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Class I FOMC – Restricted Controlled (FR)

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# Report to the FOMC on Economic Conditions and Monetary Policy



## Book B

### Monetary Policy: Strategies and Alternatives

March 10, 2016

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Prepared for the Federal Open Market Committee  
by the staff of the Board of Governors of the Federal Reserve System

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## Monetary Policy Strategies

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The top panel of the first exhibit, “Policy Rules and the Staff Projection,” provides near-term prescriptions for the federal funds rate from four policy rules: the Taylor (1993) rule, the Taylor (1999) rule, an inertial version of the Taylor (1999) rule, and a first-difference rule.<sup>1</sup> These prescriptions take as given the staff’s baseline projections for real activity and inflation in the near term, shown in the middle panels. The Taylor (1993) and Taylor (1999) rules call for sizable adjustments in the policy rate to values of about 2¾ percent by the third quarter of 2016, while the inertial Taylor (1999) rule, which places a considerable weight on keeping the federal funds rate close to its previous quarterly value, calls for raising the policy rate to just under 1¼ percent over the same period. The first-difference rule prescribes more moderate increases in the level of the federal funds rate to just above the current target range, as it also places considerable weight on the lagged federal funds rate. Reflecting the upward revision to the projected path for inflation over 2016, the Taylor rules’ prescriptions are higher than those reported in the January Tealbook. The first-difference rule is revised up only slightly—calling for a policy rate by the third quarter of 2016 that is similar to the one computed using the January Tealbook outlook—because its forward-looking nature means that it is less sensitive to this revision in the near-term outlook for inflation.

The bottom panel of the first exhibit reports the estimate of a Tealbook-consistent, medium-term notion of the equilibrium real federal funds rate that is generated using the FRB/US model. This Tealbook-consistent FRB/US  $r^*$  is an estimate of the real federal funds rate that, if maintained over a 12-quarter period, would close the output gap in the final quarter of that period. The current estimate of  $r^*$ , at 1.33 percent, is almost unchanged from the estimate derived from the staff’s outlook in January. The panel also reports the average of the real federal funds rate in the Tealbook baseline projection for the same 12-quarter period used to compute  $r^*$ .<sup>2</sup> This average is 0.41 percent,

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<sup>1</sup> The appendix to this section provides details on each of the four rules, and also describes the nominal income targeting rule that is used in the special exhibit.

<sup>2</sup> While  $r^*$  and the average projected real federal funds rate are calculated over the same 12-quarter period, they need not be associated with the same macroeconomic outcomes even when their values are identical. The reason is that, in the  $r^*$  simulations, the real federal funds rate is held constant over the entire 12-quarter period, whereas in the Tealbook baseline, the real federal funds rate can vary

### Policy Rules and the Staff Projection

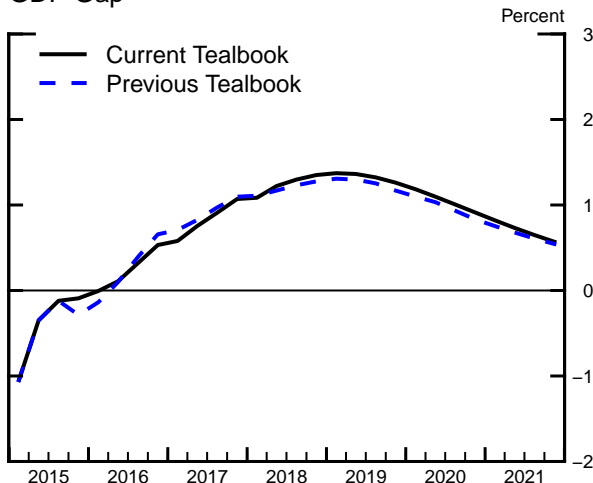
#### Near-Term Prescriptions of Selected Policy Rules<sup>1</sup>

(Percent)

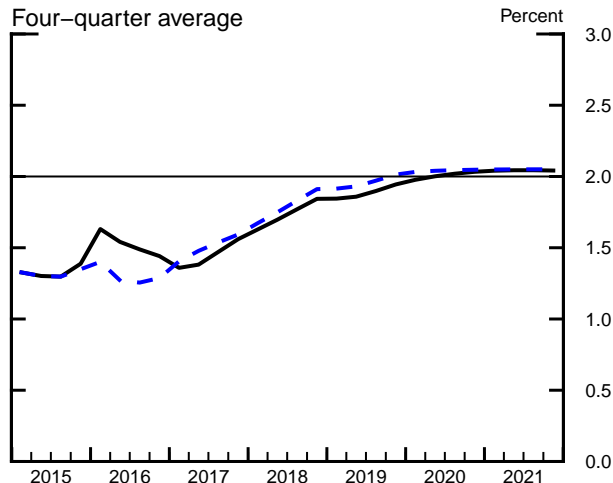
	2016:Q2	2016:Q3
Taylor (1993) Rule	<b>2.65</b>	<b>2.67</b>
<i>Previous Tealbook</i>	2.26	2.37
Taylor (1999) Rule	<b>2.71</b>	<b>2.82</b>
<i>Previous Tealbook</i>	2.31	2.56
Inertial Taylor (1999) Rule	<b>0.89</b>	<b>1.18</b>
<i>Previous Tealbook outlook</i>	0.76	1.03
First-difference rule	<b>0.54</b>	<b>0.55</b>
<i>Previous Tealbook outlook</i>	0.40	0.50

#### Key Elements of the Staff Projection

GDP Gap



PCE Prices Excluding Food and Energy  
Four-quarter average



#### Real Federal Funds Rate Estimates<sup>2</sup>

(Percent)

	Current Tealbook	Previous Tealbook
Tealbook-consistent FRB/US $r^*$	1.33	1.30
Average projected real federal funds rate	0.41	0.43
Current real federal funds rate	-1.00	-0.97

1. For rules that have a lagged policy rate as a right-hand-side variable, the lines denoted "Previous Tealbook outlook" report rule prescriptions based on the previous Tealbook's staff outlook, but jumping off from the realized value for the policy rate last quarter.

2. The "Tealbook-consistent FRB/US  $r^*$ " is the level of the real federal funds rate that, if maintained over a 12-quarter period in the FRB/US model, sets the output gap equal to zero in the final quarter of that period. The "current real federal funds rate" is the difference between the federal funds rate and the trailing four-quarter change in core PCE. The "average projected real federal funds rate" is the average of the real federal funds rate under the Tealbook baseline projection calculated over the same 12-quarter period as the Tealbook FRB/US  $r^*$ .

about 1 percentage point below the estimate of  $r^*$ . The panel further reports a measure of the current real federal funds rate which, at  $-1$  percent, is little changed from the January Tealbook.<sup>3</sup>

The second exhibit, “Policy Rule Simulations,” reports dynamic simulations of the FRB/US model under the Taylor (1993) rule, the Taylor (1999) rule, and a first-difference rule. These simulations reflect the endogenous responses of inflation and the output gap when the federal funds rate follows the paths implied by the different policy rules.<sup>4</sup> The results for each rule presented in these and subsequent simulations depend importantly on the assumptions that policymakers will adhere to the rule in the future and that market participants as well as price and wage setters fully understand the policy rule that will be pursued and its implications for real activity and inflation.

The second exhibit also displays the implications of following the baseline monetary policy assumptions in the current staff forecast. The federal funds rate is assumed to follow the prescriptions of the inertial version of the Taylor (1999) rule. The nominal federal funds rate increases about 25 basis points per quarter for the next three years, reaching about  $3\frac{1}{4}$  percent by the end of 2018. The pace of tightening subsequently slows, and the federal funds rate peaks at around 4 percent in 2021—consistent with the higher projected level of resource utilization around that time—before eventually returning to its longer-run normal level of  $3\frac{1}{4}$  percent.

The Taylor (1993) and Taylor (1999) rules call for an immediate sharp tightening and produce paths for the real federal funds rate that lie significantly above the Tealbook baseline path over the next few years. The sharp tightening mostly reflects these rules’ intercept terms, which are consistent with an equilibrium longer-run real federal funds rate of  $1\frac{1}{4}$  percent. These rules lead to higher trajectories of the unemployment rate relative to its path under the baseline projection through at least the end of 2019. The Taylor (1999) rule prescribes somewhat higher policy rates than the Taylor (1993) rule over the period shown because it places more weight on the output gap. As a

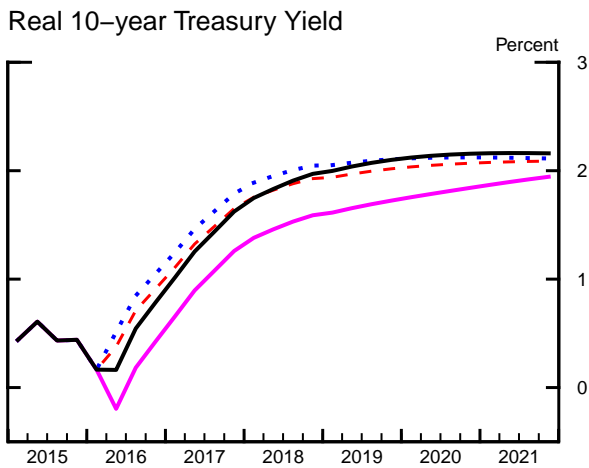
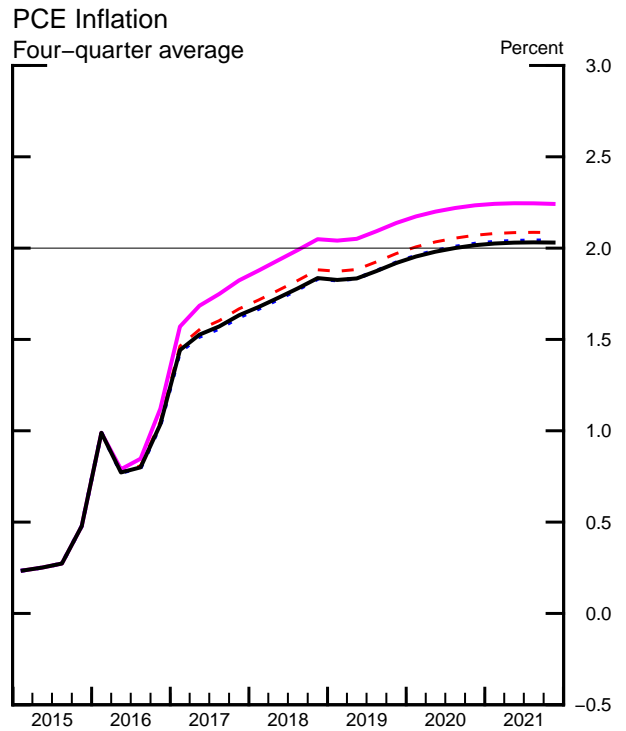
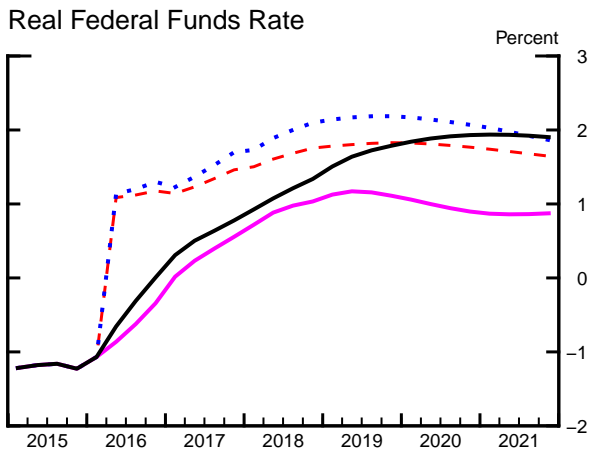
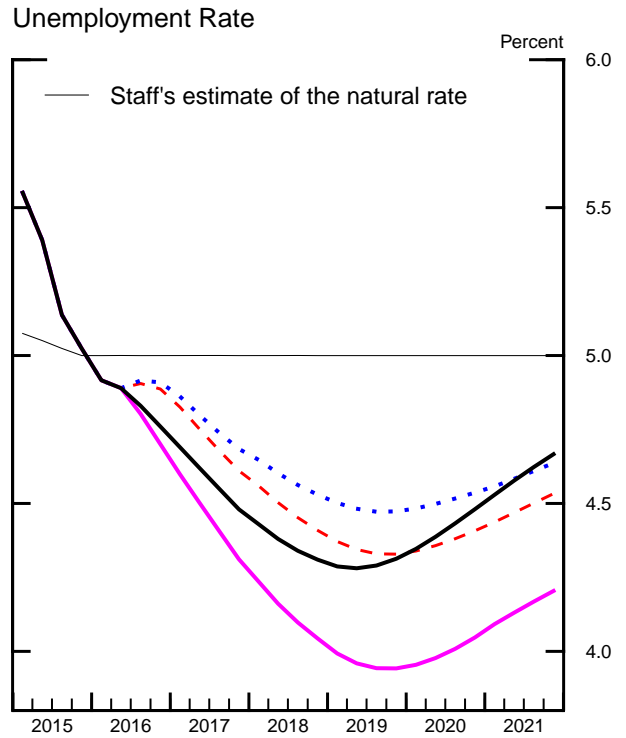
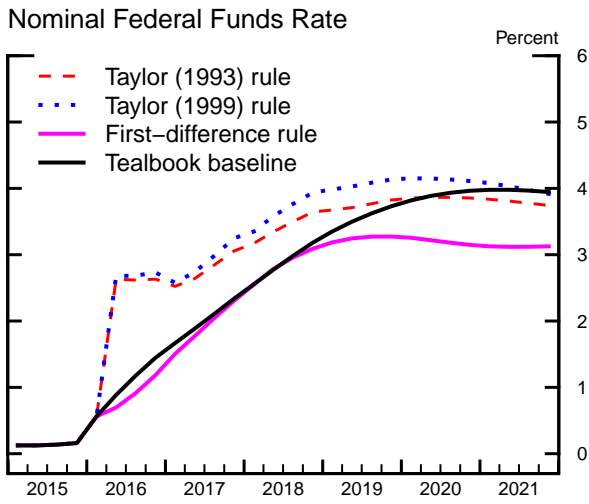
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over time. Distinct paths of real short-term rates can, in turn, generate different paths for inflation and economic activity, even if they have the same 12-quarter average.

<sup>3</sup> The current real federal funds rate is constructed as the difference between the midpoint of the prevailing target range for the federal funds rate and the trailing four-quarter change in the core PCE price index.

<sup>4</sup> Because of these endogenous responses, prescriptions from the dynamic simulations can differ from those shown in the top panel of the first exhibit.

### Policy Rule Simulations



Note: The policy rule simulations in this exhibit are based on rules that respond to core inflation. This choice of rule specification was made in light of the tendency for current and near-term core inflation rates to outperform headline inflation rates as predictors of the medium-term behavior of headline inflation.

consequence, the Taylor (1999) rule also generates a higher trajectory of the unemployment rate and a slightly lower trajectory of inflation than the Taylor (1993) rule.

