

Prefatory Note

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Class II FOMC – Restricted (FR)

Report to the FOMC on Economic Conditions and Monetary Policy



Book A

Economic and Financial Conditions:
Outlook, Risks, and Policy Strategies

December 1, 2017

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

Authorized for Public Release

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Domestic Economic Developments and Outlook

Incoming data suggest that economic activity has continued to expand at an above-trend pace. Real GDP appears to be rising at a solid annual rate of $2\frac{3}{4}$ percent in the second half of this year. The labor market looks to have tightened further, with the unemployment rate dropping to 4.1 percent in October and the gain in payroll employment bouncing back after being depressed by the effects of the recent hurricanes.

Over the medium term, we expect real GDP growth to slow gradually from $2\frac{1}{2}$ percent this year and next, to 2 percent in 2019, and then to $1\frac{3}{4}$ percent in 2020 as monetary policy continues to tighten. As in the previous projection, we assume tax cuts will be implemented in early 2018, but we have shifted the composition of the cuts toward corporate taxes and have also incorporated some small positive effects on aggregate supply. Nonetheless, by the end of 2020 the level of real GDP is essentially the same as in our October Tealbook forecast.

As in our previous projection, we forecast that output growth will be sufficient to push the level of real GDP $2\frac{1}{4}$ percent above our estimate of its potential by mid-2019, and we expect the output gap to remain near that level through the end of the medium term. Correspondingly, the unemployment rate is projected to fall to $3\frac{1}{2}$ percent in 2019 and to remain at that level through 2020, $1\frac{1}{4}$ percentage points below our estimate of its natural rate.

PCE prices rose 1.6 percent over the 12 months ending in October, and core PCE prices rose 1.4 percent; both measures were a touch higher than in our October Tealbook projection. We continue to view the unanticipated softness of this year's readings as largely transitory and expect core PCE price inflation to pick up next year. As resource utilization tightens further and underlying inflation gradually edges up, core PCE price inflation is projected to move up to 2 percent in 2019, while total PCE price inflation hits 2 percent in 2020.

KEY BACKGROUND FACTORS

Fiscal Policy

- In light of recent tax proposals currently being considered in the Congress, we have adjusted some of the parameters of our fiscal expansion placeholder. In

Comparing the Staff Projection with Other Forecasts

The staff's projection for real GDP growth is a little below the projections from both the Survey of Professional Forecasters (SPF) and the Blue Chip consensus in 2017 and similar to both of them in 2018. The staff's unemployment rate forecast is similar to the SPF and Blue Chip forecasts in 2017 and about ½ percentage point below them in 2018. The staff's projection for CPI inflation is above the Blue Chip and SPF forecasts in 2017 but in line with both in 2018. The staff's projections for overall PCE price inflation is a little higher than the SPF forecast in 2017 and similar in 2018, while the staff's projection for core PCE price inflation is similar to the SPF forecast in both years.

Comparison of Tealbook and Outside Forecasts

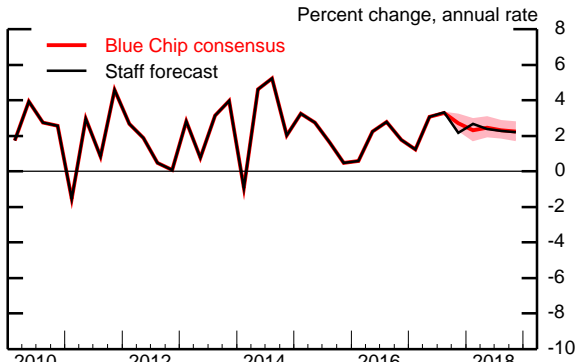
	2017	2018
GDP (Q4/Q4 percent change)		
December Tealbook	2.4	2.4
Blue Chip (11/10/17)	2.5	2.3
SPF median (11/13/17)	2.6	2.3
Unemployment rate (Q4 level)		
December Tealbook	4.1	3.6
Blue Chip (11/10/17)	4.2	4.0
SPF median (11/13/17)	4.2	4.0
CPI inflation (Q4/Q4 percent change)		
December Tealbook	2.1	2.0
Blue Chip (11/10/17)	1.8	2.1
SPF median (11/13/17)	1.8	2.1
PCE price inflation (Q4/Q4 percent change)		
December Tealbook	1.7	1.7
SPF median (11/13/17)	1.5	1.8
Core PCE price inflation (Q4/Q4 percent change)		
December Tealbook	1.5	1.8
SPF median (11/13/17)	1.4	1.8

Note: SPF is the Survey of Professional Forecasters, CPI is the consumer price index, and PCE is personal consumption expenditures. Blue Chip does not provide results for PCE price inflation. The Blue Chip consensus forecast includes input from about 50 panelists, and the SPF about 40. Roughly 20 panelists contribute to both surveys.

Source: Blue Chip Economic Indicators; Federal Reserve Bank of Philadelphia.

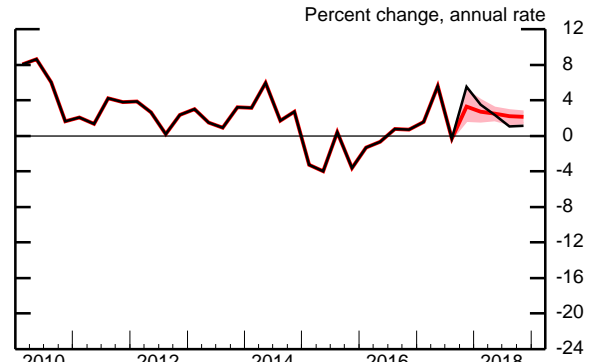
Tealbook Forecast Compared with Blue Chip (Blue Chip survey released November 10, 2017)

Real GDP

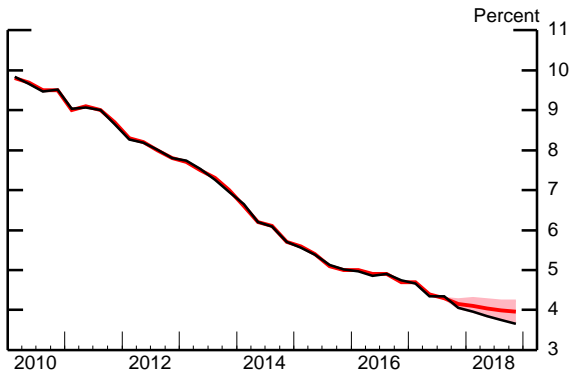


Note: The shaded area represents the area between the Blue Chip top 10 and bottom 10 averages.

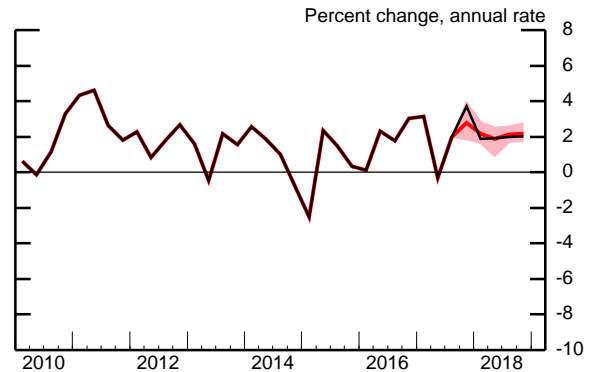
Industrial Production



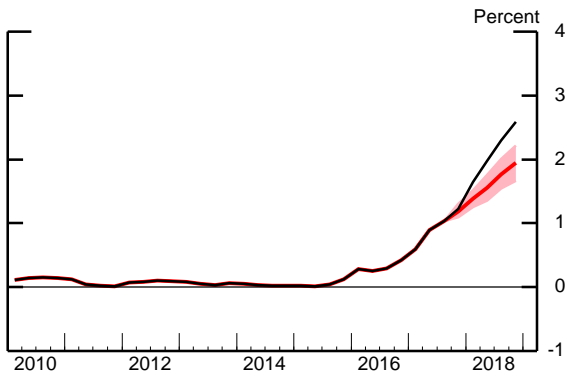
Unemployment Rate



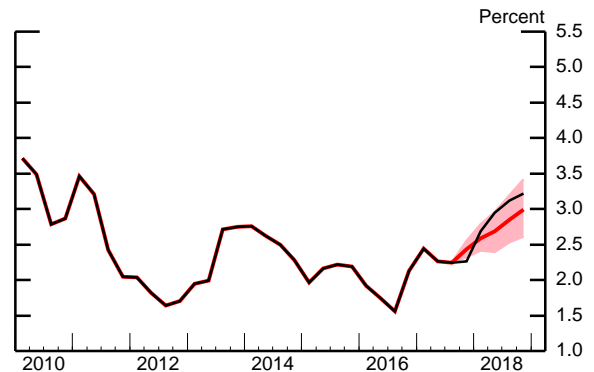
Consumer Price Index



Treasury Bill Rate



10-Year Treasury Yield



Note: The yield is for on-the-run Treasury securities. Over the forecast period, the staff's projected yield is assumed to be 15 basis points below the off-the-run yield.

Note: The shaded area represents the area between the Blue Chip top 10 and bottom 10 averages.

Revisions to the Staff Projection since the Previous SEP

The FOMC most recently published its Summary of Economic Projections, or SEP, following the September FOMC meeting. The table below compares the staff's current economic projection with the one we presented in the September Tealbook.

GDP growth this year now looks to be a little weaker than it did in September. Nonetheless, we have upgraded our growth outlook slightly for next year and beyond, reflecting financial assumptions that are a little more supportive. The unemployment rate has again come in a bit lower than we had projected, and with a further reduction in our estimate of the natural rate of unemployment (to 4.7 percent), our projection for the unemployment rate over the medium term is revised down 0.2 percentage point relative to September. Thus, resource utilization, as measured by the unemployment gap or the output gap, is slightly tighter in this projection than in September.

Our projection for core PCE price inflation in 2017 is unrevised relative to the September Tealbook, while a rise in oil prices has pushed our projection for headline inflation higher in the near term. We continue to view this year's weak core inflation readings as being largely transitory, though we have reduced our core inflation projection for 2018 slightly since September. We continue to project that both total and core inflation will edge up further after next year and will reach 2 percent over the medium term.

With both resource utilization and inflation close to our September projections, the federal funds rate path from the intercept-adjusted inertial Taylor (1999) rule that we use in our baseline forecast is also close to that in the September Tealbook.

Staff Economic Projections Compared with the September Tealbook

Variable	2017		2017	2018	2019	2020	Longer run
	H1	H2					
Real GDP ¹	2.1	2.7	2.4	2.4	2.0	1.7	1.7
September Tealbook	2.3	3.0	2.6	2.3	1.9	1.6	1.7
Unemployment rate ²	4.4	4.1	4.1	3.6	3.5	3.5	4.7
September Tealbook	4.4	4.2	4.2	3.8	3.7	3.7	4.8
PCE inflation ¹	1.2	2.2	1.7	1.7	1.9	2.0	2.0
September Tealbook	1.2	1.9	1.5	1.9	2.0	2.0	2.0
Core PCE inflation ¹	1.4	1.6	1.5	1.8	2.0	2.0	n.a.
September Tealbook	1.4	1.6	1.5	1.9	2.0	2.0	n.a.
Federal funds rate ²	.95	1.25	1.25	2.50	3.46	4.00	2.50
September Tealbook	.95	1.42	1.42	2.62	3.47	3.93	2.50
Memo:							
Federal funds rate, end of period	1.13	1.26	1.26	2.52	3.47	4.01	2.50
September Tealbook	1.13	1.44	1.44	2.64	3.49	3.94	2.50
Output gap ^{2,3}	.8	1.3	1.3	2.1	2.3	2.1	n.a.
September Tealbook	.8	1.4	1.4	2.1	2.2	2.0	n.a.

1. Percent change from final quarter of preceding period to final quarter of period indicated.

2. Percent, final quarter of period indicated.

3. Percent difference between actual and potential. A negative number indicates that the economy is operating below potential.

n.a. Not available.

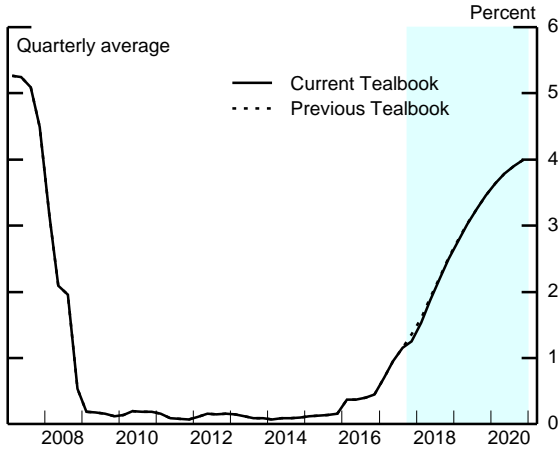
previous Tealbooks, we had assumed that adjustments to federal fiscal policy would increase the primary budget deficit—that is, the deficit excluding interest costs—by ½ percent of GDP, and we implemented this fiscal expansion through a cut in personal income taxes starting in the first quarter of 2018. Since the October Tealbook, however, the House and Senate have unveiled tax legislation that would cause the bulk of the tax cuts to accrue to businesses. Accordingly, we have altered the composition of our placeholder to one-third personal tax rate cuts and two-thirds corporate tax rate cuts, but we have kept the total size and starting date the same.¹

- We continue to assume that in five years, with an elevated and rising debt-to-GDP ratio, the Congress will begin enacting deficit reduction measures that gradually bring annual deficits back to sustainable levels.
- Now that the composition of the projected tax policy changes seems somewhat clearer, we have built in some aggregate supply responses.
 - We assume that the personal income tax rate cuts lead to a small increase in potential labor supply, and that the corporate tax rate cuts will boost the capital stock and lead to slightly higher structural productivity. All told, these effects raise the level of potential output 0.1 percent by the end of 2020.
 - These supply effects also translate into higher demand as households begin to realize the higher labor income associated with greater productivity and labor force participation.
- The placeholder tax cuts raise the level of real GDP at the end of 2020 by about ½ percent, a little larger than what we have assumed in previous Tealbook projections because of our new aggregate supply effects.
- We continue to project that discretionary policy actions across all levels of government will have a roughly neutral effect on aggregate demand in 2017

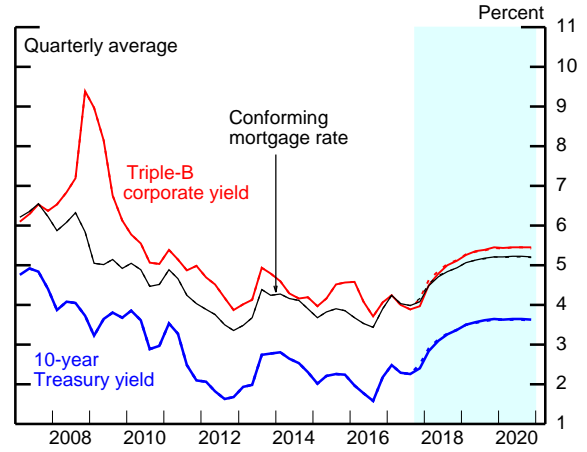
¹ The tax cuts recently passed by the House and currently being considered by the Senate are heavily front-loaded such that the size of the tax cuts declines notably over a 10-year budget window on net. Our fiscal placeholder assumes that the tax legislation ultimately passed into law will not be front-loaded. Accordingly, over the next three years our assumed tax cuts are smaller—by roughly one-third—than ones in the current House and Senate legislation.

Key Background Factors underlying the Baseline Staff Projection

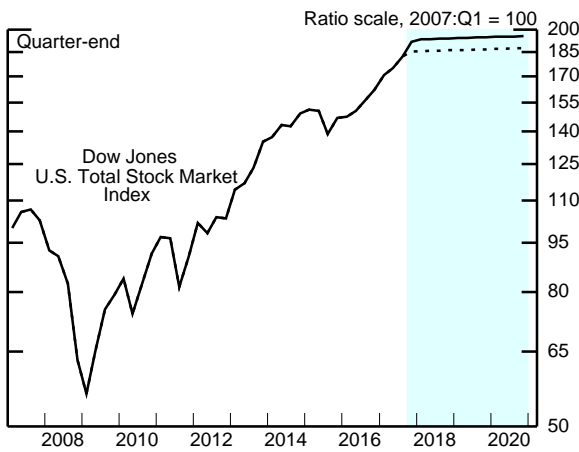
Federal Funds Rate



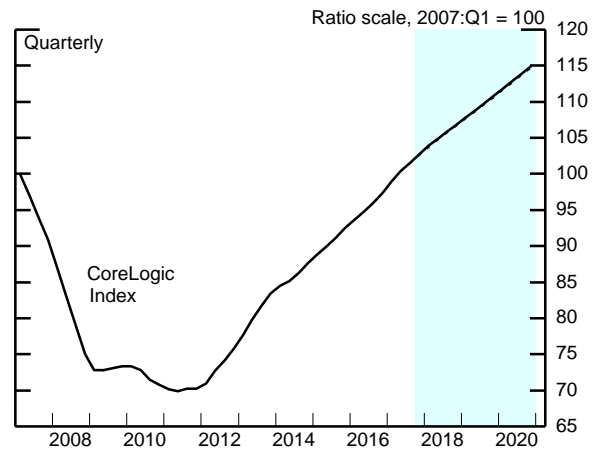
Long-Term Interest Rates



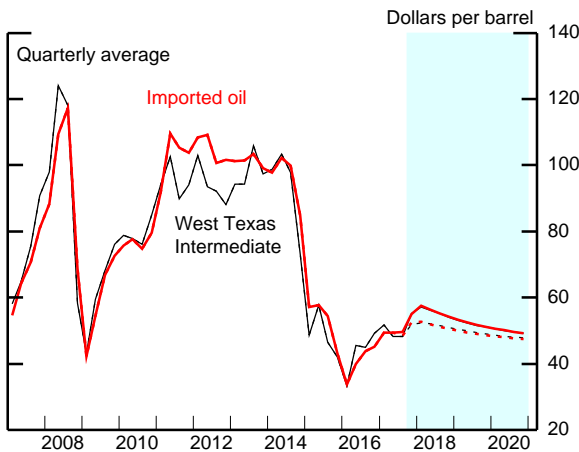
Equity Prices



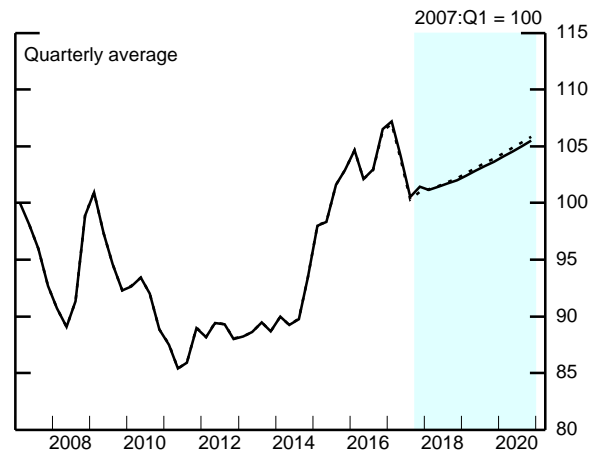
House Prices



Crude Oil Prices



Broad Real Dollar



but will boost output growth about $\frac{1}{4}$ percentage point per year from 2018 through 2020, exclusive of any multiplier effects and offsets from reactions in interest rates and the dollar.

- Federal government operations are funded through December 8. We assume the Congress will pass appropriations in time to avoid disruptions, although the chance of a temporary shutdown appears greater than it was a month ago.²

Monetary Policy

- The intercept-adjusted inertial Taylor (1999) rule used in our projection calls for the federal funds rate to increase a little less than 1 percentage point per year, on average, over the projection period and to average 4 percent in the fourth quarter of 2020, in line with our previous forecast.
- The SOMA portfolio declines gradually and predictably as securities are redeemed in a manner consistent with the June 2017 addendum to the Committee’s Policy Normalization Principles and Plans.

Other Interest Rates

- The 10-year Treasury yield is projected to rise over the medium term from an average of 2.4 percent in the current quarter to 3.6 percent by the end of 2020. During this period, the 10-year valuation window moves through a period of rising short-term interest rates, and the term premium is projected to increase to more normal levels. In this forecast, similar to previous projections, the yield curve is inverted from 2020 through late 2026, as discussed in the box “Why Is the Yield Curve Inverted in the Tealbook Projection?”
- The paths of the 30-year fixed mortgage rate and the triple-B corporate bond rate generally follow the contour of the 10-year Treasury yield.

² A lapse of appropriations that results in a short-term shutdown of the federal government would have only minor implications for the outlook. For example, the staff estimated that the 16-day shutdown in October 2013 reduced GDP growth $\frac{1}{4}$ percentage point in the fourth quarter of that year and boosted it by an equal amount in the following quarter. This estimate embodies our judgment that there were no material effects on private investment or consumption due to reduced confidence or increased uncertainty.

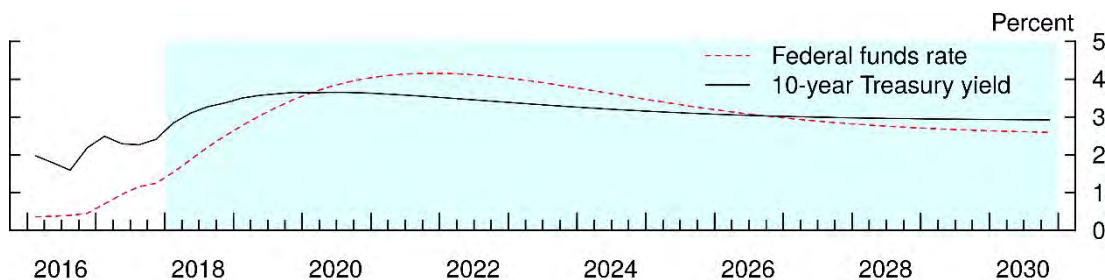
Why Is the Yield Curve Inverted in the Tealbook Projection?

In the baseline projection, the federal funds rate implied by the staff’s assumed intercept-adjusted inertial Taylor (1999) rule rises above the 10-year Treasury yield starting in the second quarter of 2020, resulting in an inverted yield curve that lasts until late 2026, as illustrated in figure 1.

We construct the projected 10-year yield as the sum of an expectations-hypothesis component and a term-premium component. In our framework, two factors explain the projected inversion. First, the policy rule used in the staff projection implies that the federal funds rate begins to overshoot its estimated long-run value of 2.5 percent in early 2019, reaching 4¼ percent by the end of 2021 and then converging back very slowly.¹ During most of the period of this overshoot, the federal funds rate is high relative to its 10-year-forward moving average (the expectations-hypothesis component of the 10-year yield). Second, the 10-year term premium is currently quite low and is assumed to increase only gradually to a long-run value of about 40 basis points, which is still very low by historical standards. All else being equal, a regime with lower term premiums makes a yield curve inversion more likely, as the required overshoot in the federal funds rate is smaller in that case.²

Figure 2 shows the evolution of the term premium on 10-year Treasury securities estimated using the procedure developed by Kim and Wright (2005). The term premium appears to have trended materially lower over time, and there is evidence of structural breaks in its mean.³

Figure 1: Interest Rate Projections



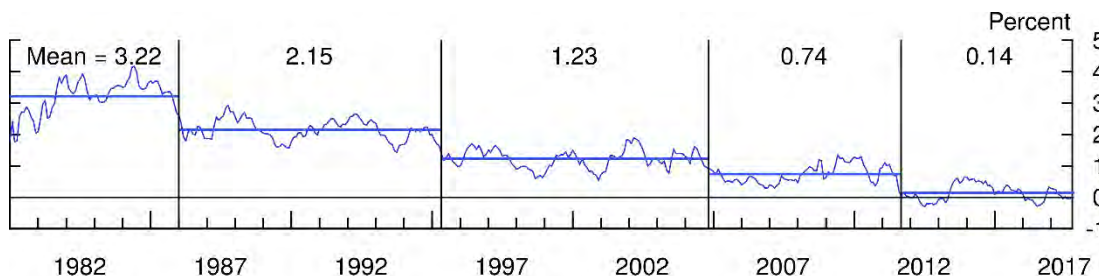
Source: Staff forecast.

¹ This overshoot, in turn, is mainly a consequence of an overshoot in the projected output gap. Inflation is projected to exceed its target, but only slightly.

² The box “The Flattening of the U.S. Yield Curve since December 2015” in the Financial Market Developments section explores the reasons for the recent decline in the slope of the yield curve, focusing on the spread between 2- and 10-year Treasury yields. The behavior of the slope of the yield curve in the projection is qualitatively similar at present using either the 2-year Treasury yield or the federal funds rate.

³ See Don H. Kim and Jonathan Wright (2005), “An Arbitrage-Free Three-Factor Term Structure Model and the Recent Behavior of Long-Term Yields and Distant-Horizon Forward Rates,” Finance and Economics Discussion Series 2005-33 (Washington: Board of Governors of the Federal Reserve System, August), www.federalreserve.gov/pubs/feds/2005/200533/200533pap.pdf. The estimated structural break dates in figure 2, indicated by vertical lines, are as follows: January 1986, April 1995, October 2004, and August 2011.

Figure 2: Kim-Wright 10-Year Term Premium (1980–2017)



Source: Staff estimates.

The current regime is estimated to have started in late 2011 and implies an average term premium of only 14 basis points. This term premium is significantly lower than it was between 1995 and 2011, for example, when it averaged about 1 percent. Mechanically, and keeping everything else constant, had we assumed the term premium would return to its 1995–2011 average by the end of the medium term, the projection would not imply an inverted yield curve.

Historically, an inverted yield curve has often signaled an oncoming recession. Indeed, a yield curve inversion has preceded each of the past seven recessions in the United States.⁴ However, in many of these instances, the inversion occurred as the FOMC increased the federal funds rate aggressively, with the goal of curbing significant inflation pressures even at the cost of a recession.⁵ In contrast, over the forecast period, inflation is never more than about 0.1 percentage point above target and the federal funds rate tightening implied by the assumed policy rule is correspondingly relatively mild.

In the baseline forecast, the inverted yield curve is indeed associated with a period of subpar growth as the policy rule coaxes the economy toward its longer-run equilibrium, but not with recession. To be sure, the risk of recession during this period is elevated because a smaller adverse shock would be sufficient to tip the economy from subpar growth into outright contraction. But the inverted yield curve that is forecast to prevail during this period should not be interpreted as an exogenous signal that a recession will mechanically follow.

⁴ There also have been inversions that were not followed by a recession.

⁵ These instances are broadly consistent with the “Romer and Romer dates” as identified in Christina D. Romer and David H. Romer (1989), “Does Monetary Policy Matter? A New Test in the Spirit of Friedman and Schwartz,” in Olivier Jean Blanchard and Stanley Fischer, eds., *NBER Macroeconomics Annual*, vol. 4 (Cambridge, Mass.: MIT Press), pp. 121–84; and in Christina D. Romer and David H. Romer (1994), “Monetary Policy Matters,” *Journal of Monetary Economics*, vol. 34 (August), pp. 75–88.

