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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

September 15, 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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This section considers a selection of monetary policy strategies for setting the federal funds rate and compares the associated policy paths and macroeconomic outcomes to those in the Tealbook baseline forecast. The strategies fall into one of two categories. Under simple policy rules, policymakers set the federal funds rate according to a reaction function that includes a small number of macroeconomic factors. Under optimal control policies, policymakers compute a path for the federal funds rate that minimizes a loss function meant to capture policymakers' preferences over macroeconomic outcomes. Both approaches recognize the Federal Reserve's dual mandate. Unless otherwise noted, the simulations assume that policymakers will adhere to the policy strategy in the future and that financial market participants, price setters, and wage setters not only believe that policymakers will follow through with their strategy but also fully understand the macroeconomic implications. Such policy strategies are described as commitment strategies.

The two approaches have different merits and limitations. The parsimony of simple rules makes them relatively easy to communicate to the public, and because they respond only to variables that are central to a range of models, proponents argue that they may be more robust to uncertainty about the structure of the economy. However, simple rules omit, by construction, other potential influences on policy decisions; thus, strict adherence to such rules may, at times, lead to unsatisfactory outcomes. By comparison, optimal control policies respond to a broader set of economic factors; their prescriptions optimally balance various policy objectives. And although this section focuses on policies under commitment, optimal control policies can more generally be derived under various assumptions about the degree to which policymakers can commit. That said, optimal control policies assume substantial knowledge on the part of policymakers and are sensitive to the assumed loss function and the specifics of the particular model.

Given the different strengths and weaknesses of the two approaches, they are probably best considered together, possibly along with others, as a means to assess the various tradeoffs policymakers may face when pursuing their mandated objectives.

As was the case in the July Tealbook, most of the policy strategies considered herein, though not all, prescribe a more rapid increase in the federal funds rate than assumed in the staff forecast. Relative to the July Tealbook, the simple rules and optimal

control exercises generally call for a slightly less accommodative stance of monetary policy, reflecting a bit more positive output gap in the staff's projection.

### **NEAR-TERM PRESCRIPTIONS OF SELECTED SIMPLE POLICY RULES**

The top panel of the first exhibit 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 the output gap and inflation in the near term, shown in the middle panels. The top and middle panels also include the staff's baseline projection for the federal funds rate.

- The Taylor-type rules call for federal funds rates above those in the Tealbook baseline at the end of 2016.
- The Taylor (1993) and Taylor (1999) rules, which feature no interest rate smoothing term, prescribe substantially higher federal funds rates in the near term than the inertial Taylor (1999) or the first-difference rules.
- All three Taylor-type rules call for slightly higher policy rates than they did in the July Tealbook (after adjusting previous-Tealbook values to account for the staff's new estimate of the real federal funds rate in the long run) because the staff now projects a modestly higher path for the output gap.<sup>2</sup> The prescriptions of the first-difference rule, which depend on expected changes in the output gap and inflation, are essentially unchanged.

### **A MEDIUM-TERM EQUILIBRIUM REAL FEDERAL FUNDS RATE**

The bottom panel of the 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  $r^*$  corresponds to the level of the real

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<sup>1</sup> The appendix to this section provides details on each of these four simple rules.

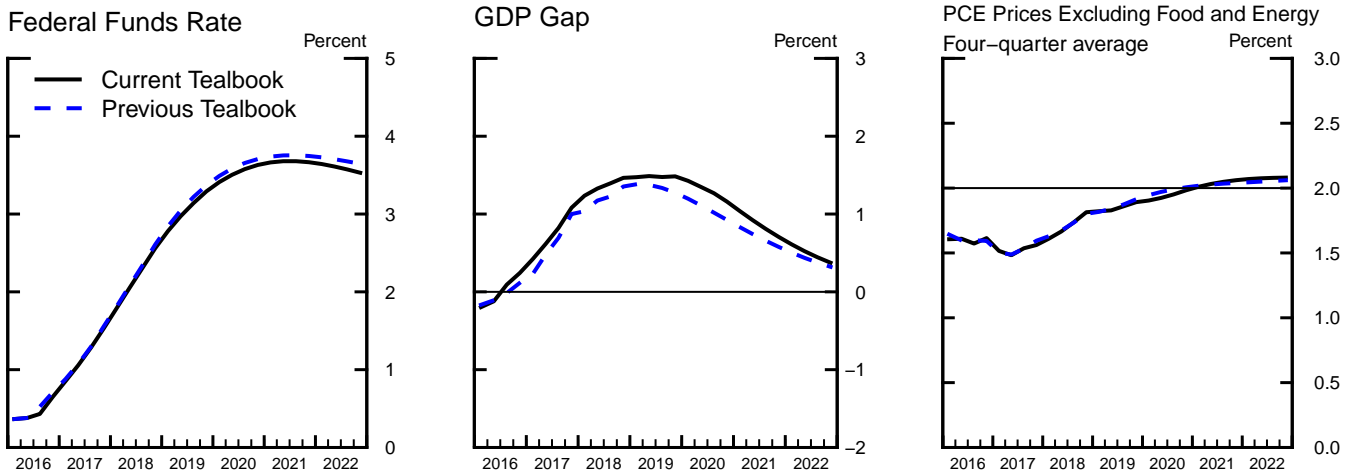
<sup>2</sup> Staff has lowered its estimate of the long-run equilibrium value of the real federal funds rate  $\frac{1}{4}$  percentage point in this Tealbook; see Cristina Fuentes-Albero and Ashley Wang (2016), "Adjustments to some Long-Term Parameters of the Staff Judgmental Forecast," memorandum to the Federal Open Market Committee, Board of Governors of the Federal Reserve System, Division of Research and Statistics, September 9.

### Policy Rules and the Staff Projection

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

	(Percent)	
	<u>2016:Q4</u>	<u>2017:Q1</u>
Taylor (1993) rule	<b>2.33</b>	<b>2.25</b>
<i>Previous Tealbook (intercept-adjusted)</i>	2.21	2.14
Taylor (1999) rule	<b>2.44</b>	<b>2.46</b>
<i>Previous Tealbook (intercept-adjusted)</i>	2.27	2.25
Inertial Taylor (1999) rule	<b>0.73</b>	<b>0.99</b>
<i>Previous Tealbook (intercept-adjusted)</i>	0.70	0.94
First-difference rule	<b>0.56</b>	<b>0.75</b>
<i>Previous Tealbook</i>	0.55	0.78
<i>Addendum:</i>		
Tealbook baseline	<b>0.64</b>	<b>0.84</b>

#### Key Elements of the Staff Projection



#### A Medium-Term Equilibrium Real Federal Funds Rate<sup>2</sup>

	(Percent)	
	<i>Current Tealbook</i>	<i>Previous Tealbook (intercept-adjusted)</i>
Tealbook-consistent FRB/US $r^*$	1.03	0.81
Average projected real federal funds rate	0.02	-0.07

1. The prescriptions of rules conditional on the previous Tealbook projection reflect, where applicable, the downward revision to the staff's estimate of the long-run equilibrium real federal funds rate, as implemented in the current Tealbook. Moreover, the previous-Tealbook prescriptions of rules featuring the lagged policy rate are conditional on the current-Tealbook value of the lagged policy rate.

2. The "Tealbook-consistent FRB/US  $r^*$ " is the level of the real federal funds rate that, if maintained over a 12-quarter period (beginning in the current quarter) in the FRB/US model, sets the output gap equal to zero in the final quarter of that period. The "average projected real federal funds rate" is calculated under the Tealbook baseline projection over the same 12-quarter period. Statistics for the previous Tealbook are adjusted to reflect the downward revision to the time-varying intercept of the baseline policy rule implemented in the current Tealbook.

federal funds rate that, if maintained over a 12-quarter period, sets the output gap to zero in the final quarter of that period.

- The current estimate of  $r^*$ , at 1.03 percent, is a bit higher than in the July Tealbook due to the higher path of the output gap in the current projection.
- At 2 basis points, the average level of the real federal funds rate in the staff's forecast for the same 12-quarter period used to compute  $r^*$  is about 1 percentage point below  $r^*$ . The relatively accommodative stance of policy in the Tealbook baseline projection reflects policy considerations other than closing the output gap that are embedded in the policy reaction function assumed by the staff.

### SIMPLE POLICY RULES SIMULATIONS

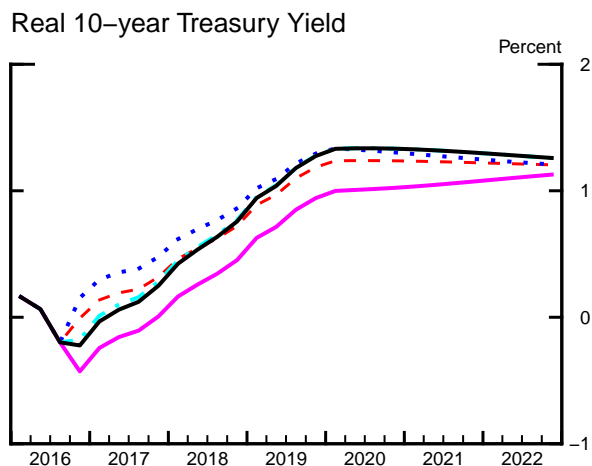
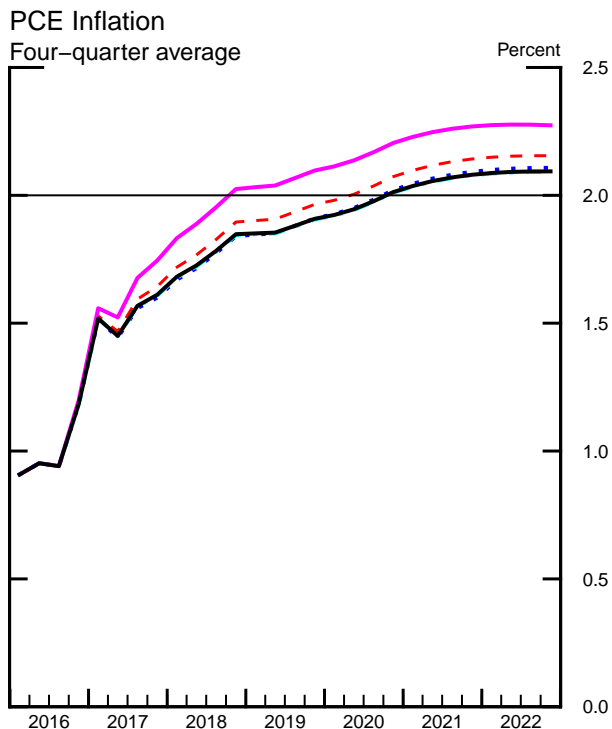
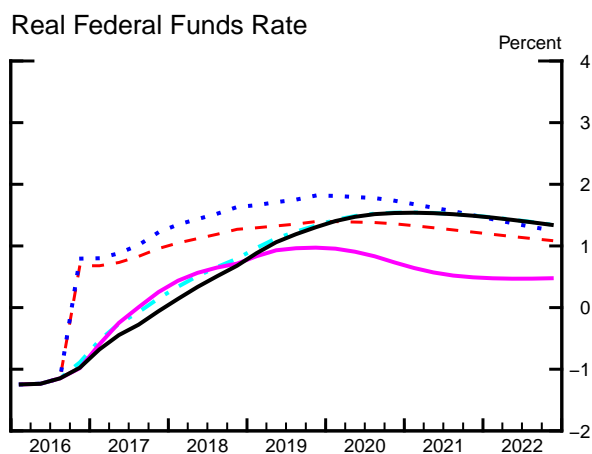
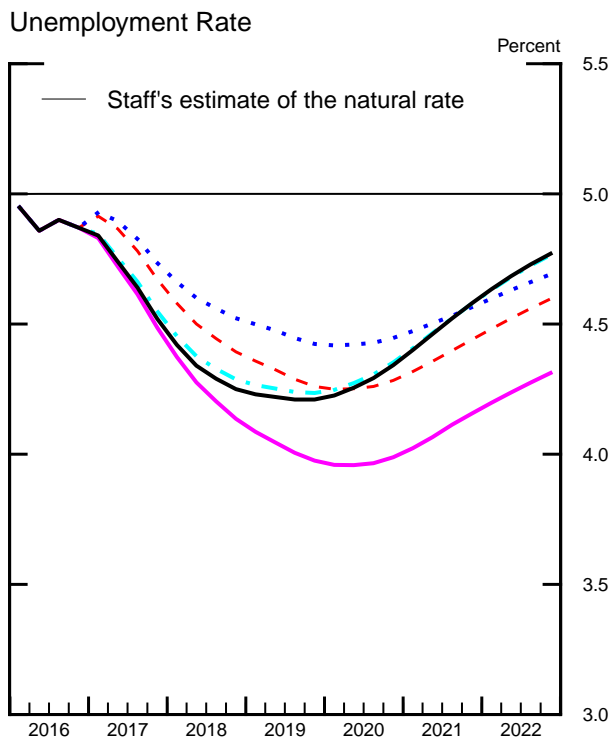
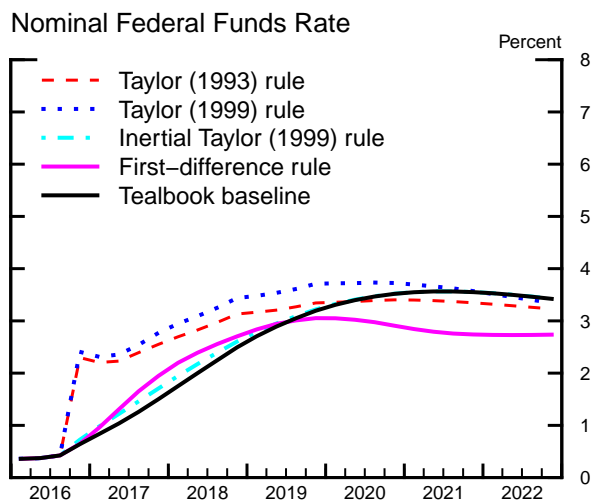
The second exhibit reports dynamic simulations of the FRB/US model under the Taylor (1993) rule, the Taylor (1999) rule, the inertial Taylor (1999) rule, and the first-difference rule. These simulations reflect the endogenous responses of the output gap and inflation when the federal funds rate follows the paths implied by the different policy rules.<sup>3</sup> The intercepts of the Taylor-type rules correspond to the staff's assumption that the long-run level of the equilibrium real federal funds rate equals  $\frac{3}{4}$  percent.