In contrast to the Taylor-type rules, the first-difference rule prescribes a pace of increase in the federal funds rate that is similar to the Tealbook baseline through 2018. At that point, the federal funds rate levels off under the first-difference rule, whereas it keeps rising for a time under the Tealbook baseline. This divergence occurs because the first-difference rule, which responds to the expected change in the output gap rather than to its level, reacts to the slower pace of economic growth projected late in the decade. The lower path of the federal funds rate in the medium run under the first-difference rule, in conjunction with expectations of higher price and wage inflation in the future, leads to lower long-term real rates and thus to higher levels of resource utilization and inflation in the short run. The first-difference rule generates outcomes for the unemployment rate over the forecast period that are markedly below the staff's estimate of the natural rate and the unemployment rate paths generated under the other policy rules. Relative to the other simple policy rules, under this rule inflation runs a bit closer to the Committee's 2 percent longer-run inflation objective over the next few years before overshooting the target by a modest margin.

The third exhibit, "Optimal Control Policy under Commitment," compares optimal control simulations for this Tealbook's outlook with those reported in January. Policymakers are assumed to place equal weights on keeping headline PCE inflation close to the Committee's 2 percent goal, on keeping the unemployment rate close to the staff's estimate of the natural rate of unemployment, and on minimizing changes in the federal funds rate. The concept of optimal control that is employed here corresponds to a commitment policy under which the plans that policymakers make today are assumed to constrain future policy choices.<sup>5</sup>

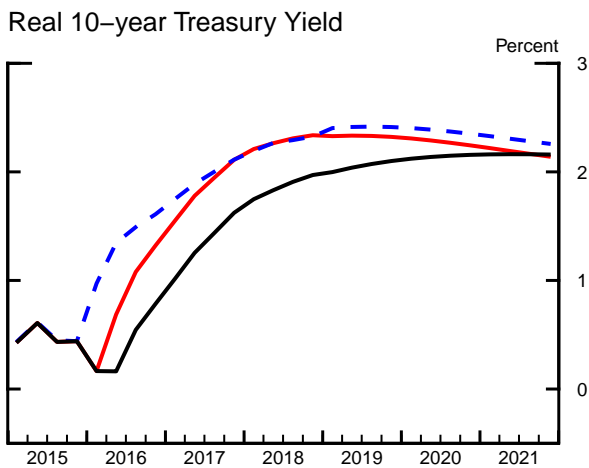
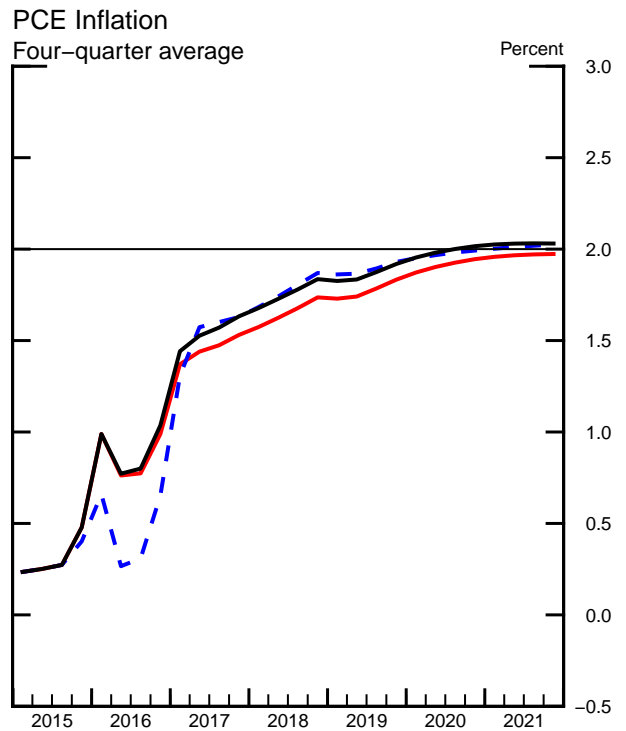
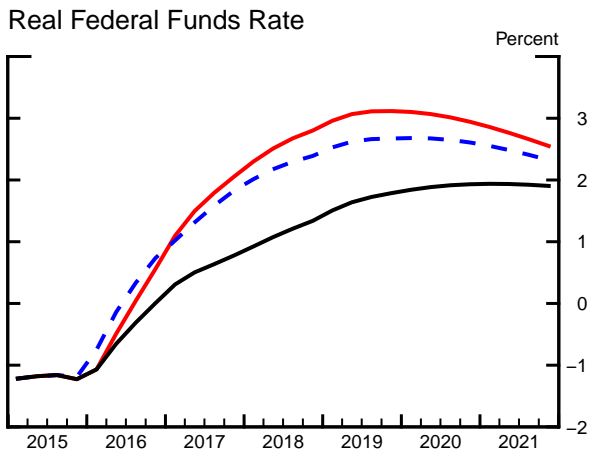
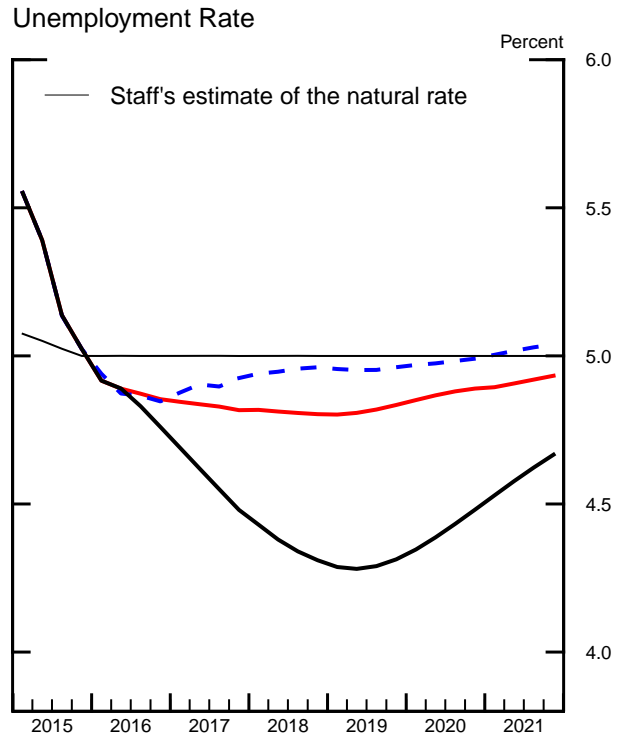
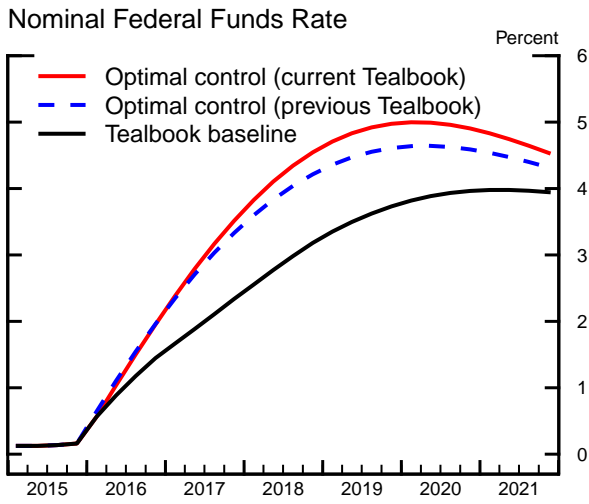
The optimal control path for the real federal funds rate is significantly higher than the path in the Tealbook outlook. In the current baseline projection, unemployment falls well below the staff's estimate of the natural rate over the next several years. Under the

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<sup>5</sup> The results for optimal control policy under discretion (in which policymakers cannot credibly commit to carrying out a plan involving policy choices that would be suboptimal at the time that these choices have to be implemented) are similar.



### Optimal Control Policy under Commitment



preferences embedded in the standard implementation of optimal control, policymakers judge this undershooting of the natural rate to be costly, leading them to tighten policy more than in the Tealbook baseline.<sup>6</sup> Accordingly, the path for the real federal funds rate is almost 1 percentage point higher, on average, than the Tealbook baseline path over the period shown. The trajectory for the real 10-year Treasury yield is also higher. The tighter policy under optimal control results in a path of the unemployment rate that runs substantially closer to the staff's estimate of the natural rate of unemployment; headline PCE inflation is slightly lower than in the Tealbook baseline over the simulation period, consistent with lower levels of resource utilization.

Relative to the optimal control path shown in the January Tealbook, the path for the real federal funds rate is somewhat higher over the period shown but the real 10-year Treasury yield is lower over the next few years, due to the revised outlook for term premiums in the current Tealbook baseline projection. On net, this leads to a lower path for the unemployment rate, although it is important to note that the staff's downward revision to the estimated natural rate of unemployment, as well as the upward revision to near-term inflation, dampen the loss associated with this lower trajectory.

## **NOMINAL INCOME TARGETING RULES**

With the federal funds rate near its effective lower bound (ELB) and lingering concerns about the outlook for global economic growth, the Committee may wish to examine possible ways to deliver additional monetary stimulus so as to insure against adverse macroeconomic outcomes. This special exhibit uses the FRB/US model to explore the implications of nominal income (NI) targeting rules—in which monetary policy reacts to the gap between the level of actual nominal GDP and some predetermined level—under both the staff's baseline outlook and a recession scenario. Even when the current policy rate is constrained by the ELB, NI targeting, which promises to make up for cumulative past undershooting of nominal income growth, can stimulate current economic activity by generating a lower expected path for the federal funds rate.

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<sup>6</sup> In optimal control, the assumption that policymakers place less weight on the unemployment gap falling below the staff's estimate of the natural rate than posited under the standard case can result in policymakers favoring a more accommodative policy than the Tealbook baseline. See the Monetary Policy Strategies section of the October 2015 Tealbook B for an illustration of such a scenario.

The amount of stimulus that NI targeting delivers depends importantly on the target path for nominal income and, in particular, on the initial shortfall in nominal income that policymakers seek to offset. To illustrate this property, we use an NI targeting rule that targets a path for the level of nominal income anchored in 2015:Q4, and thus effectively only promises to make up for current and future shortfalls in nominal income. We compare macroeconomic outcomes under this rule with outcomes associated with an NI targeting rule that seeks to make up for the cumulative shortfall in nominal income growth since 2011:Q4, just before the Committee announced its 2 percent inflation objective. Under both rules, target nominal income grows at a rate consistent with the Committee's 2 percent inflation target and the staff's estimate of the path of real potential output; as a result, the 2011:Q4 NI targeting rule inherits a nominal income shortfall of about  $2\frac{3}{4}$  percent that is due to inflation having run below the Committee's inflation objective.<sup>7</sup>

The panels on the left column of the fourth exhibit, "Nominal Income (NI) Targeting," show the effects of following the 2011:Q4 and 2015:Q4 NI targeting rules conditional on the staff's baseline outlook from the January 2016 Tealbook. The nominal federal funds rate prescribed by the 2015:Q4 NI targeting rule (the green line) tracks the Tealbook baseline (the black line) projection closely over the first two years of the simulation, but is lower in later years. As a consequence, the path for the unemployment rate is slightly lower under this NI targeting rule than under the baseline, but overall the effects of the two policies are quite similar. The 2011:Q4 NI targeting rule (the blue line) is significantly more accommodative because it inherits a large shortfall in nominal income. Under this rule, the federal funds rate does not exceed 1 percent until the end of 2017, over a year later than under the 2015:Q4 NI targeting rule.<sup>8</sup> As a result, the unemployment rate undershoots the staff's estimate of the natural rate by about  $\frac{1}{2}$  percentage point more than it does under the 2015:Q4 NI targeting rule. Moreover,

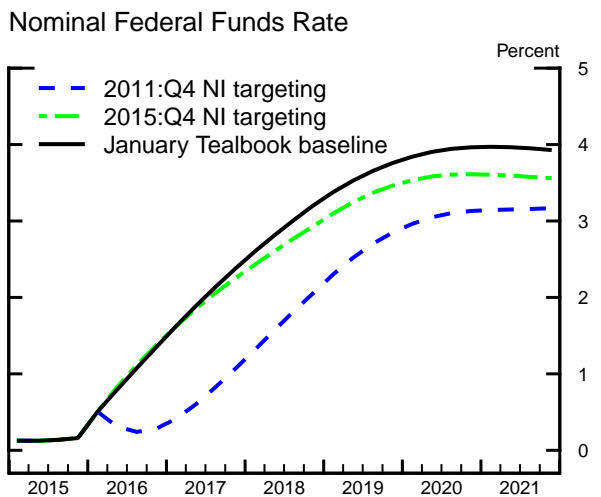
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<sup>7</sup> As detailed in the appendix, the nominal income gap can be expressed as the sum of the current estimate of the output gap and the shortfall of the GDP deflator from the level it would have attained had it increased at an annual rate of 2 percent since the date associated with the rule. Because the current output gap is estimated to be 0.1 percent in 2016:Q2, the 2011:Q4 NI targeting rule is effectively only making up for past misses in inflation.

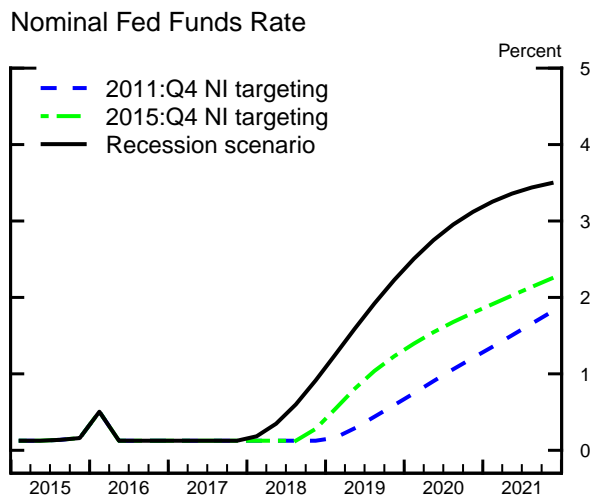
<sup>8</sup> An NI targeting rule with an anchor date of 2007:Q4, shown in past Tealbooks, would call for an even more accommodative path for the policy rate.