Federal Reserve System Nowcasts of 2017:Q4 Real GDP Growth
(Percent change at annual rate from previous quarter)

Federal Reserve entity	Type of model	Nowcast as of Nov. 29, 2017
Federal Reserve Bank		
Boston	<ul style="list-style-type: none"> Mixed-frequency BVAR 	3.5
New York	<ul style="list-style-type: none"> Factor-augmented autoregressive model combination Factor-augmented autoregressive model combination, financial factors only Dynamic factor model 	2.4 2.4 3.9
Cleveland	<ul style="list-style-type: none"> Bayesian regressions with stochastic volatility Tracking model 	3.4 2.0
Atlanta	<ul style="list-style-type: none"> Tracking model combined with Bayesian vector autoregressions (VARs), dynamic factor models, and factor-augmented autoregressions (known as GDPNow) 	3.0
Chicago	<ul style="list-style-type: none"> Dynamic factor models Bayesian VARs 	3.3 3.6
St. Louis	<ul style="list-style-type: none"> Dynamic factor models News index model Let-the-data-decide regressions 	3.5 3.3 2.8
Kansas City	<ul style="list-style-type: none"> Accounting-based tracking estimate 	2.5
Board of Governors	<ul style="list-style-type: none"> Board staff's forecast (judgmental tracking model) Monthly dynamic factor models (DFM-45) Mixed-frequency dynamic factor model (DFM-BM) 	2.4 3.8 4.5
Memo: Median of Federal Reserve System nowcasts		3.3

Equity Prices and Home Prices

- Equity prices are revised $4\frac{1}{4}$ percent higher starting in 2018, in part reflecting our new tax policy assumptions. Equity prices have probably already been bolstered by the prospects of a corporate tax cut, and we assume some additional increases when the tax package is enacted. However, we view the scope for further stock price appreciation over the medium term as limited, and we continue to expect equity values to rise beyond the first quarter of 2018 at just below $\frac{1}{2}$ percent per year on average.
- Incoming data on house prices have been in line with our expectations. With data through September, we project that house prices will rise $5\frac{1}{2}$ percent this year before decelerating to an average annual rate of about 4 percent over the next three years. The ratio of house prices to rents is projected to remain only marginally above its estimated long-run trend.

Foreign Economic Activity and the Dollar

- We estimate that real GDP growth in the foreign economies stepped down from an annual rate of 3 percent in the second quarter of 2017 to $2\frac{1}{4}$ percent in the third quarter, $\frac{1}{2}$ percentage point weaker than estimated at the time of the October Tealbook. With some of this step-down in growth reflecting temporary factors in Canada and Mexico, growth is expected to rebound to 3 percent in the current quarter. Over the remainder of the medium term, growth moderates to a pace just under $2\frac{3}{4}$ percent.
- The broad nominal dollar is down a touch, on net, since the October Tealbook. Early in the period, more-accommodative-than-expected communications by AFE central banks boosted the dollar, but the dollar later resumed its downward trend from earlier in the year. We expect the broad real dollar to appreciate at an annual rate of $1\frac{1}{2}$ percent over the forecast period as market expectations for the federal funds rate move up toward the staff forecast. Our projection for the broad real dollar is about $\frac{3}{4}$ percent lower by the end of 2020 than in the October Tealbook.

Oil Prices

- The spot price of Brent crude oil jumped in early November and now stands at \$63, about \$5 per barrel higher than at the time of the October Tealbook.

Prices for futures contracts with delivery at the end of 2020 are up about \$2 per barrel, at \$57. Prices moved higher in response to recent political developments in Saudi Arabia and ongoing tensions in the Iraqi Kurdish region. Some observers have suggested that the responsiveness of U.S. shale oil production to prices would offset Middle Eastern supply shocks in the medium term. However, the recent rise in farther-dated futures prices suggests that this offset is not complete. (For further analysis, see the box “The Limited Effectiveness of Shale Oil in Moderating Oil Price Fluctuations.”)

THE OUTLOOK FOR REAL GDP

We expect real GDP to increase at an annual rate of $2\frac{3}{4}$ percent in the second half of this year, up from 2 percent in the first half. Much of the step-up reflects a rebound in inventory investment, which was a large drag on GDP growth in the first half and is projected to boost growth slightly in the second half. Relative to the October Tealbook, second-half growth is a little slower, reflecting weaker-than-expected data on consumer spending and net exports.

Within the second half of this year, real GDP rose at a $3\frac{1}{4}$ percent pace in the third quarter, and we project a $2\frac{1}{4}$ percent gain in the fourth quarter.³ Swings in inventory investment are estimated to have boosted GDP growth $\frac{3}{4}$ percentage point in the third quarter, and we expect they will restrain growth by $\frac{1}{2}$ percentage point in the fourth quarter. For the first quarter of 2018, we expect output to expand at an annual rate of $2\frac{1}{2}$ percent, similar to the average pace in 2017.

- Real PCE appears on track to rise at a moderate $2\frac{1}{2}$ percent pace over the second half of the year, somewhat less than in our October Tealbook forecast. Motor vehicle sales have been boosted by hurricane-related vehicle replacement demand in recent months, while growth of consumer spending outside of motor vehicles has been modest. We expect consumer spending to expand about $2\frac{3}{4}$ percent in the first quarter of next year, supported in part by the personal income tax cuts.

³ If not for the hurricanes, the swing in GDP growth between the third and fourth quarters would have been even larger. We continue to estimate that the effects of the hurricanes held down real GDP growth $\frac{1}{2}$ percentage point in the third quarter and will boost it $\frac{3}{4}$ percentage point in the fourth.

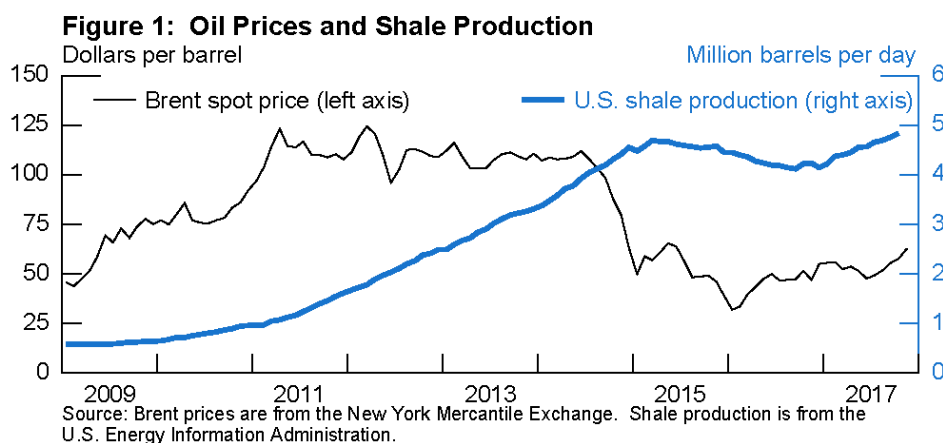
- Business investment in equipment and intangibles (E&I) appears to be increasing at an annual rate of $8\frac{3}{4}$ percent in the second half of this year and $7\frac{1}{4}$ percent for 2017 overall—a marked improvement from flat E&I spending in 2016. Data on orders and shipments of nondefense capital goods in September and October were positive, on balance, and recent indicators of business optimism and expected profitability remain upbeat. In contrast, investment in nonresidential structures appears to be declining in the second half of the year, as investment in nondrilling structures falls and the recovery in drilling activity that began last year further subsides. We expect that overall business fixed investment will continue to expand at a moderate rate in early 2018, with the tax cuts generating a modest boost to investment through the medium term.
- Following declines in the second and third quarters of this year, residential investment is forecast to advance at a 2 percent pace, on average, in the fourth and first quarters. Over the course of 2017, residential investment has been held down by higher mortgage interest rates as well as supply constraints caused by the limited availability of labor and developed lots.
- Net exports have been contributing positively to GDP growth for most of the year as a result of strong foreign demand and weaker-than-expected import growth, especially for consumer goods. In the current quarter, net exports are expected to make a neutral contribution to real GDP growth as import growth picks up. Next year the net export contribution is also expected to be near neutral, as the recent strength in imports persists and, supported by recent dollar depreciation, export growth continues at its 2017 pace.
- Recent indicators of manufacturing activity, including data on October production and readings from manufacturing surveys, have been upbeat and point to strong growth of about $6\frac{1}{4}$ percent at an annual rate in the current quarter. Much of that strength reflects transitory factors, most notably the recovery from the hurricanes and a bounceback in motor vehicle assemblies after a third-quarter lull. With essentially all of the catch-up from the hurricanes having concluded, we expect growth in manufacturing production to step down to a moderate pace of about 2 percent in the first quarter.

The Limited Effectiveness of Shale Oil in Moderating Oil Price Fluctuations

Recent political turmoil in the Middle East has again raised concerns about the stability of global oil supplies, pushing up the spot price of oil. In recent years, some commentators have suggested that U.S. shale oil production is flexible enough to moderate, or even neutralize, oil price shocks in the medium term.¹ Here we critically examine the hypothesis that shale oil has altered the perceived persistence of oil price changes.² We estimate that the co-movement of oil price futures with the spot price of oil has not declined following the rapid growth of shale production, suggesting that the potential buffering effect of shale production might be overstated, or, at least, that market participants have not yet fully internalized that effect into their expectations for prices.

The potential for shale oil production to moderate oil price shocks is based on two key differences between shale and conventional oil production. First, shale oil wells move more quickly from planning to production than conventional wells. Second, the output of a producing shale well naturally declines more quickly. As such, with a greater share of production coming from shale wells, U.S. production can respond more quickly to prices and possibly moderate the price effects of changes in oil market supply and demand.

As shown in figure 1, shale production has responded to shifts in oil prices, falling back when prices started declining in mid-2014 and then resuming growth relatively quickly after prices troughed in early 2016.³



¹ This hypothesis is discussed in Spencer Dale (2015), “The New Economics of Oil,” Oxford Institute for Energy Studies, October, <https://www.oxfordenergy.org/wpcms/wp-content/uploads/2015/10/The-New-Economics-of-Oil.pdf>.

² The role of the perceived persistence of oil price changes in determining macroeconomic outcomes is discussed in Sylvain Leduc, Kevin Moran, and Robert Vigfusson (2016), “Learning in the Oil Futures Markets: Evidence and Macroeconomic Implications,” International Finance Discussion Papers 1179 (Washington: Board of Governors of the Federal Reserve System, September), <http://dx.doi.org/10.17016/IFDP.2016.1179>.

³ As discussed in the June 2017 Tealbook box “Why Is U.S. Oil Output So Strong?,” although the U.S. oil industry did dramatically reduce the number of operating drilling rigs, strong productivity growth moderated the decline in shale output.

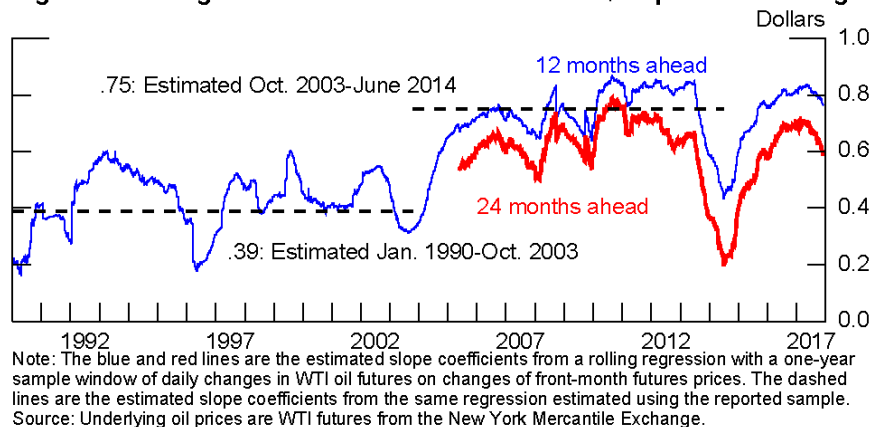
If market participants perceive that shale oil production largely moderates oil price spikes, then oil price changes should be less persistent and farther-dated futures prices should co-move less with spot prices. To test this claim, figure 2 reports time-varying estimates of how oil price futures co-move with spot prices.⁴ In the 2003–14 period, a \$1 change in the spot price was associated with 12-month-ahead futures increasing 75 cents. In mid-2014, the link between spot and futures temporarily weakened but quickly bounced back. The current co-movement is much higher than its average in the 1990s, when oil markets believed that OPEC would stabilize the long-term price of oil.

Why has increased shale oil production not made oil price futures less responsive to spot prices? One possibility is that shale production is indeed flexible enough to buffer price shocks in the medium run, but, after a 15-year period when oil prices went from \$20 to \$145 and then back to \$26 per barrel, market participants are reluctant to believe that longer-term oil prices have stabilized. Over time, market participants could internalize the increased flexibility of shale production, disconnecting futures prices from spot prices.

Another possibility is that market participants are accurately assessing the reality that aggregate shale production is less flexible than boosters would suggest. The flexibility of individual shale oil wells may not directly scale up to overall production because of industry-wide constraints on materials, labor, and transportation. For example, to increase production beyond existing pipeline capacity requires transporting oil by rail, putting an additional \$10 wedge per barrel between wellhead and delivery prices.

Whether shale oil will ultimately prove flexible enough to neutralize the effects of foreign supply disruptions is yet to be determined and could change over time as the industry evolves, constraints are relaxed, and new technologies are developed. But at present, even though the domestic shale oil industry would expand in response to a foreign supply outage, it appears that markets would expect that expansion to have only a modest effect on global oil prices.⁵

Figure 2: Change in Oil Futures Associated with \$1 Spot Price Change



⁴ Regressions are for daily dollar changes in West Texas intermediate oil prices using a one-year rolling window.

⁵ The alternative scenario “Higher Oil Prices and Faster AFE Tightening” in the Risks and Uncertainty section discusses macroeconomic effects of oil price changes.

Summary of the Near-Term Outlook
(Percent change at annual rate except as noted)

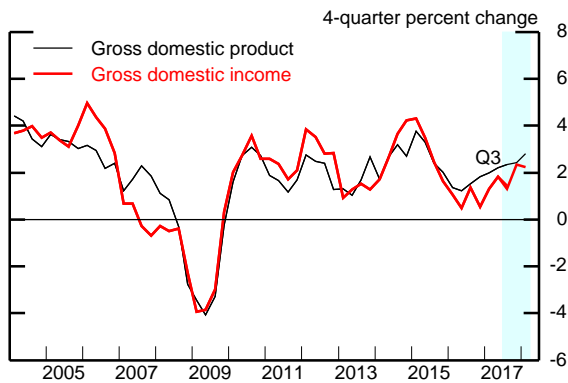
Domestic Econ Devel & Outlook

Measure	2017:Q3		2017:Q4		2018:Q1	
	Previous Tealbook	Current Tealbook	Previous Tealbook	Current Tealbook	Previous Tealbook	Current Tealbook
Real GDP	2.9	3.3	3.2	2.2	2.5	2.7
Private domestic final purchases	2.4	2.4	3.3	2.9	2.9	2.8
Personal consumption expenditures	2.3	2.3	3.3	2.5	2.8	2.7
Residential investment	-6.2	-5.1	-6	3.2	1.6	1.0
Nonres. private fixed investment	5.6	5.1	5.0	5.2	3.8	4.0
Government purchases	-1.0	.4	.8	.7	.4	.3
<i>Contributions to change in real GDP</i>						
Inventory investment ¹	.4	.8	.1	-.5	.2	.4
Net exports ¹	.6	.4	.2	.0	-.2	-.2
Unemployment rate	4.3	4.3	4.2	4.1	4.1	4.0
PCE chain price index	1.5	1.5	2.0	2.8	1.6	1.7
Ex. food and energy	1.3	1.4	1.5	1.9	1.8	1.9

1. Percentage points.

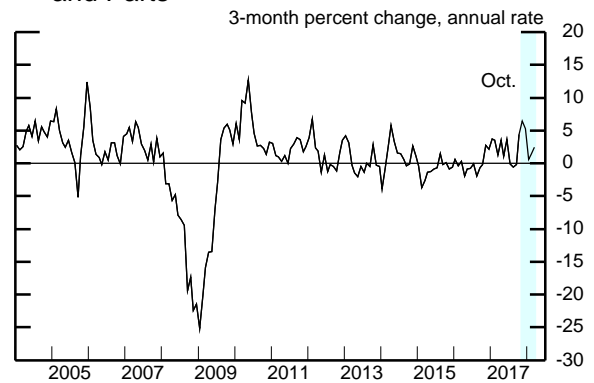
Recent Nonfinancial Developments (1)

Real GDP and GDI



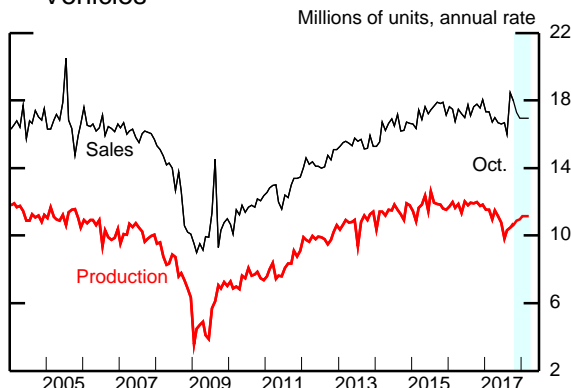
Source: U.S. Dept. of Commerce, Bureau of Economic Analysis.

Manufacturing IP ex. Motor Vehicles and Parts



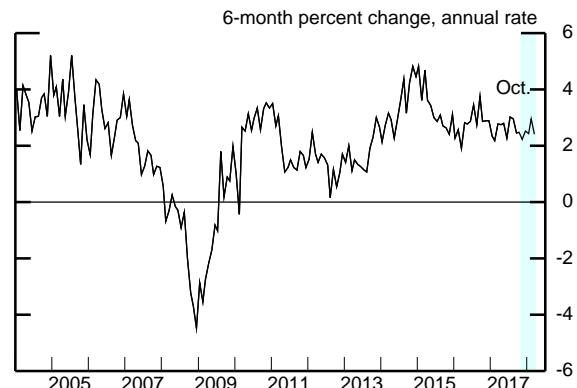
Source: Federal Reserve Board, G.17 Statistical Release, "Industrial Production and Capacity Utilization."

Sales and Production of Light Motor Vehicles



Source: Ward's Communications; Chrysler; General Motors; FRB seasonal adjustments.

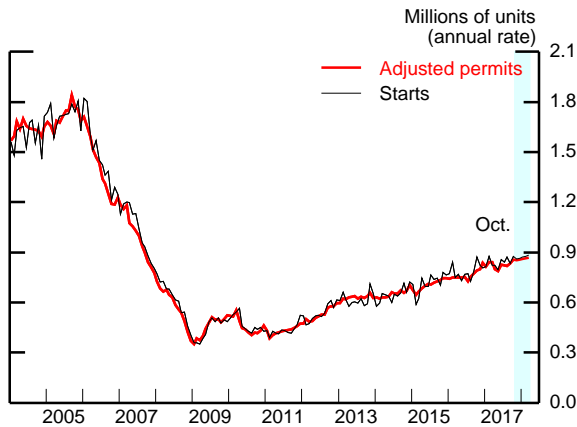
Real PCE Growth



Source: U.S. Dept. of Commerce, Bureau of Economic Analysis.

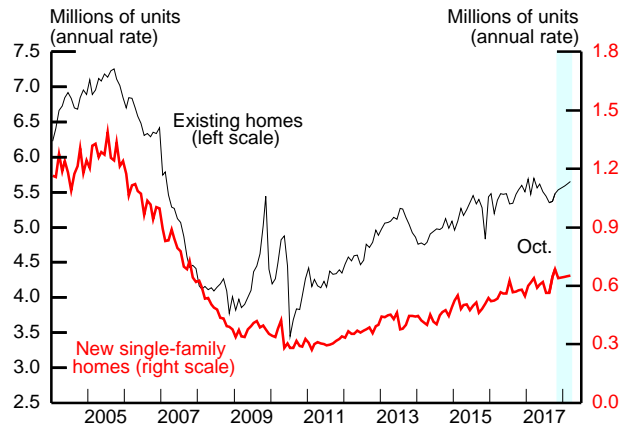
Recent Nonfinancial Developments (2)

Single-Family Housing Starts and Permits



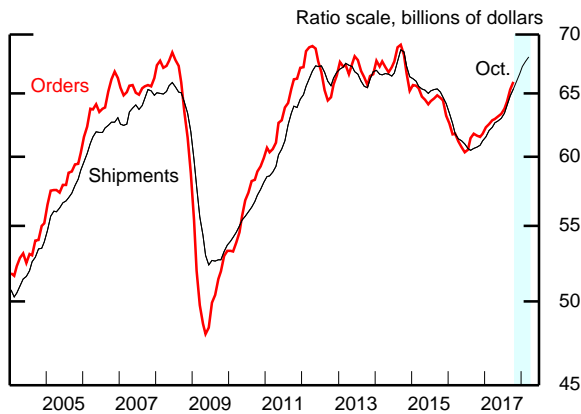
Note: Adjusted permits equal permit issuance plus starts outside of permit-issuing areas.
Source: U.S. Census Bureau.

Home Sales



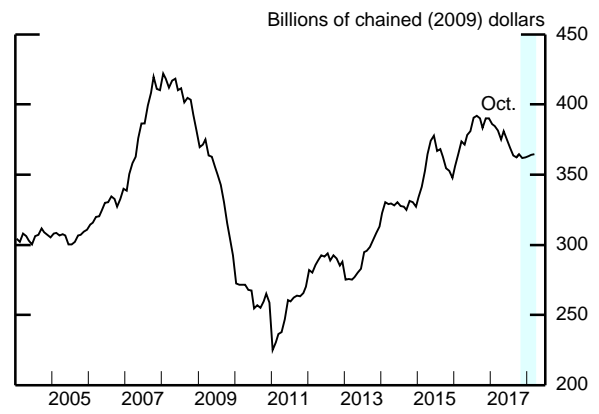
Source: For existing, National Association of Realtors; for new, U.S. Census Bureau.

Nondefense Capital Goods ex. Aircraft



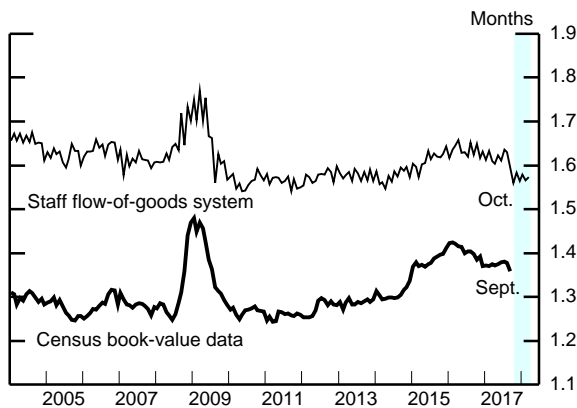
Note: Data are 3-month moving averages.
Source: U.S. Census Bureau.

Nonresidential Construction Put in Place



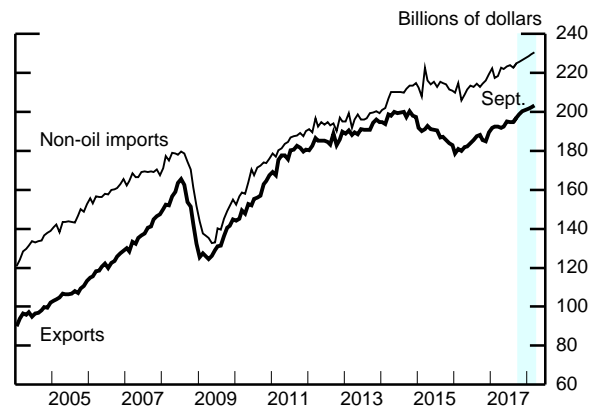
Note: Nominal CPIP deflated by BEA prices through 2017:Q2 and by the staff's estimated deflator thereafter.
Source: U.S. Census Bureau.

Inventory Ratios



Note: Flow-of-goods system inventories include manufacturing and mining industries and are relative to consumption. Census data cover manufacturing and trade, and inventories are relative to sales.
Source: U.S. Census Bureau; staff calculations.

Exports and Non-oil Imports



Note: Forecasts are linear interpolations of quarterly values.
Source: U.S. Dept. of Commerce, Bureau of Economic Analysis; U.S. Census Bureau.

Over the medium term, we project real GDP growth will slow steadily from 2½ percent in 2018 to 1¾ percent in 2020 as monetary policy continues to tighten. Relative to the October Tealbook, the output gap is essentially unrevised at the end of 2020.

- With the assumed composition of tax cuts now tilted more toward corporate taxes and less toward personal taxes, we have increased the boost from fiscal policy to business investment and scaled back the boost to consumer spending.
- Potential GDP growth edges up to 1¾ percent by the end of the medium term. With real GDP growth expected to outpace potential growth throughout much of the projection, resource utilization tightens further. In 2019 and 2020, real GDP is projected to exceed its potential level by around 2¼ percent on average.

THE OUTLOOK FOR THE LABOR MARKET AND AGGREGATE SUPPLY

Since the October Tealbook, labor market conditions have continued to tighten on balance.⁴ We expect further tightening over the medium term at a similar pace to the one in the October Tealbook projection.

- Following an upwardly revised gain of 18,000 in September, total nonfarm payroll employment rose 261,000 in October, as the labor market largely recovered from the effects of the hurricanes.⁵ Excluding those effects, we estimate that payroll gains averaged around 180,000 over the past three months and will continue to expand at this pace through the first quarter—well above the estimates of 80,000 to 120,000 or so per month the staff thinks would be consistent with unchanged labor market slack. (See the box “Measuring the Labor Market Using ADP Microdata” for a discussion of

⁴ The employment report for November will be released on December 8, the Friday before the FOMC meeting. We will provide a forecast update that afternoon.

⁵ Given the upward revision to September payrolls and the smaller-than-expected job gains in October, we now estimate that the hurricanes temporarily depressed payroll employment by 150,000 in September (about 50,000 less than in the October Tealbook), boosted job gains in October by 100,000 (also 50,000 less than in our earlier projection), and will further boost job gains in November by 50,000. We do not think that the hurricanes had any material effect on the unemployment and participation rates.

alternative data sources that we are beginning to use to inform our assessment of labor market conditions.)

- The unemployment rate declined to 4.1 percent in October, 0.1 percentage point below our previous forecast, and has now fallen nearly $\frac{3}{4}$ percentage point since the end of last year. We expect the unemployment rate to remain at this level through December and to tick down to 3.9 percent by March—a downward revision of 0.1 percentage point.
- The labor force participation rate (LFPR) fell sharply to 62.7 percent in October, a little below our previous projection. Nevertheless, since the end of last year and, indeed, for the past several years, the LFPR has essentially moved sideways, consistent with modest labor market tightening on this dimension when judged against its declining trend. We expect the LFPR to be 62.8 percent for the remainder of the year and to edge back down to 62.7 percent in the first quarter, about the same as in our previous projection.
- Other labor market data in October were also consistent with further tightening, including declines in the share of workers who report being employed part time for economic reasons and the share of the population out of the labor force but who report wanting a job. These measures have both fallen on net this year and are near their pre-recession levels.

We have made some small revisions to our aggregate supply assumptions this round.

