal Reserve, Moody's Analytics

by Scenario 1 and Scenario 2 using the monetary rule approach.

To examine how each scenario would have altered our baseline forecast, we ran them through our December 2015 vintage forecast, which was the last forecast vintage to not include the Fed's December 2015 rate hike. For each scenario, we first began by setting the long-run unemployment rate. In Scenario 1, we assume the Fed's current 4.45% estimate is correct. In Scenario 2, we assume that the correct long-run estimate of unemployment is equal to the current unemployment rate of 3.9%. Next, we exogenize the federal funds rate using the corresponding estimates derived by the monetary rule approach described above. Finally, the initial level of potential GDP is estimated using the gap version of Okun's law, and is assumed to grow at the same rate as our December 2015 baseline thereafter. All other variables in the model are left as endogenous.

The results suggest that under either scenario, the Fed's decision to begin raising rates in December 2015 had significant costs compared with an optimal rate path. Under Scenario 1, where the long-run unemployment rate is 4.45%, real GDP would be 0.4% higher today if the Fed pursued the optimal rate path. Under Scenario 2, where the long-run unemployment rate is 3.9%, real GDP would be 0.8% higher had the Fed pursued the optimal rate path consistent with that unemployment rate gap. The effect on output is therefore mild but still substantial over 10 quarters (see Chart 7).

The effects on the labor market are more substantial. The unemployment rate would be 0.3 to 0.6 percentage point lower 10 quarters out had the Fed followed the optimal rate path (see Chart 8). Job growth would have been stronger had the Fed kept rates lower for longer as well. By the second quarter of 2018, payrolls would have been 530,000 higher under Scenario 1. If the long-run unemployment rate is 3.9%, as under Scenario 2, payrolls in the second quarter of 2018 would be 1 million higher (see Chart 9).

Overall, the models suggest that if the Fed is currently right and the long-run unemployment rate is 4.45%, then its decision to begin hiking rates in the fourth quarter of 2015 reduced real GDP growth slightly, increased unemployment by 0.3 percentage point, and lowered payroll gains by 530,000 jobs.

If instead the Fed's pattern of revisions continues and the current rate of 3.9% represents the long-run unemployment rate, the costs of raising rates too fast are even greater. Payrolls today would be 1 million higher if the Fed had delayed raising rates until earlier this year, as prescribed by both the preferred monetary policy rule of Yellen and the preferred mapping of the FOMC revealed by its path of rate hikes and real-time beliefs about the unemployment gap.

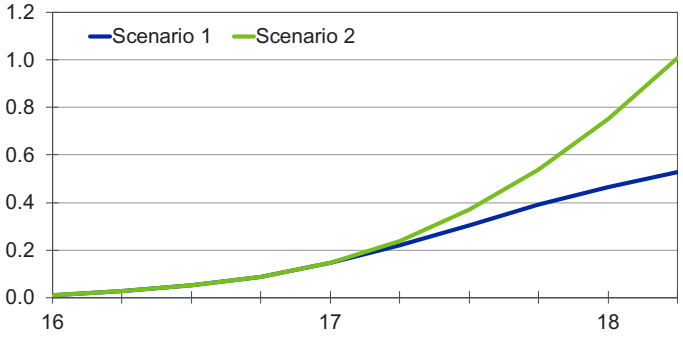
Risks

There are a variety of risks that undermine the conclusion that the Fed should have raised rates at the optimal pace prescribed in Scenario 1 or Scenario 2 above. One is that a more gradual pace of rate hikes would be optimal for the economy, and that waiting would have resulted in a steeper rate path.

However, when the Fed began raising rates in December 2015, the FOMC median projections were for rates to increase by around 1 percentage point per year for the next three years, significantly faster than they actually increased. This illustrates that the approach the Fed believed optimal was not to begin raising rates when the unemployment gap was still significant so

Chart 9: Lower Rates, Higher Employment

Effect on employment of optimal funds rate path, jobs, mil



Sources: Federal Reserve, Moody's Analytics

that rates could be increased gradually. Rather, the best approach appeared to be to wait until the unemployment gap was almost zero and to begin raising rates at a pace of around 1 percentage point per year. Therefore, although a very gradual path starting with a significant unemployment gap was optimal, that was not in fact the Fed's plan.

A second risk is that keeping rates lower for longer would have created some form of increased risk in the financial sector. However, the results from the Moody's Analytics U.S. Macro Model suggest that waiting to raise rates later would have returned the economy to full-employment sooner. Thus, waiting to raise rates may have brought rates up to their neutral level sooner than the path that attempts to hike them prematurely. In other words, if the actual path of rate hikes was premature, the Fed may have maintained an accommodative stance for longer, thereby increasing financial sector risk.

Despite these counterarguments, monetary policy is an uncertain art and science, and determining the optimal rate path is far from clear. This uncertainty remains especially stark over the past decade, when the Great Recession and its aftermath produced circumstances that have consistently surprised both the Fed and private sector forecasters. Given this uncertainty, it remains a serious possibility that raising sooner and more slowly minimized financial sector risk and/or pushed the economy to full-employment faster.

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