### Nominal Income (NI) Targeting

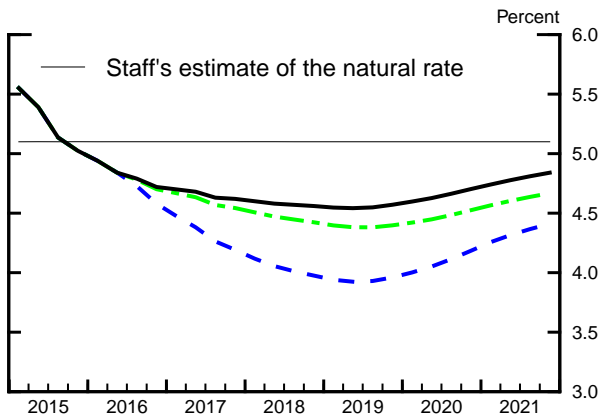
#### January Baseline



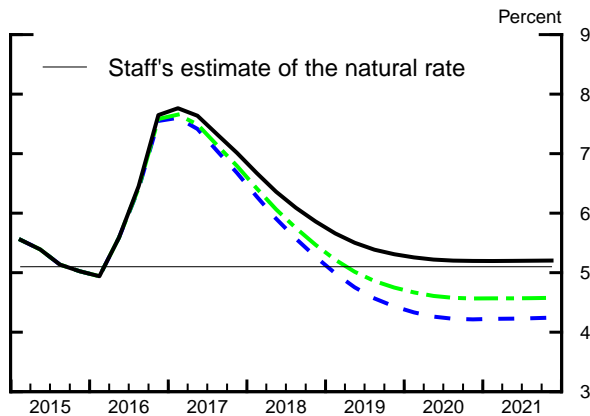
#### Recession Scenario



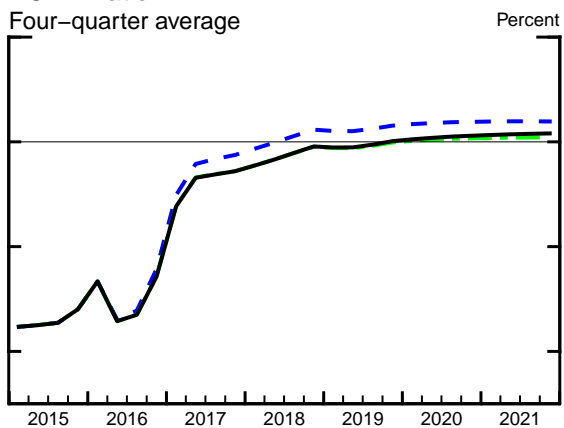
#### Unemployment Rate



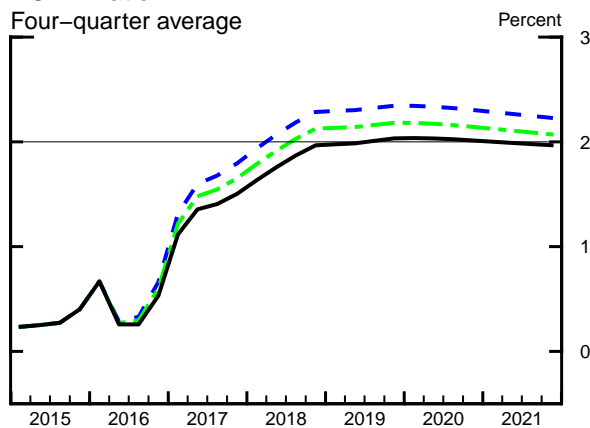
#### Unemployment Rate



#### PCE Inflation Four-quarter average



#### PCE Inflation Four-quarter average



Note: In the right column, the recession scenario is the same one discussed in the FOMC memo titled "Unconventional Policy Responses to a Recession" by Hess Chung and Edward Herbst, sent to the Committee on March 4, 2016.

unlike the 2015:Q4 NI targeting rule, inflation overshoots the Committee's 2 percent objective persistently, albeit by a small amount.

Even NI targeting rules that place less emphasis on addressing past shortfalls in nominal income may be effective at providing stimulus in the event of negative shocks that push the federal funds rate back down to the ELB. The panels on the right column of the exhibit show the same two NI targeting rules under a recession scenario that causes a large shortfall in nominal income starting in 2016:Q2.<sup>9</sup> Both NI targeting rules are considerably more accommodative than the inertial Taylor (1999) rule used in the construction of the baseline recession scenario: Under the NI rules, the federal funds rate remains at the ELB longer than under the inertial Taylor rule, and rises more gradually after departing from the ELB. Accordingly, the unemployment rate falls more rapidly than in the baseline recession scenario. Inflation rises back to the Committee's 2 percent target more quickly and afterwards is above this target for an extended period of time, with a somewhat greater degree of overshooting under the 2011:Q4 NI targeting rule. Overall, both NI targeting rules prove effective at mitigating the persistently high unemployment associated with the recession, though these outcomes are accompanied by a sustained period with inflation slightly above 2 percent. Of course, the ability of NI targeting rules to deliver such outcomes relies heavily on the assumptions that policymakers can credibly commit to such policies and communicate them clearly, and that private sector agents understand and anticipate their effects.

The final two exhibits, "Outcomes under Alternative Policies" and "Outcomes under Alternative Policies, Quarterly," tabulate the simulation results for key variables under the policy rules described earlier.

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<sup>9</sup> This recession scenario is the same one discussed in the FOMC memo titled "Unconventional Policy Responses to a Recession" by Hess Chung and Edward Herbst, sent to the Committee on March 4, 2016, and thus allows a direct comparison of the macroeconomic effects of the NI targeting rules to the unconventional policies considered in that memo.

**Outcomes under Alternative Policies**

(Percent change, annual rate, from end of preceding period except as noted)

Measure and policy	2015	2016	2017	2018	2019
	H2				
<i>Real GDP</i>					
Extended Tealbook baseline <sup>1</sup>	1.6	2.2	2.2	2.0	1.8
Taylor (1993)	1.6	2.0	2.1	2.1	1.9
Taylor (1999)	1.6	2.0	2.0	2.0	1.9
Inertial Taylor (1999)	1.6	2.2	2.2	2.0	1.8
First-difference	1.6	2.3	2.5	2.2	2.0
Optimal control	1.6	2.0	1.7	1.7	1.7
<i>Unemployment Rate<sup>2</sup></i>					
Extended Tealbook baseline <sup>1</sup>	5.0	4.8	4.5	4.3	4.3
Taylor (1993)	5.0	4.9	4.6	4.4	4.3
Taylor (1999)	5.0	4.9	4.7	4.5	4.5
Inertial Taylor (1999)	5.0	4.8	4.5	4.3	4.3
First-difference	5.0	4.7	4.3	4.0	3.9
Optimal control	5.0	4.9	4.8	4.8	4.8
<i>Total PCE prices</i>					
Extended Tealbook baseline <sup>1</sup>	0.8	1.0	1.6	1.8	1.9
Taylor (1993)	0.8	1.1	1.7	1.9	2.0
Taylor (1999)	0.8	1.0	1.6	1.8	1.9
Inertial Taylor (1999)	0.8	1.0	1.6	1.8	1.9
First-difference	0.8	1.1	1.8	2.0	2.1
Optimal control	0.8	1.0	1.5	1.7	1.8
<i>Core PCE prices</i>					
Extended Tealbook baseline <sup>1</sup>	1.4	1.4	1.6	1.8	1.9
Taylor (1993)	1.4	1.5	1.6	1.9	2.0
Taylor (1999)	1.4	1.4	1.5	1.8	1.9
Inertial Taylor (1999)	1.4	1.4	1.6	1.8	1.9
First-difference	1.4	1.5	1.8	2.1	2.2
Optimal control	1.4	1.4	1.5	1.7	1.9
<i>Nominal federal funds rate<sup>2</sup></i>					
Extended Tealbook baseline <sup>1</sup>	0.2	1.4	2.3	3.2	3.7
Taylor (1993)	0.2	2.6	3.1	3.6	3.8
Taylor (1999)	0.2	2.7	3.2	3.9	4.1
Inertial Taylor (1999)	0.2	1.4	2.3	3.2	3.7
First-difference	0.2	1.2	2.3	3.1	3.3
Optimal control	0.2	2.0	3.5	4.5	5.0

1. In the Tealbook baseline, the federal funds rate follows the prescriptions of the inertial Taylor (1999) rule.  
 2. Percent, average for the final quarter of the period.

**Outcomes under Alternative Policies, Quarterly**  
(Four-quarter percent change, except as noted)

Measure and policy	2016				2017			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
<i>Real GDP</i>								
Extended Tealbook baseline <sup>1</sup>	2.2	1.8	1.9	2.2	2.2	2.3	2.2	2.2
Taylor (1993)	2.2	1.8	1.8	2.0	1.9	2.0	2.1	2.1
Taylor (1999)	2.2	1.8	1.8	2.0	1.9	1.9	1.9	2.0
Inertial Taylor (1999)	2.2	1.8	1.9	2.2	2.2	2.3	2.2	2.2
First-difference	2.2	1.8	1.9	2.3	2.4	2.5	2.5	2.5
Optimal control	2.2	1.8	1.8	2.0	1.8	1.8	1.7	1.7
<i>Unemployment Rate<sup>2</sup></i>								
Extended Tealbook baseline <sup>1</sup>	4.9	4.9	4.8	4.8	4.7	4.6	4.6	4.5
Taylor (1993)	4.9	4.9	4.9	4.9	4.8	4.8	4.7	4.6
Taylor (1999)	4.9	4.9	4.9	4.9	4.9	4.8	4.7	4.7
Inertial Taylor (1999)	4.9	4.9	4.8	4.8	4.7	4.6	4.5	4.5
First-difference	4.9	4.9	4.8	4.7	4.6	4.5	4.4	4.3
Optimal control	4.9	4.9	4.9	4.9	4.8	4.8	4.8	4.8
<i>Total PCE prices</i>								
Extended Tealbook baseline <sup>1</sup>	1.0	0.8	0.8	1.0	1.4	1.5	1.6	1.6
Taylor (1993)	1.0	0.8	0.8	1.1	1.5	1.6	1.6	1.7
Taylor (1999)	1.0	0.8	0.8	1.0	1.4	1.5	1.6	1.6
Inertial Taylor (1999)	1.0	0.8	0.8	1.0	1.4	1.5	1.6	1.6
First-difference	1.0	0.8	0.8	1.1	1.6	1.7	1.7	1.8
Optimal control	1.0	0.8	0.8	1.0	1.4	1.4	1.5	1.5
<i>Core PCE prices</i>								
Extended Tealbook baseline <sup>1</sup>	1.6	1.5	1.5	1.4	1.4	1.4	1.5	1.6
Taylor (1993)	1.6	1.5	1.5	1.5	1.4	1.4	1.5	1.6
Taylor (1999)	1.6	1.5	1.5	1.4	1.3	1.4	1.5	1.5
Inertial Taylor (1999)	1.6	1.5	1.5	1.4	1.4	1.4	1.5	1.6
First-difference	1.6	1.6	1.5	1.5	1.5	1.5	1.6	1.8
Optimal control	1.6	1.5	1.5	1.4	1.3	1.3	1.4	1.5
<i>Nominal federal funds rate<sup>2</sup></i>								
Extended Tealbook baseline <sup>1</sup>	0.6	0.9	1.2	1.4	1.7	1.9	2.1	2.3
Taylor (1993)	0.6	2.6	2.6	2.6	2.5	2.6	2.8	3.1
Taylor (1999)	0.6	2.7	2.7	2.7	2.6	2.7	3.0	3.2
Inertial Taylor (1999)	0.6	0.9	1.2	1.4	1.7	1.9	2.1	2.3
First-difference	0.6	0.7	0.9	1.2	1.5	1.8	2.0	2.3
Optimal control	0.6	1.0	1.5	2.0	2.4	2.8	3.2	3.5

1. In the Tealbook baseline, the federal funds rate follows the prescriptions of the inertial Taylor (1999) rule.  
2. Percent, average for the quarter.

## Appendix

### POLICY RULES USED IN “MONETARY POLICY STRATEGIES”

The table below gives the expressions for the four policy rules regularly reported in “Monetary Policy Strategies.” In the table,  $R_t$  denotes the nominal federal funds rate for quarter  $t$ , while the right-hand-side variables include the staff’s projection of trailing four-quarter core PCE inflation for the current quarter and three quarters ahead ( $\pi_t$  and  $\pi_{t+3|t}$ ), the output gap estimate for the current period ( $gap_t$ ), and the forecast of the three-quarter-ahead annual change in the output gap ( $\Delta^4 gap_{t+3|t}$ ). The value of policymakers’ longer-run inflation objective, denoted  $\pi^{LR}$ , is 2 percent.

<b>Taylor (1993) rule</b>	$R_t = r^{LR} + \pi_t + 0.5(\pi_t - \pi^{LR}) + 0.5gap_t$
<b>Taylor (1999) rule</b>	$R_t = r^{LR} + \pi_t + 0.5(\pi_t - \pi^{LR}) + gap_t$
<b>Inertial Taylor (1999) rule</b>	$R_t = 0.85R_{t-1} + 0.15(r^{LR} + \pi_t + 0.5(\pi_t - \pi^{LR}) + gap_t)$
<b>First-difference rule</b>	$R_t = R_{t-1} + 0.5(\pi_{t+3 t} - \pi^{LR}) + 0.5\Delta^4 gap_{t+3 t}$

The first two of the selected rules were studied by Taylor (1993, 1999), while the inertial version of the Taylor (1999) rule has been featured prominently in analysis by Board staff.<sup>1</sup> The intercepts of these rules are chosen so that they are consistent with a 2 percent longer-run inflation objective and a longer-run real federal funds rate, denoted  $r^{LR}$ , of 1¼ percent, a value used in the FRB/US model. The prescriptions of the first-difference rule do not depend on the level of the output gap or the longer-run real interest rate; see Orphanides (2003).

Near-term prescriptions from the four policy rules are calculated using Tealbook projections for inflation and the output gap. For the rules that include the lagged policy rate as a right-hand-side variable—the inertial Taylor (1999) rule and the first-difference rule—the lines labeled “Previous Tealbook outlook” report prescriptions derived from the previous Tealbook projections for inflation and the output gap, while using the same lagged funds rate value as in the prescriptions computed for the current Tealbook. When the Tealbook is published early in a quarter, this lagged funds rate value is set equal to the actual value of the lagged funds rate in the previous quarter, and prescriptions are shown for the current quarter. When the Tealbook is published late in a quarter, the prescriptions are shown for the next quarter, and the lagged policy rate, for each of these rules, including those that use the “Previous Tealbook outlook,” is set equal to the average value for the policy rate thus far in the quarter. For the subsequent quarter, these rules use the lagged values from their simulated, unconstrained prescriptions.

<sup>1</sup> See, for example, Erceg and others (2012).



## REAL FEDERAL FUNDS RATE ESTIMATES

The bottom panel of the exhibit, “Policy Rules and the Staff Projection,” provides an estimate of one notion of the equilibrium real federal funds rate,  $r^*$ . This measure is an estimate of the real federal funds rate that, if maintained over a 12-quarter period (beginning in the current quarter), makes the output gap equal to zero in the final quarter of that period using the output projection from FRB/US, the staff’s large-scale econometric model of the U.S. economy. This “Tealbook-consistent FRB/US  $r^*$ ” depends on broad array of economic factors, some of which take the form of projected values of the model’s exogenous variables. It is generated after the paths of exogenous variables in the FRB/US model are adjusted so that they match those in the extended Tealbook forecast. Model simulations then determine the value of the real federal funds rate that closes the output gap conditional on the exogenous variables in the extended baseline forecast.

The “current real federal funds rate” reported in the panel is constructed as the difference between the midpoint of the prevailing target range for the federal funds rate and the trailing four-quarter change in the core PCE price index.