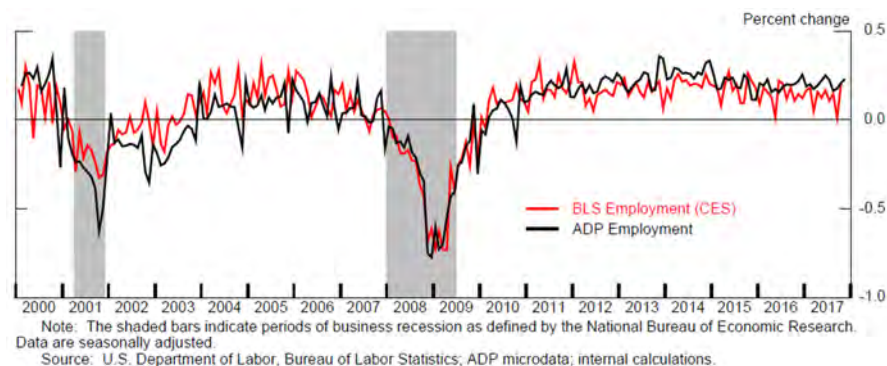
- Since the September Tealbook when we last made a small downward adjustment to the natural rate, the unemployment rate has come in a little lower than expected, continuing a pattern of surprises seen over the course of the year on net. Also over the year, core price inflation has been soft, which seems inconsistent with the additional labor market tightness suggested by the greater-than-expected decline in the unemployment rate. We have interpreted this constellation of data as suggesting that the natural rate is slightly lower

Measuring the Labor Market Using ADP Microdata

A key challenge for both policymakers and staff is to gauge the current state of the macroeconomy, including the labor market. The payroll employment series from the Bureau of Labor Statistics (BLS) Current Employment Statistics (CES) program is one of the most carefully constructed measures of labor market activity, but even this series is subject to sampling and nonsampling errors.¹ Indeed, the 90 percent confidence interval around the monthly change in private payroll employment is $\pm 111,000$ due to sampling error alone. Moreover, the variation of actual (preliminary-to-benchmark) revisions to this series since 2003, which reflects both some sampling and some nonsampling errors, is even larger than would be implied by the sampling-based confidence interval. New sources of labor market data offer an opportunity to complement official statistics and to produce more timely, accurate, and detailed analyses of labor market activity. In this regard, the Board's staff has been working with data from the payroll-processing company ADP that cover 20 percent of the private workforce and are available weekly in near real time.²

The BLS and ADP data are both based on large samples of firms that cover roughly equal fractions of private payroll employment. The BLS measure is based on a probability sample of establishments.³ In contrast, the ADP data set consists of the firms that hire ADP to manage their payrolls, which may introduce sample selection issues. These potential selection issues are reduced to some extent by the fact that we reweight the ADP data by establishment size and industry to match the characteristics of the universe of firms along these dimensions. Reassuringly, our ADP employment index (the black line shown in figure 1) has a similar mean and variance to, and is highly correlated with, the BLS series (the red line).

Figure 1: BLS and ADP Monthly Employment Growth



¹ Sampling error arises because the estimate of payroll employment is based on responses from a sample of employers, not a census. Nonsampling error arises because of issues such as respondent errors, errors in data processing, and bias due to nonresponse.

² One existing use of ADP data is ADP's monthly National Employment Report (NER). The NER forecasts BLS payroll employment changes using a combination of ADP-derived data and other publicly available data. By contrast, our primary goal in using the ADP microdata is to produce an estimate of employment changes independent from the BLS payroll series as well as other data sources.

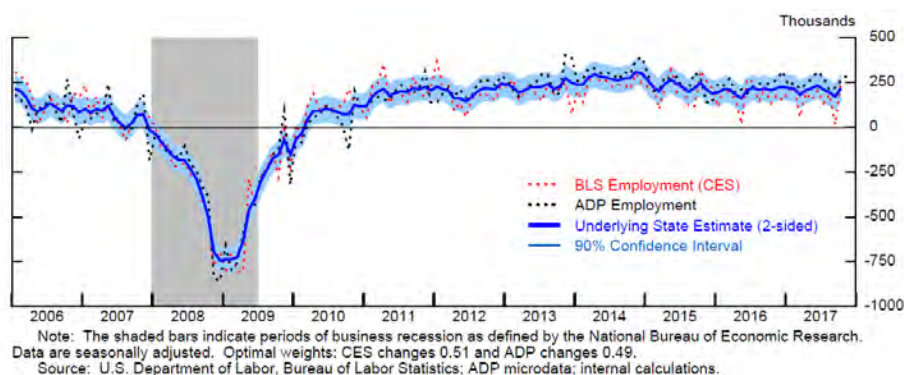
³ The BLS payroll series is benchmarked annually to administrative data, which increases the reliability of the historical series. However, the administrative data are available only with several months' delay.

The ADP data have several useful properties. First, the data cover each week of the month, so the ADP index captures employment developments for the month as a whole, whereas the BLS series covers only the pay period including the 12th of the month. Second, our ADP employment index helps predict BLS employment changes in real time, even after accounting for private forecaster expectations and other standard indicators. Third, the ADP index is useful for dealing with a particular anomaly of the BLS data: In recent years, the first BLS estimate of employment changes for August has tended to be too low and has subsequently been revised upward, while the ADP index does not have this bias. Finally, the ADP data can be updated every week and include full geographic detail. This timeliness and detail allow better analysis of transitory or localized events such as storms. The staff has already started to incorporate such insights in its assessment of the labor market, including when estimating the effects of the recent hurricanes.

A natural question is whether we can create a more precise estimate of employment growth by pooling the information in the BLS and ADP payroll employment data. In preliminary work, we combine the information in the two series using a statistical tool called the Kalman filter. The resultant measure of underlying employment growth is the blue line in figure 2, plotted along with the model-based confidence interval. A similar exercise that excludes ADP data and only uses BLS data yields a confidence interval that is about 20 percent wider. The Kalman filter places roughly equal weight on the BLS series and the ADP series, which is consistent with the fact that ADP and BLS cover roughly equal-sized samples from the establishment population.⁴

These results are encouraging in their own right. Moreover, they point to the possibility of even greater gains if information from other large payroll-processing companies could be incorporated into the estimates as well. Over the coming years, we are hopeful that ever-expanding technological possibilities combined with a rise in the availability of private data will continue to improve economic measurement.

Figure 2: Combining BLS and ADP Monthly Employment Changes with the Kalman Filter

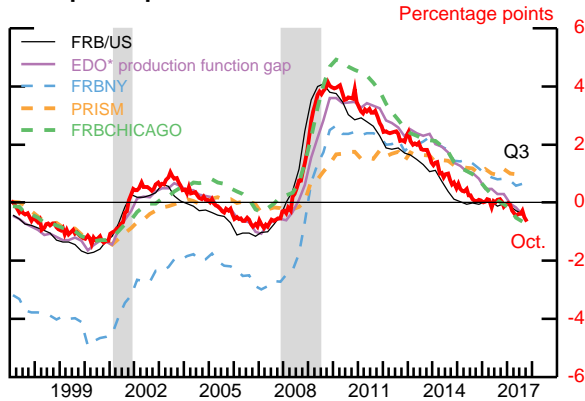


⁴ For comparison, the same exercise with the BLS payroll employment series and the employment series from the household survey (adjusted to match the scope of the payroll series) puts a weight of well over 90 percent on the payroll series.

Alternative Measures of Slack

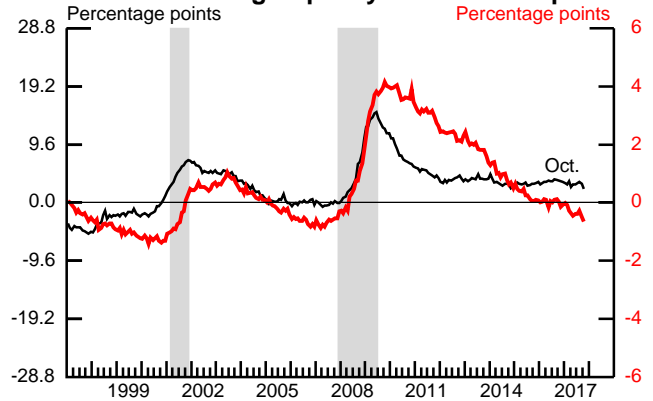
The red line in each panel is the staff's measure of the unemployment rate gap (right axis).

Output Gaps



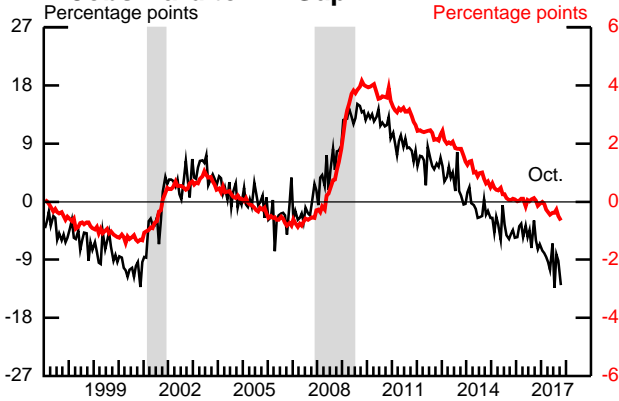
* EDO is Estimated, Dynamic, Optimization-based model.
 Source: Federal Reserve Board; PRISM: Federal Reserve Board Bank of Chicago; Federal Reserve Board Bank of Philadelphia, PRISM Model Documentation (June 2011); FRBNY: Federal Reserve Bank of New York Staff Report 618 (May 2013, revised April 2014).

Manufacturing Capacity Utilization Gap*



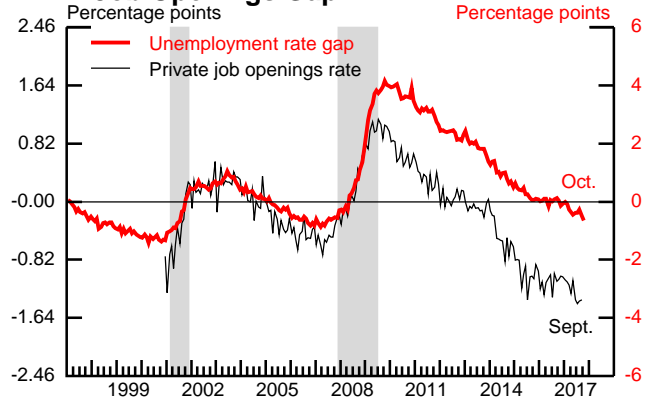
Source: Federal Reserve Board.

Jobs Hard to Fill Gap*



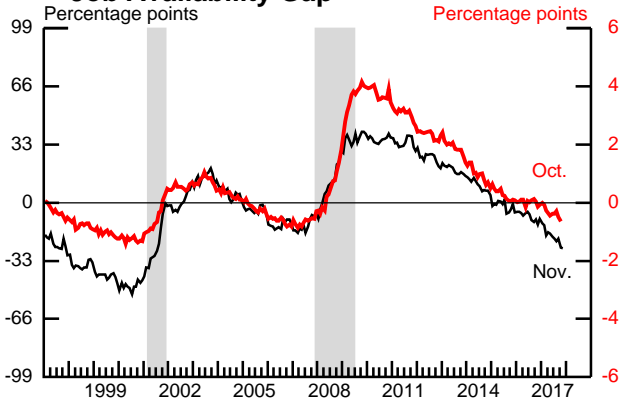
Note: Percent of small businesses surveyed with at least one "hard to fill" job opening. Seasonally adjusted by Federal Reserve Board Staff.
 Source: National Federation of Independent Business, Small Business Economic Trends Survey.

Job Openings Gap*



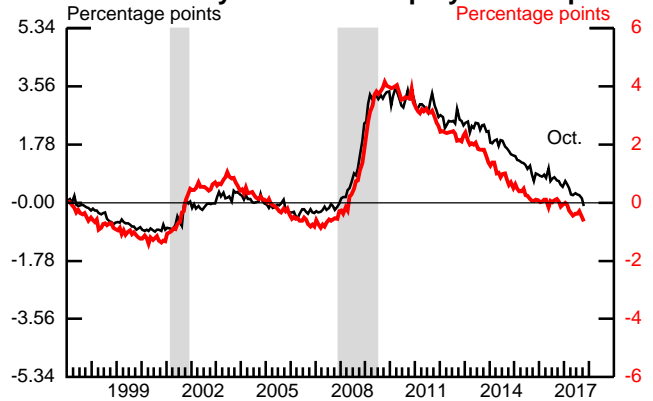
Note: Job openings rate is the number of job openings divided by employment plus job openings.
 Source: Job Openings and Labor Turnover Survey; U.S. Department of Labor, Bureau of Labor Statistics, Current Employment Statistics; Conference Board, Help Wanted OnLine.

Job Availability Gap*



Note: Percent of households believing jobs are plentiful minus the percent believing jobs are hard to get.
 Source: Conference Board.

Involuntary Part-Time Employment Gap



Note: Percent of employment.
 Source: U.S. Department of Labor, Bureau of Labor Statistics, Current Population Survey.

* Plots the negative of the gap to have the same sign as the unemployment rate gap.
 Note: The shaded bars indicate a period of business recession as defined by the National Bureau of Economic Research. Output gaps are multiplied by negative 0.54 to facilitate comparison with the unemployment rate gap. Manufacturing capacity utilization gap is constructed by subtracting its average rate from 1972 to 2013. Other gaps were constructed by subtracting each series' average in 2004:Q4 and 2005:Q1.

than what we have been assuming, and we nudged down our estimate from 4.8 percent to 4.7 percent by the end of 2017.⁶

- As noted earlier, we assume that the cut to corporate taxes will boost structural productivity slightly through greater capital deepening, and that the cut to personal income taxes will increase potential labor supply through a slightly higher trend LFPR. Together, these effects boost the level of potential output 0.1 percent by 2020.

We continue to expect the labor market to tighten further through 2019.

- The unemployment rate is projected to decline more gradually going forward than it has this year, reaching 3.5 percent in 2019 and remaining at that level in 2020—0.1 percentage point below the previous Tealbook. However, with the 0.1 percentage point downward revision to the natural rate, at the end of the medium term the difference between the natural and actual unemployment rates is the same as in the October Tealbook.
- Total payroll employment gains are expected to slow from an average monthly pace of about 175,000 this year and next to 150,000 in 2019 and 120,000 in 2020.
- Over the medium term, the LFPR edges down a little more slowly than its trend, as sustained job gains and rising real wages continue to draw individuals into the labor force while also slowing outflows, ending 2020 0.4 percentage point above our estimate of its trend level. Compared with the October Tealbook, the LFPR is a touch higher in the medium term, reflecting the labor supply response to the cut in personal income taxes.
- We project that labor productivity in the business sector will increase about 1 percent per year over the forecast period—slightly less than our estimate of

⁶ In addition to our revision to the natural rate, we made a small downward adjustment to our estimate of the trend growth rate of output per hour for the economy as a whole in 2017.

its structural pace, though a little faster than its average over the preceding several years.⁷

THE OUTLOOK FOR INFLATION

Although core PCE inflation in September and October came in a little above our expectations, inflation has remained subdued overall, with total PCE prices increasing 1.6 percent over the 12 months ending in October and core prices rising 1.4 percent. We continue to expect the transitory factors that have held down inflation this year to largely dissipate next year.

- We project core PCE prices to increase 0.1 percent per month in November and December—held down by the residual seasonality that we think still affects data in these months—and 0.2 percent per month on average in the first quarter. We project the 12-month change in core PCE prices to fluctuate around its current level until March of next year when it will step up to 1.7 percent, as the unusual decline in core prices seen this past March drops out of the calculation.⁸
- Since the October Tealbook, gasoline and oil prices have increased, boosting our near-term projection for PCE energy prices and thus total PCE price inflation. We now expect the 12-month change in total PCE prices to move between 1.5 percent and 1.8 percent in the next several months, up about 0.2 percentage point since our previous projection.
- Core import prices are expected to rise 2 percent at an annual rate in the second half of this year. This pace is a bit faster than earlier in the year but slower than we expected in the October Tealbook, reflecting both weaker-than-expected incoming data and lower nonfuel commodity prices. Import price inflation is expected to slow to a $\frac{3}{4}$ percent pace in the medium term,

⁷ Productivity tends to grow more slowly than its structural pace when the labor market becomes tight, possibly because workers hired in a tight labor market have lower productivity, on average, relative to workers hired during a slack labor market.

⁸ The unusually large decline in wireless telephone plan prices that occurred in March 2017 held down that month's core PCE reading about 0.1 percentage point. Other components also contributed to the low reading in core PCE inflation in that month.

consistent with still-moderate foreign inflation, a gradually appreciating dollar, and slowly declining commodity prices.

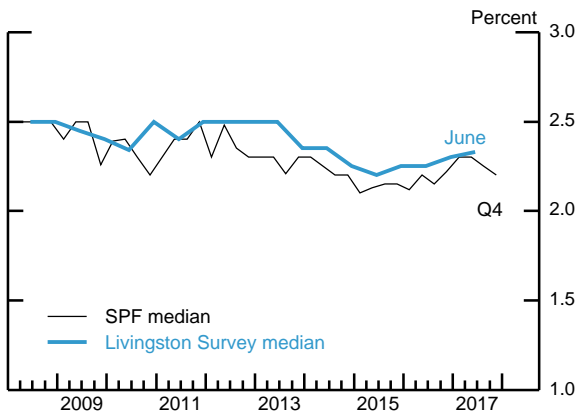
- Survey-based measures of longer-term inflation expectations have moved little since October on balance. Median 10-year inflation expectations for PCE prices in the fourth-quarter Survey of Professional Forecasters were stable at 2.0 percent, the median of expectations over the next 5 to 10 years from the Michigan survey edged down to 2.4 percent in November, and the 3-year-ahead measure of inflation expectations in the Federal Reserve Bank of New York’s Survey of Consumer Expectations was unchanged in October at 2.8 percent. Similarly, market-based measures, such as the TIPS-based measure of 5-to-10-year forward inflation compensation, were relatively stable during the intermeeting period.

Core PCE price inflation is projected to move up to 1.8 percent in 2018, mainly reflecting the abating of this year’s surprising weakness. Core price inflation then moves up further, to 2 percent in 2019 and 2020, as continued tightening in resource utilization and a gradual increase in our judgmental underlying inflation trend more than offset an increasing drag from core import prices.⁹ Total PCE price inflation also rises in the medium term, from 1.7 percent this year to 1.9 percent in 2019 and then to 2.0 percent in 2020. Relative to the October Tealbook, the forecast for core PCE price inflation is up 0.1 percentage point this year and is unrevised over the medium term. Total PCE price inflation is up 0.2 percentage point this year and essentially unrevised over the medium term.

⁹ In light of this year’s surprisingly low inflation, in this forecast we have slightly pushed back the upward drift in our estimate of underlying inflation. (We define underlying inflation to be the level that we estimate inflation would return to in the absence of upward or downward pressure from resource utilization or supply shocks, and which we think is ultimately determined by the inflation expectations of wage and price setters.) We now assume that underlying PCE inflation remains at 1.8 percent in 2018—the same as in 2017 and previous years—and starts to edge up thereafter, reaching 1.9 percent in 2020; in previous projections it started to edge up in 2018 and reached 1.9 percent in 2019. This revision resulted in no perceptible changes to our forecast for core PCE inflation in the medium term. For 2018, our reaction to this year’s low inflation had already been built into the forecast. For 2019, the small downward revision to trend was offset by other small influences.

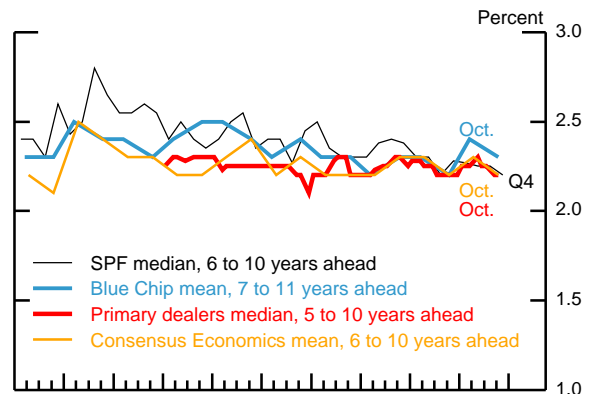
Survey Measures of Longer-Term Inflation Expectations

CPI Next 10 Years



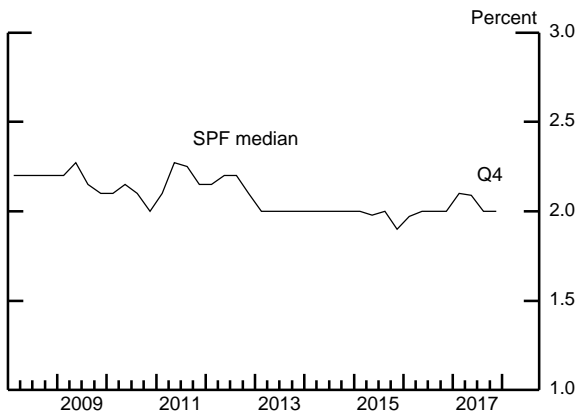
Note: SPF is Survey of Professional Forecasters.
Source: Federal Reserve Bank of Philadelphia.

CPI Forward Expectations



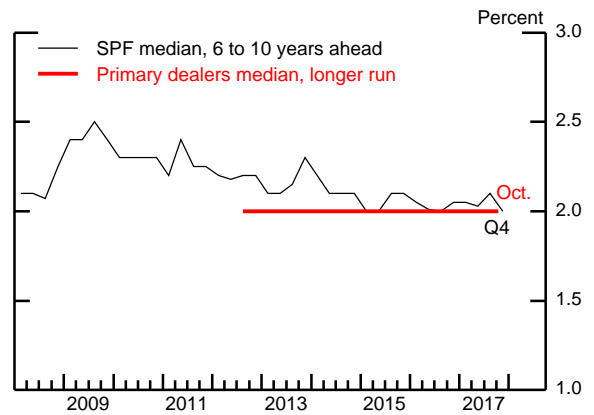
Source: Federal Reserve Bank of Philadelphia; Blue Chip Economic Indicators; Federal Reserve Bank of New York; Consensus Economics.

PCE Next 10 Years



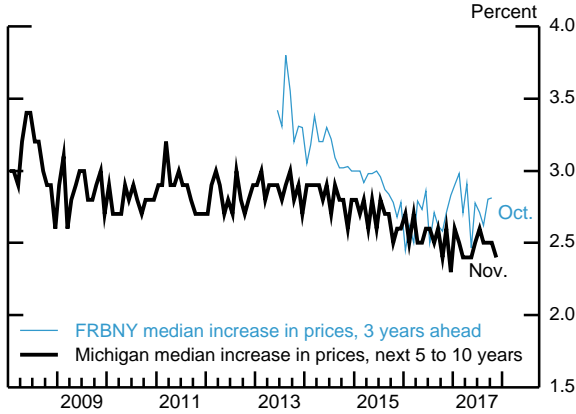
Source: Federal Reserve Bank of Philadelphia.

PCE Forward Expectations



Note: Primary dealers data begin in August 2012.
Source: Federal Reserve Bank of Philadelphia; Federal Reserve Bank of New York.

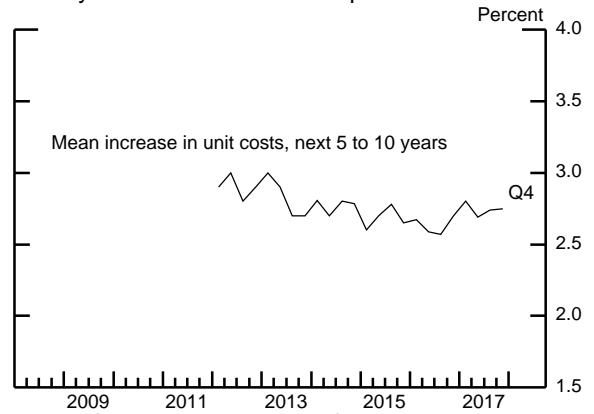
Surveys of Consumers



Note: Federal Reserve Bank of New York (FRBNY) Survey of Consumer Expectations reports expected 12-month inflation rate 3 years from the current survey date. FRBNY data begin in June 2013.

Source: University of Michigan Surveys of Consumers; Federal Reserve Bank of New York Survey of Consumer Expectations.

Survey of Business Inflation Expectations



Note: Survey of businesses in the Sixth Federal Reserve District. Data begin in February 2012.

Source: Federal Reserve Bank of Atlanta.

The data on labor compensation received since the October Tealbook have been mixed, with some measures showing signs of mild acceleration relative to a few years ago.

- The average hourly earnings of employees on private nonfarm payrolls rose 2.4 percent over the 12 months ending in October, well below the elevated reading in September; while we had viewed the September reading as transitory, we were nevertheless surprised to the downside by the October data.¹⁰ We expect the 12-month change to pick up to 2¾ percent over the next couple of quarters, a pace similar to 2016 and above the roughly 2 percent average seen earlier in the expansion.
- Compensation per hour in the business sector—an extremely volatile series—is estimated to have risen 1.0 percent over the four quarters through 2017:Q3, below our estimate in the October Tealbook, reflecting sizable downward revisions to compensation in the second and third quarters of this year. Hourly labor compensation growth is projected to step up from an average pace of around 2¼ percent over the past five years to about 3½ percent in each of the next three years amid tight labor market conditions.
- The employment cost index rose 2.5 percent over the 12 months ending in September, a touch more than we expected, and has shown some acceleration relative to its pace in recent years.
- The Federal Reserve Bank of Atlanta’s Wage Growth Tracker was 3.4 percent in October, also about the same pace as a year ago but up from earlier years.

THE LONG-TERM OUTLOOK

- In the longer-run projection, the natural rate of unemployment holds steady at its slightly downward revised level of 4.7 percent. We continue to assume that long-run potential GDP growth will be 1.7 percent.

¹⁰ Average hourly earnings in September rose substantially, which we think in part reflected a temporary shift in employment away from lower-wage workers due to the hurricanes. This effect was unwound in October when these workers returned to payrolls.

- We have maintained our assumption that the real equilibrium federal funds rate that will prevail in the longer run will be $\frac{1}{2}$ percent. While some of the tax changes are anticipated to persist, the baseline projection assumes that other budget adjustments will eventually be implemented such that the federal debt is sustainable in the long run.
- We expect that the Federal Reserve’s holdings of securities will continue to put downward pressure on longer-term interest rates, though to a diminishing extent over time. The SOMA portfolio is projected to have returned to a normal size by late 2021.
- Real GDP growth slows further to about $1\frac{1}{4}$ percent in 2021 and remains around that pace through 2023. The unemployment rate moves up from 3.5 percent in 2020 to 3.7 percent in 2021 and rises gradually toward its assumed natural rate in subsequent years.
- PCE price inflation moves up a bit to 2.1 percent in 2021 and hovers slightly above the Committee’s long-run objective for several years before edging back down to 2 percent.
- With output materially above its potential level and inflation a bit over the Committee’s 2 percent objective, the nominal federal funds rate is about $1\frac{3}{4}$ percentage points above its long-run value of 2.5 percent in 2021. It moves back toward its long-run value thereafter.