- The baseline policy path in the staff forecast is based on a version of the inertial Taylor (1999) rule with a temporary downward adjustment to the intercept.<sup>4</sup> In the Tealbook baseline, the nominal federal funds rate increases about 85 basis points per year through the final quarter of 2019, when it reaches 3.2 percent. The pace of tightening subsequently slows, and the federal funds rate peaks at  $3\frac{1}{2}$  percent in 2021, before eventually returning to its longer-run normal level of  $2\frac{3}{4}$  percent.
- The inertial Taylor (1999) rule with a constant intercept prescribes a slightly higher path for the federal funds rate over the next few years than the version with a judgmental downward intercept adjustment used to construct the Tealbook baseline. However, the difference in policy rates arising from alternative intercept assumptions

<sup>3</sup> Because of these endogenous responses, the near-term prescriptions from the dynamic simulations can differ from those shown in the top panel of the first exhibit.

<sup>4</sup> This temporary downward intercept adjustment was made consistent with the new staff estimate of the long-run equilibrium value of the real federal funds rate. For a motivation of the adjustment, see Christopher Erceg, Etienne Gagnon, David López-Salido, Matthias Paustian, and James Trevino (2016), "Changes to the Interest-Rate Reaction Function Used in the Tealbook," memorandum to the Federal Open Market Committee, Board of Governors of the Federal Reserve System, Divisions of International Finance, Monetary Affairs, and Research and Statistics, June 3.

### Simple 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 a tendency for current and near-term core inflation rates to outperform headline inflation rates as predictors of the medium-term behavior of headline inflation.



is small and dissipates too rapidly to have a material effect on the real longer-term interest rates that influence economic activity in FRB/US, so macroeconomic outcomes under the inertial Taylor (1999) rule are similar to those in the Tealbook baseline.

- The Taylor (1993) and Taylor (1999) rules call for an immediate sharp tightening in policy and produce paths for the real federal funds rate that lie significantly above the Tealbook baseline path over the next few years largely because these two policy rules do not put weight on the lagged policy rate. The Taylor (1999) rule calls for slightly higher policy rates than the Taylor (1993) rule over the period shown because it responds more strongly to the projected rise in output above its potential level over the next several years. As a consequence, the Taylor (1999) rule generates a higher trajectory of the unemployment rate and a slightly lower trajectory of inflation than does the Taylor (1993) rule.
- The first-difference rule prescribes a slightly higher path for the federal funds rate through the first half of 2019 than the Tealbook baseline. Thereafter, the federal funds rate edges down whereas it keeps rising 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 and beyond. The lower path of the federal funds rate after 2019, in conjunction with expectations of higher price and wage inflation in the future, implies lower longer-term real rates over the entire projection period, as well as higher levels of resource utilization and inflation. The first-difference rule generates outcomes for the unemployment rate that are markedly below the unemployment rate paths generated under the other policy rules and well below the staff's estimate of the natural rate.

## OPTIMAL CONTROL SIMULATIONS UNDER COMMITMENT

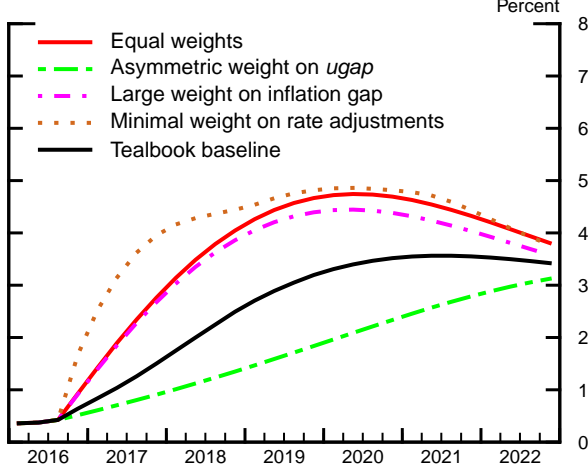
The third exhibit displays optimal control simulations under various assumptions about policymakers' preferences, as captured by four specifications of the loss function.<sup>5</sup> The concept of optimal control employed here corresponds to a commitment policy under which the plans that policymakers make today are assumed to constrain future policy

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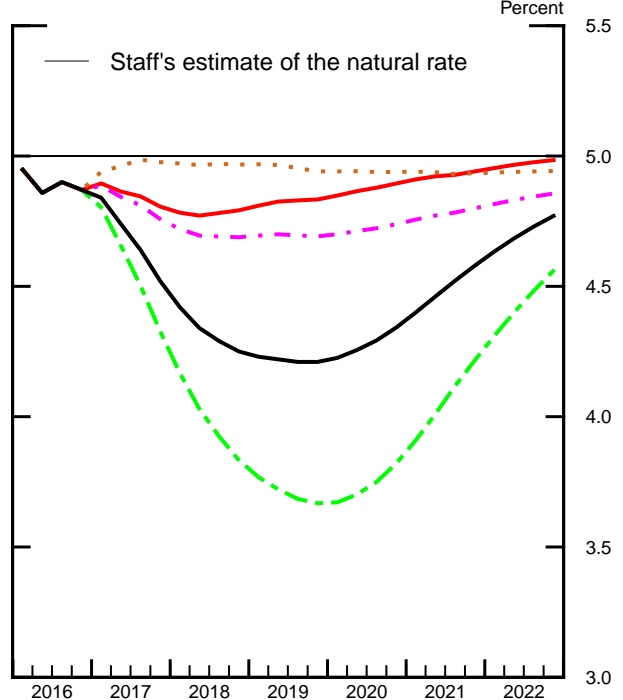
<sup>5</sup> The box "Optimal Control and the Loss Function" in the Monetary Policy Strategies section of the June 2016 Tealbook B offers motivations for these specifications; the appendix provides technical details on the optimal control simulations.

### Optimal Control Simulations under Commitment

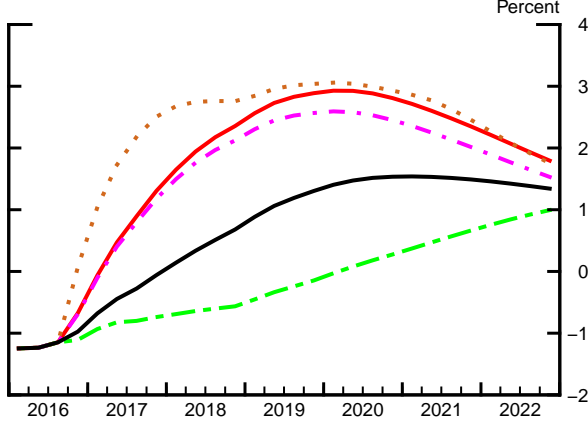
Nominal Federal Funds Rate



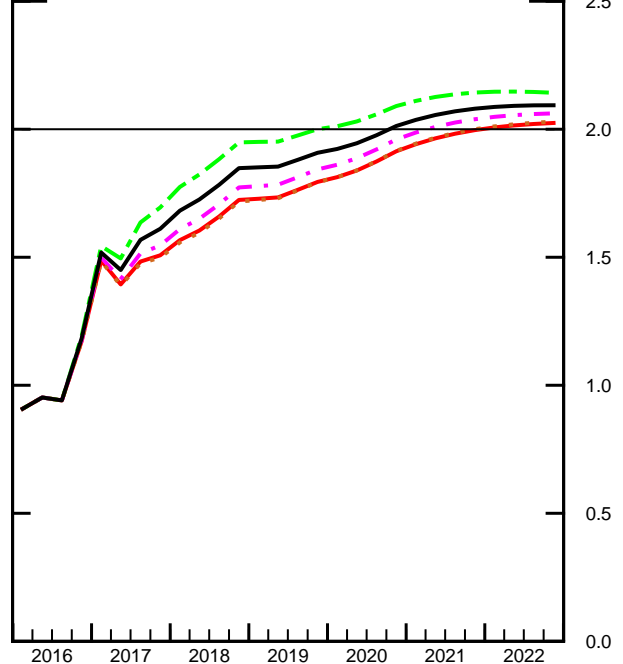
Unemployment Rate



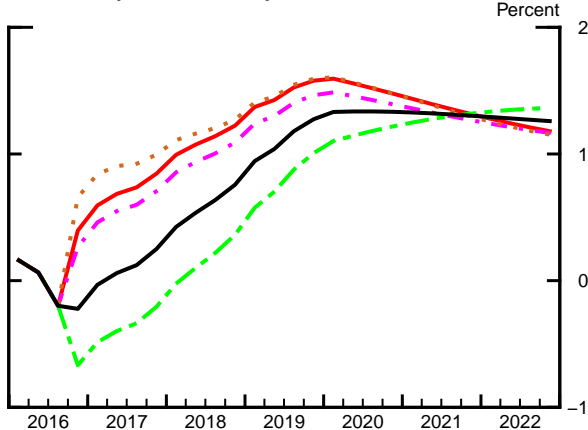
Real Federal Funds Rate



PCE Inflation  
Four-quarter average



Real 10-year Treasury Yield



Note: Each set of lines corresponds to an optimal control policy under commitment in which policymakers minimize a discounted weighted sum of squared deviations of four-quarter headline PCE inflation from the Committee's 2 percent objective, of squared deviations of the unemployment rate from the staff's estimate of the natural rate, and of squared changes in the federal funds rate. The weights vary across simulations. See the appendix for technical details and the box "Optimal Control and the Loss Function" in the June 2016 Tealbook B for a motivation.

choices in a way that improves overall economic outcomes.<sup>6</sup> The exhibit also shows the current Tealbook baseline forecast.

- The first simulation, labeled “equal weights,” presents the case in which policymakers are assumed to place the same 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 changes in the federal funds rate. Under this strategy, the path for the federal funds rate is significantly higher than the Tealbook baseline policy path. This higher path arises because, in the current baseline projection, unemployment falls well below the staff’s estimate of the natural rate over the next several years. Under equal-weight preferences, policymakers judge this undershooting of the natural rate to be costly (as would be a similar-sized deviation of the unemployment rate above the natural rate), leading them to tighten policy appreciably more than in the Tealbook baseline. This tighter policy results in a path of the unemployment rate that is substantially closer to the staff’s estimate of the natural rate; headline PCE inflation is somewhat lower than in the Tealbook baseline over the period shown, consistent with a limited response of inflation in the model to lower levels of resource utilization.
- The second simulation, labeled “asymmetric weight on *ugap*,” uses a loss function that assigns no cost to deviations of the unemployment rate from the natural rate when the unemployment rate is running below the natural rate, but that is identical to the specification with equal weights when the unemployment rate is above the natural rate. Under this strategy, the path of the federal funds rate is considerably below both the Tealbook baseline path and the path for the case of equal weights. Policymakers choose this relatively accommodative path for the policy rate because their desire to raise inflation to 2 percent is not tempered by an aversion to the undershooting of the natural rate of unemployment that helps achieve this outcome. The tighter labor market causes inflation to reach 2 percent more quickly than in the case of equal weights; inflation then edges above the Committee’s longer-run objective for the next decade.<sup>7</sup>

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<sup>6</sup> Under the optimal control policies shown in the exhibit, policymakers improve current economic outcomes by making promises that bind future policymakers’ actions; however, the simulations are not conditioned on policy commitments that might have been made in the past.

<sup>7</sup> The simultaneous overshooting of the long-run inflation objective and undershooting of the natural rate of unemployment over the medium term is time inconsistent, in the sense that, if given the

- The third simulation, labeled “large weight on inflation gap,” posits a loss function that assigns a cost to above-target or below-target inflation that is five times larger than under the specification with equal weights. The resulting optimal strategy is only slightly more accommodative than in the case with equal weights, even though the losses associated with undershooting the inflation objective in coming years are larger. The reason is that, in the FRB/US model, policymakers face an unappealing tradeoff because inflation responds little to resource utilization. Hence, policymakers would need to engineer a substantial undershooting of the natural rate of unemployment, which they see as costly, in order to raise inflation in the near term by a modest amount.
- The fourth simulation, labeled “minimal weight on rate adjustments,” uses a loss function that assigns a very small cost to changes in the federal funds rate but is otherwise identical to the loss function with equal weights. In the resulting optimal strategy, the federal funds rate rises faster than under the specification with equal weights over the next few years in an effort to contain the projected undershooting of the natural rate of unemployment. The paths for the real federal funds rate and the real 10-year Treasury yield are also higher for a couple of years than in the case of equal weights. While this policy leaves the trajectory for inflation almost unaffected, it keeps unemployment rate close to the staff’s estimate of the natural rate.

## NOMINAL INCOME TARGETING

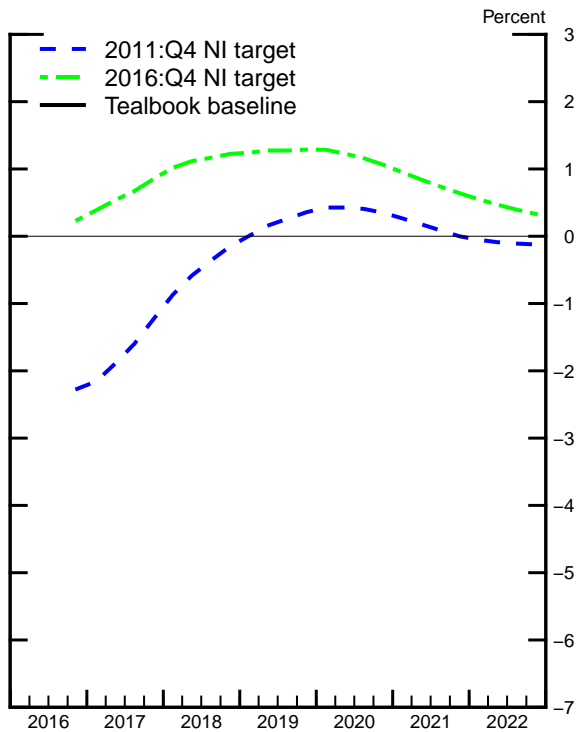
With inflation having run below 2 percent for the past several years, the Committee may want to explore policy strategies that entail commitments to achieving inflation outcomes that are, on average, near its longer-run objective by seeking to offset past deviations from that objective. Moreover, with the federal funds rate still near its effective lower bound (ELB), the Committee may wish to examine possible ways to deliver additional monetary stimulus, either in general or in the event of adverse macroeconomic outcomes. In that spirit, the pair of special exhibits, titled “Nominal Income Targeting (Tealbook Baseline Scenario)” and “Nominal Income Targeting (Recession Scenario),” use the FRB/US model to explore the implications of following a nominal income (NI) targeting rule—in which monetary policy reacts to the gap between

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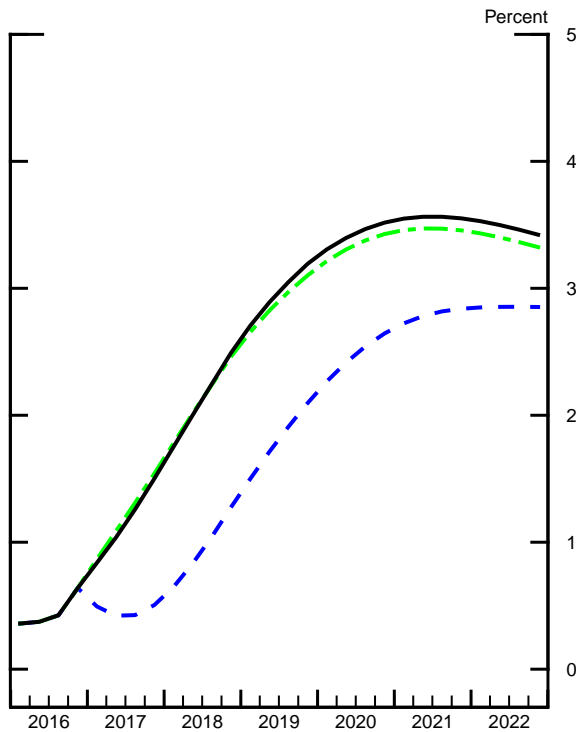
opportunity to reoptimize the path of the federal funds rate without regards to past policy commitments, policymakers in the future would choose to pursue a tighter monetary policy. When we instead simulate the model under the assumption of discretion, policy rates and macroeconomic outcomes are roughly between those under the Tealbook baseline and those under commitment. For the other three specifications of the loss function, the simulation results under commitment and discretion are similar.