The “average projected real federal funds rate” reported in the panel is the average of the real federal funds rate under the Tealbook baseline projection calculated over the same 12-quarter period as the Tealbook-consistent FRB/US  $r^*$ . The average projected real federal funds rate and  $r^*$  need not be associated with the same macroeconomic outcomes even when their values are identical. The reason is that, in the  $r^*$  simulations, the real federal funds rate is held constant over the entire 12-quarter period to close the output gap at the end of this timeframe whereas, in the Tealbook baseline, the real federal funds rate can vary over time. Distinct paths of real short-term rates can, in turn, generate different paths for inflation and economic activity.

## FRB/US MODEL SIMULATIONS

The exhibits of “Monetary Policy Strategies” that report results from simulations of alternative policies are derived from dynamic simulations of the FRB/US model. Each simulated policy rule is assumed to be in force over the whole period covered by the simulation; this period extends several decades beyond the time horizon shown in the exhibits. The simulations are conducted under the assumption that market participants as well as price and wage setters have perfect foresight, and are predicated on the staff’s extended Tealbook projection, which includes the macroeconomic effects of the Committee’s large-scale asset purchase programs. When the Tealbook is published early in a quarter, all of the simulations begin in that quarter. However, when the Tealbook is published late in a quarter, all of the simulations begin in the subsequent quarter.

## COMPUTATION OF THE OPTIMAL CONTROL POLICY UNDER COMMITMENT

The optimal control simulations posit that policymakers minimize a discounted sum of weighted squared deviations of four-quarter headline PCE inflation ( $\pi_t^{pce}$ ) from the Committee’s

2 percent objective, of squared deviations of the unemployment rate from the staff's estimate of the natural rate (this difference is also known as the unemployment rate gap,  $ugap_t$ ), and of squared changes in the federal funds rate. The resulting loss function, shown below, embeds the assumptions that policymakers discount the future using a quarterly discount factor  $\beta = 0.9963$  and place equal weights on squared deviations of inflation, the unemployment gap, and federal funds rate changes (that is,  $\lambda_\pi = \lambda_{ugap} = \lambda_R$ ).

$$L_t = \sum_{\tau=0}^T \beta^\tau \{ \lambda_\pi (\pi_{t+\tau}^{pce} - \pi^{LR})^2 + \lambda_{ugap} (ugap_{t+\tau})^2 + \lambda_R (R_{t+\tau} - R_{t+\tau-1})^2 \}$$

The optimal control policy is the path for the federal funds rate that minimizes the above loss function in the FRB/US model, subject to the effective lower bound constraint on nominal interest rates, under the assumption of perfect foresight, and conditional on the staff's extended Tealbook projection. Policy tools other than the federal funds rate are taken as given and subsumed within the Tealbook baseline. The path chosen by policymakers today is assumed to be credible, meaning that decision makers in the model see this path as being a binding commitment on the future Committees; the optimal control policy takes as given the lagged value of the federal funds rate but is otherwise unconstrained by policy decisions made prior to the simulation period. The discounted losses are calculated over a period that ends sufficiently far into the future that extending that period farther would not affect the policy prescriptions shown in the exhibits.

## NOMINAL INCOME TARGETING RULE

The nominal income targeting rule, used in the special exhibit for this Tealbook, responds to the nominal income gap, which is defined as the difference between nominal income  $yn_t$  (100 times the log of the level of nominal GDP) and a target value  $yn_t^*$  (100 times the log of target nominal GDP).

$$R_t = 0.75R_{t-1} + 0.25(r^{LR} + \pi_t + yn_t - yn_t^*)$$

The target value  $yn_t^*$  grows at a rate equal to 2 percentage points per year faster than the staff's estimate of potential GDP.<sup>2</sup> In the special exhibit, the initial value for  $yn_t^*$  is computed in two ways. In the first calibration of the rule, the initial target value is set so that policymakers address only nominal income shortfalls since 2015:Q4, while in the second calibration, the initial value for  $yn_t^*$  is constructed so that the rule seeks to offset the cumulative nominal income gap since 2011:Q4. For each of these rule specifications, the nominal income gap can be expressed as the sum of the current estimate of the output gap and the shortfall of the GDP deflator from the

<sup>2</sup> This implies that, as with many other simple policy rules, a revision to the estimate of potential GDP would change the prescription of the rule.

level it would have attained had it grown at a 2 percent annual pace since the date associated with the rule.<sup>3</sup>

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<sup>3</sup> For a discussion of the properties of NI targeting regimes, see Erceg and others (2011).

## Monetary Policy Alternatives

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The draft statements—labeled Alternative A, Alternative B, and Alternative C—offer similar assessments of incoming data on domestic economic activity and the labor market. Where they differ is in their characterization of inflation expectations and the outlook for inflation, of the risks attending the outlook in light of financial market turbulence and developments abroad, and of the implications for adjustments in the stance of monetary policy at this and subsequent meetings. In particular, Alternative B maintains the current target range while keeping open the option for target range adjustments at upcoming meetings, Alternative A specifies conditions for raising the target range that, in the staff’s view, are unlikely to be met in the near term, and Alternative C increases the target range.

All three statements begin by acknowledging that “economic activity has been expanding at a moderate pace,” with Alternative B and Alternative C emphasizing the economy’s resilience to date by pointing out that this expansion has been occurring “despite the global economic and financial developments of recent months.” The draft statements next note that household spending “has been increasing at a solid rate” while business fixed investment and net exports “have been soft.” The three statements then report that recent indicators point to “strengthening of the labor market.” This language recognizes that, from November to February, total nonfarm payroll employment expanded, on average, by a solid 228,000 jobs per month, the unemployment rate ticked down to 4.9 percent, and the labor force participation rate rose 0.4 percentage point.

The three draft statements observe that inflation picked up in recent months but also note that it has continued to run below 2 percent. Alternative B and Alternative C both suggest that measures of inflation compensation and survey-based measures of longer-run inflation expectations are little changed, on balance, but Alternative B draws attention to the low levels of some of these measures whereas Alternative C does not. Alternative A conveys greater concern about readings from these measures by stating that they point to increased risks that inflation “will fail to rise to 2 percent over the medium term.” With respect to the Committee’s modal outlook for inflation, Alternative A and Alternative B both reaffirm the Committee’s expectation that inflation will “remain low in the near term,” in part because of earlier declines in energy prices, but that inflation will rise to 2 percent over the medium term as the transitory effects of these declines

dissipate and as the labor market strengthens further. Alternative C dispenses with any mention of expected softness in the near term; it simply states the Committee's anticipation that inflation will rise to 2 percent as transitory influences dissipate.

Financial conditions deteriorated early in the intermeeting period, with equity prices falling and credit spreads on risky corporate bonds rising. Subsequently, investor sentiment improved markedly, and financial conditions ended the period generally less tight than at the time of the January meeting. The reasons for this improvement in sentiment are unclear, as the factors that have fuelled concerns over the global outlook in recent months—such as the possibility of a hard landing in China, unsettling news about the health of European banks, and excessive corporate debt in emerging market economies—remain largely unaddressed. Stepping back, on balance since the December FOMC meeting, the S&P 500 stock price index is down 4 percent, 10-year nominal Treasury yields are down about 35 basis points, and the levels of the federal funds rate implied by OIS quotes for year-end 2016 and year-end 2017 are down nearly 20 basis points and about 40 basis points, respectively.

The draft statements suggest that the global economic and financial developments of the past few months have not had a material effect on the Committee's medium-term baseline outlook; however, they offer differing characterizations of the risks to the U.S. economy stemming from these developments. Alternative B acknowledges that these developments “continue to pose risks” whereas Alternative A cautions that they “pose downside risks.” Alternative C returns to December statement language in affirming that the Committee “sees the risks to the outlook for both economic activity and the labor market as balanced.”

Turning to the policy decision, Alternative B repeats language from the January statement by indicating that the decision to hold the target range at this meeting will support “further improvement in labor market conditions and a return to 2 percent inflation.” But the new opening words of paragraph 3 suggest that the Committee's decision is based not only on its economic outlook but also on its risk assessment, and thus suggest that risk management considerations contributed to the decision to maintain the current target range. Alternative B preserves the option to alter the target range at any future meeting and leaves unchanged the guidance regarding future target range adjustments and balance sheet management. By contrast, Alternative A communicates a judgment that the “economic outlook and associated risks” warrant not increasing the target range “until inflation moves closer to 2 percent on a sustained basis and the risks to

the economic outlook are more closely balanced;” the staff forecast presented in Tealbook A suggests that the inflation condition is unlikely to be met in short order. In any case, by the time these inflation and risk conditions are met, the labor market could have strengthened substantially further, a situation that would call for relatively rapid increases in the target range. Accordingly, Alternative A drops the indication that future adjustments to the stance of policy will be “only gradual.” Alternative C raises the target range by 25 basis points and maintains the existing guidance about future monetary policy actions, consistent with a view that the economy has evolved in a way that makes it appropriate to follow a path of policy rate increases like the median path in the December Summary of Economic Projections (SEP).

The next pages contain the January postmeeting statement, the three draft statements, and summaries of the arguments for each alternative. These elements are followed by drafts of the implementation note regarding the decisions taken by the Federal Reserve to implement the monetary policy stance announced by the Committee. The first draft could be issued if the Committee decides to maintain the current setting of the target range for the federal funds rate, as in Alternative A and Alternative B, and the second draft could be issued if the Committee decides to raise the target range for the federal funds rate, as in Alternative C. In either case, the implementation note, which contains the Committee’s domestic policy directive to the Desk, will be released with the Committee’s postmeeting statement.

**JANUARY 2016 FOMC STATEMENT**

1. Information received since the Federal Open Market Committee met in December suggests that labor market conditions improved further even as economic growth slowed late last year. Household spending and business fixed investment have been increasing at moderate rates in recent months, and the housing sector has improved further; however, net exports have been soft and inventory investment slowed. A range of recent labor market indicators, including strong job gains, points to some additional decline in underutilization of labor resources. Inflation has continued to run below the Committee's 2 percent longer-run objective, partly reflecting declines in energy prices and in prices of non-energy imports. Market-based measures of inflation compensation declined further; survey-based measures of longer-term inflation expectations are little changed, on balance, in recent months.
2. Consistent with its statutory mandate, the Committee seeks to foster maximum employment and price stability. The Committee currently expects that, with gradual adjustments in the stance of monetary policy, economic activity will expand at a moderate pace and labor market indicators will continue to strengthen. Inflation is expected to remain low in the near term, in part because of the further declines in energy prices, but to rise to 2 percent over the medium term as the transitory effects of declines in energy and import prices dissipate and the labor market strengthens further. The Committee is closely monitoring global economic and financial developments and is assessing their implications for the labor market and inflation, and for the balance of risks to the outlook.
3. Given the economic outlook, the Committee decided to maintain the target range for the federal funds rate at  $\frac{1}{4}$  to  $\frac{1}{2}$  percent. The stance of monetary policy remains accommodative, thereby supporting further improvement in labor market conditions and a return to 2 percent inflation.
4. In determining the timing and size of future adjustments to the target range for the federal funds rate, the Committee will assess realized and expected economic conditions relative to its objectives of maximum employment and 2 percent inflation. This assessment will take into account a wide range of information, including measures of labor market conditions, indicators of inflation pressures and inflation expectations, and readings on financial and international developments. In light of the current shortfall of inflation from 2 percent, the Committee will carefully monitor actual and expected progress toward its inflation goal. The Committee expects that economic conditions will evolve in a manner that will warrant only gradual increases in the federal funds rate; the federal funds rate is likely to remain, for some time, below levels that are expected to prevail in the longer run. However, the actual path of the federal funds rate will depend on the economic outlook as informed by incoming data.
5. The Committee is maintaining its existing policy of reinvesting principal payments from its holdings of agency debt and agency mortgage-backed securities in agency

mortgage-backed securities and of rolling over maturing Treasury securities at auction, and it anticipates doing so until normalization of the level of the federal funds rate is well under way. This policy, by keeping the Committee's holdings of longer-term securities at sizable levels, should help maintain accommodative financial conditions



**MARCH 2016 ALTERNATIVE A**

1. Information received since the Federal Open Market Committee met in ~~December~~ **January** suggests that ~~labor market conditions improved further even as economic growth slowed late last year~~ **economic activity has been expanding at a moderate pace**. Household spending and ~~business fixed investment have~~ **has** been increasing at ~~moderate rates~~ **a solid rate** in recent months, and the housing sector has improved further; however, **business fixed investment and** net exports have been soft and ~~inventory investment slowed~~. A range of recent labor market indicators, including strong job gains, points to some additional ~~decline in underutilization of labor resources~~ **strengthening of the labor market**. Inflation has **picked up in recent months; however, it** continued to run below the Committee's 2 percent longer-run objective, partly reflecting declines in energy prices and in prices of non-energy imports. Market-based measures of inflation compensation ~~declined further~~ **remain near historically low levels; some** survey-based measures of longer-term inflation expectations ~~are little changed, on balance, in recent months~~ **declined further**.
2. Consistent with its statutory mandate, the Committee seeks to foster maximum employment and price stability. The Committee currently expects that, with ~~gradual adjustments in the stance of~~ **appropriately accommodative** monetary policy, economic activity will expand at a moderate pace and labor market indicators will continue to strengthen. **However, global economic and financial developments in recent months pose downside risks to the outlook for economic activity and the labor market**. Inflation is expected to remain low in the near term, in part because of ~~the further~~ **earlier** declines in energy prices, but to rise to 2 percent over the medium term as the transitory effects of declines in energy and import prices dissipate and the labor market strengthens further. The Committee is closely monitoring global economic and financial developments and is assessing their implications for the labor market and inflation, and for the balance of risks to the outlook. **In light of continued low readings from measures of longer-term inflation compensation and expectations, the Committee judges that the risks that inflation will fail to rise to 2 percent over the medium term have increased**.
3. Given the economic outlook **and associated risks**, the Committee decided to maintain the target range for the federal funds rate at ¼ to ½ percent. ~~The stance of monetary policy remains accommodative, thereby supporting further improvement in labor market conditions and a return to 2 percent inflation.~~ **The Committee anticipates that it will not increase this target range until inflation moves closer to 2 percent on a sustained basis and the risks to the economic outlook are more closely balanced**.
4. ~~In determining the~~ **When adjustments to the target range become appropriate, their** timing and size of future adjustments to the target range for the federal funds rate, ~~the Committee will assess~~ **will depend on the Committee's assessment of** realized and expected economic conditions relative to its objectives of maximum employment and 2 percent inflation. This assessment will take into account a wide

range of information, including measures of labor market conditions, indicators of inflation pressures and inflation expectations, and readings on financial and international developments. ~~In light of the current shortfall of inflation from 2 percent, the Committee will carefully monitor actual and expected progress toward its inflation goal.~~ The Committee expects that ~~economic conditions will evolve in a manner that will warrant only gradual increases in the federal funds rate;~~ the federal funds rate is likely to **will** remain, for some time, below levels that are expected to prevail in the longer run. However, the actual path of the federal funds rate will depend on the economic outlook as informed by incoming data.