Projections of Real GDP and Related Components
 (Percent change at annual rate from final quarter
 of preceding period except as noted)

Measure	2016	2017		2017	2018	2019	2020
		H1	H2				
Real GDP	1.8	2.1	2.7	2.4	2.4	2.0	1.7
Previous Tealbook	1.8	2.1	3.1	2.6	2.4	1.9	1.6
Final sales	1.9	2.8	2.6	2.7	2.5	1.9	1.7
Previous Tealbook	1.9	2.8	2.8	2.8	2.4	1.9	1.6
Personal consumption expenditures	2.8	2.6	2.4	2.5	2.6	2.3	2.1
Previous Tealbook	2.8	2.6	2.8	2.7	2.6	2.3	2.1
Residential investment	2.5	1.5	-1.0	.2	3.9	2.0	3.4
Previous Tealbook	2.5	1.5	-3.5	-1.0	3.9	2.3	2.7
Nonresidential structures	3.5	10.8	-6.0	2.1	2.5	.7	-.6
Previous Tealbook	3.5	10.8	-3.6	3.4	2.0	.1	-1.2
Equipment and intangibles	-.1	5.8	8.7	7.2	4.0	2.5	1.6
Previous Tealbook	-.1	5.8	8.1	7.0	3.4	1.9	1.2
Federal purchases	-.3	-.3	.6	-.2	-.4	.6	.5
Previous Tealbook	-.3	-.3	.1	-.1	-.6	.7	.6
State and local purchases	.8	-.5	.5	.0	1.0	.8	.9
Previous Tealbook	.8	-.5	-.2	-.3	1.1	.9	.9
Exports	.6	5.4	3.4	4.4	4.5	4.2	3.1
Previous Tealbook	.6	5.4	3.4	4.4	4.8	4.0	2.9
Imports	2.7	2.9	1.2	2.0	3.7	4.1	3.8
Previous Tealbook	2.7	2.9	.2	1.5	4.1	4.1	3.7
Contributions to change in real GDP (percentage points)							
Inventory change	.0	-.7	.1	-.3	-.1	.0	.0
Previous Tealbook	.0	-.7	.3	-.2	.0	.0	.0
Net exports	-.3	.2	.2	.2	.0	-.1	-.2
Previous Tealbook	-.3	.2	.4	.3	.0	-.1	-.2

Real GDP

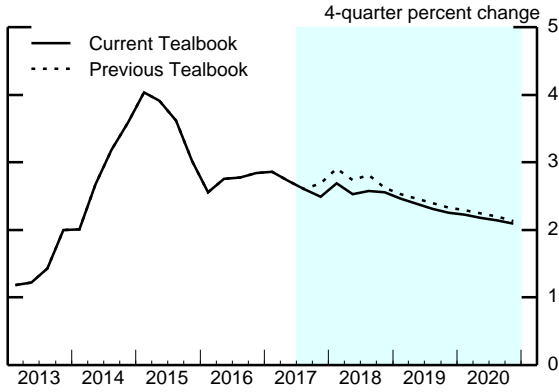


Note: The gray shaded bars indicate a period of business recession as defined by the National Bureau of Economic Research.

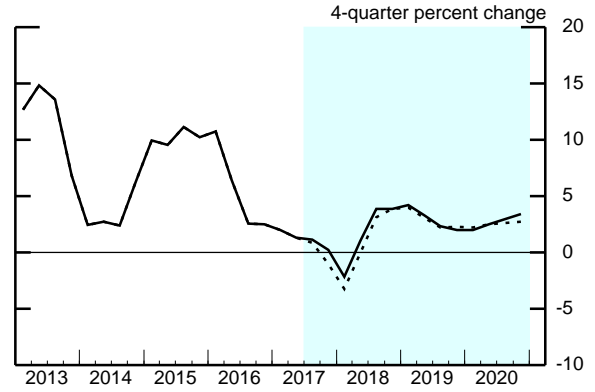
Source: U.S. Department of Commerce, Bureau of Economic Analysis.

Components of Final Demand

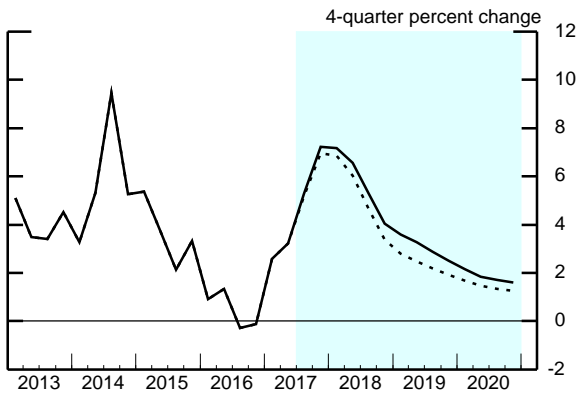
Personal Consumption Expenditures



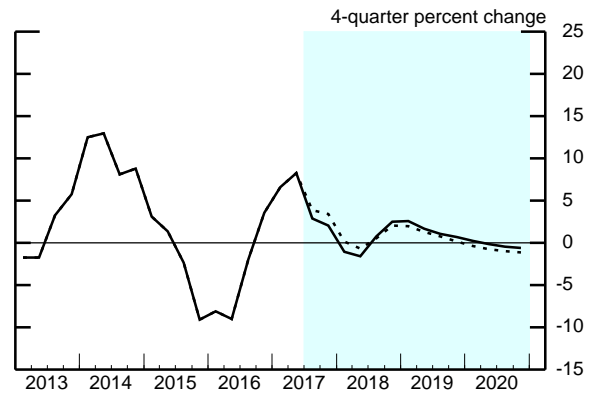
Residential Investment



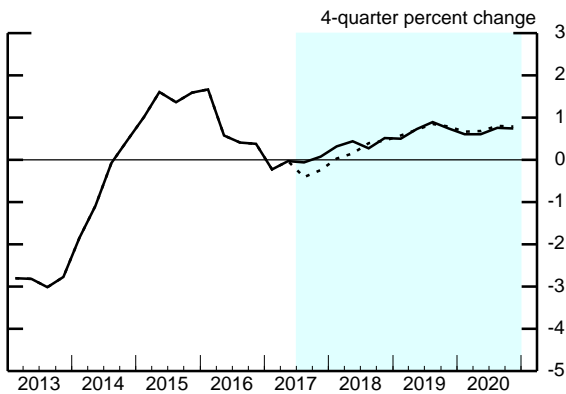
Equipment and Intangibles



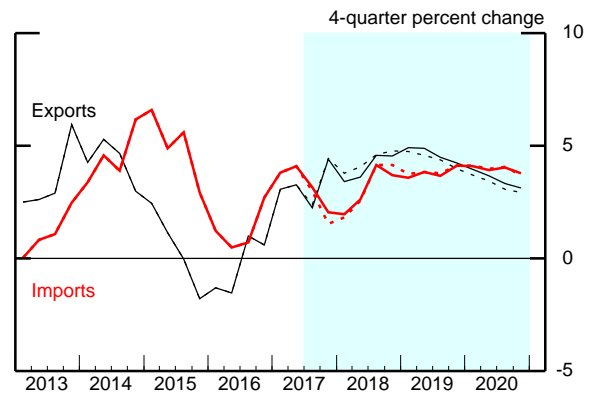
Nonresidential Structures



Government Consumption and Investment



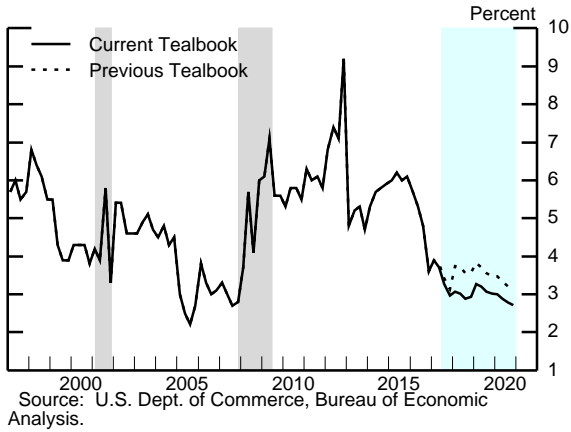
Exports and Imports



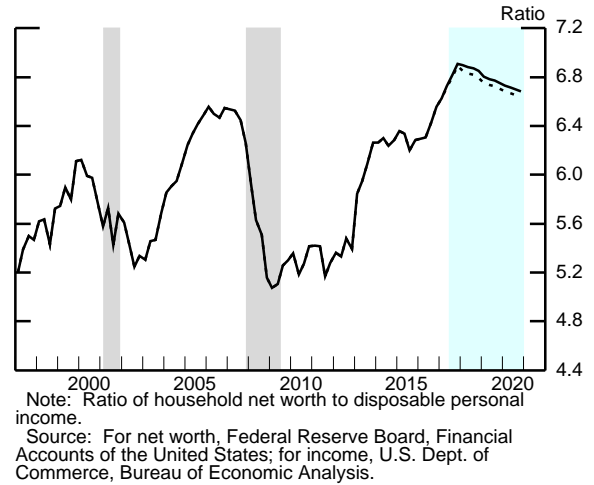
Source: U.S. Department of Commerce, Bureau of Economic Analysis.

Aspects of the Medium-Term Projection

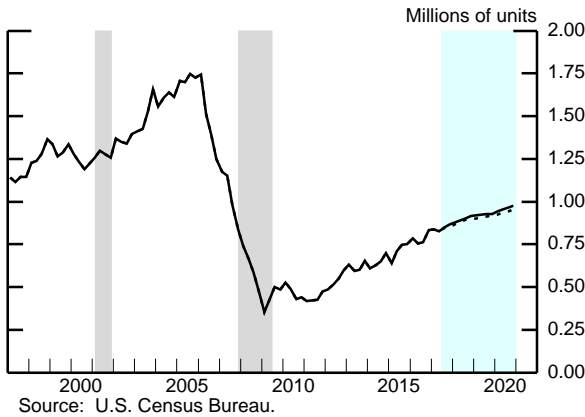
Personal Saving Rate



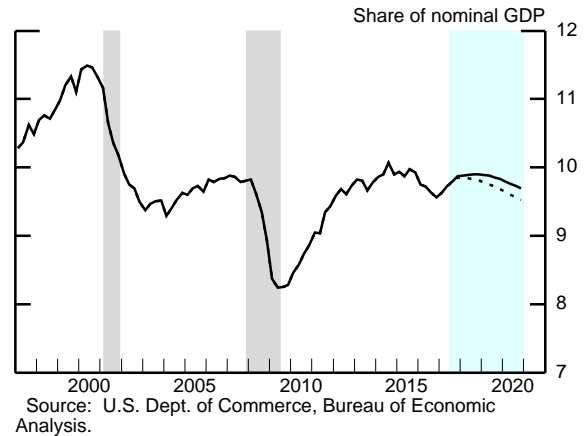
Wealth-to-Income Ratio



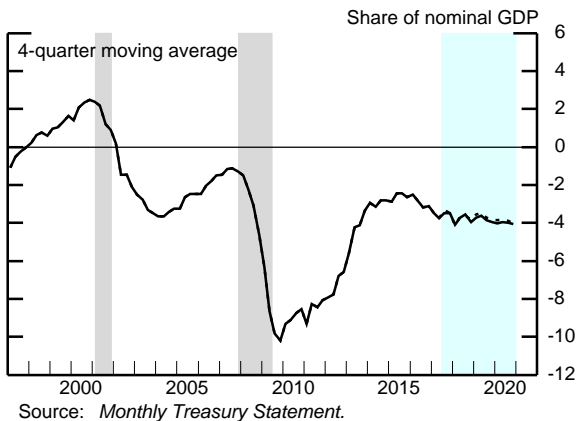
Single-Family Housing Starts



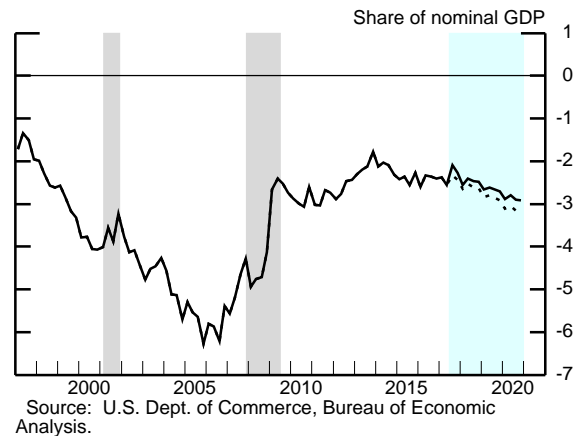
Equipment and Intangibles Spending



Federal Surplus/Deficit



Current Account Surplus/Deficit



Note: The gray shaded bars indicate a period of business recession as defined by the National Bureau of Economic Research.

Decomposition of Potential GDP
(Percent change, Q4 to Q4, except as noted)

Domestic Econ Devel & Outlook

Measure	1974-95	1996-2000	2001-07	2008-10	2011-15	2016	2017	2018	2019	2020
Potential real GDP	3.1	3.4	2.6	1.6	1.2	1.4	1.4	1.6	1.8	1.8
Previous Tealbook	3.1	3.4	2.6	1.6	1.2	1.4	1.5	1.6	1.7	1.7
<i>Selected contributions¹</i>										
Structural labor productivity ²	1.6	2.9	2.8	1.4	.8	.8	1.0	1.1	1.3	1.3
Previous Tealbook	1.6	2.9	2.8	1.4	.8	.8	1.1	1.2	1.3	1.3
Capital deepening	.6	1.5	1.0	.3	.5	.5	.5	.5	.5	.4
Multifactor productivity	.7	1.0	1.5	.9	.1	.1	.3	.4	.6	.7
Structural hours	1.6	1.2	.8	.0	.6	.8	.2	.5	.5	.5
Previous Tealbook	1.6	1.2	.8	.0	.6	.8	.1	.5	.5	.5
Labor force participation	.4	-.1	-.2	-.5	-.6	-.3	-.3	-.3	-.3	-.3
Previous Tealbook	.4	-.1	-.2	-.5	-.6	-.3	-.3	-.4	-.4	-.4
Memo:										
Output gap ³	-1.9	2.4	.8	-4.2	-.1	.3	1.3	2.1	2.3	2.1
Previous Tealbook	-1.9	2.4	.8	-4.2	-.1	.3	1.4	2.1	2.3	2.1

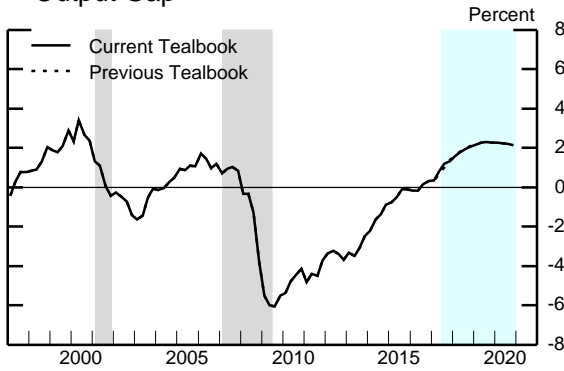
Note: For multiyear periods, the percent change is the annual average from Q4 of the year preceding the first year shown to Q4 of the last year shown.

1. Percentage points.

2. Total business sector.

3. Percent difference between actual and potential GDP in the final quarter of the period indicated. A negative number indicates that the economy is operating below potential.

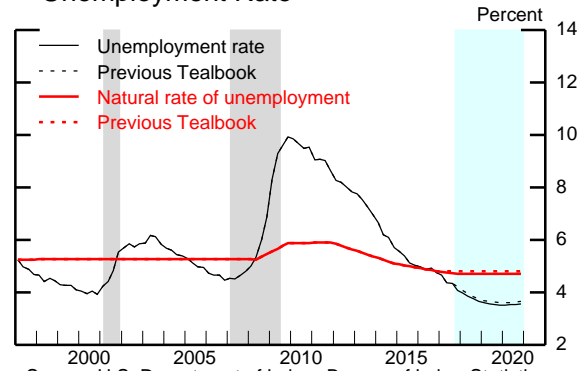
Output Gap



Note: The Output gap is the percent difference between actual and potential GDP; a negative number indicates that the economy is operating below potential.

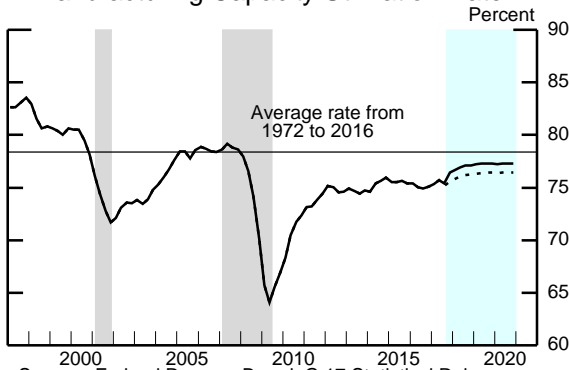
Source: U.S. Department of Commerce, Bureau of Economic Analysis; staff assumptions.

Unemployment Rate



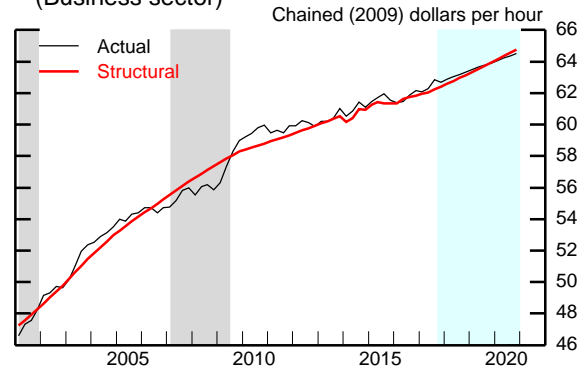
Source: U.S. Department of Labor, Bureau of Labor Statistics; staff assumptions.

Manufacturing Capacity Utilization Rate



Source: Federal Reserve Board, G.17 Statistical Release, "Industrial Production and Capacity Utilization."

Structural and Actual Labor Productivity (Business sector)



Source: U.S. Department of Labor, Bureau of Labor Statistics; U.S. Department of Commerce, Bureau of Economic Analysis; staff assumptions.

Note: The gray shaded bars indicate a period of business recession as defined by the National Bureau of Economic Research.

The Outlook for the Labor Market

Measure	2016	2017		2017	2018	2019	2020
		H1	H2				
Output per hour, business ¹	1.0	.3	1.3	.8	1.0	.9	.9
Previous Tealbook	1.0	.2	2.1	1.2	1.0	.8	.9
Nonfarm payroll employment ²	187	177	171	174	179	147	117
Previous Tealbook	187	177	167	172	179	138	109
Private employment ²	170	174	163	168	170	138	108
Previous Tealbook	170	173	161	167	170	129	100
Labor force participation rate ³	62.7	62.8	62.7	62.7	62.6	62.5	62.4
Previous Tealbook	62.7	62.8	62.8	62.8	62.6	62.5	62.4
Civilian unemployment rate ³	4.7	4.4	4.1	4.1	3.6	3.5	3.5
Previous Tealbook	4.7	4.4	4.2	4.2	3.7	3.6	3.6

1. Percent change from final quarter of preceding period at annual rate.

2. Thousands, average monthly changes.

3. Percent, average for the final quarter in the period.

Source: U.S. Department of Labor, Bureau of Labor Statistics; staff assumptions.

Inflation Projections

Measure	2016	2017		2017	2018	2019	2020
		H1	H2				
<i>Percent change at annual rate from final quarter of preceding period</i>							
PCE chain-weighted price index	1.6	1.2	2.2	1.7	1.7	1.9	2.0
Previous Tealbook	1.6	1.2	1.7	1.5	1.7	2.0	2.0
Food and beverages	-1.7	1.2	.5	.9	2.1	2.3	2.2
Previous Tealbook	-1.7	1.2	.9	1.0	2.1	2.3	2.2
Energy	2.2	-1.5	19.2	8.3	-2.5	-.4	.3
Previous Tealbook	2.2	-1.5	11.2	4.6	-1.6	.2	.7
Excluding food and energy	1.9	1.4	1.6	1.5	1.8	2.0	2.0
Previous Tealbook	1.9	1.4	1.4	1.4	1.8	2.0	2.0
Prices of core goods imports ¹	-.2	1.2	1.9	1.6	.9	.7	.7
Previous Tealbook	-.2	1.2	2.4	1.8	.9	.7	.7
	Sept. 2017	Oct. 2017	Nov. 2017 ²	Dec. 2017 ²	Jan. 2018 ²	Feb. 2018 ²	Mar. 2018 ²
<i>12-month percent change</i>							
PCE chain-weighted price index	1.7	1.6	1.8	1.7	1.5	1.5	1.8
Previous Tealbook	1.6	1.5	1.5	1.4	1.2	1.2	1.6
Excluding food and energy	1.4	1.4	1.5	1.5	1.4	1.4	1.7
Previous Tealbook	1.3	1.3	1.4	1.4	1.3	1.3	1.6

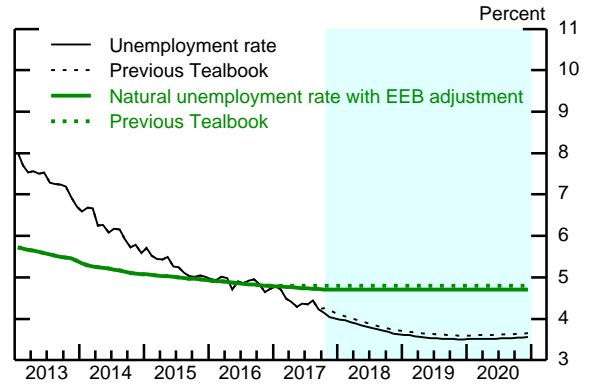
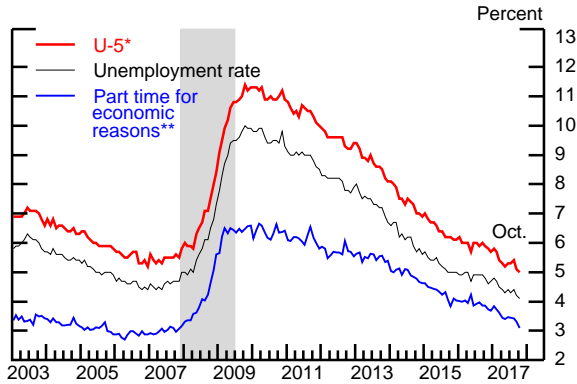
1. Core goods imports exclude computers, semiconductors, oil, and natural gas.

2. Staff forecast.

Source: U.S. Department of Commerce, Bureau of Economic Analysis.

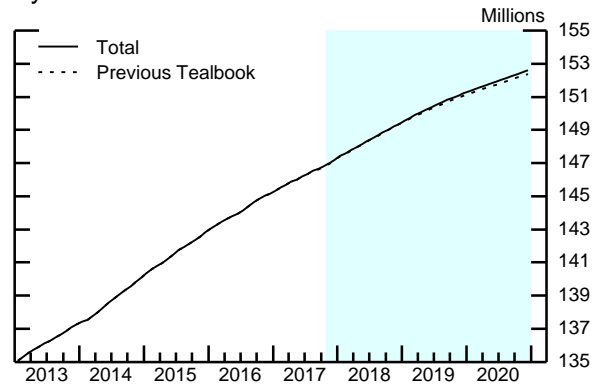
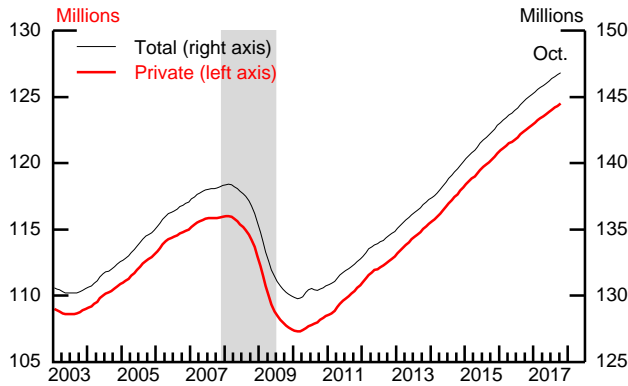
Labor Market Developments and Outlook (1)

Measures of Labor Underutilization



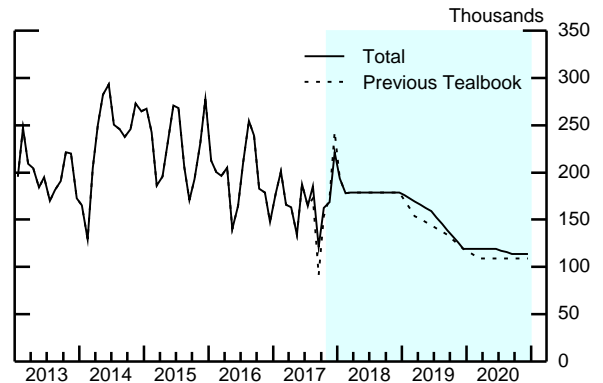
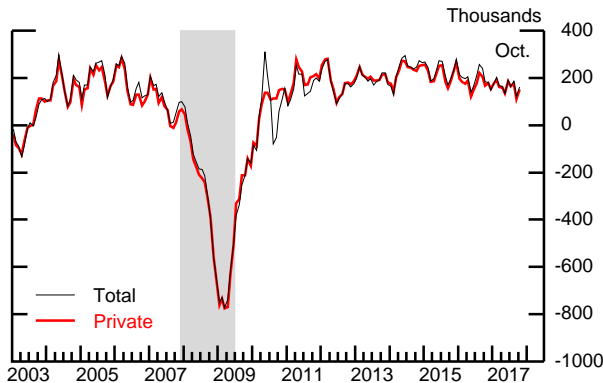
* U-5 measures total unemployed persons plus all marginally attached to the labor force, as a percent of the labor force plus persons marginally attached to the labor force.
 ** Percent of Current Population Survey employment.
 EEB Extended and emergency unemployment benefits.
 Source: U.S. Department of Labor, Bureau of Labor Statistics.

Level of Payroll Employment*



* 3-month moving averages.
 Source: U.S. Department of Labor, Bureau of Labor Statistics.

Change in Payroll Employment*

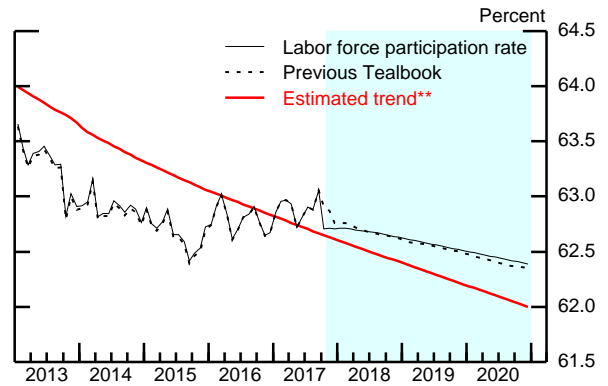
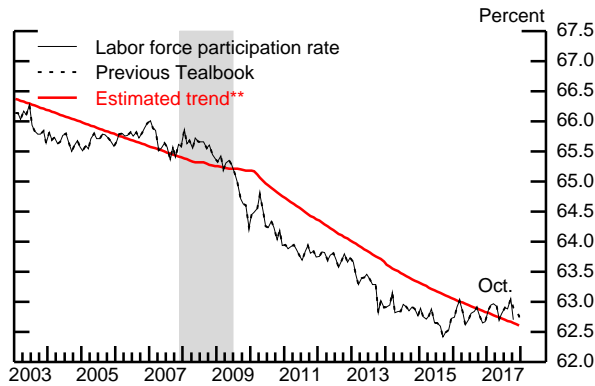


* 3-month moving averages.
 Source: U.S. Department of Labor, Bureau of Labor Statistics.

Note: The gray shaded bars indicate a period of business recession as defined by the National Bureau of Economic Research.