### Nominal Income Targeting (Tealbook Baseline Scenario)

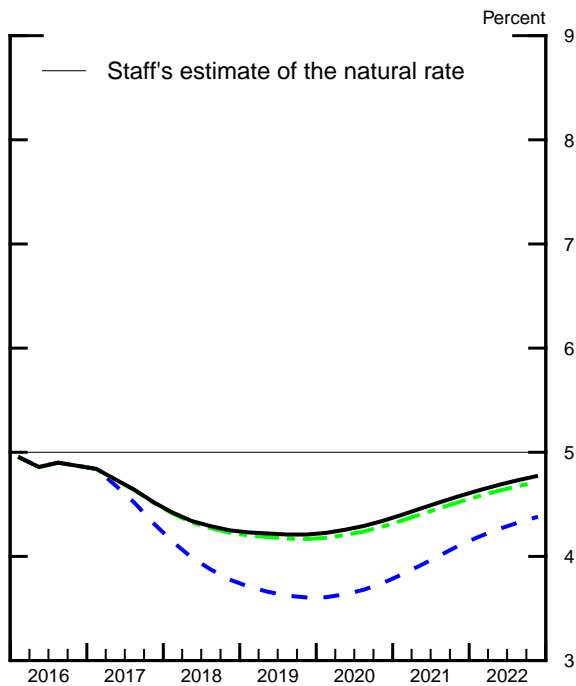
Nominal Income Gap



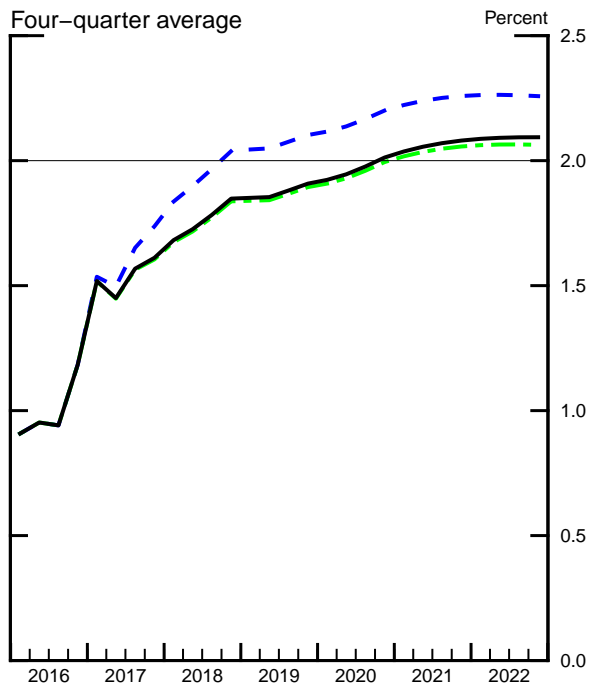
Nominal Federal Funds Rate



Unemployment Rate



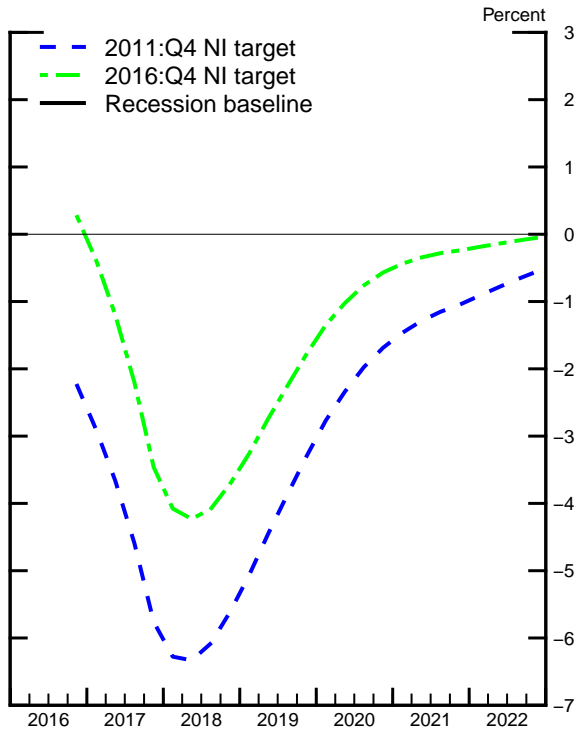
PCE Inflation  
Four-quarter average



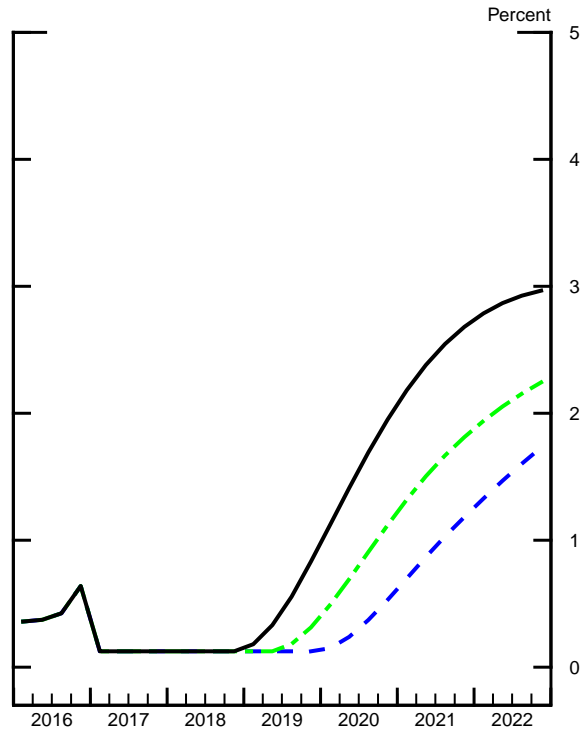
Note: For comparability, the nominal income targeting rule in this exhibit has the same weight on the lagged federal funds rate and the same temporary adjustment to the intercept as the inertial Taylor (1999) rule in the Tealbook baseline. The simulation period begins in 2017:Q1. The Tealbook baseline does not include an NI target.

### Nominal Income Targeting (Recession Scenario)

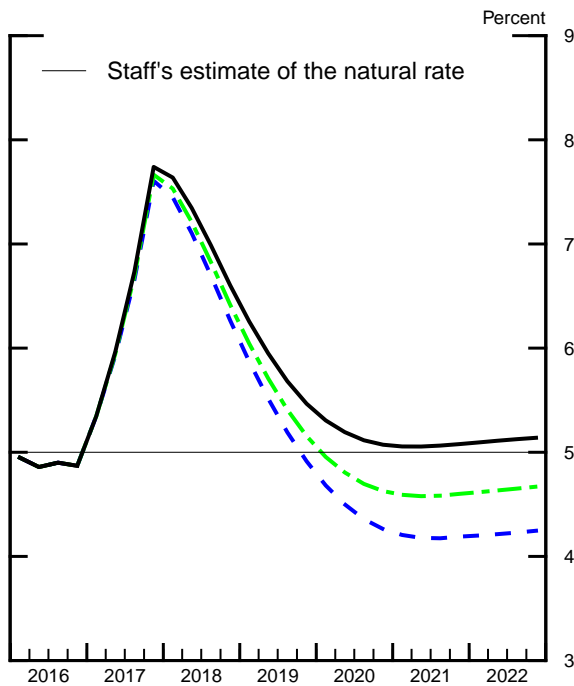
Nominal Income Gap



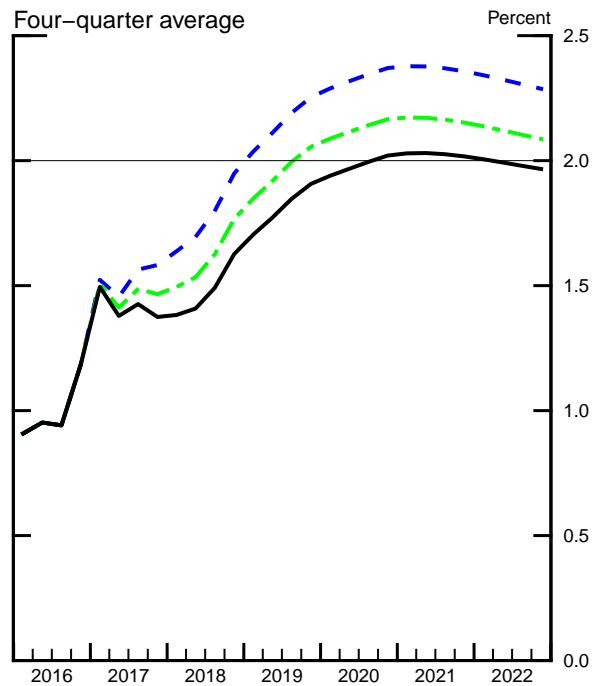
Nominal Federal Funds Rate



Unemployment Rate



PCE Inflation  
Four-quarter average



Note: For comparability, the nominal income targeting rule in this exhibit has the same weight on the lagged federal funds rate and the same temporary adjustment to the intercept as the inertial Taylor (1999) rule in the Tealbook baseline. The simulation period begins in 2017:Q1 and imposes an immediate fall in the federal funds rate to the effective lower bound. The Tealbook baseline does not include an NI target.

the level of actual nominal GDP and a target path—under the staff’s baseline outlook and a recession scenario, respectively. In these scenarios, policymakers adopt the NI targeting rule beginning in the first quarter of 2017, when the simulations begin. And as in the simulations presented above, it is assumed that economic agents understand the model and that policymakers can credibly commit to following an NI targeting rule for an extended period.<sup>8</sup>

Because the amount of stimulus that NI targeting delivers depends importantly on the target path for nominal income and, in particular, on the shortfall in nominal income that policymakers seek to offset, we consider two specifications of the target path. Under the “2016:Q4 NI target,” policymakers target a path for the level of nominal income that, in 2016:Q4, equals real potential GDP multiplied by the GDP deflator in that quarter; subsequently, the target grows 2 percentage points faster than the staff’s baseline projection for real potential GDP. Under the “2011:Q4 NI target,” policymakers seek to make up for the shortfall in nominal income relative to a path anchored in 2011:Q4, just before the Committee announced its 2 percent inflation objective.<sup>9</sup>

- The first special exhibit shows the effects of responding to the 2011:Q4 and 2016:Q4 NI targets conditional on the staff’s current baseline. The pursuit of the 2016:Q4 NI target leads to paths for the nominal federal funds rate and associated macroeconomic outcomes that are similar to those under the Tealbook baseline. This similarity arises because policymakers begin with only a small NI gap to close (shown in the upper-left panel), whereas the output gap and inflation gap entering the Tealbook baseline rule (shown on the first exhibit) have largely offsetting effects on the prescriptions of that rule.
- The pursuit of the 2011:Q4 NI target entails closing a nominal income gap that is initially 2½ percentage points larger than under the 2016:Q4 NI target; accordingly, policy in this instance is significantly more accommodative. Under the 2011:Q4 NI

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<sup>8</sup> For increased comparability, the NI targeting rule used herein features the same weight on the lagged federal funds rate and temporary intercept adjustment as the inertial Taylor (1999) rule used to construct the Tealbook baseline. In the Monetary Policy Strategies section of the March 2016 Tealbook B and in earlier memos to the FOMC, the NI targeting rule typically featured a lower degree of inertia and no temporary intercept adjustment.

<sup>9</sup> Under both NI targets, we use the current estimates of the path of real potential GDP and the GDP deflator to compute the respective NI target paths. Were the Federal Reserve to pursue such targets, revisions to these estimates could affect the level of the nominal income gap that the rule seeks to close, thus requiring an adjustment to the stance of policy.

target, the federal funds rate does not exceed 1 percent until the second half of 2018, about one year later than under the 2016:Q4 NI target. As a result, inflation persistently exceeds 2 percent, an outcome that reduces real interest rates and, in turn, exacerbates the undershooting of the natural rate of unemployment.

- The second special exhibit shows the effects of adopting the same 2011:Q4 and 2016:Q4 NI targets under a recession scenario that begins in early 2017. The ensuing drop in resource utilization and weakening of inflation cause a large shortfall in nominal income. Both NI targeting policies are notably more accommodative than the intercept-adjusted inertial Taylor rule policy, with the federal funds rate remaining at the ELB longer and rising somewhat more gradually after departing from the ELB.<sup>10</sup> Accordingly, the unemployment rate falls somewhat more rapidly than in the baseline recession scenario; inflation rises back toward 2 percent more quickly and then stays above this level for an extended period of time, especially under the 2011:Q4 NI target. Because monetary policy works with a lag, the NI policies have little effect on the severity of the recession but are, nonetheless, more effective than the Tealbook baseline policy rule at hastening the recovery.
- The ability of NI targeting rules to speed the economic recovery relies on the assumption that policymakers can credibly commit to high levels of resource utilization and inflation over the medium run to make up for past shortfalls in nominal income growth.<sup>11</sup> However, once that situation arises, policymakers may well find it preferable to scale back on the amount of accommodation embedded in the rule. To the extent that the public anticipates such a shift, policymakers' ability to improve near-term macroeconomic outcomes would be reduced.