5. The Committee is maintaining its existing policy of reinvesting principal payments from its holdings of agency debt and agency mortgage-backed securities in agency mortgage-backed securities and of rolling over maturing Treasury securities at auction, and it anticipates doing so until normalization of the level of the federal funds rate is well under way. This policy, by keeping the Committee's holdings of longer-term securities at sizable levels, should help maintain accommodative financial conditions.

**MARCH 2016 ALTERNATIVE B**

1. Information received since the Federal Open Market Committee met in ~~December~~ **January** suggests that ~~labor market conditions improved further even as economic growth slowed late last year~~ **economic activity has been expanding at a moderate pace despite the global economic and financial developments of recent months.** Household spending and ~~business fixed investment have~~ **has** been increasing at moderate rates in recent months **a solid rate**, and the housing sector has improved further; however, **business fixed investment and** net exports have been soft ~~and inventory investment slowed~~. A range of recent labor market indicators, including strong job gains, points to ~~some additional decline in underutilization of labor resources~~ **strengthening of the labor market.** Inflation has **picked up in recent months; however, it** continued to run below the Committee's 2 percent longer-run objective, partly reflecting declines in energy prices and in prices of non-energy imports. Market-based measures of inflation compensation ~~declined further~~ **remain low**; survey-based measures of longer-term inflation expectations are little changed, on balance, in recent months.
2. Consistent with its statutory mandate, the Committee seeks to foster maximum employment and price stability. The Committee currently expects that, with gradual adjustments in the stance of monetary policy, economic activity will expand at a moderate pace and labor market indicators will continue to strengthen. **However, global economic and financial developments continue to pose risks.** Inflation is expected to remain low in the near term, in part because of ~~the further~~ **earlier** declines in energy prices, but to rise to 2 percent over the medium term as the transitory effects of declines in energy and import prices dissipate and the labor market strengthens further. ~~The Committee is closely monitoring global economic and financial developments and is assessing their implications for the labor market and inflation, and for the balance of risks to the outlook.~~ **The Committee continues to monitor inflation developments closely.**
3. ~~Given the economic outlook~~ **Against this backdrop**, the Committee decided to maintain the target range for the federal funds rate at ¼ to ½ percent. The stance of monetary policy remains accommodative, thereby supporting further improvement in labor market conditions and a return to 2 percent inflation.
4. In determining the timing and size of future adjustments to the target range for the federal funds rate, the Committee will assess realized and expected economic conditions relative to its objectives of maximum employment and 2 percent inflation. This assessment will take into account a wide range of information, including measures of labor market conditions, indicators of inflation pressures and inflation expectations, and readings on financial and international developments. In light of the current shortfall of inflation from 2 percent, the Committee will carefully monitor actual and expected progress toward its inflation goal. The Committee expects that economic conditions will evolve in a manner that will warrant only gradual increases in the federal funds rate; the federal funds rate is likely to remain, for some time,

below levels that are expected to prevail in the longer run. However, the actual path of the federal funds rate will depend on the economic outlook as informed by incoming data.

5. The Committee is maintaining its existing policy of reinvesting principal payments from its holdings of agency debt and agency mortgage-backed securities in agency mortgage-backed securities and of rolling over maturing Treasury securities at auction, and it anticipates doing so until normalization of the level of the federal funds rate is well under way. This policy, by keeping the Committee's holdings of longer-term securities at sizable levels, should help maintain accommodative financial conditions.

## MARCH 2016 ALTERNATIVE C

1. Information received since the Federal Open Market Committee met in ~~December~~ **January** suggests that ~~labor market conditions improved further even as economic growth slowed late last year~~ **economic activity has been expanding at a moderate pace despite the global economic and financial developments of recent months.** Household spending and ~~business fixed investment have~~ **has** been increasing at ~~moderate rates in recent months~~ **a solid rate**, and the housing sector has improved further; however, **business fixed investment and** net exports have been soft ~~and inventory investment slowed~~. A range of recent labor market indicators, including strong job gains, points to ~~some additional decline in underutilization of labor resources~~ **strengthening of the labor market**. Inflation has continued to run below the Committee's 2 percent longer-run objective, partly reflecting **earlier** declines in energy prices and in prices of non-energy imports, **but it has risen in recent months.** Market-based measures of inflation compensation ~~declined further~~; **and** survey-based measures of longer-term inflation expectations are little changed, on balance, in recent months.
2. Consistent with its statutory mandate, the Committee seeks to foster maximum employment and price stability. The Committee currently expects that, with gradual adjustments in the stance of monetary policy, economic activity will expand at a moderate pace and labor market indicators will continue to strengthen. **Overall, taking into account domestic and international developments, the Committee sees the risks to the outlook for both economic activity and the labor market as balanced.** Inflation is expected to ~~remain low in the near term, in part because of the further declines in energy prices, but~~ to rise to 2 percent over the medium term as the transitory effects of declines in energy and import prices dissipate and the labor market strengthens further. The Committee is ~~closely monitoring global economic and financial developments and is assessing their implications for the labor market and inflation, and for the balance of risks to the outlook~~ **continues to monitor inflation developments closely.**
3. ~~Given the economic outlook~~ **Against this backdrop**, the Committee decided to ~~maintain~~ **increase** the target range for the federal funds rate at  $\frac{1}{4}$  to  $\frac{1}{2}$  **to**  $\frac{3}{4}$  percent. The stance of monetary policy remains accommodative, thereby supporting further improvement in labor market conditions and a return to 2 percent inflation.
4. In determining the timing and size of future adjustments to the target range for the federal funds rate, the Committee will assess realized and expected economic conditions relative to its objectives of maximum employment and 2 percent inflation. This assessment will take into account a wide range of information, including measures of labor market conditions, indicators of inflation pressures and inflation expectations, and readings on financial and international developments. In light of the current shortfall of inflation from 2 percent, the Committee will carefully monitor actual and expected progress toward its inflation goal. The Committee expects that economic conditions will evolve in a manner that will warrant only gradual increases

in the federal funds rate; the federal funds rate is likely to remain, for some time, below levels that are expected to prevail in the longer run. However, the actual path of the federal funds rate will depend on the economic outlook as informed by incoming data.

5. The Committee is maintaining its existing policy of reinvesting principal payments from its holdings of agency debt and agency mortgage-backed securities in agency mortgage-backed securities and of rolling over maturing Treasury securities at auction, and it anticipates doing so until normalization of the level of the federal funds rate is well under way. This policy, by keeping the Committee's holdings of longer-term securities at sizable levels, should help maintain accommodative financial conditions.

## THE CASE FOR ALTERNATIVE B

Alternatives

Policymakers may see the available information as suggesting that economic activity and the labor market are evolving in ways that are broadly consistent with their modal forecasts at the time of the December FOMC meeting. The earlier downside surprise to fourth-quarter real GDP growth was partly revised away, leaving the estimate of GDP growth in 2015 modestly below the median response in the December SEP. First-quarter indicators of real activity, including personal consumption expenditures in January as well as consumer confidence and light vehicle sales through February, appear consistent with moderate growth. Labor market conditions have strengthened further, with nonfarm payroll employment expanding solidly through February and the labor force participation rate moving up. Although global financial conditions have generally improved of late, the factors that led to their sharp deterioration earlier this year remain largely unaddressed, suggesting that concerns over the global outlook are likely to persist. Turning to inflation, policymakers may judge that developments have been mixed and further complicate the task of disentangling the persistent and temporary components: Although inflation picked up recently, it remains below 2 percent and at least part of the firming seems to be due to erratic components and transitory seasonal movements. On the other hand, while measures of inflation compensation and longer-run inflation expectations have remained soft, and have even edged down in some cases, policymakers may judge that this softness likely reflects changes in risk and liquidity premiums and the known sensitivity of survey responses to gasoline prices. Given these considerations, Committee members may find it prudent to maintain the current target range, as in Alternative B, until they have greater confidence that the economy will remain on a path consistent with achieving their mandated objectives.

Policymakers may judge that global economic and financial developments continue to pose risks to their economic outlook, and they might want to convey that risk management considerations are playing a role in their March policy decision. They may note that, under certain conditions, it is optimal to follow a shallower policy rate path in response to increased uncertainty about the economic outlook when there is a material possibility that the effective lower bound (ELB) could bind for a protracted period going forward than when there is little or no risk of being constrained by the ELB. In the current context, they might conclude that waiting for greater clarity regarding the economic outlook before taking the next step in normalizing the stance of monetary policy might provide some insurance against costly downside risks and that waiting has the added benefit of confirming to the public that policy is not on a preset course.

Some participants may judge it unlikely that an increase in the target range will be warranted in the near term. In light of historically low readings on measures of inflation compensation and expectations, they may have become less confident that inflation will move up to 2 percent. Or they may view the low sensitivity of inflation to resource utilization as requiring a period of unemployment well below its longer-run normal rate to ensure a return of inflation to 2 percent over the medium run. Nevertheless, those who judge that the outlook is sufficiently uncertain to make near-term rate hikes inadvisable may conclude that, by not increasing the target range in March, the Committee would go far enough, for now, in signaling that policy is not on a preset course, that the FOMC is committed to achieving its inflation goal, and that the FOMC is mindful of its limited ability to offset adverse shocks in the vicinity of the ELB. Moreover, they might judge that the statement should signal that the Committee is closely monitoring inflation developments, as in Alternative B.

Other policymakers may see incoming data, in particular strong job gains and solid consumption indicators, as reinforcing their view that the ongoing economic expansion is resilient and that worries about the recent market volatility and foreign developments significantly restraining the U.S. economy are exaggerated. Looking through temporary influences from energy and import prices, these policymakers may view the recent uptick in core inflation, the moderate rebound in oil prices, and the further strengthening of the labor market as suggesting that inflation will, as they had previously expected, rise toward 2 percent over the medium term. If so, these policymakers may lean toward continuing on the path of gradual policy normalization envisioned in December. That said, they may believe that postponing the decision to raise the target range until a later meeting entails little, if any, extra risks that the economy could overheat or that financial imbalances could emerge, because real GDP growth remains moderate, inflation continues to run below 2 percent, wage growth is tepid, measures of longer-term inflation expectations are at or below normal levels, and asset valuation pressures are generally moderate. Moreover, these policymakers may recognize that the Committee could readily tighten policy rapidly were it necessary, and that the language in Alternative B emphasizing the Committee's pursuit of a data-dependent approach indicates that the Committee stands ready to do so.

A decision to maintain the current target range would be in line with the expectations of financial market participants. According to the Desk's latest Survey of Primary Dealers and Survey of Market Participants, respondents perceive there to be only a remote chance that the Committee will change the target range at this meeting.



Moreover, respondents do not anticipate any changes to the Committee's forward guidance or reinvestment policy, which Alternative B both maintains. Whether market participants will perceive the statement as more or less accommodative, on balance, than they had anticipated is unclear. On the one hand, the statement acknowledges that "global economic and financial developments continue to pose risks," which some market participants might interpret as the Committee showing greater concerns than they had anticipated. On the other hand, the statement contrasts these concerns with a relatively upbeat assessment of the U.S. economy, which might boost market participants' confidence in economic prospects. Obviously, the market reaction to the March decision could also be sensitive to the content of the accompanying SEP.

## THE CASE FOR ALTERNATIVE A

Some policymakers might argue that the global economic and financial situation poses substantial downside risks to the domestic economic outlook, and that recent financial market turbulence offers an important reminder that the ability of U.S. and foreign central banks to offset the effects of adverse economic shocks is limited. Despite the improvement in the labor market to date, these policymakers may believe that more needs to be done to reach maximum employment. And with the risks to economic activity skewed to the downside, they might be concerned that progress toward that objective might stall or be reversed. These policymakers might also stress that both core and headline inflation have run below 2 percent for several years, and that headline inflation will linger at low levels well into 2016 because of earlier movements in the exchange value of the dollar and in the prices of oil and other commodities. With FOMC participants, the staff, and many other forecasters having repeatedly overpredicted inflation in recent years, some policymakers might want to see actual inflation move more convincingly toward their objective rather than to continue to predicate their policy decisions on inflation forecasts that hinge on a tenuous relationship with slack in labor or product markets and on the assumption that inflation expectations are, and will remain, well anchored. In sum, these policymakers might prefer a statement along the lines of Alternative A, which asserts that the Committee anticipates that it will not increase the target range "until inflation moves closer to 2 percent on a sustained basis and the risks to the economic outlook are more closely balanced."

These policymakers might favor including language indicating that recent global developments pose downside risks to their outlook for economic activity and the labor market. More generally, these policymakers might see alternative scenarios such as

“Global Recession” or “Less Effective Foreign Monetary Policy” in the “Risks and Uncertainty” section of Tealbook A as increasingly likely. They might observe that the scope to use conventional policy measures to support the economy in the event that such scenarios materialize would be quickly exhausted, given the proximity to the effective lower bound. On a related note, these policymakers might expect that the neutral rate of interest is likely to remain low for an extended period, thus exacerbating the risk that conventional policy could be constrained going forward. They might also judge that unconventional monetary policies provide only a limited extra cushion against adverse shocks unless the FOMC commits to maintaining extraordinary amounts of accommodation for a prolonged period, a point illustrated in the memo “Unconventional Policy Responses to a Recession” sent to the Committee on March 4, 2016. Because the benefits of such forceful actions are uncertain and the risks they entail are not well captured by economic models, these policymakers may worry that the scope for unconventional policy actions is even more limited than suggested in the memo. Therefore, these policymakers may believe that risk management considerations call for signaling that any further removal of policy accommodation is some time off.

Policymakers might also worry that the failure of inflation to rise to target over the past several years has become ingrained in longer-term inflation expectations. They might note that the Michigan Survey measure of longer-term inflation expectations slid to the lowest level in its nearly four-decade history in February, and that the New York Fed’s measure of three-year-ahead expected inflation displays a similar downward drift. They might add that market-based measures of inflation compensation have been at low levels for so long that it is difficult to believe that these declines are entirely due to liquidity and risk premiums. On balance, they may see the weakness in those various measures as suggesting that the inflation expectations relevant for wage and price setting have declined slightly, and note that staff, in effect, reached such a conclusion this round when it lowered its estimate of underlying inflation over the medium term from 1.8 percent to 1.75 percent. Some policymakers might further dismiss the recent uptick in core inflation as a transitory anomaly, and instead point to wage inflation falling back to the low levels seen over the past several years as evidence that there is little upward pressure from resource utilization and that inflation is likely to continue trending below 2 percent. These observations may lead these policymakers to conclude that there is little reason to be confident that inflation will return to 2 percent in the medium term if the Committee raises interest rates in the near future. Moreover, these policymakers might argue that a chronic failure to get inflation moving up risks eroding the credibility of the

FOMC's commitment to achieving 2 percent inflation and to treating deviations from this objective on a symmetric basis.