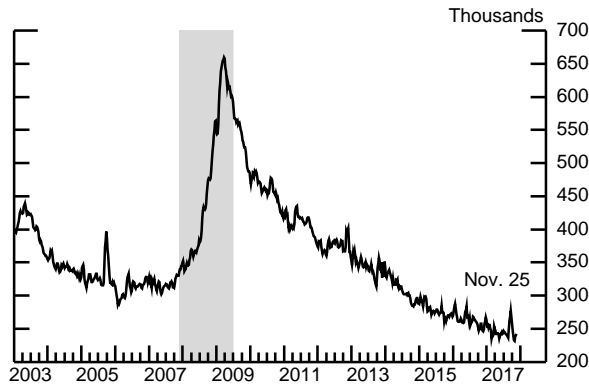
Labor Market Developments and Outlook (2)

Labor Force Participation Rate*



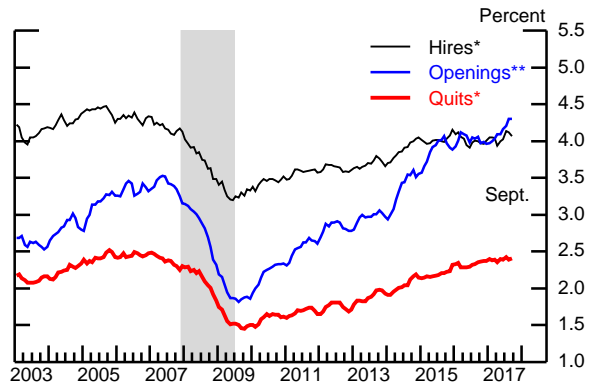
* Published data adjusted by staff to account for changes in population weights.
 ** Includes staff estimate of the effect of extended and emergency unemployment benefits.
 Source: U.S. Department of Labor, Bureau of Labor Statistics; staff assumptions.

Initial Unemployment Insurance Claims*



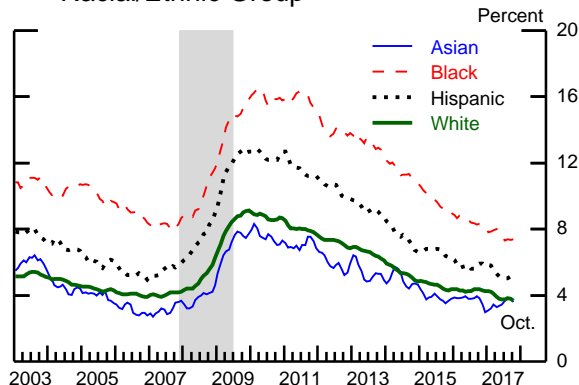
* 4-week moving average.
 Source: U.S. Department of Labor, Employment and Training Administration.

Hires, Quits, and Job Openings



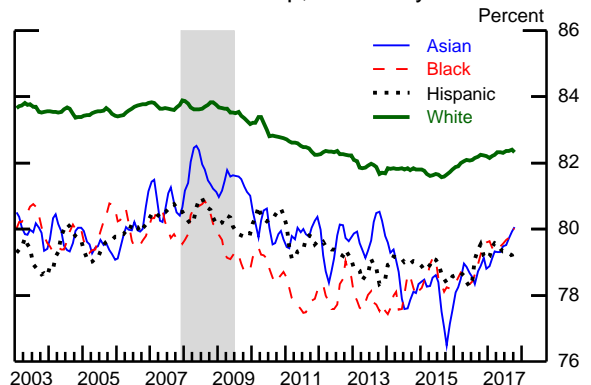
* Percent of private nonfarm payroll employment, 3-month moving average.
 ** Percent of private nonfarm payroll employment plus unfilled jobs, 3-month moving average.
 Source: Job Openings and Labor Turnover Survey.

Unemployment Rate by Racial/Ethnic Group



Note: These categories are not mutually exclusive, as the ethnicity Hispanic may include people of any race. The Current Population Survey defines Hispanic ethnicity as those who report their origin is Mexican, Puerto Rican, Cuban, Central American, or South American (and some others). 3-month moving averages.
 Source: U.S. Department of Labor, Bureau of Labor Statistics, Current Population Survey.

Labor Force Participation Rate by Racial/Ethnic Group, 25 to 54 years old

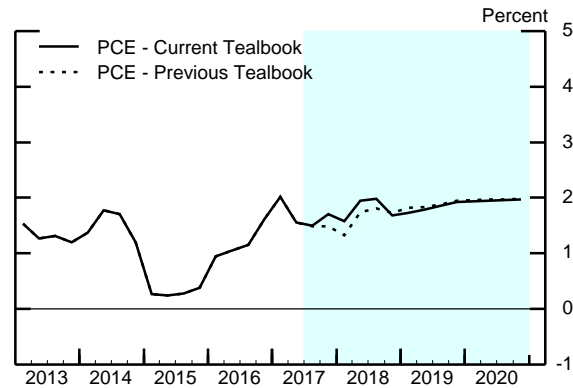
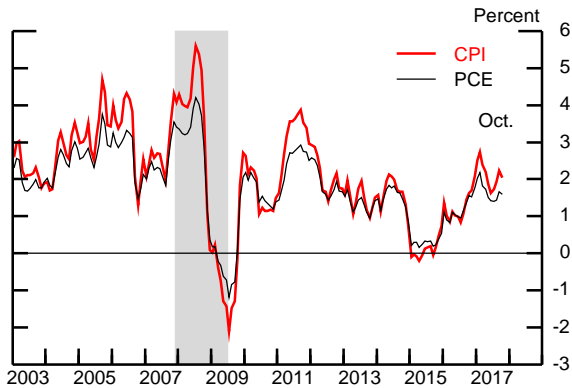


Note: These categories are not mutually exclusive, as the ethnicity Hispanic may include people of any race. The Current Population Survey defines Hispanic ethnicity as those who report their origin is Mexican, Puerto Rican, Cuban, Central American, or South American (and some others). 3-month moving averages.
 Source: U.S. Department of Labor, Bureau of Labor Statistics, Current Population Survey.

Inflation Developments and Outlook (1)

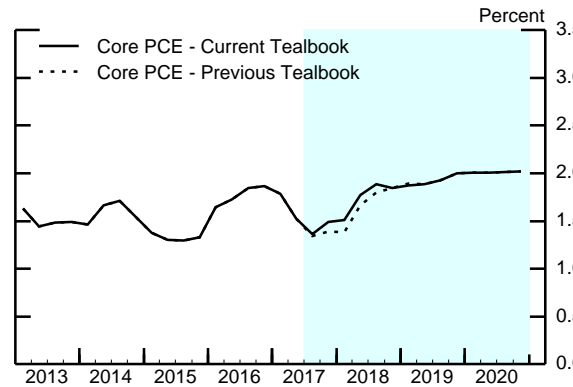
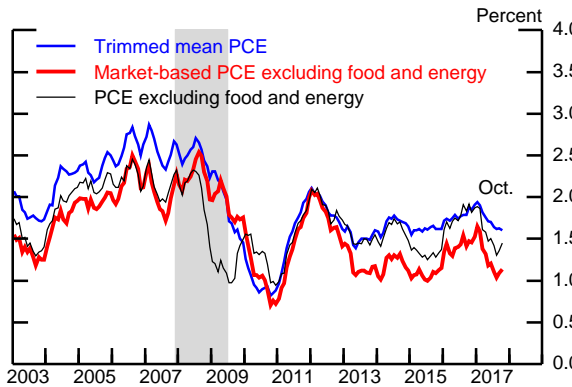
(Percent change from year-earlier period)

Headline Consumer Price Inflation



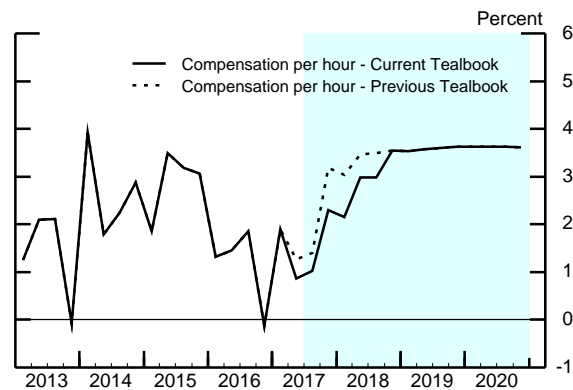
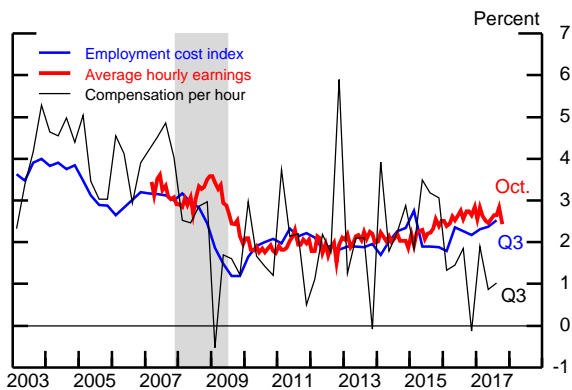
Source: For CPI, U.S. Department of Labor, Bureau of Labor Statistics; for PCE, U.S. Department of Commerce, Bureau of Economic Analysis.

Measures of Underlying PCE Price Inflation



Source: For trimmed mean PCE, Federal Reserve Bank of Dallas; otherwise, U.S. Department of Commerce, Bureau of Economic Analysis.

Labor Cost Growth



Note: Compensation per hour is for the business sector. Average hourly earnings are for the private nonfarm sector. The employment cost index is for the private sector.

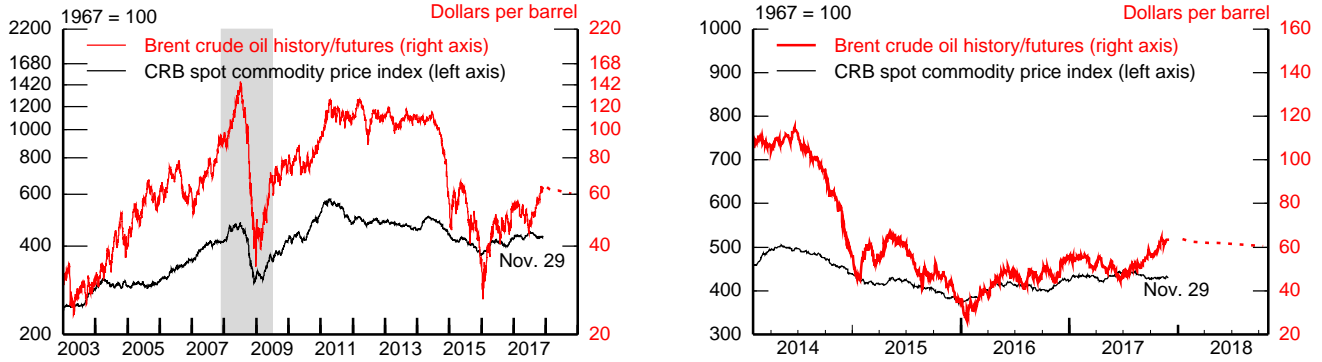
Source: U.S. Department of Labor, Bureau of Labor Statistics.

Note: The gray shaded bars indicate a period of business recession as defined by the National Bureau of Economic Research.

Inflation Developments and Outlook (2)

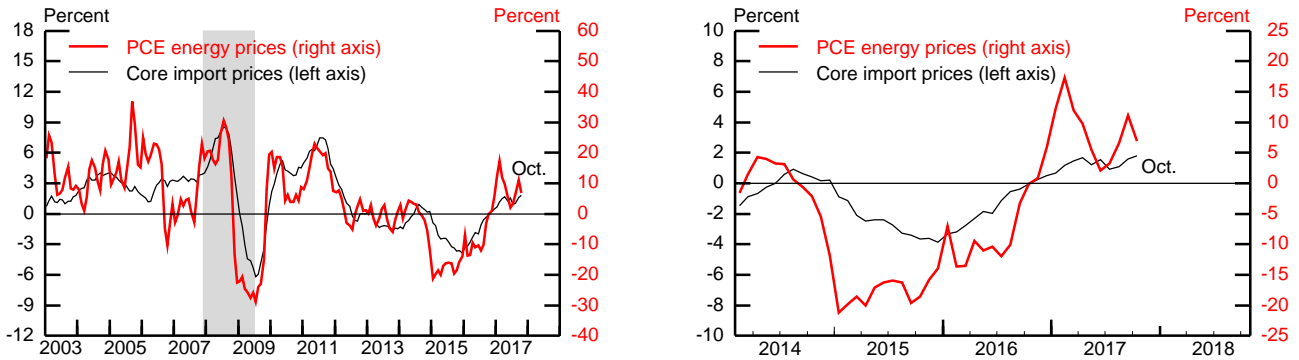
(Percent change from year-earlier period, except as noted)

Commodity and Oil Price Levels



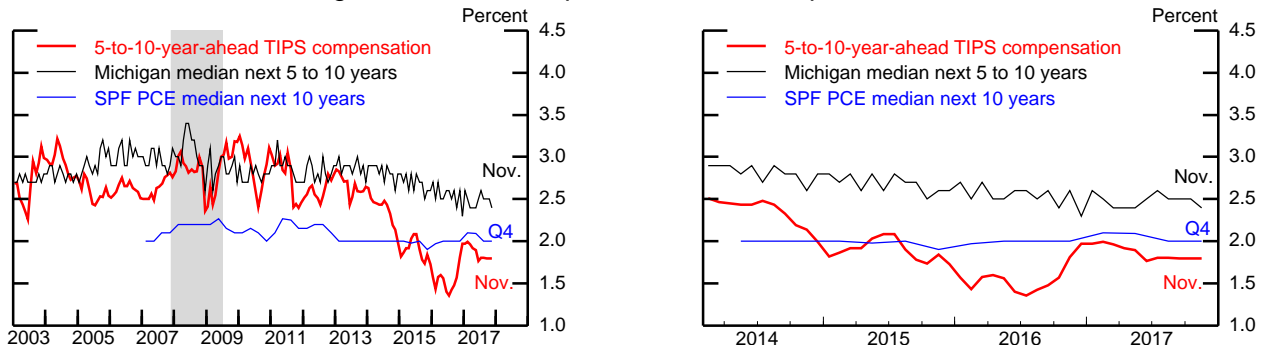
Note: Futures prices (dotted lines) are the latest observations on monthly futures contracts.
 Source: For oil prices, U.S. Department of Energy, Energy Information Agency; for commodity prices, Commodity Research Bureau (CRB).

Energy and Import Price Inflation



Source: For core import prices, U.S. Dept. of Labor, Bureau of Labor Statistics; for PCE, U.S. Dept. of Commerce, Bureau of Economic Analysis.

Long-Term Inflation Expectations and Compensation



Note: Based on a comparison of an estimated TIPS (Treasury Inflation-Protected Securities) yield curve with an estimated nominal off-the-run Treasury yield curve, with an adjustment for the indexation-lag effect.
 SPF Survey of Professional Forecasters.

Source: For Michigan, University of Michigan Surveys of Consumers; for SPF, the Federal Reserve Bank of Philadelphia; for TIPS, Federal Reserve Board staff calculations.

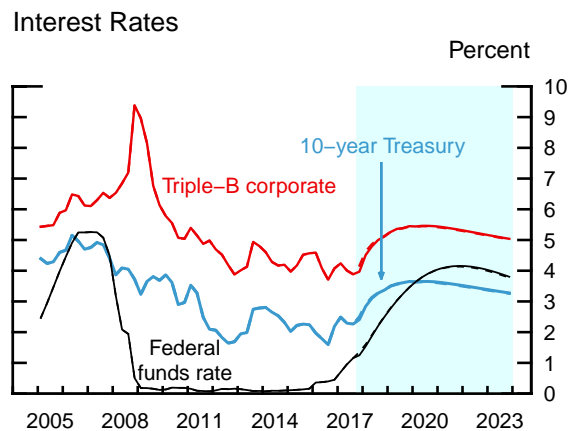
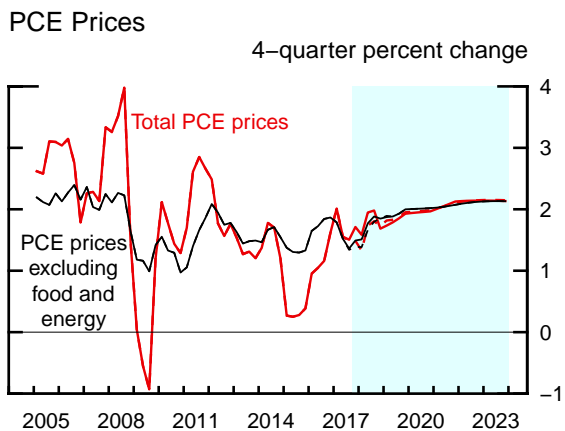
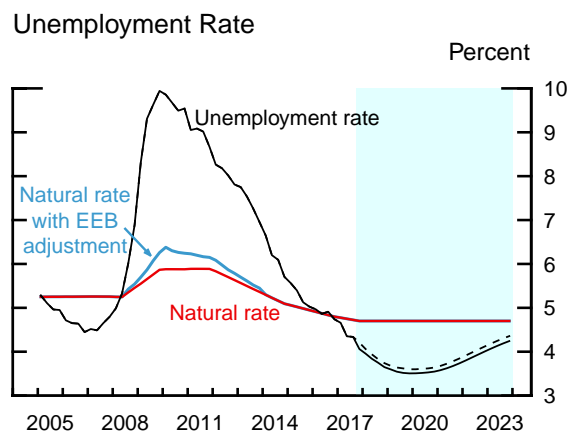
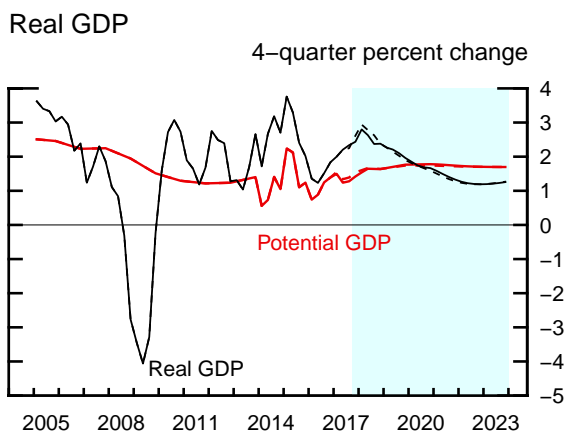
Note: The gray shaded bars indicate a period of business recession as defined by the National Bureau of Economic Research.

The Long-Term Outlook

(Percent change, Q4 to Q4, except as noted)

Measure	2017	2018	2019	2020	2021	2022	2023	Longer run
Real GDP	2.4	2.4	2.0	1.7	1.3	1.2	1.3	1.7
Previous Tealbook	2.6	2.4	1.9	1.6	1.3	1.2	1.3	1.7
Civilian unemployment rate ¹	4.1	3.6	3.5	3.5	3.7	4.0	4.2	4.7
Previous Tealbook	4.2	3.7	3.6	3.6	3.8	4.1	4.4	4.8
PCE prices, total	1.7	1.7	1.9	2.0	2.1	2.1	2.1	2.0
Previous Tealbook	1.5	1.7	2.0	2.0	2.1	2.1	2.1	2.0
Core PCE prices	1.5	1.8	2.0	2.0	2.1	2.1	2.1	2.0
Previous Tealbook	1.4	1.8	2.0	2.0	2.1	2.1	2.1	2.0
Federal funds rate ¹	1.25	2.50	3.46	4.00	4.16	4.05	3.80	2.50
Previous Tealbook	1.35	2.52	3.46	4.00	4.13	4.02	3.77	2.50
10-year Treasury yield ¹	2.4	3.4	3.7	3.6	3.5	3.4	3.3	2.9
Previous Tealbook	2.5	3.4	3.6	3.6	3.5	3.4	3.3	2.9

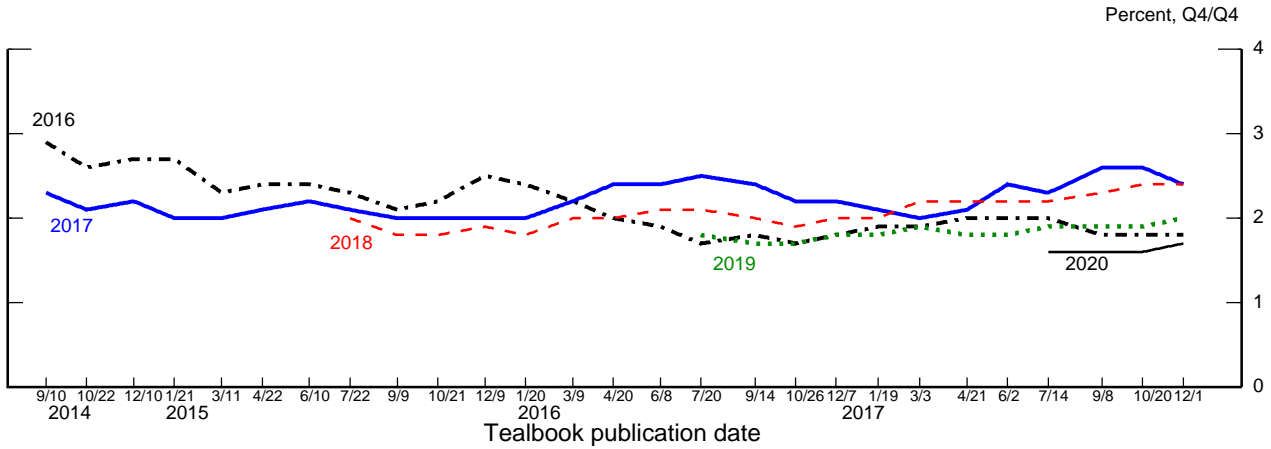
1. Percent, average for the final quarter of the period.



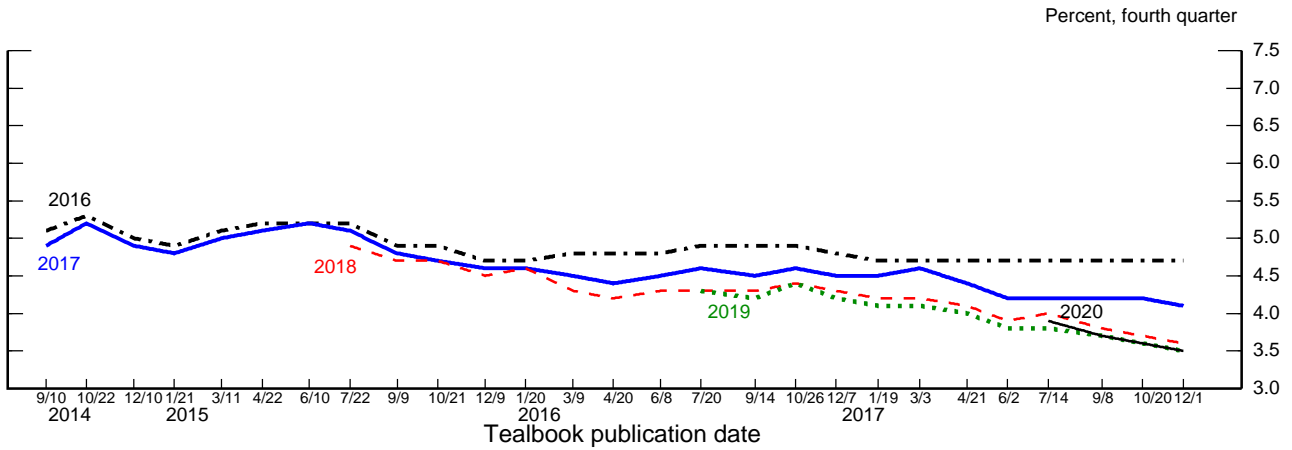
Note: In each panel, shading represents the projection period, and dashed lines are the previous Tealbook.

Evolution of the Staff Forecast

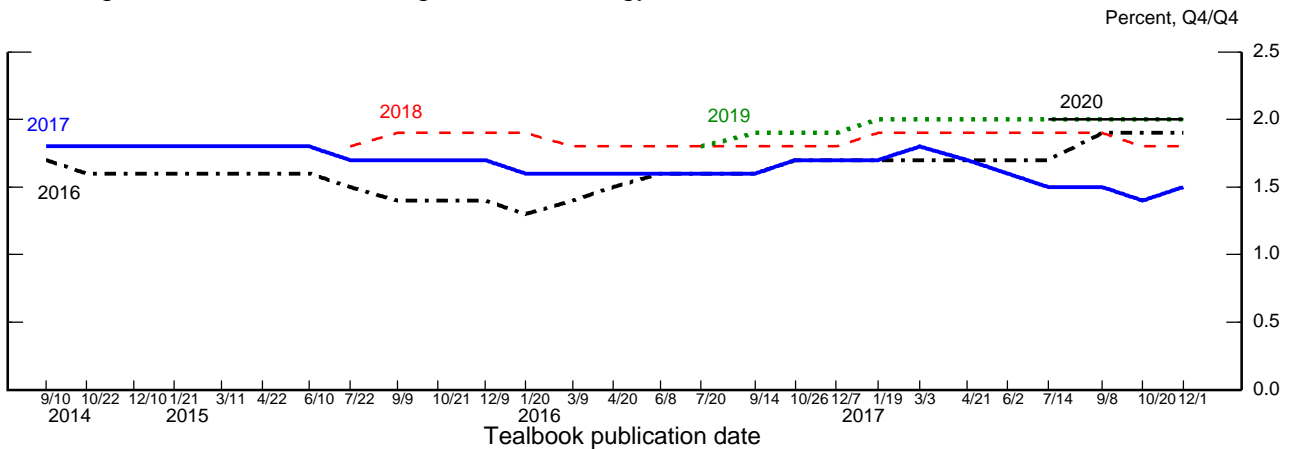
Change in Real GDP



Unemployment Rate



Change in PCE Prices excluding Food and Energy



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International Economic Developments and Outlook

Foreign GDP growth stepped down from a strong annual rate of 3 percent in the second quarter to an estimated 2¼ percent in the third, mainly reflecting a contraction in Mexico induced by its recent hurricane and earthquakes and a slowing in the red-hot pace of activity in Canada. Largely because of an expected rebound in Mexican activity, foreign growth is projected to bounce back to 3 percent in the current quarter. Subsequently, foreign growth is projected to stabilize around its potential pace of just below 2¾ percent in 2018 and over the remainder of the forecast period. Even though growth abroad remains at about potential, we see the foreign recovery becoming more self-sustained, allowing for the gradual normalization of monetary policy. On balance, this projection is little changed from the October Tealbook.

Despite a boost from recent increases in crude oil prices, inflation in the advanced foreign economies (AFEs) is expected to remain muted. In the euro area and Japan, inflation is projected to remain below target over the forecast period, creeping up to 1¾ percent and just above 1 percent, respectively, by 2020. In the United Kingdom, as the effects of past currency depreciation wear off, inflation is projected to slow from 2¾ percent in the current quarter to the 2 percent target by the end of the forecast period. In Canada, inflation is expected to rise from 1.2 percent in the third quarter to just under 2½ percent in 2018, boosted by higher oil prices and a tight labor market, before declining to target by 2020.

With prospects for a sustained pickup in underlying inflation still uncertain, especially in the euro area and Japan, we expect that AFE central banks will maintain accommodative policies. Although the Bank of Canada (BOC) and the Bank of England (BOE) have begun withdrawing stimulus, both central banks are expected to proceed cautiously with further policy normalization.

Developments in oil markets, however, could upset our projection of only gradual increases in interest rates abroad. For example, an escalation of geopolitical tensions in the Middle East could lead to a much sharper increase in oil prices than the moderate rise observed to date. In the context of tight labor markets, such an increase could further boost headline and core inflation, possibly prompting a quicker normalization of monetary policy in the AFEs and a tightening of global financial conditions. We discuss

such a situation in the “Higher Oil Prices and Faster Advanced Foreign Economy Tightening” alternative scenario in the Risks and Uncertainty section.

Global financial conditions could also tighten as a result of spillovers from adverse developments in China, a risk that is magnified by how surprisingly quiescent global financial markets have been lately. We explore this possibility in the “China-Driven Emerging Market Economy Turbulence” scenario in the Risks and Uncertainty section.