The next four exhibits tabulate the simulation results for key variables under the policy rule and optimal control simulations described above.

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<sup>10</sup> In constructing the recession scenario, we assume that policymakers immediately lower the federal funds rate to the ELB even if the interest rate smoothing term in the NI rule might have called for doing so gradually.

<sup>11</sup> The assumed credibility of monetary policy in the model also guarantees that inflation expectations will not become unanchored over the medium term as the economy modestly overheats.



**Outcomes of Simple Policy Rule Simulations**

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

Measure and policy	2016	2017	2018	2019	2020
<i>Nominal federal funds rate<sup>1</sup></i>					
Taylor (1993)	2.3	2.6	3.1	3.3	3.4
Taylor (1999)	2.4	2.8	3.4	3.7	3.7
Inertial Taylor (1999)	0.7	1.7	2.6	3.2	3.5
First-difference	0.6	1.9	2.7	3.1	2.9
Extended Tealbook baseline	0.6	1.5	2.5	3.2	3.5
<i>Real GDP</i>					
Taylor (1993)	1.8	2.1	2.0	1.9	1.6
Taylor (1999)	1.8	2.0	1.8	1.8	1.6
Inertial Taylor (1999)	1.8	2.3	1.9	1.7	1.4
First-difference	1.8	2.5	2.1	1.9	1.6
Extended Tealbook baseline	1.8	2.4	2.0	1.7	1.4
<i>Unemployment rate<sup>1</sup></i>					
Taylor (1993)	4.9	4.7	4.4	4.3	4.3
Taylor (1999)	4.9	4.7	4.5	4.4	4.4
Inertial Taylor (1999)	4.9	4.5	4.3	4.2	4.4
First-difference	4.9	4.5	4.1	4.0	4.0
Extended Tealbook baseline	4.9	4.5	4.3	4.2	4.3
<i>Total PCE prices</i>					
Taylor (1993)	1.2	1.6	1.9	2.0	2.1
Taylor (1999)	1.2	1.6	1.8	1.9	2.0
Inertial Taylor (1999)	1.2	1.6	1.8	1.9	2.0
First-difference	1.2	1.7	2.0	2.1	2.2
Extended Tealbook baseline	1.2	1.6	1.8	1.9	2.0
<i>Core PCE prices</i>					
Taylor (1993)	1.6	1.6	1.9	1.9	2.0
Taylor (1999)	1.6	1.6	1.8	1.9	2.0
Inertial Taylor (1999)	1.6	1.6	1.8	1.9	2.0
First-difference	1.6	1.7	2.0	2.1	2.2
Extended Tealbook baseline	1.6	1.6	1.8	1.9	2.0

1. Percent, average for the final quarter of the period.

**Outcomes of Simple Policy Rule Simulations, Quarterly**

(Four-quarter percent change, except as noted)

Measure and policy	2016				2017			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
<i>Nominal federal funds rate<sup>1</sup></i>								
Taylor (1993)	0.4	0.4	0.4	2.3	2.2	2.2	2.4	2.6
Taylor (1999)	0.4	0.4	0.4	2.4	2.3	2.4	2.5	2.8
Inertial Taylor (1999)	0.4	0.4	0.4	0.7	1.0	1.2	1.5	1.7
First-difference	0.4	0.4	0.4	0.6	1.0	1.3	1.7	1.9
Extended Tealbook baseline	0.4	0.4	0.4	0.6	0.8	1.0	1.3	1.5
<i>Real GDP</i>								
Taylor (1993)	1.6	1.3	1.5	1.8	2.1	2.2	2.1	2.1
Taylor (1999)	1.6	1.3	1.5	1.8	2.0	2.2	2.0	2.0
Inertial Taylor (1999)	1.6	1.3	1.5	1.8	2.2	2.4	2.3	2.3
First-difference	1.6	1.3	1.5	1.8	2.2	2.5	2.4	2.5
Extended Tealbook baseline	1.6	1.3	1.5	1.8	2.2	2.4	2.3	2.4
<i>Unemployment rate<sup>1</sup></i>								
Taylor (1993)	4.9	4.9	4.9	4.9	4.9	4.9	4.8	4.7
Taylor (1999)	4.9	4.9	4.9	4.9	4.9	4.9	4.8	4.7
Inertial Taylor (1999)	4.9	4.9	4.9	4.9	4.8	4.8	4.7	4.5
First-difference	4.9	4.9	4.9	4.9	4.8	4.7	4.6	4.5
Extended Tealbook baseline	4.9	4.9	4.9	4.9	4.8	4.7	4.6	4.5
<i>Total PCE prices</i>								
Taylor (1993)	0.9	1.0	0.9	1.2	1.5	1.5	1.6	1.6
Taylor (1999)	0.9	1.0	0.9	1.2	1.5	1.4	1.6	1.6
Inertial Taylor (1999)	0.9	1.0	0.9	1.2	1.5	1.4	1.6	1.6
First-difference	0.9	1.0	0.9	1.2	1.6	1.5	1.7	1.7
Extended Tealbook baseline	0.9	1.0	0.9	1.2	1.5	1.5	1.6	1.6
<i>Core PCE prices</i>								
Taylor (1993)	1.6	1.6	1.6	1.6	1.5	1.5	1.6	1.6
Taylor (1999)	1.6	1.6	1.6	1.6	1.5	1.5	1.5	1.6
Inertial Taylor (1999)	1.6	1.6	1.6	1.6	1.5	1.5	1.5	1.6
First-difference	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7
Extended Tealbook baseline	1.6	1.6	1.6	1.6	1.5	1.5	1.5	1.6

1. Percent, average for the quarter.

**Outcomes of Optimal Control Simulations under Commitment**

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

Measure and policy	2016	2017	2018	2019	2020
<i>Nominal federal funds rate<sup>1</sup></i>					
Equal weights	0.9	2.8	4.0	4.7	4.7
Aymmetric weight on <i>ugap</i>	0.5	0.9	1.3	1.8	2.3
Large weight on inflation gap	0.9	2.7	3.9	4.4	4.4
Minimal weight on rate adjustments	1.7	4.0	4.4	4.8	4.8
Extended Tealbook baseline	0.6	1.5	2.5	3.2	3.5
<i>Real GDP</i>					
Equal weights	1.8	1.8	1.5	1.6	1.5
Aymmetric weight on <i>ugap</i>	1.8	2.8	2.4	1.9	1.4
Large weight on inflation gap	1.8	1.9	1.6	1.6	1.5
Minimal weight on rate adjustments	1.8	1.5	1.4	1.7	1.6
Extended Tealbook baseline	1.8	2.4	2.0	1.7	1.4
<i>Unemployment rate<sup>1</sup></i>					
Equal weights	4.9	4.8	4.8	4.8	4.9
Aymmetric weight on <i>ugap</i>	4.9	4.3	3.8	3.7	3.8
Large weight on inflation gap	4.9	4.8	4.7	4.7	4.7
Minimal weight on rate adjustments	4.9	5.0	5.0	4.9	4.9
Extended Tealbook baseline	4.9	4.5	4.3	4.2	4.3
<i>Total PCE prices</i>					
Equal weights	1.2	1.5	1.7	1.8	1.9
Aymmetric weight on <i>ugap</i>	1.2	1.7	1.9	2.0	2.1
Large weight on inflation gap	1.2	1.5	1.8	1.8	2.0
Minimal weight on rate adjustments	1.2	1.5	1.7	1.8	1.9
Extended Tealbook baseline	1.2	1.6	1.8	1.9	2.0
<i>Core PCE prices</i>					
Equal weights	1.6	1.5	1.7	1.8	1.9
Aymmetric weight on <i>ugap</i>	1.6	1.6	1.9	2.0	2.1
Large weight on inflation gap	1.6	1.5	1.7	1.8	1.9
Minimal weight on rate adjustments	1.6	1.4	1.7	1.8	1.9
Extended Tealbook baseline	1.6	1.6	1.8	1.9	2.0

1. Percent, average for the final quarter of the period.

**Outcomes of Optimal Control Simulations under Commitment, Quarterly**

(Four-quarter percent change, except as noted)

Measure and policy	2016				2017			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
<i>Nominal federal funds rate<sup>1</sup></i>								
Equal weights	0.4	0.4	0.4	0.9	1.4	1.9	2.3	2.8
Asymmetric weight on <i>ugap</i>	0.4	0.4	0.4	0.5	0.6	0.7	0.8	0.9
Large weight on inflation gap	0.4	0.4	0.4	0.9	1.4	1.8	2.3	2.7
Minimal weight on rate adjustments	0.4	0.4	0.4	1.7	2.5	3.1	3.6	4.0
Extended Tealbook baseline	0.4	0.4	0.4	0.6	0.8	1.0	1.3	1.5
<i>Real GDP</i>								
Equal weights	1.6	1.3	1.5	1.8	2.1	2.1	1.9	1.8
Asymmetric weight on <i>ugap</i>	1.6	1.3	1.5	1.8	2.3	2.6	2.6	2.8
Large weight on inflation gap	1.6	1.3	1.5	1.8	2.1	2.2	2.0	1.9
Minimal weight on rate adjustments	1.6	1.3	1.5	1.8	2.0	2.0	1.7	1.5
Extended Tealbook baseline	1.6	1.3	1.5	1.8	2.2	2.4	2.3	2.4
<i>Unemployment rate<sup>1</sup></i>								
Equal weights	4.9	4.9	4.9	4.9	4.9	4.9	4.8	4.8
Asymmetric weight on <i>ugap</i>	4.9	4.9	4.9	4.9	4.8	4.7	4.5	4.3
Large weight on inflation gap	4.9	4.9	4.9	4.9	4.9	4.8	4.8	4.8
Minimal weight on rate adjustments	4.9	4.9	4.9	4.9	4.9	5.0	5.0	5.0
Extended Tealbook baseline	4.9	4.9	4.9	4.9	4.8	4.7	4.6	4.5
<i>Total PCE prices</i>								
Equal weights	0.9	1.0	0.9	1.2	1.5	1.4	1.5	1.5
Asymmetric weight on <i>ugap</i>	0.9	1.0	0.9	1.2	1.5	1.5	1.6	1.7
Large weight on inflation gap	0.9	1.0	0.9	1.2	1.5	1.4	1.5	1.5
Minimal weight on rate adjustments	0.9	1.0	0.9	1.2	1.5	1.4	1.5	1.5
Extended Tealbook baseline	0.9	1.0	0.9	1.2	1.5	1.5	1.6	1.6
<i>Core PCE prices</i>								
Equal weights	1.6	1.6	1.6	1.6	1.5	1.4	1.4	1.5
Asymmetric weight on <i>ugap</i>	1.6	1.6	1.6	1.6	1.5	1.5	1.6	1.6
Large weight on inflation gap	1.6	1.6	1.6	1.6	1.5	1.4	1.5	1.5
Minimal weight on rate adjustments	1.6	1.6	1.6	1.6	1.5	1.4	1.4	1.4
Extended Tealbook baseline	1.6	1.6	1.6	1.6	1.5	1.5	1.5	1.6

1. Percent, average for the quarter.

## Appendix

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

The table below gives the expressions for the four simple policy rules reported in “Monetary Policy Strategies.”  $R_t$  denotes the nominal federal funds rate for quarter  $t$ , and 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 ( $ygap_t$ ), and the forecast of the three-quarter-ahead annual change in the output gap ( $\Delta^4 ygap_{t+3|t}$ ). The value of policymakers’ longer-run inflation objective, denoted  $\pi^{LR}$ , is 2 percent.

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

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, denoted  $r^{LR}$ , are constant and chosen so that they are consistent with a 2 percent longer-run inflation objective and a longer-run real federal funds rate of  $\frac{3}{4}$  percent, a value used in the FRB/US model.<sup>2</sup> 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 taking as given the Tealbook projections for inflation and the output gap. When the Tealbook is published early in a quarter, the prescriptions are shown for the current and next quarters. When the Tealbook is published late in a quarter, the prescriptions are shown for the next two quarters. Rules that include a lagged policy rate as a right-hand-side variable are conditioned on the lagged federal funds rate in the Tealbook projection for the first quarter shown, and then conditioned on their simulated lagged federal funds rate for the second quarter shown. To isolate the effects of changes in the macroeconomic projections on the prescriptions of these inertial rules, the lines labeled “Previous Tealbook projection” report prescriptions conditional on the previous Tealbook

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

<sup>2</sup> All nominal and real federal funds rates reported in the Monetary Policy Strategies section are expressed on the same 360-day basis as the published federal funds rate. Consistent with the methodology in the FRB/US model, the simple rules are first implemented on a fully-compounded, 365-day basis and then converted to a 360-day basis.

projections for inflation and the output gap but using the value of the lagged federal funds rate in the current Tealbook for the first quarter shown.

## REAL FEDERAL FUNDS RATE ESTIMATES

The bottom panel of the exhibit titled “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 a 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 “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; 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 weighted sum of squared inflation gaps (measured as the difference between four-quarter headline PCE inflation,  $\pi_t^{PCE}$ , and the Committee’s 2 percent objective), squared unemployment gaps ( $ugap_t$ , measured as the difference between the unemployment rate and the staff’s estimate of the natural

rate), and squared changes in the federal funds rate. The resulting loss function, shown below, embeds the assumption that policymakers discount the future using a quarterly discount factor  $\beta = 0.9963$ :

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

The exhibit “Optimal Control Simulations under Commitment” considers four specifications of the weights on the inflation gap, the unemployment gap, and the rate change components of the loss function. The box “Optimal Control and the Loss Function” in the Monetary Policy Strategies section of the June 2016 Tealbook B provides motivations for the four specifications of the loss function.

The first specification, titled “equal weights,” assigns equal weights to all three components at all times. The second specification, titled “asymmetric weight on *ugap*,” uses the same weights as the equal-weights specification whenever the unemployment rate is above the staff’s estimate of the natural rate but it assigns no penalty to the unemployment rate falling below the natural rate. The third specification, titled “large weight on inflation gap,” attaches a relatively large weight to inflation gaps. The fourth specification, titled “minimal weight on rate adjustments,” places almost no weight on changes in the federal funds rate.<sup>3</sup> The table below shows the weights used in the four specifications. The optimal control policy and associated outcomes depend on the relative (rather than the absolute) values of the weights.