Most respondents in the Desk's latest surveys expect the Committee to continue to emphasize the gradual nature of its normalization approach and to convey a bias toward raising rates later this year. Respondents also did not report an expectation that the March statement would emphasize downside risks to the economic outlook to the extent suggested by Alternative A. Therefore, the issuance of a postmeeting statement like Alternative A would likely surprise financial market participants. Investors would likely push further into the future the expected date of the next rate increase, the expected path for the federal fund rate would likely flatten further, and longer-term yields would decline. If the statement is primarily seen as more accommodative, equity prices and inflation compensation might rise, and the dollar would depreciate. But if investors interpret the statement as reflecting an unexpectedly downbeat assessment of global economic conditions and greater-than-anticipated concerns over the downside risks to the outlook, equity prices and inflation compensation could fall.

## THE CASE FOR ALTERNATIVE C

With the unemployment rate, now at 4.9 percent, equal to the median of participants' estimates of its longer-run value in the December SEP, some policymakers might conclude that the economy is at or close to maximum sustainable employment. They might also assess that incoming indicators of real activity and the labor market continue to display sufficient strength, despite the recent bout of financial turbulence, to continue to foster improvement in the labor market and promote the expected progress to the Committee's inflation objective over the medium term. In particular, they may see claims that the risks to the economic outlook are significantly skewed to the downside as unjustified and instead view the risks as balanced. These policymakers may judge that conditions remain favorable for solid consumption growth and further improvement in the housing sector even with a modest further increase in the target range because household balance sheets have improved, gains in disposable income have been healthy, gasoline prices are low, consumer confidence is high, and job prospects are good.

Regarding the Committee's inflation objective, policymakers may note that various measures of the trend in inflation have moved closer to 2 percent, with the 12-month change in core PCE inflation and the Dallas Fed's trimmed mean PCE inflation edging up to 1.7 percent and 1.9 percent, respectively, in January. Moreover, participants

may have only limited concerns about low readings on longer-term inflation compensation because they judge that these indicators are depressed by movements in liquidity and risk premiums that are unrelated to longer-run inflation outcomes. Similarly, they may attribute the softening in the median Michigan Survey respondent's expectation of average inflation over the coming 5 or 10 years to the transitory influences of earlier declines in gasoline prices rather than to a reduction in expected inflation over the longer run. Therefore, policymakers may have confidence that headline inflation will be close to the 2 percent objective once the transitory effects of earlier declines in energy and import prices fade, and that the projected further tightening of the labor market will suffice to return headline inflation to the Committee's longer-run objective.

These policymakers might further argue that leaving rates unchanged in the face of rapid job growth and a closed unemployment rate gap would likely foster expectations of a prolonged, unconditionally shallow path for the federal funds rate, creating incipient excess demand. Leaving the stance of monetary policy unchanged thus runs the risk that inflation will persistently overshoot 2 percent, eliciting an upward drift in inflation expectations, possibly along the lines of the alternative scenario "Faster Growth with Higher Inflation" in the "Risks and Uncertainty" section of Tealbook A. In addition, such an expected path could induce further "reach for yield" or excessive risk-taking behavior in financial markets. Some policymakers might also be concerned that the public might misinterpret a statement like Alternative B as an indication that the FOMC is placing excessive weight on the downside economic risks that might accompany market volatility and reduced asset valuations, and too little weight on a solid central outlook for the economy, labor markets, and inflation.

For all of the above reasons, these policymakers may judge that it is appropriate to announce a 25 basis point increase in the target range for the federal funds rate to  $\frac{1}{2}$  to  $\frac{3}{4}$  percent, as in Alternative C. Policymakers may note that, even with this increase, the real federal funds rate would still lie well below the Tealbook-consistent estimate of the equilibrium real federal funds rate reported in the "Monetary Policy Strategies" section of Tealbook B. An increase in the target range would also be consistent with the level of the federal funds rate prescribed by the optimal control policy reported there.

According to the Desk's latest surveys, the average perceived probability of a tightening at this meeting is about 5 percent, and so a decision to increase the target range would be very surprising. If market participants infer that, all else equal, the Committee intends to pursue a much less accommodative stance of policy going forward than they

had expected, then medium- and longer-term real interest rates would rise, equity prices and inflation compensation would likely decline, and the dollar would appreciate. However, if investors see a statement like Alternative C as reflecting an upbeat assessment for the strength of the U.S. expansion, then equity prices and inflation compensation might fall less than otherwise, or even rise.

## IMPLEMENTATION NOTE

If the Committee decides to maintain the current target range for the federal funds rate, as in Alternative A or Alternative B, an implementation note that indicates no change in the Federal Reserve’s administered rates—the interest rates on required and excess reserves, the offering rate on overnight reverse repurchase agreements, and the discount rate—would be issued. If the Committee instead decides to raise the target range for the federal funds rate, as in Alternative C, an implementation note that communicates the changes the Federal Reserve decided to make to these three policy tools would be issued.

Regardless of which policy alternative the Committee adopts, the Committee may decide to authorize the Desk to conduct term reverse repurchase agreement operations (RRP) over the March quarter-end.<sup>1</sup> If the Committee authorizes term RRP, the directive would include a sentence to that effect.

On the following pages, struck-out text indicates language deleted from the January directive and implementation note; bold red underlined text indicates added language; blue underlined text indicates text that links to websites.

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<sup>1</sup> See the memo titled “Term RRP over the March 2016 Quarter-End” by Josh Frost, Deborah Leonard, and Suraj Prasanna that was distributed to the Committee on March 9, 2016.

## Implementation Note for March 2016 Alternative A and Alternative B

Release Date: ~~January 27~~ **March 16**, 2016

### Decisions Regarding Monetary Policy Implementation

The Federal Reserve has made the following decisions to implement the monetary policy stance announced by the Federal Open Market Committee in its [statement](#) on ~~January 27~~ **March 16**, 2016:

- The Board of Governors of the Federal Reserve System left unchanged the interest rate paid on required and excess reserve balances at 0.50 percent.
- As part of its policy decision, the Federal Open Market Committee voted to authorize and direct the Open Market Desk at the Federal Reserve Bank of New York, until instructed otherwise, to execute transactions in the System Open Market Account in accordance with the following domestic policy directive:

"Effective ~~January 28~~ **March 17**, 2016, the Federal Open Market Committee directs the Desk to undertake open market operations as necessary to maintain the federal funds rate in a target range of 1/4 to 1/2 percent, including overnight reverse repurchase operations (and reverse repurchase operations with maturities of more than one day when necessary to accommodate weekend, holiday, or similar trading conventions) at an offering rate of 0.25 percent, in amounts limited only by the value of Treasury securities held outright in the System Open Market Account that are available for such operations and by a per-counterparty limit of \$30 billion per day. **[ In addition, the Committee directs the Desk to undertake term reverse repurchase operations involving Treasury securities during the period of March 28 to March 31, 2016, to mature no later than April 4, 2016, subject to a maximum bid rate of 0.26 percent and an overall size limit of \$250 billion outstanding at any one time. ]**

The Committee directs the Desk to continue rolling over maturing Treasury securities at auction and to continue reinvesting principal payments on all agency debt and agency mortgage-backed securities in agency mortgage-backed securities. The Committee also directs the Desk to engage in dollar roll and coupon swap transactions as necessary to facilitate settlement of the Federal Reserve's agency mortgage-backed securities transactions."

More information regarding open market operations may be found on the Federal Reserve Bank of New York's [website](#).

- The Board of Governors of the Federal Reserve System took no action to change the discount rate (the primary credit rate), which remains at 1.00 percent.

This information will be updated as appropriate to reflect decisions of the Federal Open Market Committee or the Board of Governors regarding details of the Federal Reserve's operational tools and approach used to implement monetary policy.



## Implementation Note for March 2016 Alternative C

Release Date: ~~January 27~~ **March 16**, 2016

### Decisions Regarding Monetary Policy Implementation

The Federal Reserve has made the following decisions to implement the monetary policy stance announced by the Federal Open Market Committee in its [statement](#) on ~~January 27~~ **March 16**, 2016:

- The Board of Governors of the Federal Reserve System ~~left unchanged the interest rate paid on required and excess reserve balances at 0.50 percent~~ **voted [ unanimously ] to raise the interest rate paid on required and excess reserve balances to 0.75 percent, effective March 17, 2016.**
- As part of its policy decision, the Federal Open Market Committee voted to authorize and direct the Open Market Desk at the Federal Reserve Bank of New York, until instructed otherwise, to execute transactions in the System Open Market Account in accordance with the following domestic policy directive:

"Effective ~~January 28~~ **March 17**, 2016, the Federal Open Market Committee directs the Desk to undertake open market operations as necessary to maintain the federal funds rate in a target range of ~~1/4 to 1/2~~ **to 3/4** percent, including overnight reverse repurchase operations (and reverse repurchase operations with maturities of more than one day when necessary to accommodate weekend, holiday, or similar trading conventions) at an offering rate of ~~0.25~~ **0.50** percent, in amounts limited only by the value of Treasury securities held outright in the System Open Market Account that are available for such operations and by a per-counterparty limit of \$30 billion per day. **[ In addition, the Committee directs the Desk to undertake term reverse repurchase operations involving Treasury securities during the period of March 28 to March 31, 2016, to mature no later than April 4, 2016, subject to a maximum bid rate of 0.51 percent and an overall size limit of \$250 billion outstanding at any one time. ]**

The Committee directs the Desk to continue rolling over maturing Treasury securities at auction and to continue reinvesting principal payments on all agency debt and agency mortgage-backed securities in agency mortgage-backed securities. The Committee also directs the Desk to engage in dollar roll and coupon swap transactions as necessary to facilitate settlement of the Federal Reserve's agency mortgage-backed securities transactions."

More information regarding open market operations may be found on the Federal Reserve Bank of New York's [website](#).

- **In a related action**, the Board of Governors of the Federal Reserve System ~~took no action to change the discount rate (the primary credit rate), which remains at 1.00~~ **voted [ unanimously ] to approve a 1/4 percentage point increase in the discount rate (the primary credit rate) to 1.25 percent, effective March 17, 2016. In taking this action, the Board approved requests submitted by the Boards of Directors of the Federal Reserve Banks of ...**

This information will be updated as appropriate to reflect decisions of the Federal Open Market Committee or the Board of Governors regarding details of the Federal Reserve's operational tools and approach used to implement monetary policy.

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# Projections

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## BALANCE SHEET AND INCOME

The staff has prepared projections of the Federal Reserve's balance sheet and key elements of the associated income statement under two scenarios for the path of monetary policy. The first set of projections (labeled "March Tealbook baseline" in the accompanying exhibits) reflects the policy assumptions incorporated in the staff's baseline forecast presented in Tealbook A. The second set (labeled "Lower federal funds rate") incorporates the lower path for the federal funds rate assumed in the DEDO box in Tealbook A "An Alternative Path for the Federal Funds Rate" as well as a delayed cessation of reinvestments relative to the staff's baseline forecast.<sup>1</sup>

The paths of interest rates and macroeconomic variables as well as the date of cessation of reinvestments differ across the two scenarios. In the March Tealbook baseline scenario, the federal funds rate follows the inertial Taylor (1999) rule and rises roughly 1 percentage point per year until the end of 2018. In the lower federal funds rate scenario, the policy rate remains on hold through the end of 2016 and thereafter follows the prescriptions of the inertial Taylor rule. The baseline scenario also assumes that reinvestments of maturing Treasury securities and agency debt as well as principal received on agency MBS will cease at the end of 2016, when the federal funds rate is projected to be at about 1½ percent. Under the lower federal funds rate scenario, reinvestments are also assumed to cease when the policy rate reaches 1½ percent, but this occurs in the third quarter of 2017, three quarters later than in the baseline projection.

In both scenarios, we assume that, once reinvestments cease, the SOMA portfolio shrinks through full redemptions of maturing Treasury and agency debt securities as well as paydowns of principal from agency MBS. Regarding the Federal Reserve's use of its policy normalization tools, we also assume in both scenarios that the level of overnight reverse repurchase agreements (ON RRP) runs at \$100 billion through the end of 2018

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<sup>1</sup> The DEDO box assumes no change in the date of cessation of reinvestments from the staff's baseline forecast.

before declining to zero by the end of 2019, and that term deposits and term RRP are not used.<sup>2</sup> Below, we highlight some key features of the two scenarios.

- Balance sheet.** Under the baseline scenario, the size of the portfolio is normalized in the third quarter of 2021, one quarter earlier than projected in the January Tealbook, reflecting a lower path of the 10-year Treasury yield and a faster pace of agency MBS prepayments than in our previous forecast (see the solid black lines in the exhibit “Total Assets and Selected Balance Sheet Items” and the table that follows).<sup>3</sup> At that time, total assets are projected to stand at \$2.35 trillion, with about \$2.2 trillion in total SOMA securities holdings. Total assets and SOMA Treasury holdings increase thereafter, keeping pace with the growth in both Federal Reserve notes in circulation and Federal Reserve Bank capital.

Under the lower federal funds rate scenario, the normalization of the size of the portfolio occurs in the first quarter of 2022, nearly two quarters later than in the baseline scenario, primarily reflecting the longer reinvestment period, a development that results in about \$340 billion of additional reinvestments (see the dotted red lines in the exhibit and the second table).

- Federal Reserve earnings remittances.** After record remittances to the Treasury in 2015 that included payments of nearly \$100 billion in net income, remittances under the baseline scenario are projected to decline to about \$65 billion this year

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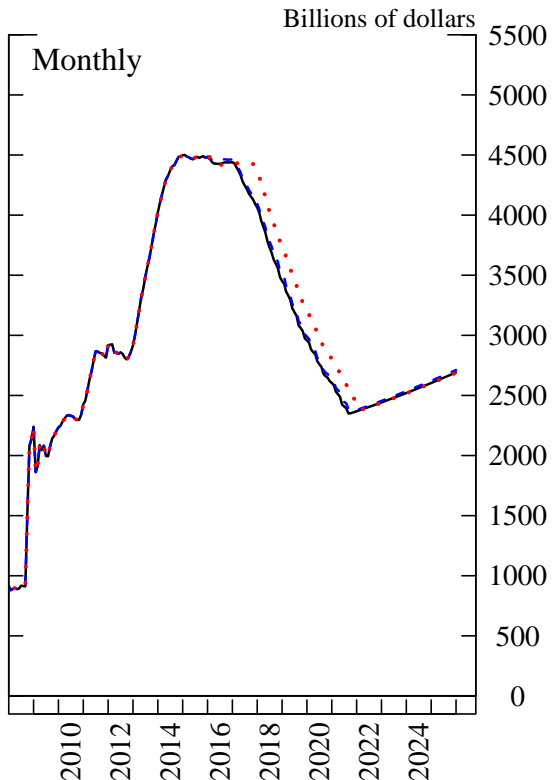
<sup>2</sup> Use of term RRP or term deposits would result in a shift in the composition of Federal Reserve liabilities—a decline in reserve balances and an equal increase in term RRP or term deposits—but would not produce a change in the overall size of the balance sheet. We also assume that RRP associated with foreign official and international accounts remain near their January 29, 2016, level of \$235 billion throughout the projection period.