ADVANCED FOREIGN ECONOMIES

- **Canada.** Real GDP growth slowed from 4.3 percent in the second quarter to 1.7 percent in the third, as private consumption growth moderated and disruptions in the auto industry weighed on exports. As exports recover, we expect GDP growth to rise to 2¼ percent in the current quarter before gradually slowing to its potential pace of 1¾ percent by 2019. Relative to the October Tealbook, this projection is a touch stronger in 2018 and 2019 owing to the positive effect of higher oil prices on investment.

The BOC, which raised its overnight rate target from ½ percent to 1 percent earlier in 2017, signaled that it will be cautious about future rate hikes, pointing to elevated uncertainty about potential output, the dynamics of wage and price inflation, and the sensitivity of highly indebted households to higher interest rates. Accordingly, we now expect the BOC to wait until early 2018 to tighten policy further, one quarter later than assumed in the October Tealbook.

- **Euro area.** Real GDP grew 2.5 percent in the third quarter, supported by solid domestic and foreign demand. More-recent indicators, such as PMIs and economic sentiment, suggest that activity will expand at a similar pace in the current quarter. Growth is projected to slow to 1¾ percent by mid-2018 and remain at that pace, slightly above potential growth, through 2020. Compared with the October Tealbook, this outlook is about ¼ percentage point stronger in the current quarter as a result of stronger-than-expected incoming data and a touch weaker in 2018 largely because of higher oil prices.

Data through November suggest that core inflation declined from 1.4 percent in the third quarter to ¼ percent in the current quarter, partly reflecting one-off changes in service prices. Even so, headline inflation should edge up to 1½ percent in the

current quarter as a result of higher retail energy prices, and we see it reaching $1\frac{3}{4}$ percent by 2020 as the output gap closes. Given the subdued inflation outlook, the European Central Bank (ECB) announced on October 26 its intention to continue purchasing assets at least through September 2018, albeit at a reduced pace of €30 billion per month starting in January 2018. We expect the ECB to wait until late 2018 to end its purchases and until mid-2019 to start hiking its policy rates.

- **United Kingdom.** Real GDP growth increased from about 1 percent in the first half of 2017 to 1.6 percent in the third quarter, largely reflecting a strong pickup in private consumption growth. Based on better-than-expected incoming data—including PMIs, consumer confidence, and retail sales through October—we project that growth will edge up slightly to $1\frac{3}{4}$ percent in the current quarter. Thereafter, growth should remain near this pace, supported by accommodative monetary policy.

We expect inflation to rise to $2\frac{3}{4}$ percent in the current quarter before gradually falling back to the BOE's 2 percent target over the forecast period as the pass-through from earlier sterling depreciation fades. The BOE raised its policy rate to 0.5 percent on November 2 but also signaled a very gradual pace of tightening over the next few years, partly because of concerns about downside risks from Brexit. In line with this guidance, we now see the policy rate rising to only 1.25 percent by the end of 2020, $\frac{1}{4}$ percentage point less than assumed in the October Tealbook.

- **Japan.** Real GDP growth slowed to 1.4 percent in the third quarter, still well above our potential growth estimate of $\frac{3}{4}$ percent. Based on solid recent data, including exports for October and PMIs through November, we expect growth to remain just below $1\frac{1}{2}$ percent in the current quarter before slowing to a more sustainable 1 percent pace in 2018. In line with recent news, we now assume that proceeds of the 2019 tax hike—rather than being used exclusively to reduce the deficit—will partly fund new childcare and education programs. Accordingly, we revised our growth forecast up a touch to $\frac{1}{4}$ percent in 2019 and to $\frac{3}{4}$ percent in 2020.

Inflation turned positive in the third quarter, with both overall and core consumer prices rising at a modest 0.4 percent annual rate. Elevated resource utilization should push up inflation further over the forecast period, though only to about 1 percent, given that inflation expectations remain well below the Bank of Japan's 2 percent target. Against this background, we continue to assume that monetary policy will remain highly accommodative throughout the forecast period.

EMERGING MARKET ECONOMIES

- **Mexico.** After growing a paltry 1.1 percent in the second quarter, real GDP contracted 1¼ percent in the third quarter as two major earthquakes and a hurricane significantly disrupted economic activity. This estimate is about 2¾ percentage points below our October Tealbook projection. As temporary disruptions from these natural disasters unwind and reconstruction gets under way, growth is projected to rebound to 3½ percent in the current quarter. Thereafter, we expect diminishing fiscal drag, past reforms in the energy sector, and monetary easing to support real GDP growth at an average pace of around 2¾ percent over the forecast period. However, uncertainties stemming from the July 2018 presidential election and the NAFTA renegotiation process present downside risks to growth.

Headline inflation eased from 6.9 percent in the second quarter to a still-high 5.1 percent in the third. Highlighting risks of another pickup in inflation, the Bank of Mexico kept its policy rate unchanged at 7 percent at its November meeting, the last meeting before Alejandro Díaz de León succeeds Agustín Carstens as governor. As inflation falls further to just above 3 percent in 2018, the Bank of Mexico is projected to begin reducing its policy rate gradually in mid-2018.

- **Brazil.** The recovery from Brazil's long and deep recession remains very weak. Real GDP growth slowed from 2.7 percent in the second quarter to 0.6 percent in the third; a strong rebound in imports more than offset the boost to GDP from improving domestic demand. We expect growth to pick up to a still-tepid 2 percent pace in 2018, supported by substantial monetary policy easing but held back by political uncertainty, household and corporate deleveraging, and fiscal retrenchment.

As drag from earlier declines in food prices fades, inflation is projected to rise from 2¼ percent in the second and third quarters to 3¾ percent in the fourth. With inflation still below the central bank's current target of 4½ percent and domestic demand recovering very slowly, we expect the central bank to cut its policy rate 50 basis points to 7 percent at its December meeting, bringing the cumulative reduction in the policy rate since October 2016 to 7½ percentage points.

- **Venezuela.** Amid economic freefall, soaring inflation, and inadequate international reserves, Venezuela has struggled to service its sovereign and state-owned oil enterprise bonds. The current situation is murky; there are reports that some bond

payments have been made with significant delays, but other payments remain overdue. These payment delays beyond grace periods led credit agencies to downgrade some bond ratings to “selective default.” So far, Venezuela’s travails have generated little spillover to global markets.

- **China.** Recent data have been mixed. Although indicators have softened in some sectors, such as manufacturing and construction, other data, such as PMIs and retail sales, suggest that the overall pace of growth is holding up. All told, we expect real GDP to grow 6½ percent in the fourth quarter, little changed from its third-quarter pace but down from 7 percent during the first half. We continue to see growth slowing further, reaching 5¾ percent by 2020.

We see headline inflation rising from 2 percent in the third quarter to 3 percent in the fourth, primarily because of rising food and energy prices. As the temporary boost from commodity prices fades, inflation is projected to settle around 2½ percent in 2018 and stay there over the remainder of the forecast period.

- **Other Emerging Asia.** Real GDP growth rose from 4.1 percent in the second quarter to 5.1 percent in the third, mainly driven by stronger exports to China and to the United States as well as a pickup in domestic consumption. With export and PMI indicators pointing to a modest slowdown in Korea, Taiwan, and Singapore, we expect growth in emerging Asia excluding China to slow to 4¼ percent in the current quarter. Thereafter, growth is projected to gradually decline to about 3½ percent by 2020, as Chinese imports slow, the global trade boom moderates, and monetary policy becomes less accommodative.

The Foreign GDP Outlook

Real GDP*

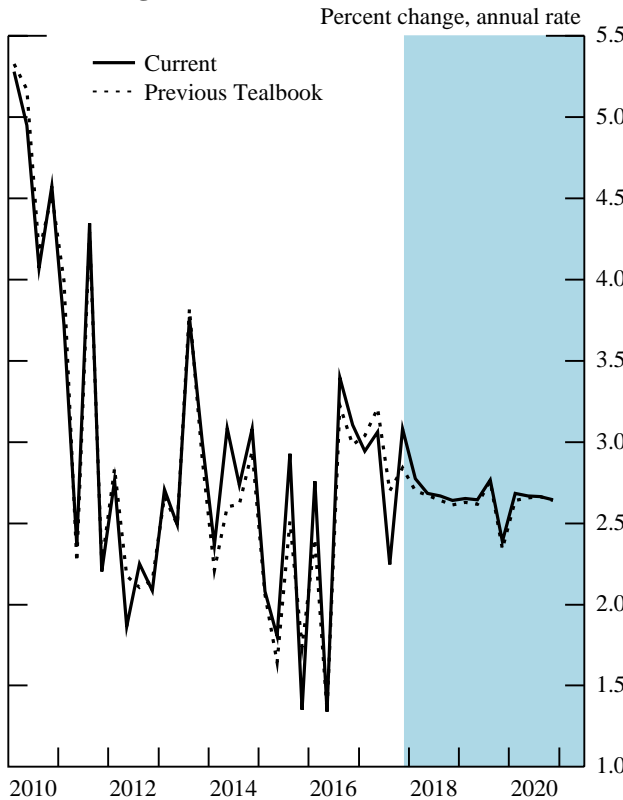
Percent change, annual rate

	2017			2018			2019	2020
	H1	Q3	Q4	Q1	Q2	H2		
1. Total Foreign	3.0	2.2	3.1	2.8	2.7	2.7	2.6	2.7
Previous Tealbook	3.1	2.7	2.8	2.7	2.7	2.6	2.6	2.7
2. Advanced Foreign Economies	2.9	2.0	2.1	2.0	1.8	1.7	1.6	1.7
Previous Tealbook	2.9	2.3	2.0	1.8	1.8	1.7	1.6	1.6
3. Canada	4.0	1.7	2.2	2.1	2.0	1.9	1.8	1.7
4. Euro Area	2.4	2.5	2.4	2.0	1.6	1.7	1.7	1.7
5. Japan	1.8	1.4	1.4	1.2	1.1	.8	.2	.8
6. United Kingdom	1.1	1.6	1.7	1.5	1.5	1.5	1.5	1.7
7. Emerging Market Economies	3.1	2.5	4.0	3.6	3.6	3.6	3.6	3.7
Previous Tealbook	3.3	3.1	3.6	3.6	3.6	3.6	3.6	3.6
8. China	6.9	6.5	6.6	6.3	6.3	6.1	6.0	5.8
9. Emerging Asia ex. China	4.2	5.1	4.2	3.9	3.7	3.7	3.6	3.6
10. Mexico	1.7	-1.2	3.5	2.6	2.6	2.6	2.7	2.9
11. Brazil	4.0	.6	1.9	2.0	2.0	2.0	2.5	2.5

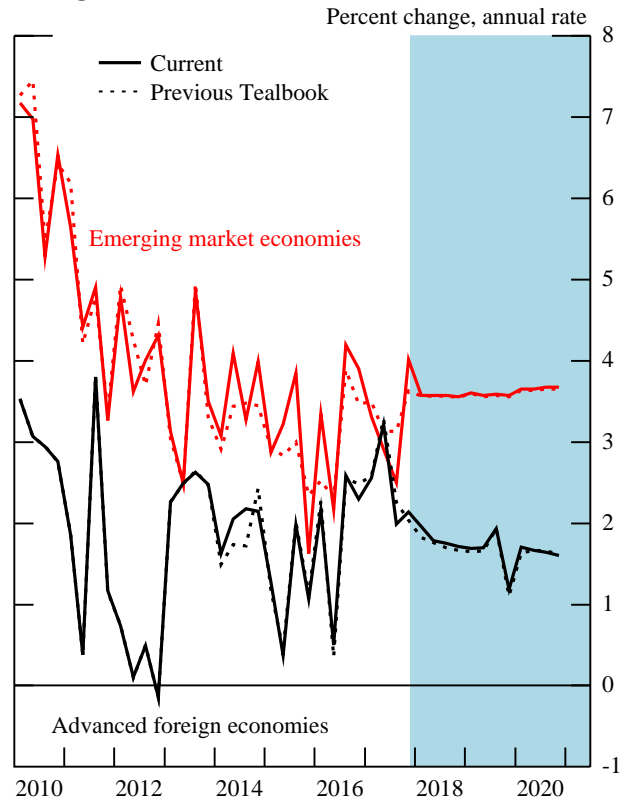
* GDP aggregates weighted by shares of U.S. merchandise exports.

Int'l Econ Devel & Outlook

Total Foreign GDP



Foreign GDP



The Foreign Inflation Outlook

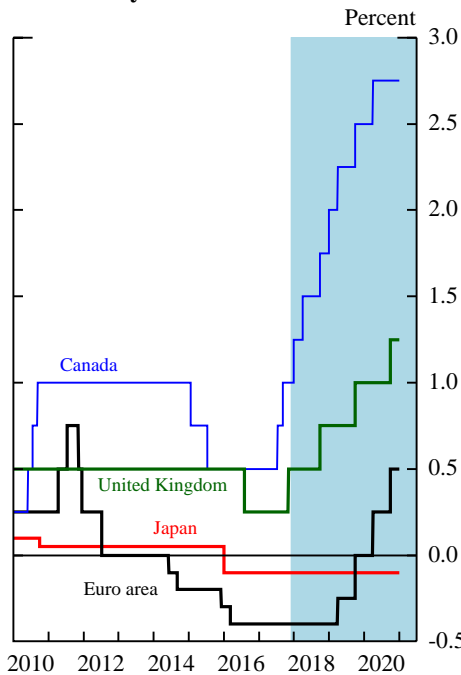
Consumer Prices*	Percent change, annual rate							
	2017			2018			2019	2020
	H1	Q3	Q4	Q1	Q2	H2		
1. Total Foreign	2.4	2.2	2.6	2.5	2.5	2.5	2.5	2.4
Previous Tealbook	2.4	2.2	2.4	2.5	2.4	2.4	2.5	2.4
2. Advanced Foreign Economies	1.3	1.1	1.8	1.7	1.6	1.6	1.9	1.7
Previous Tealbook	1.3	1.1	1.6	1.6	1.5	1.6	1.9	1.7
3. Canada	1.3	1.2	2.1	2.4	2.4	2.3	2.1	2.0
4. Euro Area	1.5	1.0	1.6	1.5	1.3	1.4	1.6	1.7
5. Japan	-2	.4	1.3	.9	.8	.8	2.3	1.0
6. United Kingdom	3.4	2.3	2.8	2.5	2.3	2.2	2.2	2.1
7. Emerging Market Economies	3.3	3.0	3.1	3.0	3.1	3.1	3.0	2.9
Previous Tealbook	3.3	2.9	3.0	3.1	3.0	3.0	3.0	2.9
8. China	.9	2.0	3.0	2.3	2.5	2.5	2.5	2.5
9. Emerging Asia ex. China	2.0	2.1	2.4	3.1	3.2	3.2	3.1	3.1
10. Mexico	8.4	5.1	3.5	3.2	3.2	3.2	3.2	3.2
11. Brazil	2.7	2.3	3.8	4.3	4.3	4.3	4.3	4.3

* CPI aggregates weighted by shares of U.S. non-oil imports.

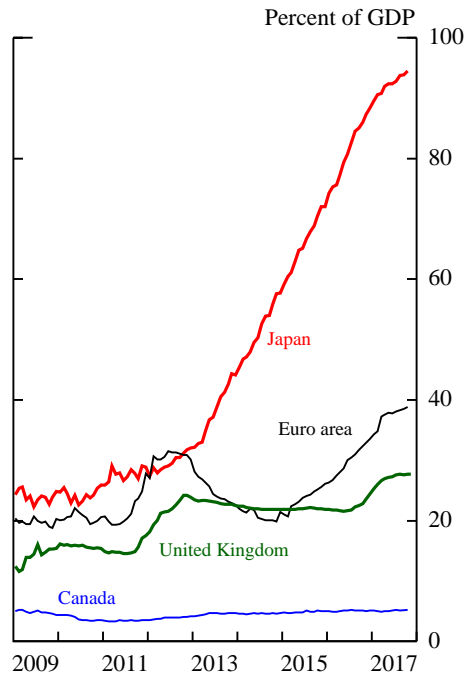
Int'l Econ Devel & Outlook

Foreign Monetary Policy

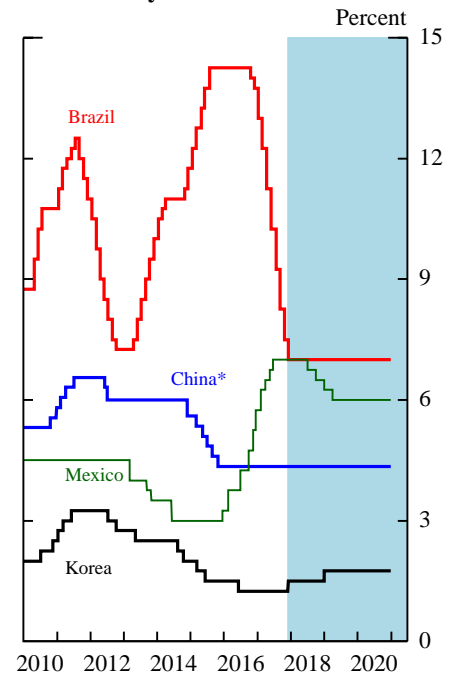
AFE Policy Rates



AFE Central Bank Balance Sheets

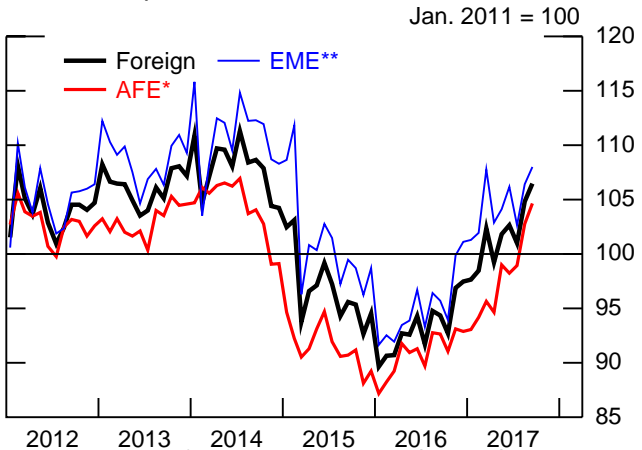


EME Policy Rates



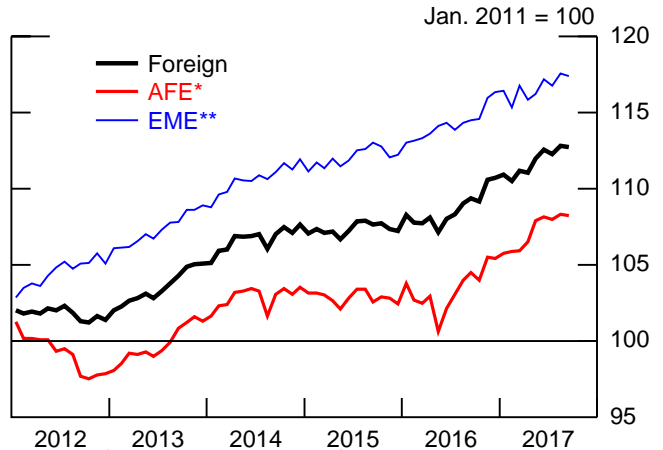
Recent Foreign Indicators

Nominal Exports



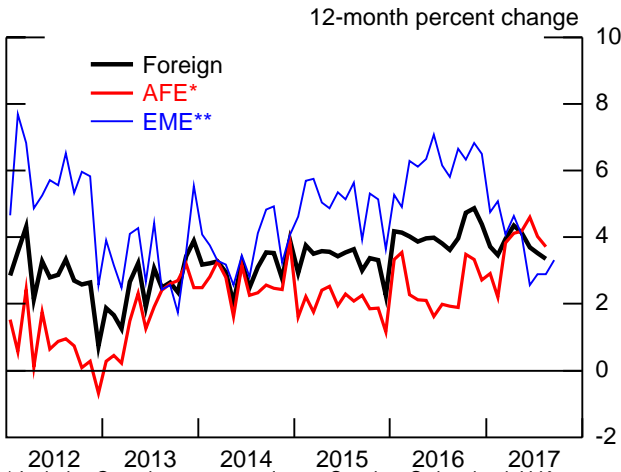
* Includes Australia, Canada, euro area, Japan, Sweden, Switzerland, U.K.
 ** Includes Argentina, Brazil, Chile, China, Colombia, Hong Kong, India, Indonesia, Israel, Korea, Malaysia, Mexico, Singapore, Taiwan, Thailand.

Industrial Production



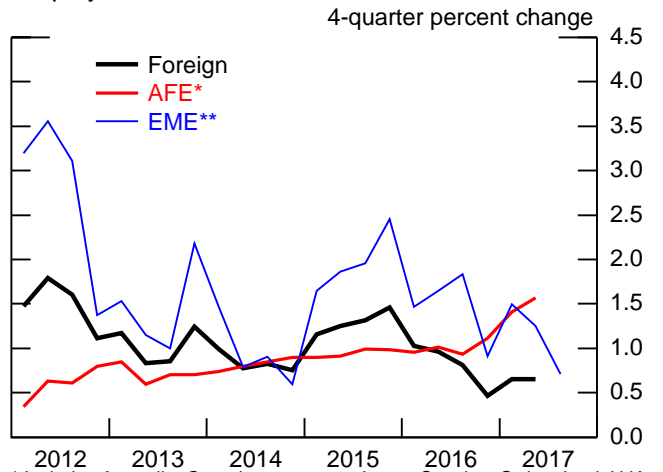
* Includes Canada, euro area, Japan, Sweden, U.K.
 ** Includes Argentina, Brazil, Chile, China, Colombia, India, Indonesia, Israel, Korea, Malaysia, Mexico, Philippines, Russia, Singapore, Taiwan, Thailand.

Retail Sales



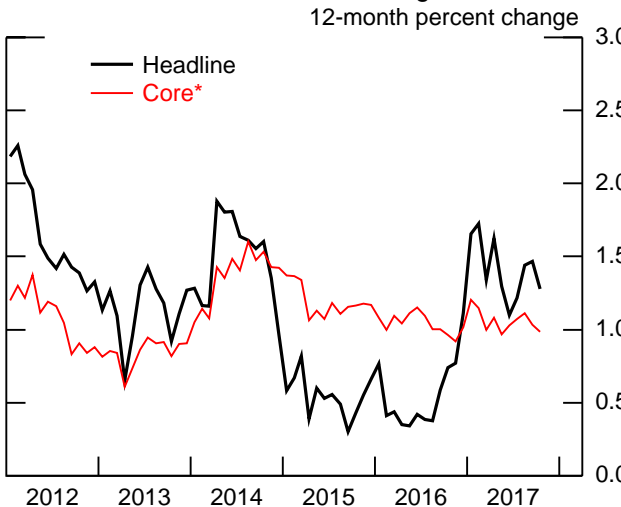
* Includes Canada, euro area, Japan, Sweden, Switzerland, U.K.
 ** Includes Brazil, Chile, China, Korea, Mexico, Singapore, Taiwan.

Employment



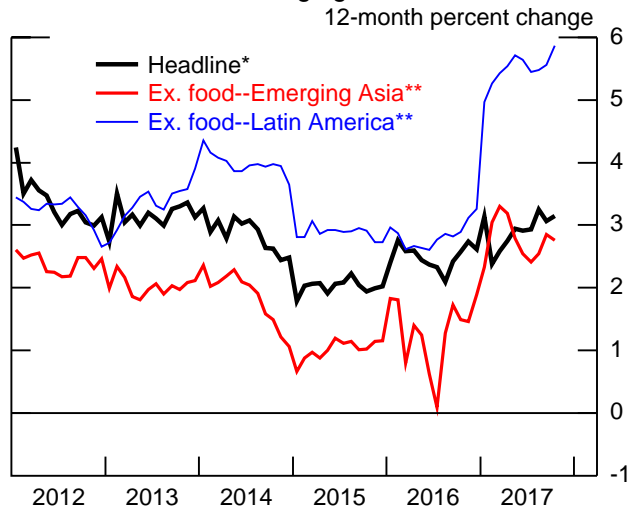
* Includes Australia, Canada, euro area, Japan, Sweden, Switzerland, U.K.
 ** Includes Chile, Colombia, Hong Kong, Israel, Korea, Mexico, Philippines, Russia, Singapore, Taiwan, Thailand, Turkey.

Consumer Prices: Advanced Foreign Economies



Note: Includes Canada, euro area, Japan, U.K.
 * Excludes all food and energy; staff calculation.
 Source: Haver Analytics.

Consumer Prices: Emerging Market Economies

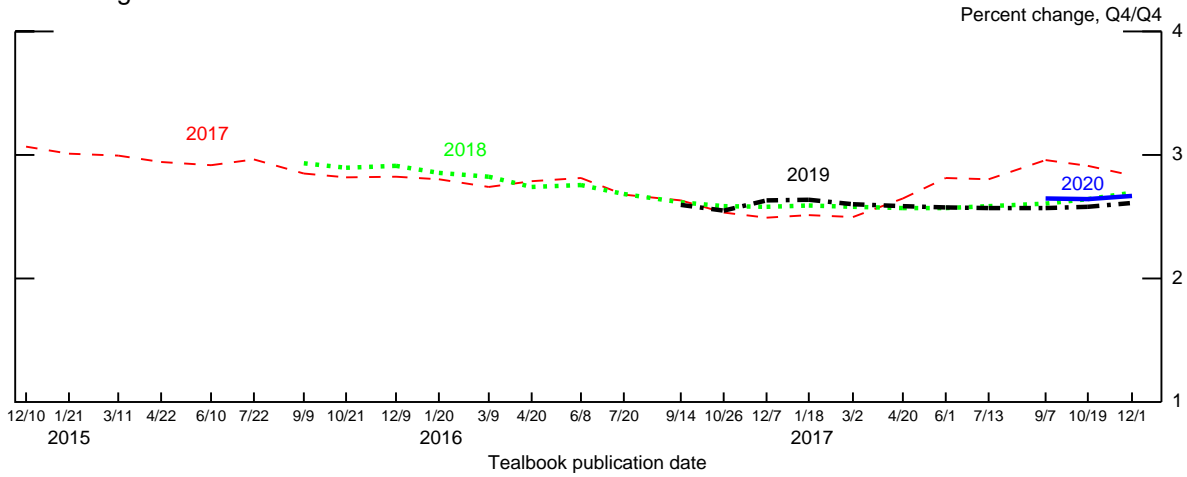


* Includes Brazil, Chile, China, Colombia, Hong Kong, India, Indonesia, Korea, Malaysia, Mexico, Philippines, Singapore, Taiwan, Thailand.
 ** Excludes all food; staff calculation. Excludes Argentina and Venezuela.