	$\lambda_\pi$	$\frac{\lambda_{u,t+\tau}}{ugap_{t+\tau}}$		$\lambda_R$
		$ugap_{t+\tau} < 0$	$ugap_{t+\tau} \geq 0$	
<b>Equal weights</b>	1	1	1	1
<b>Asymmetric weight on <i>ugap</i></b>	1	0	1	1
<b>Large weight on inflation gap</b>	5	1	1	1
<b>Minimal weight on rate adjustment</b>	1	1	1	0.01

For each of these four specifications of the loss function, the optimal control policy is the path for the federal funds rate that minimizes the 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

<sup>3</sup> The inclusion of a minimal but strictly positive weight on changes in the federal funds rate helps ensure a well-behaved numerical solution.

model see this path as being a binding commitment on future Committee decisions; the optimal control policy takes as given the initial 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 in 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 pair of special exhibits titled “Nominal Income Targeting (Tealbook Baseline Scenario)” and “Nominal Income Targeting (Recession Scenario)” is expressed as

$$R_t = 0.85R_{t-1} + 0.15(r_t^* + \pi_t + yn_t - yn_t^*).^4$$

The prescriptions of this rule depend on the lagged federal funds rate, a time-varying intercept ( $r_t^*$ ), four-quarter core PCE inflation, and a nominal income gap defined as the difference between nominal income (denoted  $yn_t$  and calculated as 100 times the log of the level of nominal GDP) and a time-varying target (denoted  $yn_t^*$  and calculated as 100 times the log of target nominal GDP). The target  $yn_t^*$  grows 2 percentage points faster per year than the staff’s estimate of real potential GDP growth.<sup>5</sup> In the special exhibit, the level of  $yn_t^*$  is calibrated in two ways. In the first calibration, the initial target value is set so that policymakers address only nominal income shortfalls since 2016:Q4. In the second calibration, the initial value for  $yn_t^*$  is set so that the rule seeks to offset the cumulative nominal income gap since 2011:Q4. In both cases, the resulting 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 grown at a 2 percent annual pace since the date associated with the calibration.<sup>6</sup>

To emphasize the role of the nominal income gap, the nominal income rule used in this Tealbook puts the same weight on the lagged federal funds rate and features the same time-varying intercept as the inertial Taylor (1999) rule used to construct the Tealbook baseline. In past Tealbooks and staff analysis (such as Erceg and others (2012)), the weight on the lagged federal funds rate was typically set to 0.75 and the intercept was held constant at  $r^{LR}$ .

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<sup>4</sup> The nominal income targeting rule is also called “nominal GDP targeting rule.”

<sup>5</sup> This assumption implies that, as with many other simple policy rules, revisions to the estimate of potential GDP would change the prescription of the nominal income rule.

<sup>6</sup> For a discussion of the properties of nominal income targeting regimes, see Erceg and others (2011) and McCallum and others (1999).



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## Monetary Policy Alternatives

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During the first half of the year, the outlook for economic activity and inflation had become clouded: Output growth in the first and second quarters appeared sluggish, payroll gains in May were quite weak, and policymakers were confronted by increases in some near-term global risks. Consequently, the Committee elected to hold off on further increases in the target range for the federal funds rate. More recently, those global risks appear to have abated and incoming economic data—including the available readings on spending in the third quarter—have generally supported the view that growth has picked up. Nevertheless, while recent job gains have, on average, been solid—suggesting that the very weak growth in payrolls in May was an aberration—many measures of labor utilization, including the unemployment rate, have shown little or no change since the beginning of this year. Meanwhile, both headline and core PCE inflation, measured on a 12-month basis, have continued to run below 2 percent and have shown no further increase since stepping up at the start of the year.

The key question for policymakers is whether, given the currently available information, an increase in the federal funds rate is warranted at this meeting, or whether, at least for the time being, it is appropriate to maintain the current target range (and possibly update the Committee’s communications about future policy) in order to ensure continued progress toward the Committee’s objectives. While the three alternative policy statements provide similar descriptions of the incoming data and the economic outlook, they offer different settings of the policy rate in the near term as well as different signals about the likely stance of policy going forward.

- In characterizing the recent data, all three alternatives highlight a pickup in growth of economic activity “from the modest pace seen in the first half of this year,” and acknowledge strength in household spending as well as remaining softness in business fixed investment. While all three alternatives note that the labor market “has continued to strengthen,” the statements differ somewhat in their characterization of the details of labor market conditions.
  - Alternatives B and C point to solid job gains, while cautioning that “the unemployment rate is little changed in recent months.”

- While also noting that job gains “have been solid” on average, Alternative A emphasizes “little change in labor utilization” based on labor market indicators other than payrolls, “including the unemployment rate.”
- The three alternatives largely agree in their interpretations of the incoming price data.
  - All three retain language used in recent statements acknowledging that inflation “has continued to run below” the Committee’s 2 percent longer-run objective, and note that this situation either “partly” reflects (in the case of Alternatives B and C) or “only partly” reflects (in the case of Alternative A) earlier declines in energy prices and in prices of non-energy imports.
  - Furthermore, all three alternatives indicate, as in the July statement, that measures of inflation compensation “remain low” and that most survey-based measures of longer-term inflation expectations are “little changed.”
- With respect to the outlook for economic activity and inflation and its implications for monetary policy:
  - Alternatives B and C retain the July statement language affirming the Committee’s expectation that, “with gradual adjustments in the stance of monetary policy, economic activity will expand at a moderate pace” while adding that labor market conditions will strengthen “somewhat further” (instead of “labor market indicators will strengthen” as in July). The addition of “somewhat further” signals that the Committee does not expect labor market conditions to strengthen indefinitely.
  - By contrast, Alternative A expresses the Committee’s expectation that economic activity will expand at a moderate pace “with the appropriate stance of monetary policy” rather than “with gradual adjustments.” (Like Alternatives B and C, Alternative A replaces labor market “indicators” with “conditions,” but omits “somewhat” in characterizing how they will strengthen further.)
  - All three alternatives 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 those earlier declines dissipate and the labor market strengthens further. Alternative A, however, qualifies that forecast by noting that inflation will rise “gradually” to 2 percent.

- Alternatives B and C offer different ways of updating the Committee’s assessment of risks to the economic outlook, whereas Alternative A removes from the statement any characterization of risks:
  - In light of the incoming data on spending and the labor market, Alternative B characterizes near-term risks to the economic outlook as appearing “roughly balanced” rather than as having “diminished” (as in July). The characterization of risks is limited to the near term. This is because certain risks—such as those stemming from yet-to-be-started Brexit negotiations or from the limited ability of monetary policy to stabilize the economy in response to adverse developments while short-term interest rates remain near zero—may remain tilted to the downside at horizons beyond the near-term.
  - Reflecting a more optimistic assessment and foreshadowing its policy decision, Alternative C describes the near-term risks to the economic outlook as appearing “balanced.”
  - Alternative A, in contrast, merely drops the previous assertion that “near-term risks to the economic outlook have diminished,” thereby suggesting there has been no change in the Committee’s assessment of risks since July.
- Turning to the policy decision, Alternatives A and B maintain the current target range for the federal funds rate but offer very different signals about the Committee’s likely next steps; Alternative C raises the target range.
  - While noting that “the case for an increase in the federal funds rate has strengthened,” Alternative B adds that the Committee “decided, for the time being, to wait for further evidence of continued progress toward its objectives.” With these words, Alternative B acknowledges past progress in labor market conditions and inflation, indicates that the Committee is adopting a wait-and-see posture, but signals that, if the economy evolves about as expected, it may not take long for the Committee to see sufficient evidence to warrant raising rates.
  - Alternative C raises the target range by 25 basis points; it notes that, even after that increase, monetary policy remains accommodative and thus will support further (or “some further”) strengthening in labor market conditions and inflation returning to 2 percent, consistent with the economic outlook summarized in paragraph 2 of the statement.

- Alternative A communicates a judgment that the outlook and associated risks warrant deferring an increase in the target range “until inflation moves closer to 2 percent on a sustained basis.” If the staff’s forecast proves correct, the inflation condition will not be met in short order.

## JULY 2016 FOMC STATEMENT

1. Information received since the Federal Open Market Committee met in June indicates that the labor market strengthened and that economic activity has been expanding at a moderate rate. Job gains were strong in June following weak growth in May. On balance, payrolls and other labor market indicators point to some increase in labor utilization in recent months. Household spending has been growing strongly but business fixed investment has been soft. 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. Market-based measures of inflation compensation remain low; most 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 strengthen. Inflation is expected to remain low in the near term, in part because of earlier declines in energy prices, but to rise to 2 percent over the medium term as the transitory effects of past declines in energy and import prices dissipate and the labor market strengthens further. Near-term risks to the economic outlook have diminished. The Committee continues to closely monitor inflation indicators and global economic and financial developments.
3. Against this backdrop, 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.

**SEPTEMBER 2016 ALTERNATIVE A**

1. Information received since the Federal Open Market Committee met in June ~~July~~ indicates that the labor market strengthened **has continued to strengthen** and that **growth of** economic activity ~~has been expanding at a moderate rate~~ **has picked up from the modest pace seen in the first half of this year**. Job gains ~~were strong in June following weak growth in May.~~ On balance, payrolls and **have been solid in recent months, on average, but** other labor market indicators, **including the unemployment rate,** point to ~~some increase~~ **little change** in labor utilization ~~in recent months~~. Household spending has been growing strongly but business fixed investment has ~~been~~ **remained** soft. Inflation has continued to run below the Committee's 2 percent longer-run objective, **only** partly reflecting earlier declines in energy prices and in prices of non-energy imports. Market-based measures of inflation compensation remain low; most 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~~ **appropriate** stance of monetary policy, economic activity will expand at a moderate pace and labor market indicators **conditions** will strengthen **further**. Inflation is expected to remain low in the near term, in part because of earlier declines in energy prices, but to rise **gradually** to 2 percent over the medium term as the transitory effects of past declines in energy and import prices dissipate and the labor market strengthens further. ~~Near-term risks to the economic outlook have diminished.~~ The Committee continues to closely monitor inflation indicators and global economic and financial developments.
3. 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. **The Committee judges that an increase in the target range will not be warranted until inflation moves closer to 2 percent on a sustained basis.**
4. In determining ~~the timing and size of future~~ **when** adjustments to the target range for the federal funds rate **might become appropriate**, the Committee will assess realized and expected economic conditions relative to its objectives of maximum employment and 2 percent inflation, **along with risks to the economic outlook**. 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 **ing**, 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.

**SEPTEMBER 2016 ALTERNATIVE B**

1. Information received since the Federal Open Market Committee met in June ~~July~~ indicates that the labor market ~~strengthened~~ **has continued to strengthen** and that **growth of** economic activity ~~has been expanding at a moderate rate~~ **has picked up from the modest pace seen in the first half of this year.** **Although the unemployment rate is little changed in recent months,** job gains ~~were strong in June following weak growth in May~~ **have been solid, on average.** On balance, payrolls and other labor market indicators ~~point to some increase in labor utilization in recent months.~~ Household spending has been growing strongly but business fixed investment has ~~been~~ **remained** soft. 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. Market-based measures of inflation compensation remain low; most 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 **conditions** will strengthen **somewhat further.** Inflation is expected to remain low in the near term, in part because of earlier declines in energy prices, but to rise to 2 percent over the medium term as the transitory effects of past declines in energy and import prices dissipate and the labor market strengthens further. Near-term risks to the economic outlook ~~have diminished~~ **appear roughly balanced.** The Committee continues to closely monitor inflation indicators and global economic and financial developments.
3. Against this backdrop, the Committee decided to maintain the target range for the federal funds rate at  $\frac{1}{4}$  to  $\frac{1}{2}$  percent. **The Committee judges that the case for an increase in the federal funds rate has strengthened but decided, for the time being, to wait for further evidence of continued progress toward its objectives.** 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.

**SEPTEMBER 2016 ALTERNATIVE C**

1. Information received since the Federal Open Market Committee met in June **July** indicates that the labor market ~~strengthened~~ **has continued to strengthen** and that **growth of** economic activity ~~has been expanding at a moderate rate~~ **has picked up from the modest pace seen in the first half of this year**. **Although the unemployment rate is little changed in recent months**, job gains ~~were strong in June following weak growth in May~~ **have been solid, on average**. On balance, payrolls and other labor market indicators ~~point to some increase in labor utilization in recent months~~. Household spending has been growing strongly but business fixed investment has been **remained** soft. 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. Market-based measures of inflation compensation remain low; most 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 **conditions** will strengthen **somewhat further**. Inflation is expected to remain low in the near term, in part because of earlier declines in energy prices, but to rise to 2 percent over the medium term as the transitory effects of past declines in energy and import prices dissipate and the labor market strengthens further. Near-term risks to the economic outlook ~~have diminished~~ **appear balanced**. The Committee continues to closely monitor inflation indicators and global economic and financial developments.
3. ~~Against this backdrop~~ **In view of realized and projected progress toward maximum employment and 2 percent inflation**, the Committee decided to ~~maintain~~ **raise** 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 **after this increase**, thereby supporting **[ some ]** further improvement **strengthening** 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, **along with risks to the outlook**. 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

Policymakers may view the information they have received so far about the labor market and real activity as consistent, on balance, with earlier expectations for stronger output growth and continued improvement in labor markets. They might also conclude that developments with regard to inflation have proceeded about as expected. While these developments may have strengthened the case for raising the target range for the federal funds rate, policymakers may prefer to wait for additional evidence supporting their expectations of continued progress in labor markets and inflation returning to 2 percent before committing to the next rate rise. Moreover, policymakers may judge that not much additional evidence may be needed to warrant a rate hike and might wish to indicate so in the statement.

### Economic Conditions and Outlook

- The solid average gain in payroll employment over recent months has exceeded most estimates of longer-run labor force growth, indicating further increases in labor utilization.<sup>1</sup> However, since the beginning of the year, the unemployment rate has, on net, remained unchanged at 4.9 percent, suggesting little increase in resource utilization (an impression supported also by other labor market indicators, such as the share of employees working part-time for economic reasons, and the long-term unemployment share).
- While recent data on inventories, business fixed investment, and residential construction continued to show weakness, generally strong readings on consumer spending have led the staff to mark up its outlook for 2016:H2 real GDP growth to about 2.6 percent.
- Policymakers may judge that, in light of incoming data that largely confirm their earlier outlook, downside risks, including those from abroad, have diminished further since July, and may see near-term risks to the U.S. economic outlook as roughly balanced.
- Twelve-month core and headline inflation stepped up at the beginning of the year but have not increased since, and headline inflation continues to run below the Committee's 2 percent objective. Policymakers may have expected inflation to return

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<sup>1</sup> See, for example, the discussion provided by the box “The Neutral Pace of Payroll Employment Gains” shown in Tealbook A.

only slowly to 2 percent all along, as in the staff forecast. But historically low levels of longer-term inflation compensation and survey measures of longer-run inflation expectations might still be tempering policymakers' confidence in this outlook.