<sup>3</sup> The size of the balance sheet is assumed to be normalized when the securities portfolio reverts to the level consistent with its longer-run trend, which is determined largely by currency in circulation and a projected steady-state level of reserve balances. The projected timing of the normalization of the size of the balance sheet depends importantly on the level of reserve balances deemed necessary to conduct monetary policy; currently, we assume that level of reserve balances to be \$100 billion. However, ongoing regulatory and structural changes could result in a higher underlying demand for reserve balances. In turn, a higher steady-state level for reserve balances would, all else equal, imply an earlier normalization of the size of the balance sheet. For instance, with a \$500 billion steady-state level of reserve balances, the balance sheet would likely normalize at the end of 2020. Alternatively, a lower assumed steady-state level of reserve balances, such as \$10 billion, would induce a delay in the projected normalization of the balance sheet until the first quarter of 2022.

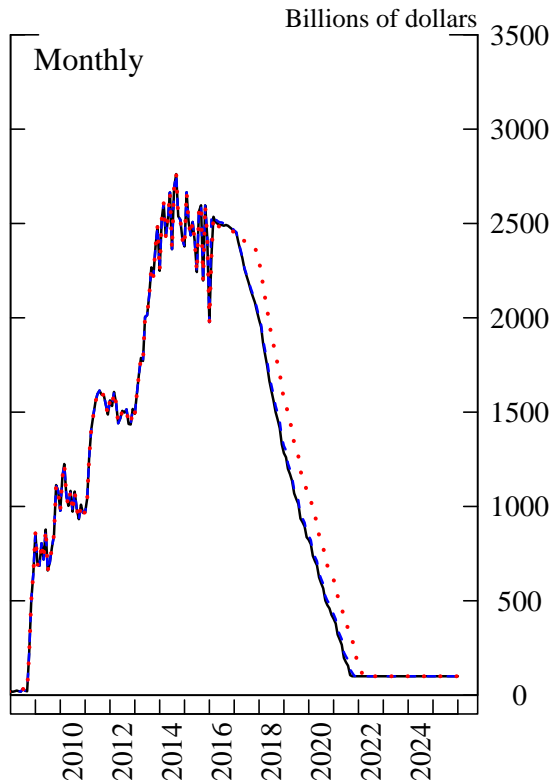
### Total Assets and Selected Balance Sheet Items

— March Tealbook baseline    ···· Lower federal funds rate  
- - - January Tealbook

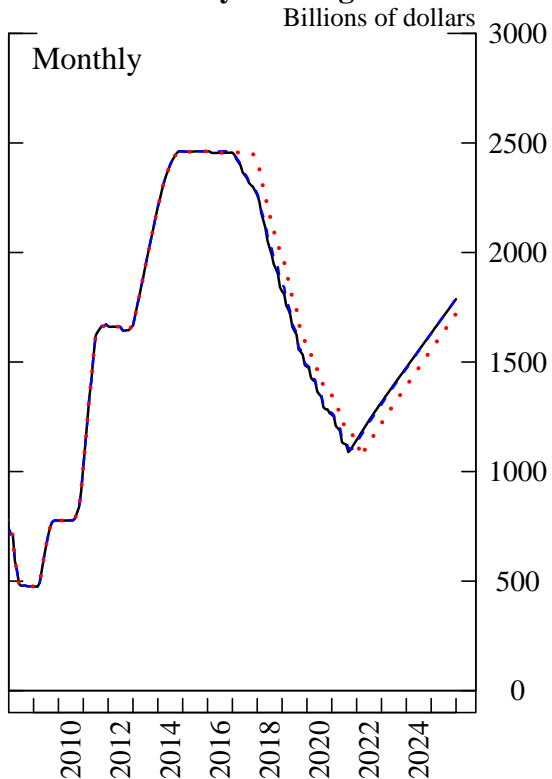
#### Total Assets



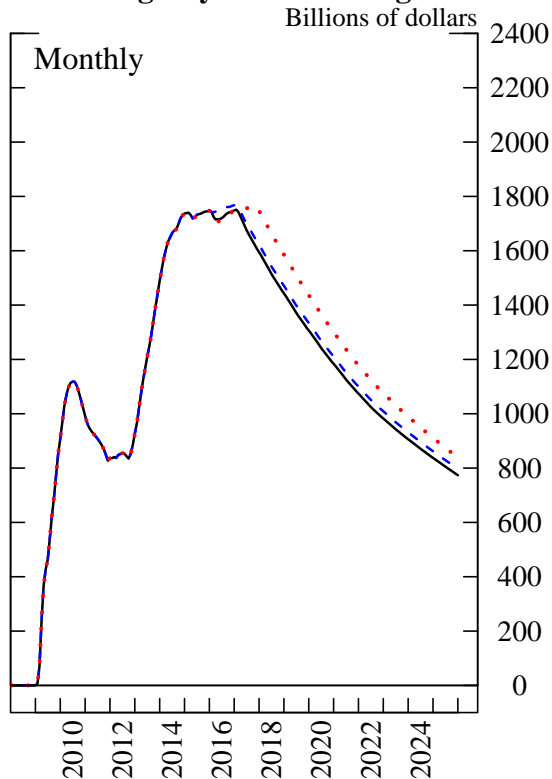
#### Reserve Balances



#### SOMA Treasury Holdings



#### SOMA Agency MBS Holdings



Projections

**Federal Reserve Balance Sheet**  
**End-of-Year Projections - March Tealbook baseline**  
 (Billions of dollars)

	Jan 31, 2016	2017	2019	2021	2023	2025
Total assets	4,483	4,063	2,957	2,368	2,520	2,691
Selected assets						
Loans and other credit extensions*	2	0	0	0	0	0
Securities held outright	4,237	3,862	2,787	2,220	2,383	2,563
U.S. Treasury securities	2,461	2,263	1,479	1,144	1,475	1,787
Agency debt securities	31	4	2	2	2	2
Agency mortgage-backed securities	1,744	1,595	1,307	1,074	906	774
Unamortized premiums	188	151	118	94	81	72
Unamortized discounts	-16	-14	-11	-8	-7	-6
Total other assets	54	55	55	55	55	55
Total liabilities	4,444	4,021	2,912	2,319	2,466	2,632
Selected liabilities						
Federal Reserve notes in circulation	1,367	1,536	1,694	1,824	1,971	2,137
Reverse repurchase agreements	350	335	235	235	235	235
Deposits with Federal Reserve Banks	2,720	2,145	978	255	255	255
Reserve balances held by depository institutions	2,329	1,990	823	100	100	100
U.S. Treasury, General Account	370	150	150	150	150	150
Other deposits	20	5	5	5	5	5
Earnings remittances due to the U.S. Treasury	2	0	0	0	0	0
Total capital**	40	42	45	49	54	59

Projections

Source: Federal Reserve H.4.1 statistical releases and staff calculations.

Note: Components may not sum to totals due to rounding.

\*Loans and other credit extensions includes primary, secondary, and seasonal credit; central bank liquidity swaps; and net portfolio holdings of Maiden Lane LLC.

\*\*Total capital includes capital paid-in and capital surplus accounts.

**Federal Reserve Balance Sheet**  
**End-of-Year Projections - Lower federal funds rate**  
(Billions of dollars)

	Jan 31, 2016	2017	2019	2021	2023	2025
<b>Total assets</b>	4,483	4,365	3,197	2,444	2,517	2,688
<b>Selected assets</b>						
Loans and other credit extensions*	2	0	0	0	0	0
Securities held outright	4,237	4,164	3,027	2,296	2,382	2,561
U.S. Treasury securities	2,461	2,413	1,589	1,115	1,390	1,720
Agency debt securities	31	4	2	2	2	2
Agency mortgage-backed securities	1,744	1,747	1,436	1,179	989	839
Unamortized premiums	188	153	119	95	81	71
Unamortized discounts	-16	-15	-12	-9	-8	-7
Total other assets	54	55	55	55	55	55
<b>Total liabilities</b>	4,444	4,323	3,152	2,395	2,463	2,629
<b>Selected liabilities</b>						
Federal Reserve notes in circulation	1,367	1,536	1,693	1,821	1,968	2,134
Reverse repurchase agreements	350	335	235	235	235	235
Deposits with Federal Reserve Banks	2,720	2,447	1,219	334	255	255
Reserve balances held by depository institutions	2,329	2,292	1,064	179	100	100
U.S. Treasury, General Account	370	150	150	150	150	150
Other deposits	20	5	5	5	5	5
Earnings remittances due to the U.S. Treasury	2	0	0	0	0	0
<b>Total capital**</b>	40	42	45	49	54	59

Source: Federal Reserve H.4.1 statistical releases and staff calculations.

Note: Components may not sum to totals due to rounding.

\*Loans and other credit extensions includes primary, secondary, and seasonal credit; central bank liquidity swaps; and net portfolio holdings of Maiden Lane LLC.

\*\*Total capital includes capital paid-in and capital surplus accounts.



(see the solid black lines in the “Income Projections” exhibit).<sup>4</sup> The large step-down in 2016 primarily reflects lower interest income from MBS holdings. Annual remittances continue to decline in subsequent years, reaching a low of roughly \$32 billion in 2019, with no deferred asset being recorded.<sup>5</sup> Under this scenario, the Federal Reserve’s cumulative remittances from 2009 through 2025 total about \$1.1 trillion.

Under the lower federal funds rate scenario, cumulative remittances are projected to be about \$20 billion higher than in the baseline projection, primarily reflecting lower interest expense through 2018 (see the dotted red lines). In particular, because during the earlier portion of the projection the path for the federal funds rate as well as those for the rates paid on reserve balances and ON RRP lie below those that prevail in the baseline scenario, interest expense rises less in the lower-rate scenario.

- ***Unrealized gains or losses.*** The staff estimates that the SOMA portfolio was in a net unrealized gain position of about \$215 billion at the end of February.<sup>6</sup> Going forward, the net unrealized gain or loss position of the portfolio will depend importantly on the path of longer-term interest rates. Under the baseline scenario, because of the assumed rise in longer-term interest rates over the next several years, the portfolio is projected to shift to a position of unrealized loss within the next two quarters, and to record a peak unrealized loss of about \$240 billion in mid-2019, about \$10 billion lower than the peak loss estimated in the January Tealbook. At that time, of the \$240 billion loss, almost \$100 billion is attributable to losses on holdings of Treasury securities and \$140 billion to losses on holdings of agency MBS. After peaking, the unrealized loss position then contracts through 2025, as the value of securities previously acquired under the large-scale asset purchase programs returns to par as these securities approach

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<sup>4</sup> We assume that the interest rate paid on excess reserve balances will average about 15 basis points above the effective federal funds rate and the ON RRP rate will average about 10 basis points below the effective federal funds rate.

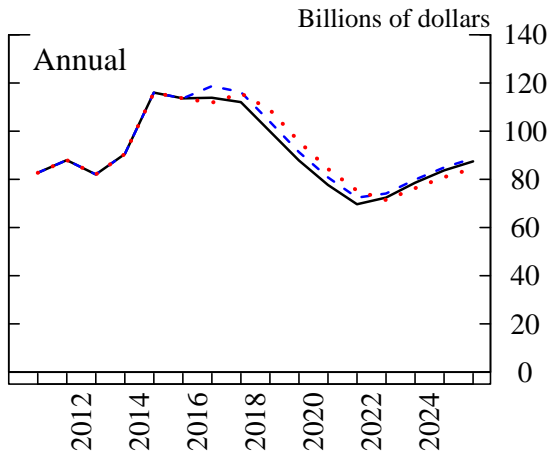
<sup>5</sup> In the event that a Federal Reserve Bank’s earnings fall short of the amount necessary to cover its operating costs and pay dividends, a deferred asset for interest on Federal Reserve notes would be recorded.

<sup>6</sup> The Federal Reserve reports the level and the change in the quarter-end net unrealized gain/loss position of the SOMA portfolio to the public in the “Federal Reserve Banks Combined Quarterly Financial Reports,” available on the Board’s website at [http://www.federalreserve.gov/monetarypolicy/bst\\_fedfinancials.htm#quarterly](http://www.federalreserve.gov/monetarypolicy/bst_fedfinancials.htm#quarterly).

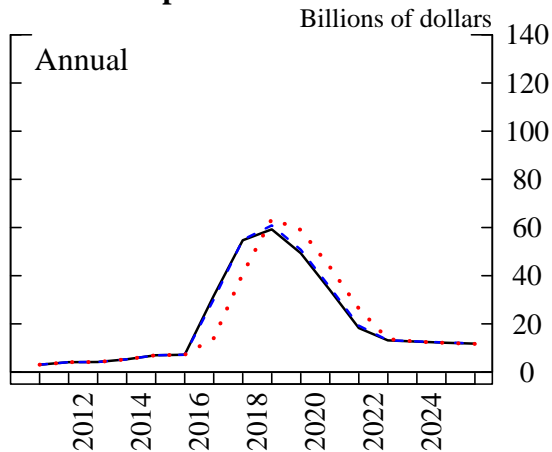
### Income Projections

— March Tealbook baseline    ···· Lower federal funds rate  
 - - - January Tealbook

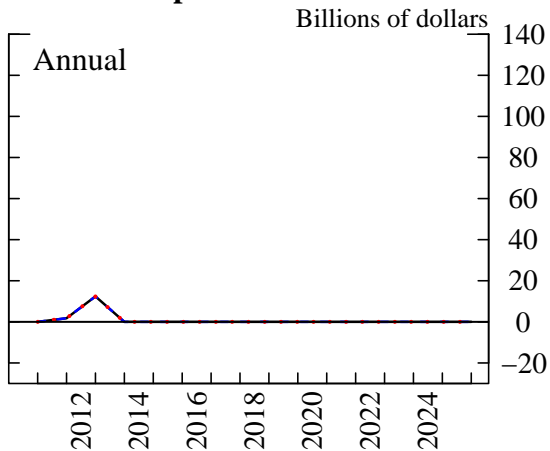
**Interest Income**



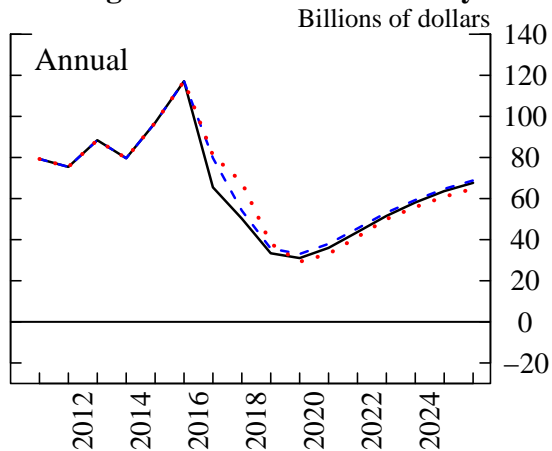
**Interest Expense**



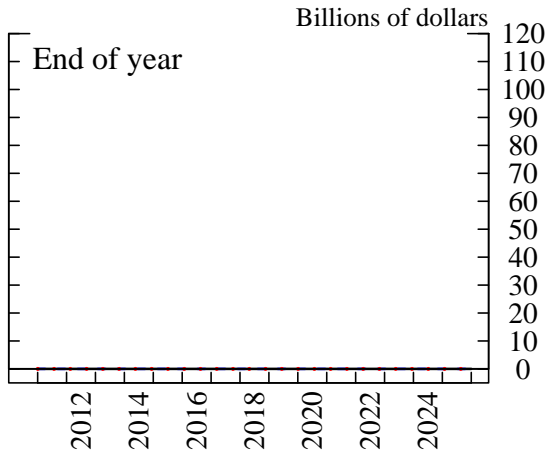
**Realized Capital Gains**



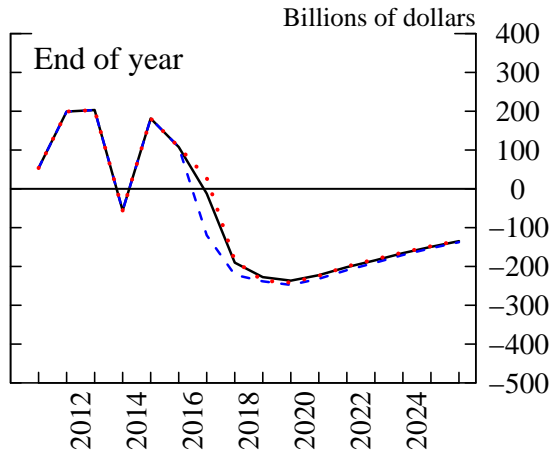
**Earnings Remittances to Treasury**



**Deferred Asset**



**Memo: Unrealized Gains/Losses**



Projections

maturity, and new securities are added to the portfolio at prevailing market yields. Under the lower federal funds rate scenario, the projected unrealized gain or loss position of the SOMA portfolio does not materially differ from the corresponding baseline projection, largely reflecting similar paths for longer-term interest rates in the two scenarios.