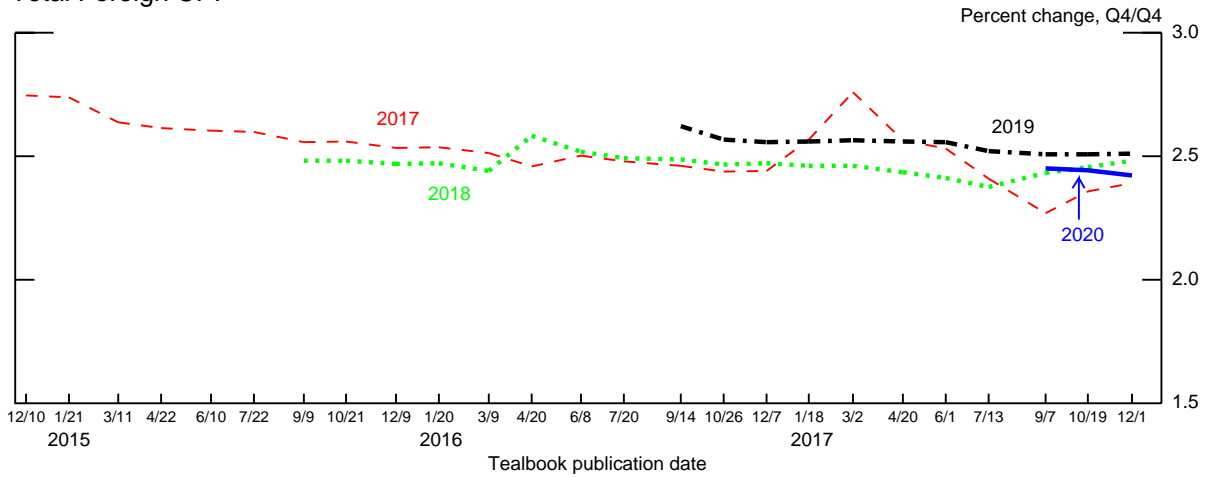
Int'l Econ Devel & Outlook

Evolution of Staff's International Forecast

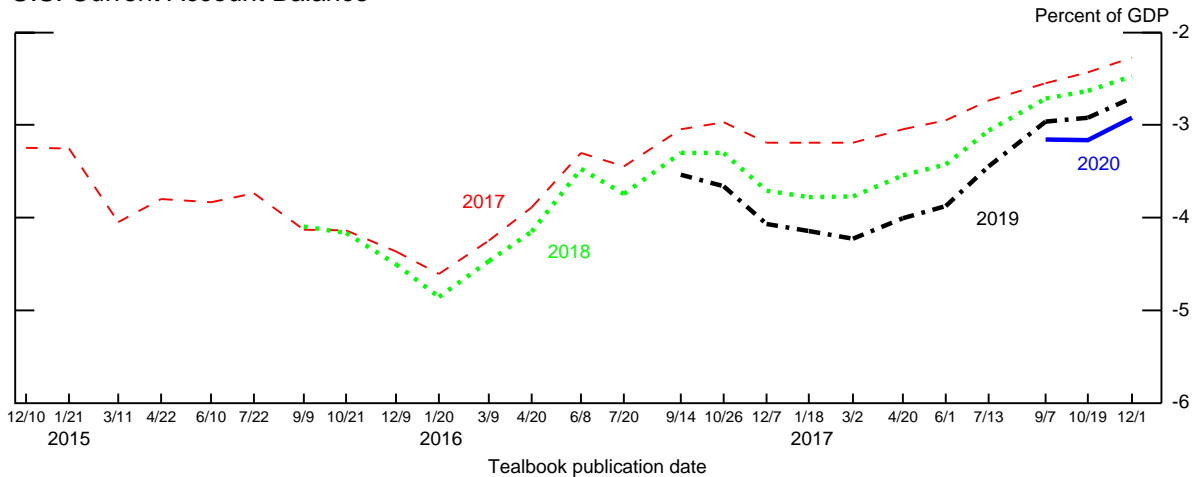
Total Foreign GDP



Total Foreign CPI



U.S. Current Account Balance



Int'l Econ Devel & Outlook

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Financial Market Developments

Over the intermeeting period, the nominal Treasury yield curve flattened, as short-dated yields increased notably while long-dated yields moved up only slightly. The Treasury Department's quarterly refunding statement and the Treasury Borrowing Advisory Committee recommendation that pointed to increased issuance of short-dated securities were reportedly seen as the main drivers behind the rise in short-dated Treasury yields. FOMC communications and slightly stronger-than-expected economic data releases have reinforced market expectations for a December rate hike. As the likelihood of the passage of U.S. tax legislation increased, broad equity price indexes rose modestly. The dollar weakened moderately against a broad basket of currencies.

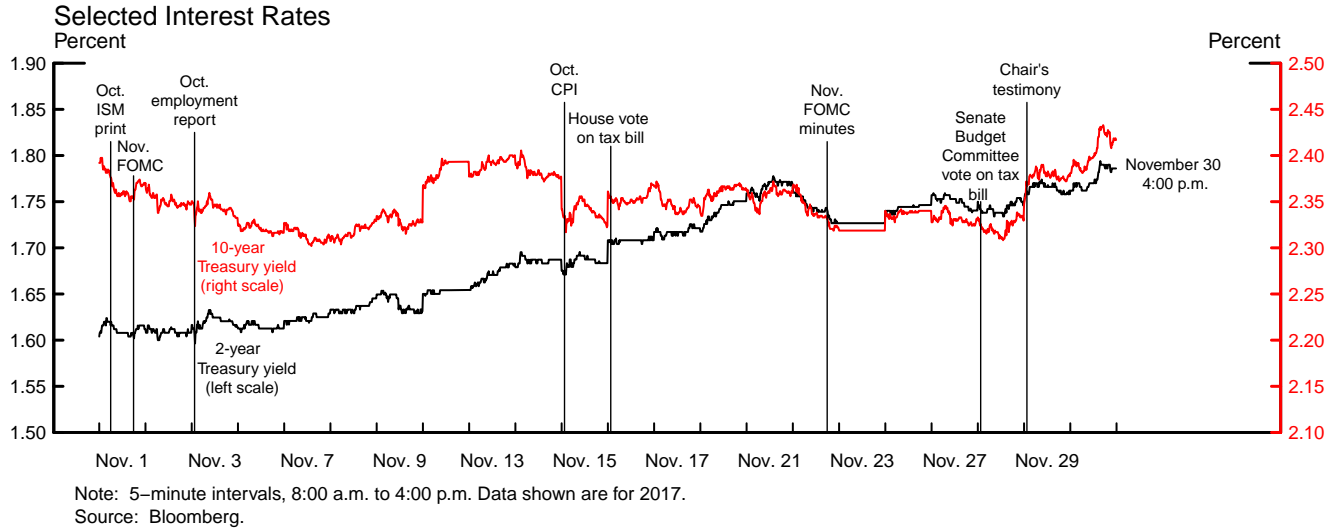
- The market-implied probability of a rate hike at the December FOMC meeting rose slightly to a level of near certainty. A straight read of market quotes implies that a further rate hike is fully priced in for the first half of 2018, while a staff model that adjusts for term premiums suggests that market participants may be expecting two rate hikes in that period.
- The 2-year Treasury yield rose 20 basis points over the intermeeting period, and the 10-year yield edged up 6 basis points. TIPS-based measures of inflation compensation were little changed on net.
- Broad U.S. equity price indexes increased about 3 percent. The VIX ticked up a bit but remained near its historically low levels. Credit spreads on both investment- and speculative-grade corporate bonds were about flat on net.
- The broad dollar depreciated 1¼ percent amid strong data releases from the euro area. Advanced foreign economy (AFE) yield curves flattened slightly. Movements in foreign risky asset prices were mixed.

POLICY EXPECTATIONS AND ASSET MARKET DEVELOPMENTS

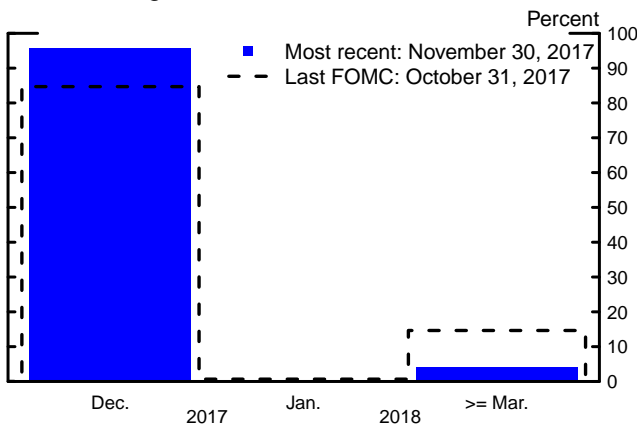
Domestic Developments

FOMC communications over the intermeeting period, including the FOMC's November postmeeting statement and the release of the November meeting minutes, were characterized by market participants as being largely in line with expectations and

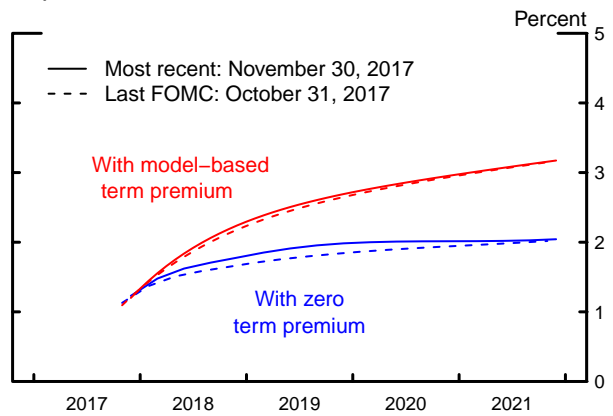
Policy Expectations and Treasury Yields



Market-Implied Probability Distribution of the Timing of Next Rate Increase

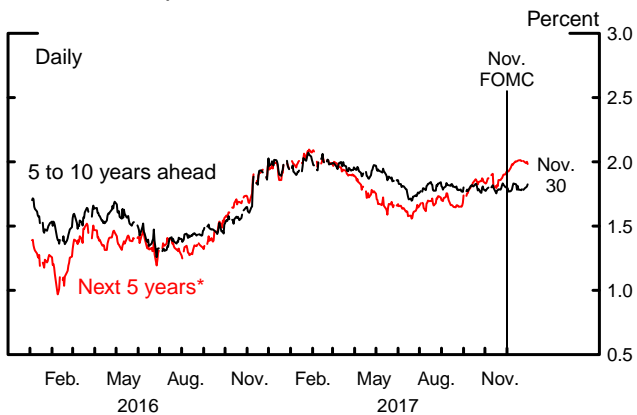


Implied Federal Funds Rate

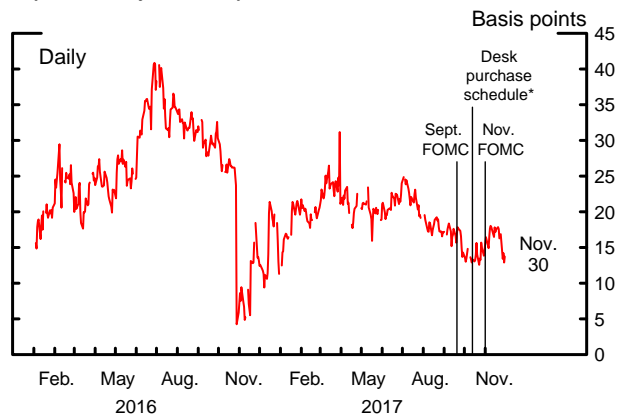


Financial Markets

Inflation Compensation



30-year Fannie Mae MBS Current-Coupon Option-Adjusted Spread



reinforcing the perceived likelihood of an increase in the target range for the federal funds rate at the December meeting. Domestic economic data releases, on balance, came in slightly stronger than anticipated. In particular, market participants highlighted the October CPI release, which was seen as consistent with a modest and sustained strengthening in inflation.

A straight read of quotes on federal funds futures contracts suggests that the probability that market participants attach to a rate hike at the upcoming FOMC meeting edged up to around 95 percent. Beyond the current year, a straight read of OIS-implied federal funds rates suggests that one rate hike is fully priced in for the first half of 2018, while a staff model that adjusts for term premiums implies two rate hikes in that period. Overall, implied rates at the end of 2018 and 2019 moved up somewhat.

The nominal Treasury yield curve flattened over the intermeeting period, as yields on 2-year nominal Treasury securities rose 20 basis points and 10-year yields edged up 6 basis points. The spread between 10- and 2-year Treasury yields narrowed to 64 basis points, its lowest level since 2007. Short-dated Treasury yields rose and the yield curve flattened following the November 1 release of the Treasury’s quarterly refunding statement and the recommendation by the Treasury Borrowing Advisory Committee that the Treasury increase the issuance of short-dated securities while maintaining recent longer-term issuance levels. We attribute the flattening of the yield curve over the intermeeting period mostly to these releases. Incoming economic data, on net, have explained only a small portion of the increase in short-term Treasury yields, and the expected path of policy appears to have risen only a bit. (For additional discussion of the decline in the slope of the yield curve, see the box “The Flattening of the U.S. Yield Curve since December 2015.”) TIPS-based measures of inflation compensation were little changed, on net, since the November FOMC meeting.

Option-adjusted spreads on current production-coupon MBS yields over Treasury yields stayed roughly the same over the intermeeting period and remained stable since the FOMC’s announced change to reinvestment policy in September. Overall, market

The Flattening of the U.S. Yield Curve since December 2015

On balance since the FOMC began its current tightening cycle in December 2015, the 2-year nominal Treasury yield (the red line in figure 1) has risen about 70 basis points while the 10-year yield (the blue line) is little changed, leaving the spread between these yields (the green line) at its lowest level since 2007.¹ This analysis puts this flattening of the Treasury yield curve into historical perspective, discusses factors that appear to explain these movements in yields, and then describes the signal that may be taken for real economic activity in the near term.

Although the recent flattening of the yield curve has attracted significant attention by market participants, the current spread between 10- and 2-year yields, seen in figure 2, is not unusually low by historical standards—it stands at about the 40th percentile of its distribution since August 1971. In addition, the extent of the recent narrowing of the spread since December 2015 has been smaller than that observed at a comparable stage in three previous tightening cycles (figure 3).²

Separate factors appear to explain the recent movements at the short and long ends of the yield curve since liftoff. The increase in short-term yields has

Figure 1: 2- and 10-Year Treasury Yields and the Term Spread

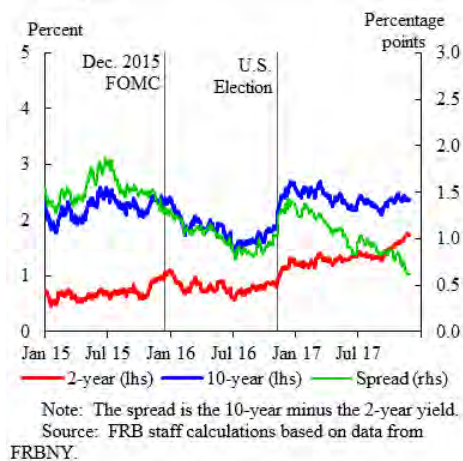
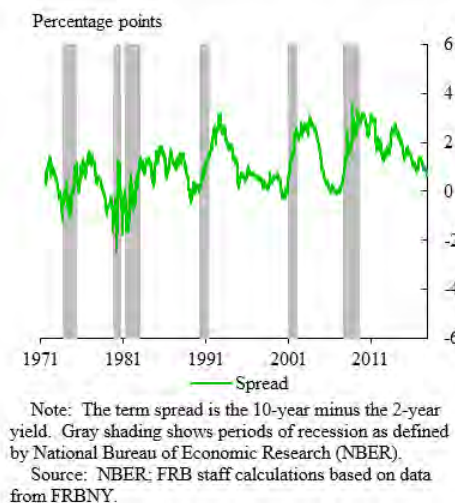


Figure 2: Term Spread and NBER Recessions



Financial Markets

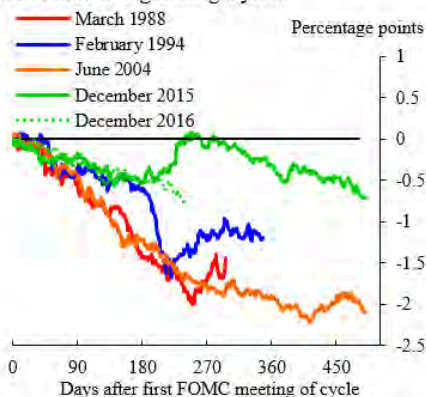
¹ The spread between the 10-year Treasury yield and the federal funds rate—an alternative measure of the slope of the yield curve that is used in the staff’s baseline economic projections—has similarly declined.

² The three previous tightening cycles began in 1988, 1994, and 2004. Of course, this sample is small and each cycle had different characteristics, which makes a direct comparison with the current cycle difficult. For example, the current cycle has been characterized by a relatively gradual pace of rate increases. How one dates the start of each cycle also matters for comparison purposes. For example, the dashed green line in figure 3 shows the cumulative change in the spread since December 2016, a period that more closely resembles previous cycles.

reflected the gradual removal of monetary policy accommodation over this period as well as expectations for continued removal over the near term. At the same time, other factors appear to have held down longer-term yields.³ There is some evidence that expectations of the longer-run equilibrium real interest rate, or r^* , may have fallen: A Blue Chip survey-based measure of 5-to-10-year-ahead real rate expectations has moved down by about 30 basis points since the end of 2015, many model-based estimates of r^* have remained persistently low relative to pre-crisis levels, and survey expectations of longer-run GDP growth have also declined.⁴ Furthermore, spillovers from unconventional monetary policies abroad, particularly in the euro area and Japan, also seem likely to have put some downward pressure on the term premium component of longer-term Treasury yields over this period. Indeed, since December 2015, staff estimates of the 10-year term premium have declined about 30 basis points.

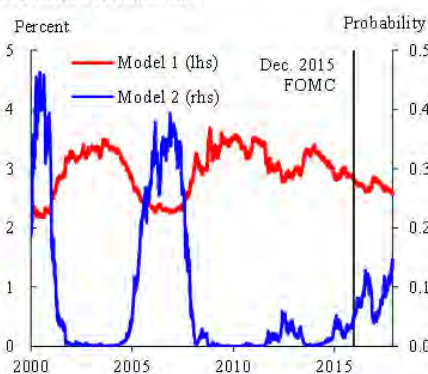
More recently this year, market commentaries have pointed to two additional factors that may have contributed to the flattening of the yield curve. First, investors appear to have revised down their expectations for expansionary U.S. fiscal policy amid slower-than-expected progress with the Administration’s legislative agenda; this factor has reportedly led to some unwinding of the steepening of the yield curve seen immediately following the U.S. election late last year. Second, the generally weaker-than-expected incoming inflation data

Figure 3: Cumulative Changes in Term Spread Over Different Tightening Cycles



Note: Cumulative changes relative to the day before the FOMC meeting of the first rate rise in the cycle. We truncate the 1988 and 1994 lines the day before the start of rate cuts.
Source: FRB staff calculations based on data from FRBNY.

Figure 4: Expected Real GDP Growth and Recession Probabilities



Note: 10- over 2-year yield spread used to predict GDP growth one year ahead (model 1) and NBER recession probability (model 2) in a year’s time.
Source: FRB staff calculations based on data from FRBNY, BEA, and NBER.

³ For a more detailed discussion of factors holding down longer-dated yields, see the memo to the FOMC titled “Recent Movements in Longer-Term Treasury Yields: Causes and Potential Policy Implications,” by the staff at the Board and the Federal Reserve Bank of New York, dated July 14, 2017.

⁴ The Monetary Policy Strategies section in the October 2017 Tealbook discussed a range of recent time-series estimates of r^* and showed that they are subject to sizable uncertainty. The median respondent to the November 2017 Survey of Primary Dealers expected “longer run” growth of 1.8 percent, down from 2.1 percent in the December 2015 survey.

Financial Markets

this year may have led some investors to assess a higher risk of continued low inflation. TIPS-based measures of 5-to-10-year inflation compensation have declined 14 basis points, on net, this year though they remain slightly higher than in December 2015, and both survey- and model-based estimates of long-term inflation expectations are generally little changed over these periods.

A large empirical literature has documented that the slope of the yield curve helps predict real economic activity.⁵ We look at two regression models that are typical of this literature: One examines the signal from the current spread between the 10- and 2-year yields for near-term growth of real GDP; the other uses that spread to estimate the probability that the economy will enter a recession during the coming year. As shown in figure 4, the results indicate that the current slope of the yield curve is historically associated with 2.5 percent real GDP growth over the coming year (the red line) and a 15 percent probability that the economy will be in an NBER recession a year from now (the blue line), about 30 basis points lower and 10 percentage points higher, respectively, than in December 2015.

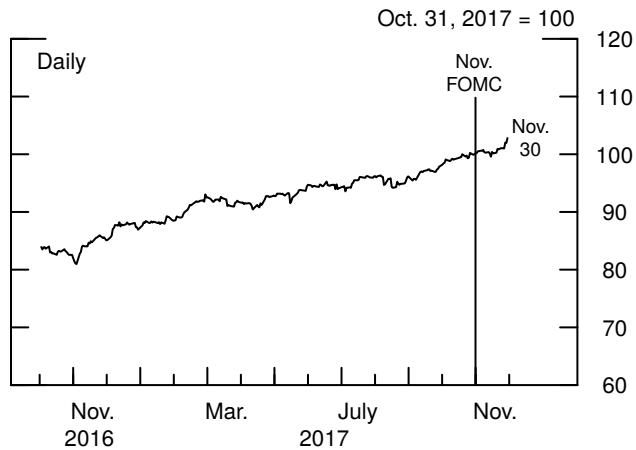
There may be reasons why the results of these simple models should not be interpreted as pointing to a deterioration in near-term growth prospects. Estimates of the term premium component of longer-dated yields have declined steadily in recent decades, and so the information content of the slope of the yield curve on future economic activity may have changed over time. Such a decline implies that, all else being equal, the same economic outlook would be associated with a flatter yield curve. (See the box “Why Is the Yield Curve Inverted in the Tealbook Projection?” in the Domestic Economic Developments and Outlook section of this Tealbook for a discussion of the effect of the decline in the term premium on the staff forecast.)

In addition, information from surveys and movements in other asset prices do not point to a notable deterioration in investors’ growth outlook since liftoff. For example, the expected GDP growth over the next four quarters for the median respondent to the Desk’s Survey of Primary Dealers has only declined modestly since December 2015, from 2.6 percent then to 2.2 percent in the most recent (October to November) survey. Furthermore, the median probability of a recession in six months’ time in the Desk survey has remained unchanged over this period at 10 percent. Finally, movements in risky asset prices since December 2015, including rising equity prices and narrowing corporate credit spreads (not shown), could suggest that investors have become more, not less, optimistic about near-term growth prospects over this period. That said, past recessions have proved difficult to foresee, and the staff will continue to closely monitor the yield curve and any signals it may contain for future economic growth.

⁵ For example, see Arturo Estrella and Frederic S. Mishkin (1996), “The Yield Curve as a Predictor of U.S. Recessions,” *Current Issues in Economics and Finance*, vol. 2 (June), pp. 1–6.

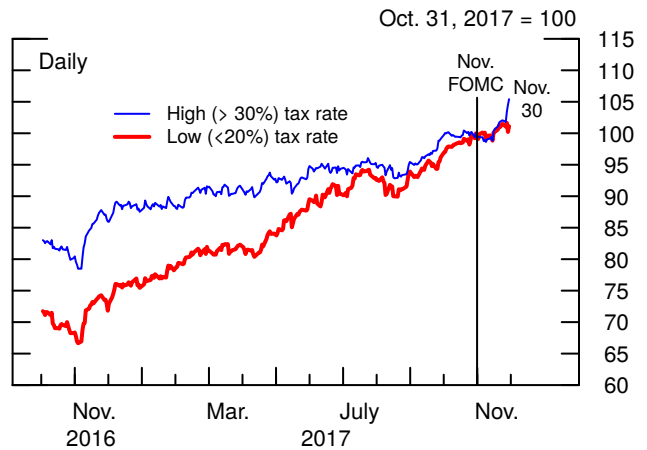
Corporate Asset Market Developments

S&P 500 Stock Price Index



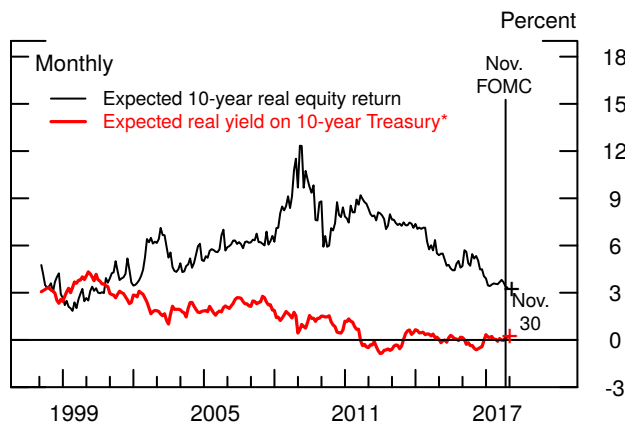
Source: Bloomberg.

Value-Weighted Stock Returns, by Domestic Tax Rate



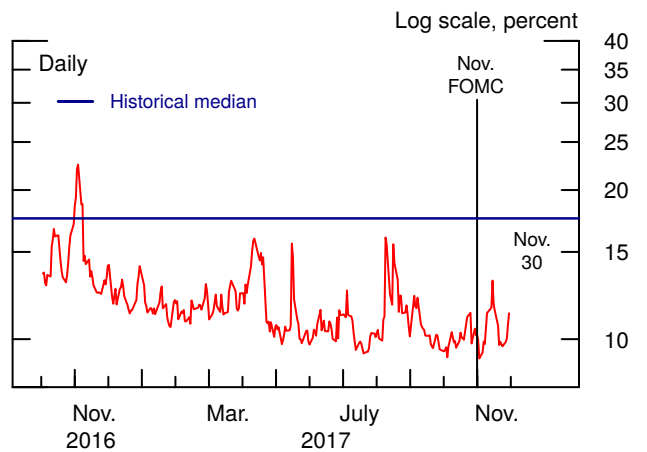
Note: The data include small firms excluding those in the financial and energy sectors. Tax rates are measured as U.S. taxes over pretax income. Source: Bloomberg.

Equity Risk Premium



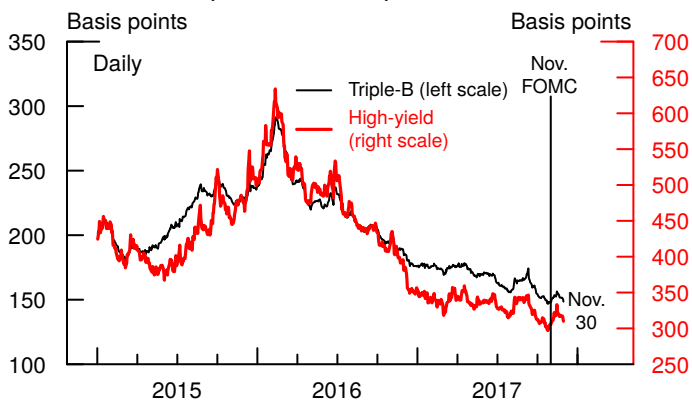
Note: The equity risk premium is the difference between the two data series.
 * Off-the-run 10-year Treasury yield less Philadelphia Fed 10-year expected inflation.
 + Denotes latest observation using daily interest rates and stock prices as well as staff forecast of corporate profits.
 Source: Staff projections.

Implied Volatility on S&P 500 (VIX)



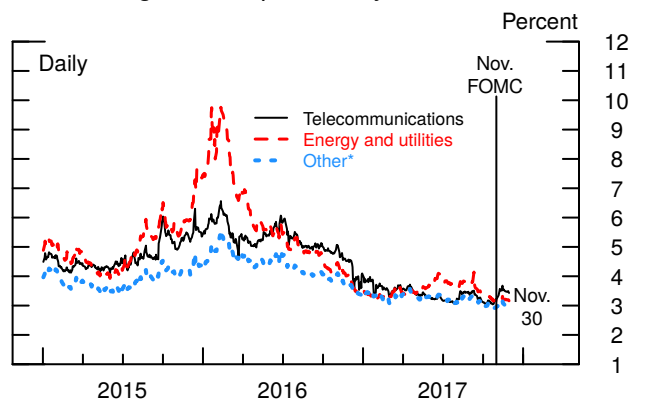
Note: Historical median is taken from 1990 onward. Source: Chicago Board Options Exchange.