## Policy Strategy

- Policymakers may judge it prudent to wait for more evidence that domestic demand will continue to grow at a moderate pace and that the labor market will strengthen somewhat further before taking their next step in adjusting the stance of monetary policy.
  - While job gains have rebounded since May, the unemployment rate and several other measures of resource utilization have changed little since the beginning of the year. Waiting somewhat longer before raising the federal funds rate could allow the Committee to better assess underlying trends in employment, productivity, and inflation.
  - In light of mostly favorable economic and financial developments in recent months, policymakers may be leaning toward removing some policy accommodation. However, the combination of slow-to-moderate output growth, little changed labor utilization, and persistently low wage and price inflation since the start of the year—while policy rates have remained low—may have tempered somewhat policymakers' confidence in their estimates of the amount of accommodation provided by current policy settings. As a result, policymakers may judge it appropriate to take a wait-and-see posture.
  - In addition, policymakers may prefer to postpone a rate hike, for the time being, in light of risk management considerations related to the proximity of nominal rates to the effective lower bound, which limits the ability of monetary policy to respond to negative shocks.
- A decision to maintain the current target range for the federal funds rate would be in line with the expectations of financial market participants.
  - The probability of an increase in the federal funds rate target range at the September meeting derived from federal funds futures quotes is approximately 15 percent. Similarly, respondents to the Desk's latest Survey of Primary Dealers and Survey of Market Participants perceive only a modest probability that the Committee will alter the target range at this meeting.

- The Desk’s surveys suggest that market participants will not be surprised by the changes in paragraph 1 of Alternative B. In contrast, few respondents expect the Committee to upgrade its assessment of risks to the outlook, suggesting that many market participants may be surprised by the sentence indicating that near-term risks to the economic outlook “appear roughly balanced” in paragraph 2 of Alternative B.
- The majority of respondents to both surveys see the December meeting as the most likely timing of the next increase in the target range for the federal funds rate, and the new language in paragraph 3 of Alternative B could reinforce such expectations. While the new language may still surprise market participants to some extent, at least several survey respondents expected the Chair to reiterate at her press conference earlier remarks (made at the Jackson Hole conference in August) that “the case for an increase in the federal funds rate has strengthened.”
- Of course, the market reaction to alternative B could also be influenced by the economic and policy outlook reported in the Committee’s Summary of Economic Projections (SEP) that will also be released at the conclusion of this meeting. Respondents to the Desk’s surveys generally expect the median of FOMC participants’ federal funds rate projections in the SEP for year-end 2016 to reflect just one rate hike this year, down from two hikes in the June SEP; they continue to expect an implied pace of tightening of three hikes per year for 2017 and 2018.

## THE CASE FOR ALTERNATIVE C

Based on continued readings of the unemployment rate at a level within the central tendency of the Committee’s long-run projections of this measure (as published in the June 2016 SEP), policymakers may see the real economy as operating near levels consistent with its longer-run capacity and close to maximum sustainable employment. Moreover, with core PCE inflation averaging above 1.5 percent and trimmed mean PCE inflation near 2 percent, policymakers may judge that inflation is not so low as to warrant concern—particularly if they expect inflation to rise as output growth and resource utilization pick up in the second half of the year. Furthermore, policymakers may see financial stability risks arising from excessive risk taking behavior in a low interest rate environment. Accordingly, policymakers may judge that an increase in the target range for the federal funds rate is called for at this meeting.



## Economic Conditions and Outlook

- Policymakers might view the solid average pace of job growth coupled with the strong increase in consumer spending in recent months as confirmation that both the slowdown in employment growth in May and the modest output growth in the first half of the year were transitory.
- Gains in real disposable income have been solid—reflecting both rising employment and the earlier period of very low headline inflation—and household balance sheets have improved further. Policymakers may see economic conditions as favorable for solid consumption growth going forward.
- Policymakers might see the average pace of job gains in recent months, though less rapid than last year and early this year, as nonetheless faster than their projections of trend growth in the labor force.
- Policymakers may project that aggregate demand will grow more rapidly than the economy’s potential output, absent further increases in the target range for the federal funds rate in the near term, and they may view resource utilization as already tight.
  - Policymakers might anticipate that further tightening of labor market conditions, combined with mediocre productivity growth, will put increasing upward pressure on wages and on prices of goods and services—possibly going beyond what is captured by the “Temporarily Weaker Productivity” scenario described in the “Risks and Uncertainty” section of Tealbook A—unless policy accommodation was removed soon.
  - Moreover, with oil prices apparently having stabilized in a fairly narrow range, policymakers may conclude that the restraint on inflation from transitory factors is already subsiding.
- Policymakers might see the news received since the last meeting as consistent with describing the near-term risks to the outlook as “balanced,” rather than “roughly balanced” (as in Alternative B). In addition to the incoming data on employment and spending, they may view developments in financial markets, which seem more favorable than in the first half of the year, as supporting their new assessment of the balance of risks.

## Policy Strategy

- Policymakers may judge that current conditions and the outlook warrant an increase in the target range for the federal funds rate of 25 basis points at this meeting.
  - Policymakers may see a higher chance of growth picking up much more forcefully than anticipated, for example, under the staff’s baseline forecast, calling for much quicker increases in the federal funds rate in the future that could eventually contribute to another recession. Accordingly, policymakers may deem a tightening of the stance of monetary policy at this meeting as appropriate to reduce the risk that an undesirably rapid pace of increases will become necessary in the future.
  - Policymakers might worry that not raising the target range for the federal funds rate at this meeting could lead the public to question the credibility of the Committee’s earlier communications. In particular, if the Committee indicates that incoming data have roughly been in line with its projections for the labor market and inflation, the public may see the decision to further delay an increase in the policy rate as inconsistent with earlier communications.
  - Policymakers may be concerned that leaving policy rates unchanged in the face of an unemployment rate that is at or below estimates of its longer-run normal level would foster expectations that monetary policy will be insufficiently responsive to evolving economic conditions. If the public were to begin doubting policymakers’ commitment to maintaining low and stable inflation, longer-term inflation expectations could rise too much.
  - In addition, policymakers might be worried that maintaining the federal funds rate at its current low level will induce further “reach for yield” and other excessive risk-taking behavior in financial markets. For example, they may point to elevated valuations in commercial real estate as indicative of rising risks to financial stability that should be countered by reduced monetary policy accommodation.
  - Policymakers may note that, even after a 25 basis point increase, the stance of monetary policy remains accommodative. Consistent with such an assessment, the real federal funds rate would still lie well below the prescriptions from most simple policy rules and optimal control exercises shown in the “Monetary Policy Strategies” section of Tealbook B.

- Policymakers may see little difference in the direct effects on the economy between raising the federal funds rate now rather than later. However, they might point to good momentum in incoming data as supporting raising rates now rather than later, when fresh but noisy readings on incoming data or some transitory financial turbulence may complicate the communication of an otherwise appropriate rate increase.
- Respondents to the Desk's latest surveys perceive there to be a roughly 15 percent probability that the Committee will change the target range at this meeting, and so a decision to increase the target range would be very surprising.
  - If market participants infer that the Committee intends to pursue a less accommodative stance of policy going forward than they had expected, for any given outlook, then it is likely that medium- and longer-term real interest rates will rise, that equity prices and inflation compensation will decline, and that the dollar will appreciate.
  - Nonetheless, if investors see a statement like Alternative C as primarily reflecting an upbeat assessment of the strength of the U.S. expansion—supported by a continuation of only gradual increases in the federal funds rate—then equity prices and inflation compensation might fall less than otherwise, or even rise.

## THE CASE FOR ALTERNATIVE A

While economic growth appears to have picked up from its modest pace in the first half of the year, and job growth has rebounded since May, policymakers may be concerned that their stated expectation of moderate growth could again prove overly optimistic. In addition, they might be worried that this year's small uptick in core inflation will prove transitory. In light of such concerns, policymakers may judge it appropriate to signal that any further removal of policy accommodation is off until a more sustained increase in inflation has been observed.

### Economic Conditions and Outlook

- Both headline and core inflation continue to run noticeably below the Committee's 2 percent objective and market-based measures of inflation compensation are at or near historical lows. In particular, policymakers might worry that the failure of inflation to rise to 2 percent over the past several years has become ingrained in longer-term

inflation expectations and that the persistent weakness in inflation compensation measures suggests that the inflation expectations relevant for wage and price setting have declined.

- Though payroll growth over recent months allayed some concerns raised by the disappointing numbers for May, the average pace of payroll growth has stepped down markedly since the beginning of the year. In addition, the unemployment rate, the share of employees working part-time for economic reasons, and the long-term unemployment share have changed little over the past three quarters.
- Moreover, continued weakness in inventories and business fixed investment suggests that firms may not expect aggregate demand to grow as much as policymakers have been projecting.
- Policymakers may judge that the risks to the economic outlook are still tilted to the downside.
  - So far, the Brexit vote has resulted in minimal disruptions to global financial markets. Nevertheless, the outcome of the vote could ultimately lead to renewed financial stress in Europe and beyond because of contentious future Brexit negotiations, the possibility of other EU breakaway movements, or increased market scrutiny of the vulnerabilities in the European banking system.
  - Furthermore, policymakers might see the volatility in financial markets during the past week as an indication that markets remain fragile.
  - Policymakers might also point to downside risk associated with persistently low readings on realized inflation and measures of longer-run inflation expectations. Indeed, policymakers may view developments as outlined, for example, in the alternative scenarios “Weak Business Investment” in the “Risks and Uncertainty” section of Tealbook A as increasingly likely.

## Policy Strategy

- Policymakers may believe that risk management considerations call for signaling that any further removal of policy accommodation is some time off.
  - Policymakers might observe that, given the proximity to the effective lower bound, the scope for conventional policy measures to support the economy would be limited in the event that adverse shocks were to hit the economy.

Moreover, unconventional monetary policies provide imperfect substitutes for conventional policy.

- Policymakers might judge that the neutral rate of interest is low, relative to its longer-run level, due to restraint on U.S. economic activity from economic and financial developments abroad, subdued household formation, or meager productivity growth. They may see the neutral rate as likely to remain low for quite some time, thus exacerbating the risk that conventional policy could be constrained going forward.
- Some policymakers might argue that the chronic failure of policy to raise inflation to 2 percent is eroding the credibility of the FOMC's commitment to achieving that objective and calling into question its statement that positive and negative deviations from this objective are treated symmetrically.
- Policymakers may believe that the natural rate of unemployment is lower than the current unemployment rate. Alternatively, they may see virtues in allowing the unemployment rate to undershoot temporarily its natural rate as a way of repairing the damage to the labor market that resulted from the prolonged period of weak labor demand following the financial crisis. Accordingly, they may see increases in the federal funds rate, at least over the near-term, as counterproductive for achieving the Committee's statutory goals.
- Most respondents to the Desk's latest surveys expect the Committee to continue to emphasize the gradual nature of its normalization approach, but a large majority of respondents expects the FOMC to raise rates this year. A postmeeting statement like Alternative A would therefore be surprising to financial market participants.
  - Investors would likely push further into the future the expected date of the next rate increase, and the expected path for the federal funds rate would likely flatten further and longer-term yields would likely decline.
  - If the statement is primarily seen as more accommodative, equity prices and inflation compensation would likely rise, and the dollar would depreciate.
  - Conversely, if investors interpret the statement as reflecting an unexpectedly downbeat assessment of global economic conditions and greater-than-anticipated concerns about the downside risks to the outlook, equity prices and inflation compensation could fall.

## IMPLEMENTATION NOTE

If the Committee decides to maintain the current target range for the federal funds rate, 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, an implementation note that communicates the changes the Federal Reserve decided to make to these three policy tools would be issued.

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

## Implementation Note if the Committee maintains the current target range

Release Date: ~~July 27~~ **September 21**, 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 ~~July 27~~ **September 21**, 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 ~~July 28~~ **September 22**, 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  $\frac{1}{4}$  to  $\frac{1}{2}$  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.

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 if the Committee raises the target range to $\frac{1}{2}$ to $\frac{3}{4}$ percent

Release Date: ~~July 27~~ **September 21**, 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 ~~July 27~~ **September 21**, 2016:

- The Board of Governors of the Federal Reserve System ~~left unchanged~~ **voted [ unanimously ] to raise** the interest rate paid on required and excess reserve balances ~~at 0.50~~ **to 0.75** percent, **effective September 22, 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 ~~July 28~~ **September 22**, 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  ~~$\frac{1}{4}$  to  $\frac{1}{2}$~~  **to  $\frac{3}{4}$**  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.

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~~ **voted [ unanimously ] to approve a  $\frac{1}{4}$  percentage point increase in** the discount rate (the primary credit rate) ~~, which remains at 1.00~~ **to 1.25** percent, **effective September 22, 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.

## Projections

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### BALANCE SHEET AND INCOME

The staff has prepared projections of the Federal Reserve's balance sheet, and of key elements of the associated income statement, under two scenarios for the paths of monetary policy and longer-term interest rates.

- The “September Tealbook baseline” scenario is consistent with the monetary policy assumptions incorporated in the staff's baseline forecast presented in Tealbook A. In this scenario, the federal funds rate path is projected to rise to about 3½ percent by the end of 2020, with a corresponding increase in longer-term interest rates.
- The “Greenspan conundrum” scenario incorporates a flat path for longer-term interest rates in the near term, as assumed in the scenario of the same name in the Risks and Uncertainty section of Tealbook A.<sup>1</sup> Under this scenario, longer-term interest rates remain fixed at their levels as of the third quarter of 2016 over the next six quarters despite the projected rise in the policy rate as prescribed by the inertial Taylor (1999) rule. Thereafter, the conundrum slowly unwinds. In the meantime, lower longer-term rates spur a faster pace of economic expansion and, consequently, a steeper path for the policy rate relative to the baseline scenario.

The key policy assumptions associated with these scenarios are highlighted below.

- **Reinvestment policy:** We continue to assume that the FOMC will cease reinvestments of maturing Treasury securities and agency debt as well as principal received on agency MBS when the target range for the federal funds rate reaches 1¼ and 1½ percent, which occurs in the third quarter of 2017 under both scenarios. Once reinvestments cease, the SOMA portfolio shrinks through redemptions of maturing Treasury and agency debt securities as well as paydowns of principal on agency MBS until reserve balances reach a level of \$100 billion.
- **Use of policy normalization tools:** The scenarios assume that take-up of overnight reverse repurchase agreements (RRPs) runs at a level of \$100 billion through the end

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<sup>1</sup> The alternative view box titled “A Return to the Greenspan Conundrum” in the DEDO section of Tealbook A details possible mechanisms behind this phenomenon.

of 2018 before declining to zero by the end of 2019, and that term deposits and term RRP are not used.<sup>2</sup>

Other features of these scenarios are described below.