- **Term premium effects.** As shown in the table “Projections for the 10-Year Treasury Term Premium Effect,” under the baseline scenario, the Federal Reserve’s elevated stock of longer-term securities is estimated to hold down the term premium embedded in the 10-year Treasury yield by 107 basis points in the current quarter. Over the next couple of years, the estimated term premium effect diminishes at a pace of about 4 basis points per quarter, reflecting in part the gradual projected shrinking of the portfolio. The projection for the term premium effect is slightly less negative than in the January Tealbook, reflecting the lower path of the 10-year Treasury rate and the resulting faster MBS prepayments. Under the lower federal funds rate scenario, the estimated term premium effect is just a few basis points more negative than in the baseline projection, a result of the later end to reinvestments.<sup>7</sup>
- **SOMA Characteristics.** Regarding the size of the portfolio, under the baseline scenario, approximately \$220 billion in SOMA Treasury holdings will mature this year, and a total of \$1.4 trillion will mature between 2016 and 2020 (see the upper panel of the exhibit “Projections for the Characteristics of SOMA Holdings”).<sup>8</sup> The amounts of Treasury securities maturing each month vary considerably, while projected MBS paydowns are much less variable. However, realized MBS

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<sup>7</sup> Because the DEDO box assumes a date for the cessation of reinvestments that is consistent with the staff’s baseline forecast, its simulations for longer-term interest rates do not incorporate the term premium effects projected here under the lower federal funds rate scenario that stem from the extension of the reinvestment period. This small additional widening of the term premium arising from the later end of reinvestments would not have a material impact on the macroeconomic effects reported in the DEDO box.

<sup>8</sup> While following its current reinvestment policy, the Desk replaces maturing Treasury security holdings with newly issued debt at Treasury auctions. Consistent with longstanding practice, these rollovers are carried out at Treasury auctions by placing bids for the SOMA in a par amount equal to the value of holdings maturing on the issue date of a newly issued security. Moreover, across the various maturities, these bids are placed proportionately to the issue amounts of the new securities. The Desk’s bids at Treasury auctions are placed as noncompetitive tenders and are treated as add-ons to announced auction sizes.

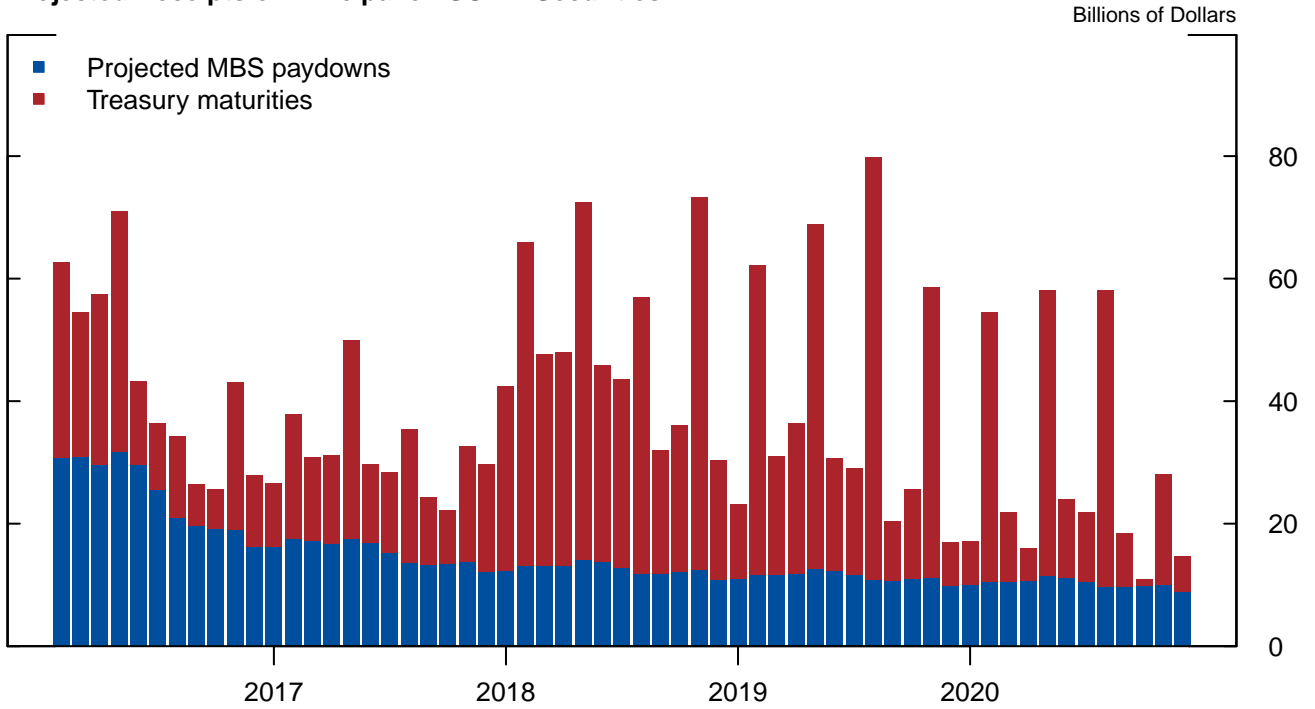
**Projections for the 10-Year Treasury Term Premium Effect**  
(Basis Points)

Date	March Tealbook baseline	Lower federal funds rate	January Tealbook
Quarterly Averages			
2016:Q1	-107	-113	-111
Q2	-103	-109	-106
Q3	-98	-105	-102
Q4	-94	-101	-97
2017:Q4	-77	-84	-81
2018:Q4	-64	-70	-67
2019:Q4	-54	-57	-56
2020:Q4	-45	-48	-47
2021:Q4	-38	-39	-39
2022:Q4	-32	-33	-33
2023:Q4	-26	-27	-27
2024:Q4	-20	-21	-21
2025:Q4	-15	-15	-15

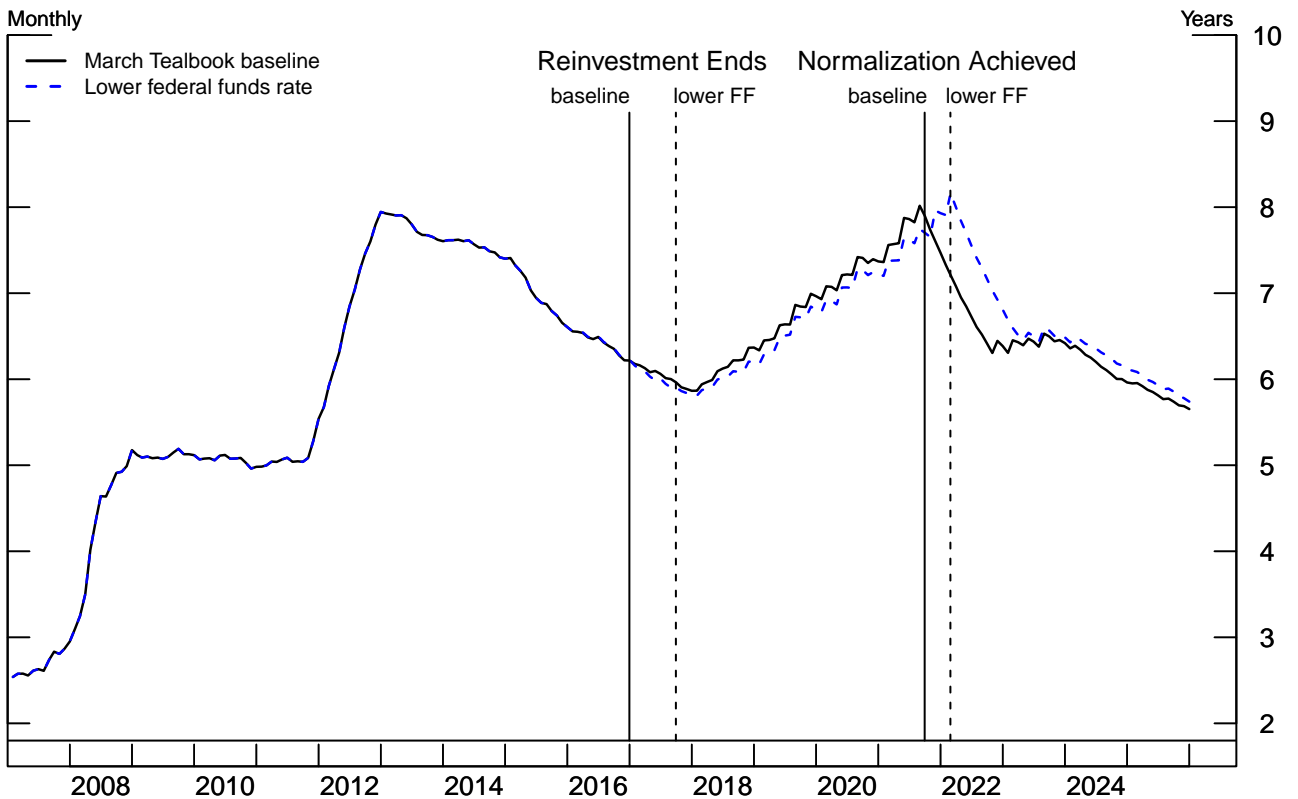
Projections

### Projections for the Characteristics of SOMA Holdings

#### Projected Receipts of Principal on SOMA Securities



#### SOMA Weighted-Average Treasury Duration



Projections

paydowns will reflect the evolution over time of interest rates and other factors and could thus be significantly more volatile than projected.<sup>9</sup>

The weighted-average duration of the SOMA Treasury portfolio is currently about 6½ years (see the lower panel of the exhibit). Under the baseline scenario, it is projected to be about three months shorter at the end of this year.<sup>10</sup> Duration is projected to decline through 2017, reflecting the end of reinvestments as well as the aging of the portfolio, and subsequently to rise through 2021, when the size of the balance sheet is normalized.<sup>11</sup> Under the lower federal funds rate scenario, duration peaks at about the same level as in the baseline scenario, but nearly two quarters later, reflecting the delayed normalization of the size of the balance sheet. After reaching its peak when the size of the balance sheet is normalized, duration is projected to resume its decline in both scenarios as the Desk starts purchasing Treasury securities to keep pace with currency growth. In particular, the duration contour in this latter portion of the projection is based on the key assumption that the Federal Reserve will buy only Treasury bills until those holdings are equal to approximately 30 percent of the Treasury portfolio, similar to the pre-crisis composition of the portfolio (currently there are no Treasury bill holdings). Thereafter, purchases of Treasury securities are assumed to be spread across the maturity spectrum.<sup>12</sup>

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<sup>9</sup> Since the January Tealbook, the Board's balance sheet and income projections use a staff MBS prepayment model. This model was previously employed earlier in the context of the "Confidence Interval Projections of the Balance Sheet" boxes in the September and December Tealbooks.

<sup>10</sup> The July 2015 Tealbook B box "History and Projections for the Characteristics of SOMA Treasury Holdings" provides more information on the duration of the SOMA Treasury portfolio.

<sup>11</sup> The duration of the SOMA Treasury portfolio initially declines once reinvestments cease, as Treasury securities in the portfolio approach maturity. Once the pace of roll-offs accelerates starting in 2018 and longer tenor securities account for a larger share in the portfolio, duration increases until the balance sheet is normalized.

<sup>12</sup> We assume zero purchases of agency MBS after reinvestments cease.

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## Abbreviations

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ABS	asset-backed securities
BEA	Bureau of Economic Analysis, Department of Commerce
BHC	bank holding company
CDS	credit default swaps
CFTC	Commodity Futures Trading Commission
C&I	commercial and industrial
CLO	collateralized loan obligation
CMBS	commercial mortgage-backed securities
CPI	consumer price index
CRE	commercial real estate
Desk	Open Market Desk
DSGE	dynamic stochastic general equilibrium
ECB	European Central Bank
EDO	Estimated, dynamic, optimization-based model
ELB	effective lower bound
EME	emerging market economy
FDIC	Federal Deposit Insurance Corporation
FOMC	Federal Open Market Committee; also, the Committee
GCF	general collateral finance
GDI	gross domestic income
GDP	gross domestic product
GSIBs	globally systemically important banking organizations
HQLA	high-quality liquid assets
ISM	Institute for Supply Management
LIBOR	London interbank offered rate
MBS	mortgage-backed securities
MMFs	money market funds



NBER	National Bureau of Economic Research
NI	nominal income
NIPA	national income and product accounts
OIS	overnight index swap
ON RRP	overnight reverse repurchase agreement
PCE	personal consumption expenditures
repo	repurchase agreement
RMBS	residential mortgage-backed securities
RRP	reverse repurchase agreement
SCOOS	Senior Credit Officer Opinion Survey on Dealer Financing Terms
SEP	Summary of Economic Projections
SFA	Supplemental Financing Account
SLOOS	Senior Loan Officer Opinion Survey on Bank Lending Practices
SOMA	System Open Market Account
TBA	to be announced (for example, TBA market)
TGA	U.S. Treasury's General Account
TIPS	Treasury inflation-protected securities
TPE	Term premium effects