- **Balance sheet.** Under the baseline scenario, the size of the portfolio is normalized in the fourth quarter of 2021, unchanged from the July Tealbook (see the solid black lines in the exhibit titled “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 roughly \$2.4 trillion, with about \$2.3 trillion in total SOMA securities holdings. Total assets and SOMA Treasury holdings rise thereafter, keeping pace with the increases in both Federal Reserve notes in circulation and Federal Reserve Bank capital.

Under the conundrum scenario, relatively lower interest rates on longer-dated Treasury securities through the medium term put downward pressure on mortgage rates, causing the trajectory of MBS prepayments to be higher during this period. Therefore, after reinvestments cease, SOMA holdings of agency MBS are projected to be lower than in the baseline scenario. As a result, the size of the portfolio is normalized in the third quarter of 2021, one quarter earlier than in the baseline scenario.<sup>4</sup>

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<sup>2</sup> Use of term RRPs 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 RRPs or term deposits—but would not produce a change in the overall size of the balance sheet. We assume that RRPs associated with foreign official and international accounts remain near their August 31, 2016 level of \$251 billion throughout the projection period.

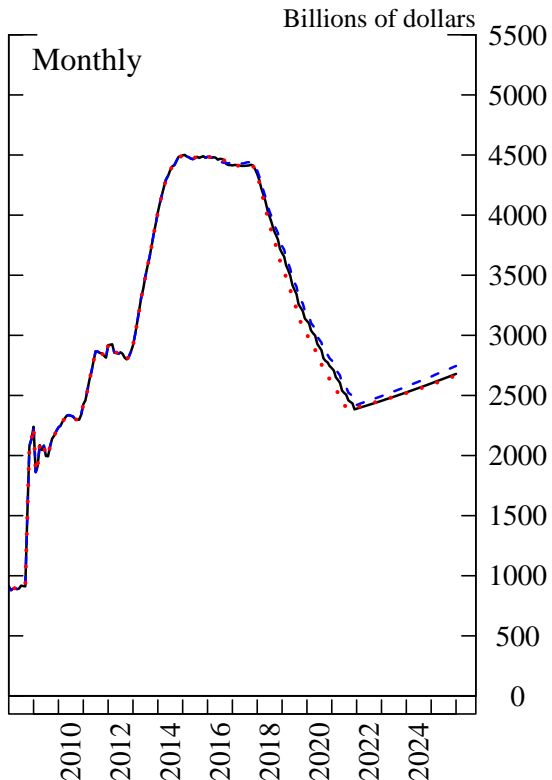
<sup>3</sup> The size of the balance sheet is assumed to be normalized when the securities portfolio reverts to the level consistent with its longer-run trend; this trend is determined largely by currency in circulation and a projected long-run level of reserve balances. The projected timing of the normalization 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, policymakers’ choice of a long-run operating framework, as well as ongoing regulatory and structural changes, could result in a higher long-run level of reserve balances. In turn, a higher long-run level of reserve balances would, all else equal, imply an earlier normalization of the size of the balance sheet. For instance, with a \$500 billion long-run level of reserve balances, the balance sheet would likely normalize at the beginning of 2021, roughly three quarters earlier than in the baseline scenario.

<sup>4</sup> The lower level of MBS in the conundrum scenario implies a need to resume purchases of Treasury securities somewhat sooner than in the baseline scenario in order to accommodate rising currency demand. Consequently, at the end of the projection period, the share of Treasury holdings relative to MBS is larger in the conundrum scenario than in the baseline.

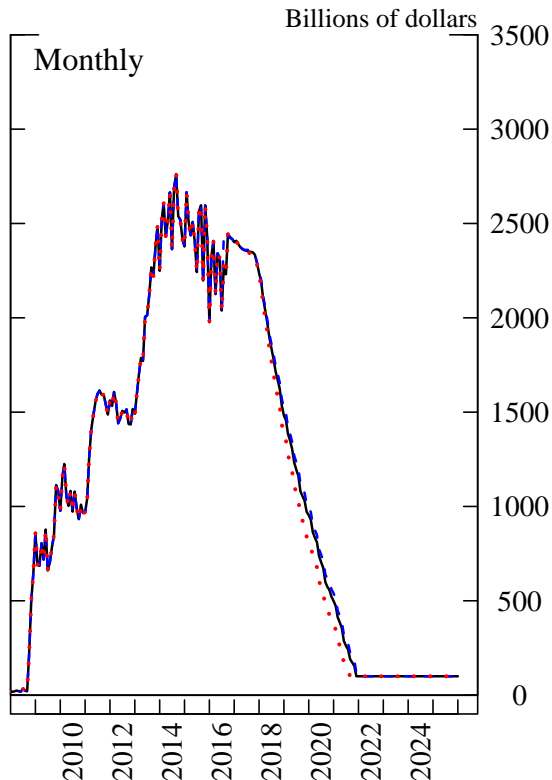
### Total Assets and Selected Balance Sheet Items

— September Tealbook baseline    ··· Greenspan Conundrum  
- - - July Tealbook

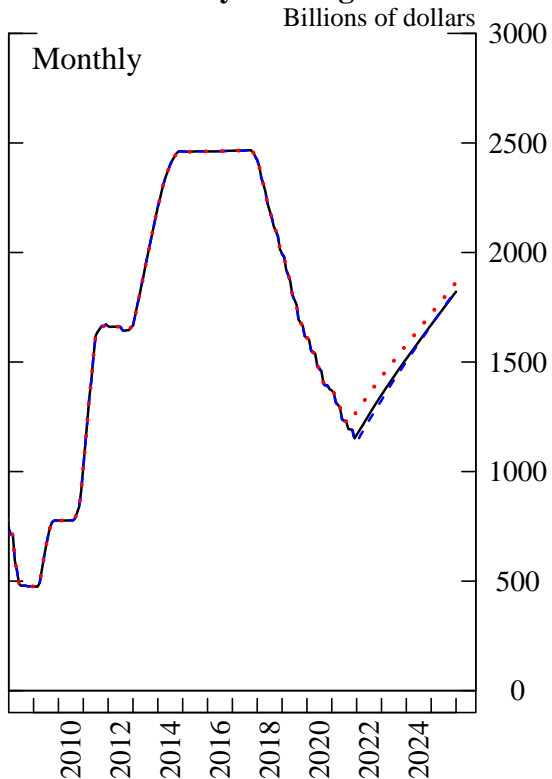
#### Total Assets



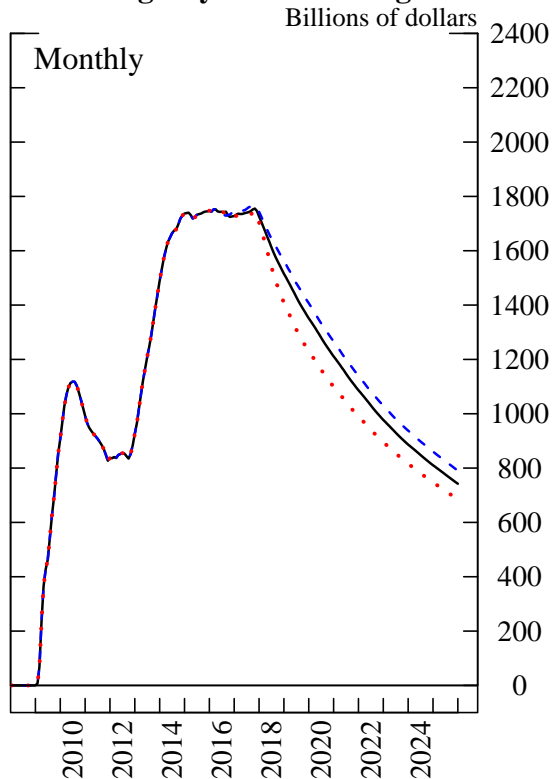
#### Reserve Balances



#### SOMA Treasury Holdings



#### SOMA Agency MBS Holdings



Projections

**Federal Reserve Balance Sheet**  
**End-of-Year Projections -- September Tealbook Baseline**  
 (Billions of dollars)

	Aug 31, 2016	2017	2019	2021	2023	2025
Total assets	4,458	4,342	3,120	2,390	2,525	2,679
Selected assets						
Loans and other credit extensions*	3	0	0	0	0	0
Securities held outright	4,230	4,153	2,964	2,256	2,404	2,566
U.S. Treasury securities	2,464	2,422	1,611	1,167	1,515	1,821
Agency debt securities	22	4	2	2	2	2
Agency mortgage-backed securities	1,744	1,726	1,351	1,086	887	742
Unamortized premiums	178	154	118	93	79	70
Unamortized discounts	-16	-14	-11	-9	-7	-7
Total other assets	41	42	42	42	42	42
Total liabilities	4,418	4,300	3,075	2,340	2,471	2,620
Selected liabilities						
Federal Reserve notes in circulation	1,423	1,550	1,708	1,828	1,959	2,108
Reverse repurchase agreements	423	351	251	251	251	251
Deposits with Federal Reserve Banks	2,565	2,393	1,109	255	255	255
Reserve balances held by depository institutions	2,231	2,237	954	100	100	100
U.S. Treasury, General Account	289	150	150	150	150	150
Other deposits	46	5	5	5	5	5
Earnings remittances due to the U.S. Treasury	1	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 -- Greenspan Conundrum**  
(Billions of dollars)

	Aug 31, 2016	2017	2019	2021	2023	2025
Total assets	4,458	4,327	3,001	2,402	2,520	2,667
Selected assets						
Loans and other credit extensions*	3	0	0	0	0	0
Securities held outright	4,230	4,132	2,843	2,266	2,396	2,551
U.S. Treasury securities	2,464	2,422	1,611	1,274	1,578	1,864
Agency debt securities	22	4	2	2	2	2
Agency mortgage-backed securities	1,744	1,705	1,230	990	816	685
Unamortized premiums	178	160	119	94	81	72
Unamortized discounts	-16	-13	-10	-8	-7	-6
Total other assets	41	42	42	42	42	42
Total liabilities	4,418	4,286	2,956	2,352	2,466	2,608
Selected liabilities						
Federal Reserve notes in circulation	1,423	1,550	1,722	1,840	1,954	2,096
Reverse repurchase agreements	423	351	251	251	251	251
Deposits with Federal Reserve Banks	2,565	2,378	976	255	255	255
Reserve balances held by depository institutions	2,231	2,223	821	100	100	100
U.S. Treasury, General Account	289	150	150	150	150	150
Other deposits	46	5	5	5	5	5
Earnings remittances due to the U.S. Treasury	1	0	0	0	0	0
Total capital**	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.

- ***Federal Reserve earnings remittances.*** Under the baseline scenario, annual remittances are projected to decline from \$98 billion in 2015 to about \$93 billion this year (see the solid black lines in the “Income Projections” exhibit).<sup>5</sup> The step-down primarily reflects increased interest expense on reserves resulting from the decision to increase the target range for the federal funds rate, and thus the IOER rate, in December 2015.<sup>6</sup> Annual remittances are projected to continue to decline, reaching a low of roughly \$35 billion in 2019, with no deferred asset being recorded.<sup>7</sup> Under the baseline scenario, the Federal Reserve’s projected remittances from 2009 through 2025 total about \$1.1 trillion.

Under the conundrum scenario, cumulative remittances over the 2009 to 2025 period are projected to be about \$58 billion lower than in the baseline projection, reflecting the combination of lower interest income and higher interest expense throughout the projection period (see the dotted red line in the “Income Projections” exhibit).

Regarding interest income, the higher path for MBS prepayments results in lower MBS coupon income, especially in the medium term. Regarding interest expense, flat longer-term rates in the near term lead to a more rapid increase in the pace of economic expansion and, in turn, to a steeper path for the policy target and for the IOER rate, which translates into higher interest expense.<sup>8</sup>

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<sup>5</sup> Earnings remittances for 2015 exclude a one-time transfer of \$19 billion in Federal Reserve surplus associated with the FAST Act.

<sup>6</sup> We assume that the interest rate paid on excess reserve balances will average 12.5 basis points above the effective federal funds rate and the ON RRP rate will average 12.5 basis points below the effective federal funds rate. The effective federal funds rate has averaged 40 basis points over the intermeeting period.

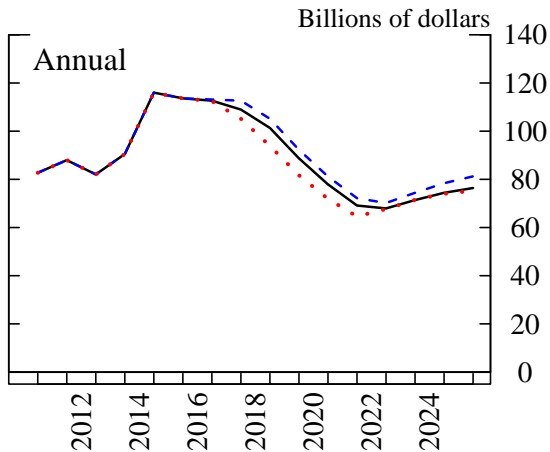
<sup>7</sup> In the event that a Federal Reserve Bank’s earnings fall short of the amount necessary to cover its operating costs and pay dividends, a deferred asset would be recorded as a claim against future earnings remittances due to the U.S. Treasury.

<sup>8</sup> This feature arises even as reserve balances are somewhat lower than in the baseline scenario until the balance sheet is normalized.

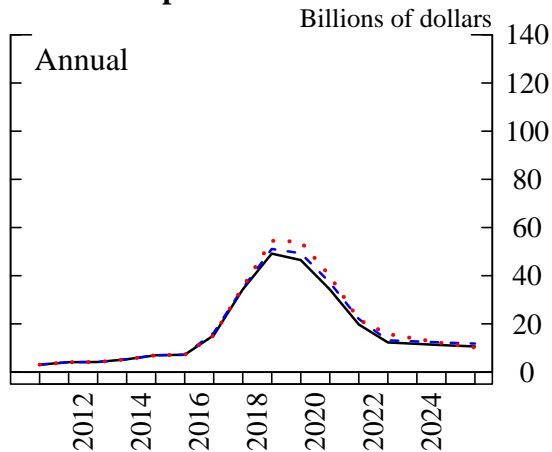
### Income Projections

— September Tealbook baseline    ··· Greenspan Conundrum  
 - - - July Tealbook

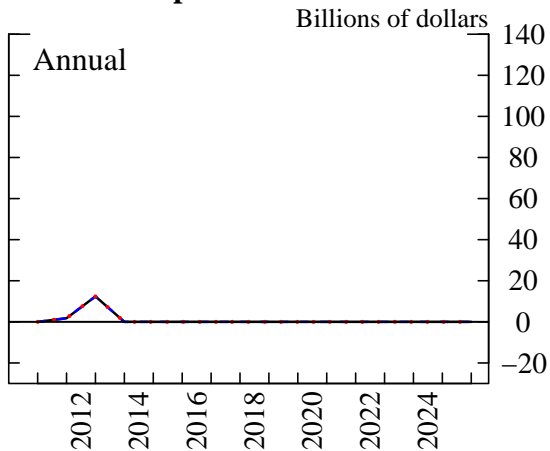
**Interest Income**



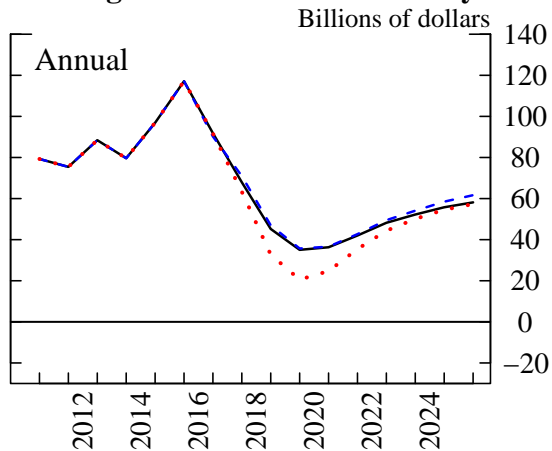
**Interest Expense**



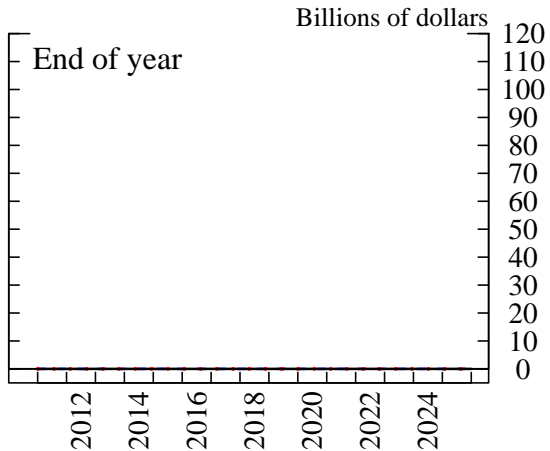
**Realized Capital Gains**



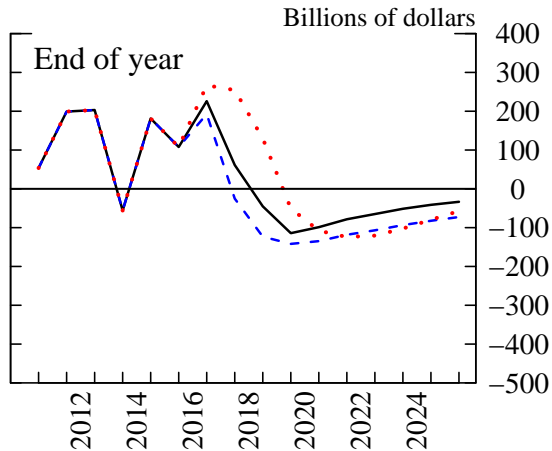
**Earnings Remittances to Treasury**



**Deferred Asset**



**Memo: Unrealized Gains/Losses**



Projections



- **Unrealized gains or losses.** The staff estimates that the SOMA portfolio was in a net unrealized gain position of \$265 billion at the end of August.<sup>9</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 rise in longer-term interest rates assumed over the next several years, the portfolio is projected to shift to an unrealized loss position in the second quarter of 2018. The portfolio is expected to record a peak unrealized loss of approximately \$118 billion in 2019. About \$28 billion of that peak unrealized loss is attributable to losses on holdings of Treasury securities and \$90 billion to losses on holdings of agency MBS. The unrealized loss position contracts from 2020 through 2025, as the value of Treasury and agency debt securities previously acquired under the large-scale asset purchase programs return to par as they approach maturity and new securities are added to the portfolio at prevailing market yields.

Under the conundrum scenario, the portfolio is projected to shift to a position of unrealized loss about one year later than in the baseline scenario, as the assumed six-quarter period of unchanged longer-term interest rates leads to higher valuations for SOMA Treasury and MBS holdings. The mark-to-market value of the portfolio decreases at a steeper pace than in the baseline scenario in the medium term, and records a peak unrealized loss of about \$127 billion in 2022 before trending toward the baseline scenario by the end of 2025.

- **Term premium effects.** As shown in the table “Projections for the 10-Year Treasury Term Premium Effect,” the Federal Reserve’s elevated holdings of longer-term securities is estimated to be reducing the term premium embedded in the 10-year Treasury yield by 91 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, in large part reflecting the projected gradual shrinking of the portfolio.

Under the conundrum scenario, the term premium effect is roughly 5 basis points less negative than under the baseline scenario for the next couple of years, reflecting marginally lower SOMA holdings of agency MBS.

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<sup>9</sup> The Federal Reserve reports 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).

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

Date	September Tealbook baseline	July Tealbook	Greenspan Conundrum
Quarterly Averages			
2016:Q3	-91	-94	-86
Q4	-87	-90	-82
2017:Q4	-71	-73	-65
2018:Q4	-57	-59	-52
2019:Q4	-46	-47	-42
2020:Q4	-37	-39	-34
2021:Q4	-31	-32	-29
2022:Q4	-26	-26	-24
2023:Q4	-21	-21	-20
2024:Q4	-16	-16	-15
2025:Q4	-12	-12	-11

Projections

- **SOMA characteristics.** Regarding the size of the portfolio, under both the baseline and the conundrum scenarios, approximately \$216 billion in SOMA Treasury holdings have already matured or will mature this year, and a total of \$1.5 trillion will mature between 2016 and 2020 (for the baseline scenario, see the top panel of the exhibit “Projections for the Characteristics of SOMA Holdings”).<sup>10</sup> The amounts of Treasury securities maturing each month will vary considerably over time, while projected MBS paydowns are much less variable. However, realized MBS paydowns will reflect the evolution of interest rates and other factors and thus could be significantly more volatile than projected.<sup>11</sup>

The weighted-average duration of the SOMA Treasury portfolio is currently about 6½ years (see the bottom panel of the exhibit). Under the two scenarios, the weighted-average duration is projected to decline through 2017, reflecting the aging of the portfolio, and subsequently to rise until mid- to late 2021, when the size of the balance sheet is normalized.<sup>12</sup> After reaching its peak, duration is projected to resume its decline as the Desk conducts open market purchases of Treasury securities to keep pace with the increase in currency. 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 SOMA holds no Treasury bills). Thereafter, purchases of Treasury securities are assumed to be spread across the maturity spectrum.<sup>13</sup>

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<sup>10</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 face value of holdings maturing on the issue date of newly issued securities. 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 by Treasury as add-ons to announced auction sizes.

<sup>11</sup> Over the intermeeting period, the Desk reinvested \$21 billion of maturing Treasury securities and is expected to purchase a total of \$65 billion of 15- and 30-year agency MBS under the reinvestment program. Additionally, on August 16, the Desk conducted a small-value buyback operation on behalf of the U.S. Treasury to ensure operational readiness of its buyback infrastructure.

<sup>12</sup> The duration of the SOMA Treasury portfolio initially declines 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 of the remaining portfolio, the duration increases until the size of the balance sheet is normalized.

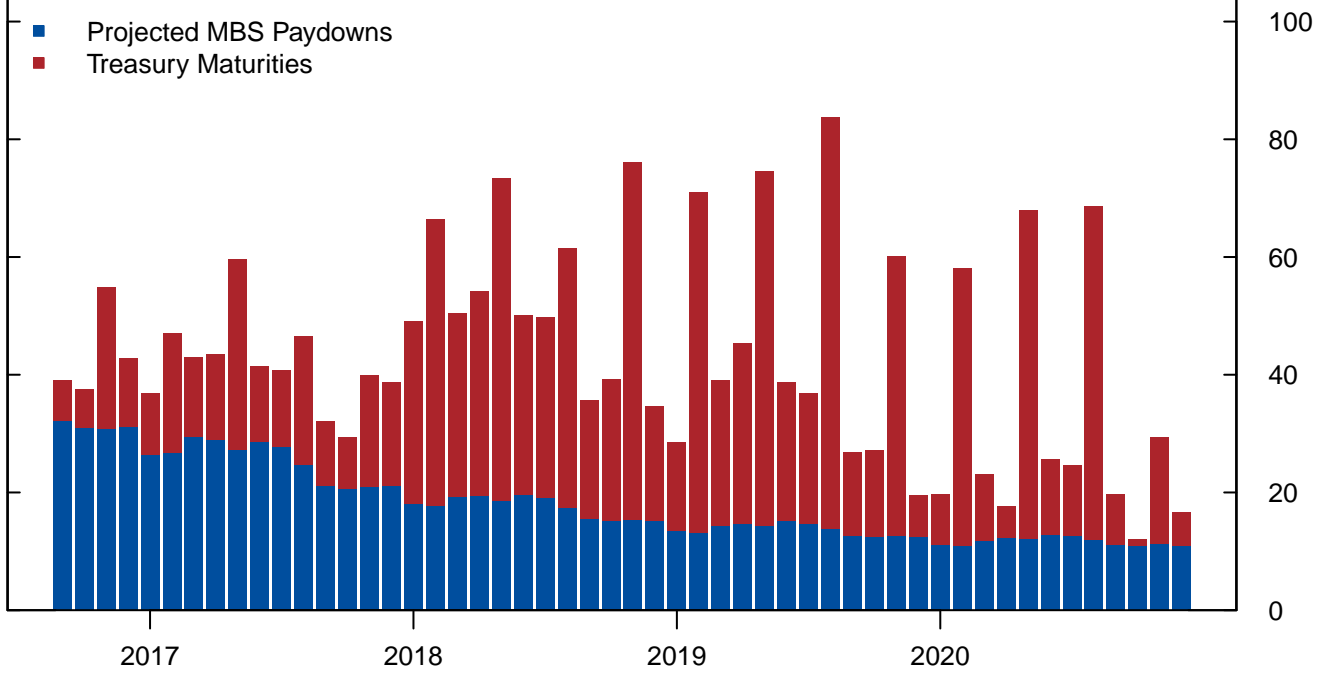
<sup>13</sup> We assume zero purchases of agency MBS after reinvestments cease.

### Projections for the Characteristics of SOMA Holdings

#### Projected Receipts of Principal on SOMA Securities

September Tealbook baseline

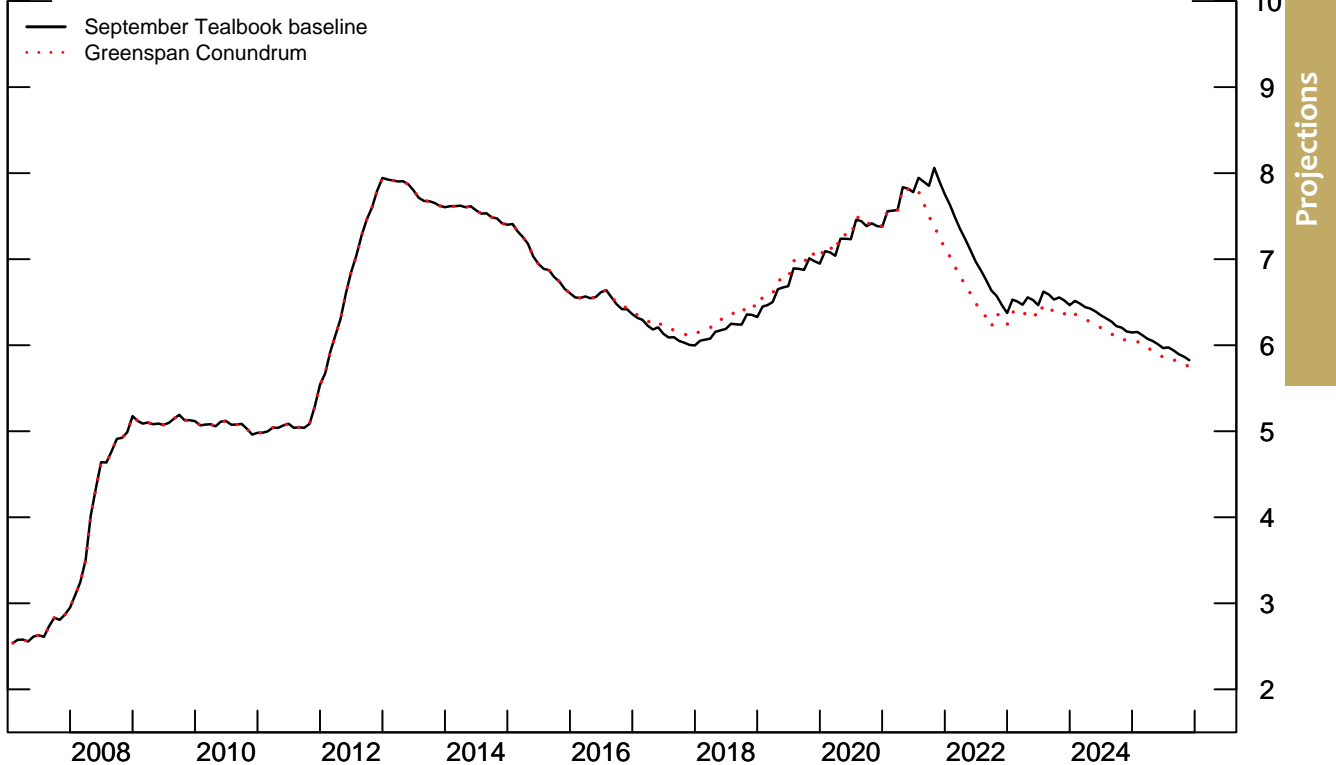
Billions of Dollars



#### SOMA Weighted-Average Treasury Duration

Monthly

Years



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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
DEDO	section in Tealbook A, “Domestic Economic Developments and Outlook”
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
EU	European Union
FAST Act	Fixing America’s Surface Transportation Act
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
IOER	interest on excess reserves

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