10-Year Corporate Bond Spreads



Note: Spreads over 10-year Treasury yield. Source: Staff estimates of smoothed yield curves based on Merrill Lynch bond data and smoothed Treasury yield curve.

10-Year High-Yield Spreads, by Sector

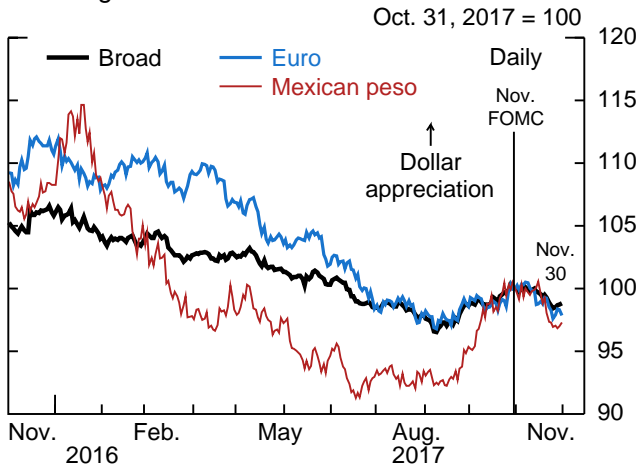


Note: Spreads over 10-year Treasury yield. * Includes high-yield firms that are not in the telecommunications sector or energy and utilities sectors. Source: Staff estimates of smoothed corporate yield curves based on Merrill Lynch data and smoothed Treasury yield curve.

Financial Markets

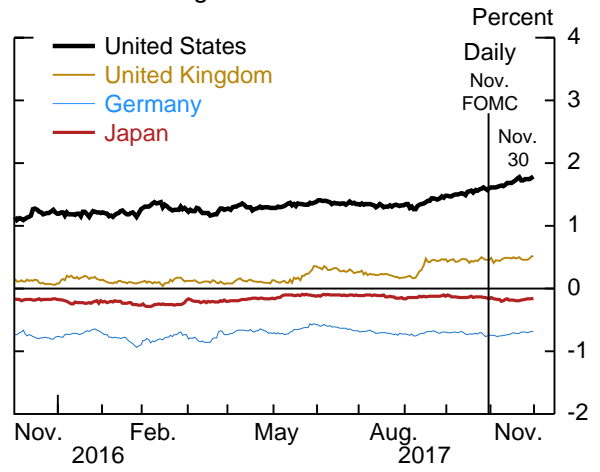
Foreign Developments

Exchange Rates



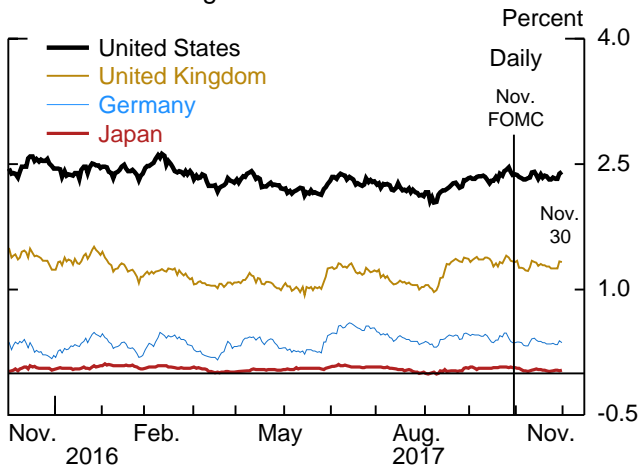
Source: Bloomberg.

2-Year Sovereign Yields



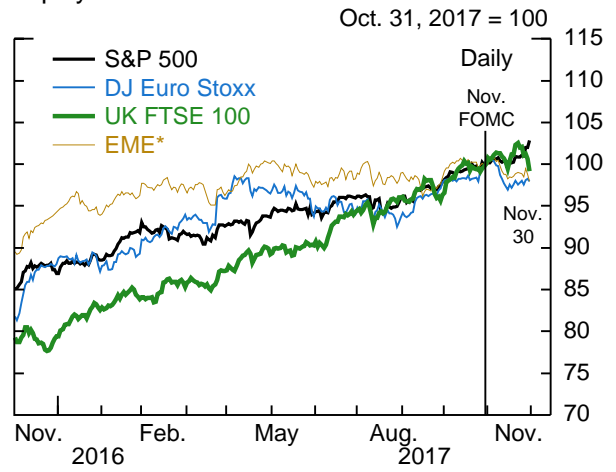
Source: Bloomberg.

10-Year Sovereign Yields



Source: Bloomberg.

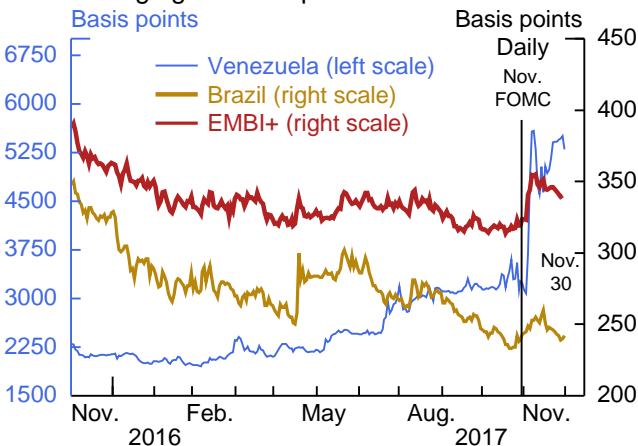
Equity Market Indexes



* MSCI local-currency indexes.
Source: Bloomberg; DataStream.

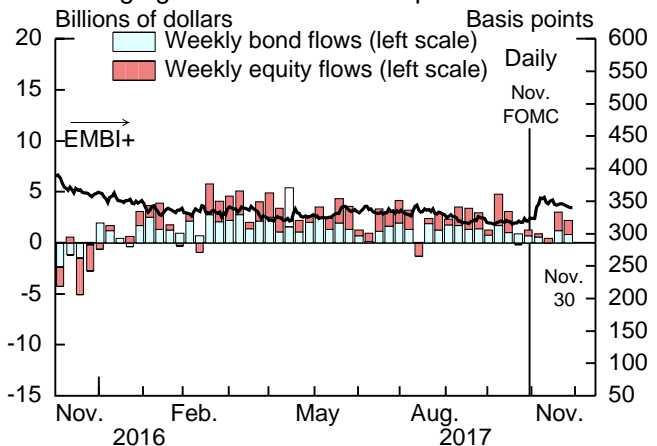
Financial Markets

Emerging Market Spreads



Note: Emerging market bond spreads calculated as yield difference to zero-coupon Treasury securities.
Source: J.P. Morgan.

Emerging Market Flows and Spreads



Note: Emerging market bond spreads calculated as yield difference to zero-coupon Treasury securities. Excludes intra-China flows.
Source: EPFR; J.P. Morgan.

participants did not attribute any price action to the implementation of reductions in reinvestments.¹

Broad stock price indexes moved up about 3 percent, reflecting in part increased expectations for the passage of U.S. tax legislation. In particular, the average stock prices of firms that recently had high effective tax rates notably outperformed those of firms with low effective tax rates. One-month-ahead option-implied volatility on the S&P 500 index—the VIX—ticked up a bit but remained near the very low end of its historical range.

Spreads of yields on triple-B-rated and speculative-grade corporate bonds over yields on comparable-maturity Treasury securities were little changed, but spreads on speculative-grade bonds issued by companies in the telecommunications sector widened somewhat. Corporate bond spreads remained below their historical median levels, particularly for speculative-grade bonds, whose spreads ended the period at about the 10th percentile of their historical distribution.

Foreign Developments

Since the previous FOMC meeting, foreign financial markets have been generally quiet. The dollar resumed the downward trend that has been evident over most of 2017, and AFE yield curves flattened slightly. Movements in risky asset prices were limited.

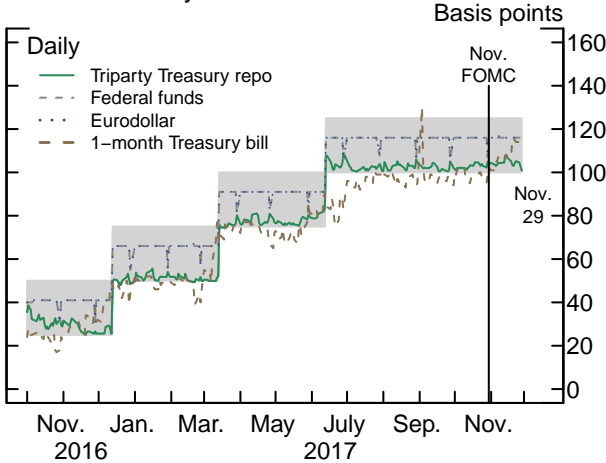
Over the intermeeting period, the broad dollar index fell about 1¼ percent on net. Despite uncertainty around efforts to establish a coalition government in Germany, the euro rose over 2 percent against the dollar, in part because of strong economic data from the euro area. Emerging market currencies also strengthened against the background of still-strong growth prospects. Additionally, the Mexican peso partially reversed previous declines despite limited progress in the fifth round of NAFTA negotiations.

Similar to developments in the United States, an increase in short-term yields in Germany and the United Kingdom resulted in some flattening of the yield curves in those countries over the period. The Bank of England (BOE) announced a widely expected rate hike of 25 basis points at its meeting on November 2 but indicated that further rate

¹ As part of the ongoing implementation of the Fed's balance sheet normalization program, \$6 billion of Treasury securities were redeemed in October and November, and \$4 billion of MBS were redeemed during the October reinvestment period, with a similar amount of MBS expected to be redeemed during the November reinvestment period, which runs from mid-November to mid-December.

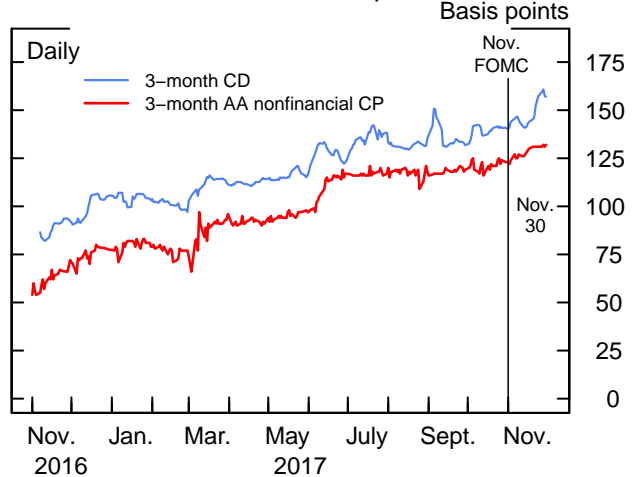
Short-Term Funding Markets and Federal Reserve Operations

Selected Money Market Rates



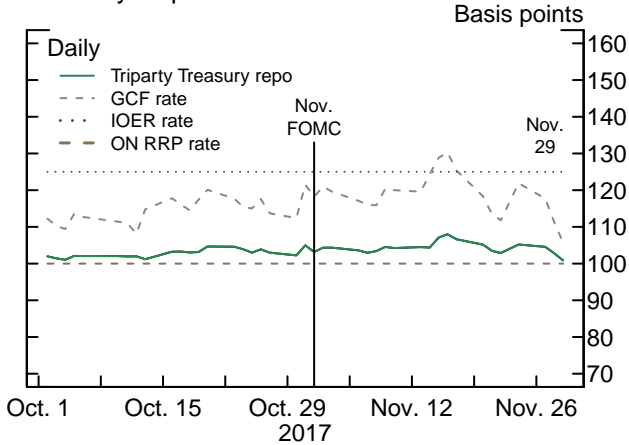
Note: Federal funds rate is a weighted median. Shaded area is the target range for the federal funds rate. Repo is repurchase agreement.
 Source: Federal Reserve Bank of New York; Federal Reserve Board, Form FR 2420, Report of Selected Money Market Rates.

Term Rates on Commercial Paper and CDs



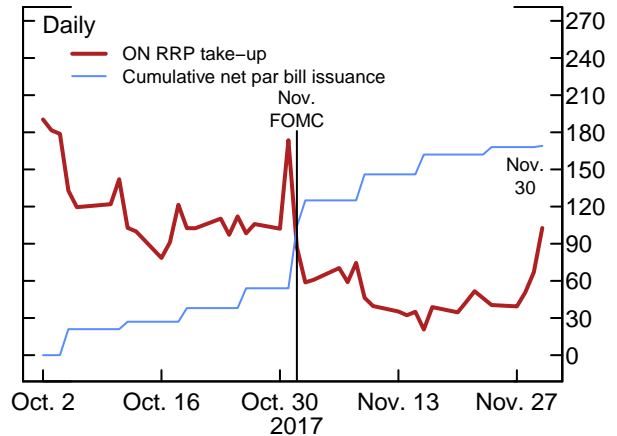
Note: Certificate of deposit (CD) yields are a 5-day moving average. CP is commercial paper.
 Source: Depository Trust & Clearing Corporation.

Treasury Repo Rates



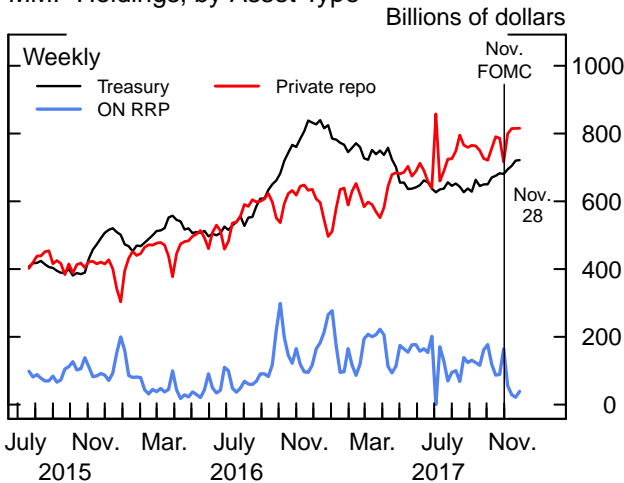
Note: Repo is repurchase agreement; GCF is General Collateral Finance; IOER is interest on excess reserves; ON RRP is overnight reverse repurchase agreement.
 Source: Federal Reserve Bank of New York; Federal Reserve Board, Form FR 2420, Report of Selected Money Market Rates.

ON RRP Take-Up and Cumulative Bill Issuance



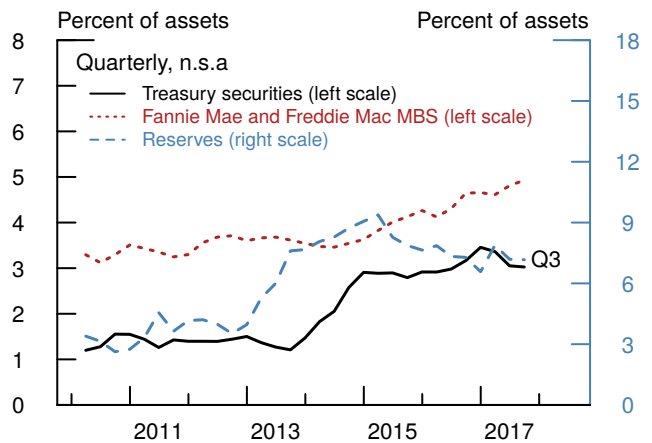
Note: ON RRP is overnight reverse repurchase agreement.
 Source: Federal Reserve Bank of New York; Treasury auction announcements and results.

MMF Holdings, by Asset Type



Note: Repo is repurchase agreement.
 Source: iMoneyNet.

Selected Liquid Assets at Standard LCR BHCs



Note: Standard liquidity coverage ratio (LCR) bank holding companies (BHCs) are large (>\$250B) BHCs.
 Source: Federal Reserve Board, Form FR Y-9C and Form FR 2900.

Financial Markets

increases are likely to be gradual and limited, and the BOE also emphasized Brexit-related risks. The BOE communications initially weighed on U.K. yields and the British pound, but these moves later retraced when U.K. and EU officials moved closer to an agreement over the amount that the United Kingdom will pay to settle its obligations for Brexit.

On balance, AFE equity price indexes have declined a touch since the FOMC meeting, while emerging market equity indexes have changed little on net. Venezuela was assigned selective default status by S&P and Fitch following the expiration of the 30-day grace period for its coupon payments due in October. The International Swaps and Derivatives Association also declared both Venezuela and the state-owned oil giant PDVSA in default, potentially triggering payouts on related credit default swaps. Venezuelan spreads have widened notably, but spillovers to other markets have been minimal, as some form of default was widely expected. Emerging market sovereign spreads were little changed, and net flows to emerging market funds remained positive.

SHORT-TERM FUNDING MARKETS AND FEDERAL RESERVE OPERATIONS

Conditions in short-term unsecured funding markets remained stable over the intermeeting period. The effective federal funds rate held steady at 1.16 percent excluding the month-end and was closely tracked by the overnight Eurodollar rate. Overnight rates on commercial paper (CP) were also little changed. Term rates on CP and negotiable certificates of deposit increased moderately, consistent with firming expectations for a December rate hike.

In secured funding markets, overnight triparty and GCF Treasury repo volumes were little changed, and their rates averaged 1.04 percent and 1.19 percent, respectively, which were 2 basis points and 7 basis points higher than those over the previous intermeeting period.² Meanwhile, Treasury bill supply increased, and short-dated bill rates rose to levels above the ON RRP offering rate. Combined, these recent developments notably damped take-up of ON RRP; such take-up averaged \$52 billion, \$84 billion lower than that over the previous intermeeting period. While money market

² The calculation of average rates and volumes over the previous intermeeting period excludes the September quarter-end. The increases in repo rates will likely be damped over the next few weeks, reflecting a shift into more short-term lending by market participants ahead of the December FOMC meeting, a decline in net bill issuance ahead of the end of the debt limit suspension period on December 8, and dealer balance sheet reductions ahead of the year-end.

funds (MMFs) reduced their take-up of ON RRP's markedly, they increased their holdings of short-term Treasury bills and private repos, continuing a trend seen since August of this year. Total MMF assets under management increased slightly.

In the near term, the Treasury is expected to reduce net bill issuance to prepare for the end of the debt limit suspension period on December 8. After that time, the staff estimates that the Treasury can use the cash it has on hand and extraordinary measures to operate without breaching the debt ceiling until February or early March of 2018.

To date, the change in the Federal Reserve's reinvestment policy has not been associated with significant changes in banks' holdings of securities or reserve balances, reflecting the limited runoff of SOMA securities holdings since the balance sheet normalization program began on October 1.

Financing Conditions for Businesses and Households

Financing conditions for businesses and households were little changed over the intermeeting period and continued to be broadly supportive of growth in spending and investment.

- Financing flows to nonfinancial firms through capital markets remained robust. In contrast, banks' lending to businesses moderated, as both C&I and CRE loan growth declined. Despite tepid loan growth so far this year, higher interest rates charged on business loans have supported bank profitability.
- Financing conditions in the residential mortgage market remained accommodative for most borrowers, while credit standards for those with low credit scores continued to loosen gradually from tight levels.
- Consumer credit growth picked up modestly in the third quarter compared with previous quarters. Financing conditions remained largely accommodative, particularly for consumers with strong credit histories.

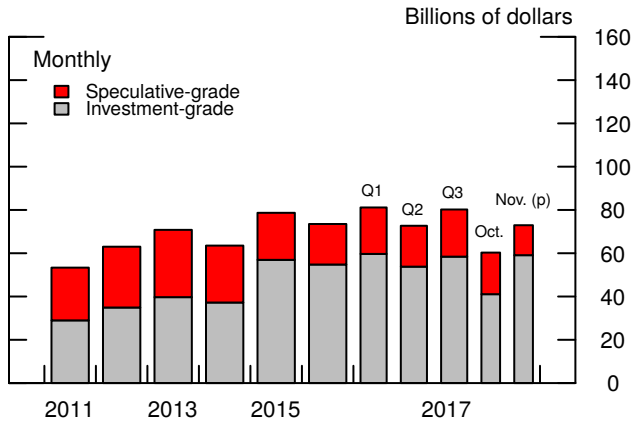
BUSINESS FINANCING CONDITIONS

Nonfinancial Corporations

Over the intermeeting period, financing conditions for large nonfinancial corporations through capital markets remained accommodative on balance. After a typically slow October, gross issuance of corporate bonds strengthened in November, driven by investment-grade offerings. In the institutional leveraged loan market, issuance rose sharply in November to a level in line with the first quarter of this year, as borrowers took advantage of favorable market conditions to refinance their debt. Net commercial paper issuance by nonfinancial companies rebounded in October after a typical quarter-end drop and was slightly negative in November. Gross equity issuance in October and November has been solid, as the volume of initial public offerings has exceeded the average volume seen in the previous quarter, and seasoned equity issuance was close to its average pace of the past few years. The volume of completed M&A deals picked up in the third quarter from its already robust pace in the second quarter. In contrast, share repurchases continued to decline in the third quarter, reportedly reflecting high stock market valuations and a growing appetite for capital expenditures.

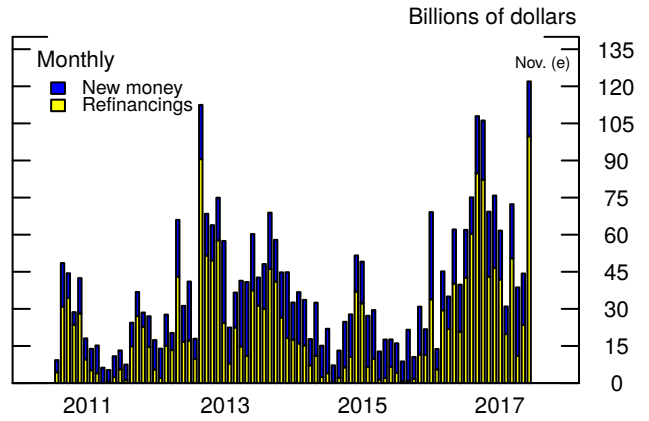
Business Finance

Gross Issuance of Nonfinancial Corporate Bonds



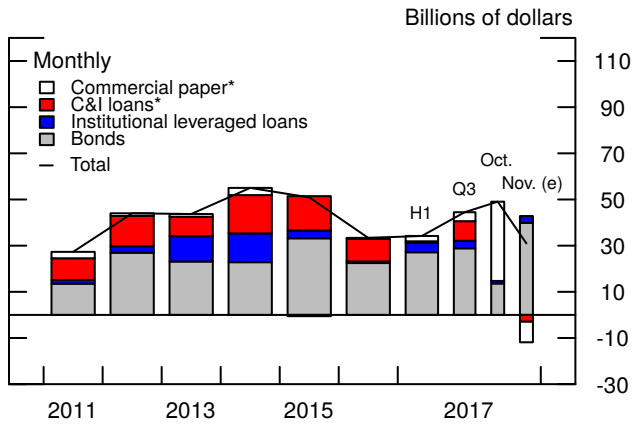
Note: Bonds are categorized by Moody's, Standard & Poor's, and Fitch.
 (p) Preliminary.
 Source: Mergent Fixed Income Securities Database.

Institutional Leveraged Loan Issuance, by Purpose



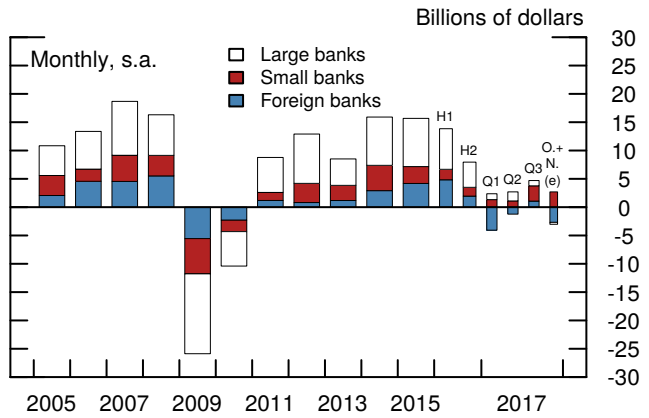
(e) Estimate.
 Source: Thomson Reuters LPC LoanConnector.

Selected Components of Net Debt Financing, Nonfinancial Firms



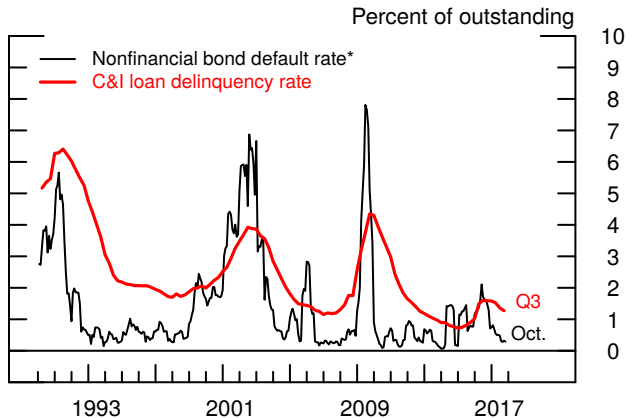
Note: C&I is commercial and industrial.
 * Period-end basis.
 (e) Estimate.
 Source: Depository Trust & Clearing Corporation; Mergent Fixed Income Securities Database; Federal Reserve Board; Thomson Reuters LPC.

Commercial and Industrial Loans



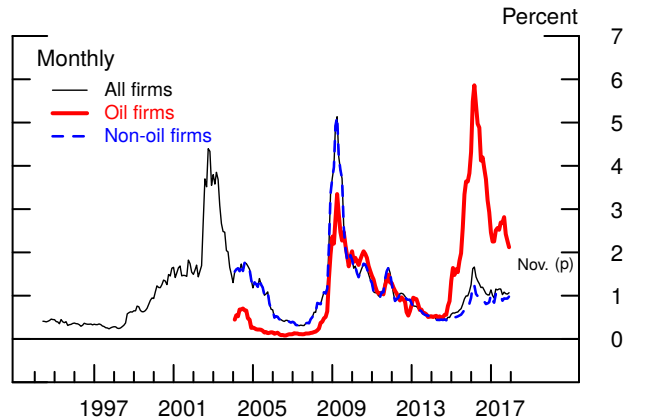
(e) Estimate.
 Source: Staff calculations, Form FR 2644, Weekly Report of Selected Assets and Liabilities of Domestically Chartered Commercial Banks and U.S. Branches and Agencies of Foreign Banks.

Selected Default and Delinquency Rates



Note: Nonfinancial bond default rate is monthly. C&I loan delinquency rate is quarterly.
 * 6-month trailing defaults divided by beginning-of-period outstanding, at an annual rate.
 Source: For default rate of nonfinancial bonds, Moody's Investors Service; for delinquency rate of commercial and industrial (C&I) loans, Call Report.

Expected Nonfinancial Year-Ahead Defaults



Note: Firm-level estimates of default weighted by firm liabilities as a percent of total liabilities, excluding defaulted firms.
 (p) Preliminary.
 Source: Calculated using firm-level data from Moody's KMV.

Growth of bank-intermediated credit to nonfinancial firms, however, was tepid in October and November. In particular, C&I loan growth declined relative to the third quarter, primarily reflecting a contraction in domestic loans held by foreign banks.

On balance, the credit quality of nonfinancial corporations was little changed over the intermeeting period and appeared to remain solid. The volume of nonfinancial corporate bond rating upgrades roughly matched that of downgrades in October, but upgrades have trailed downgrades notably thus far in November. In October, the six-month trailing bond default rate remained near its lowest level since 2014, while the November expected year-ahead default rate for all firms is projected to stay only a bit higher than the midpoint of its range seen during nonrecessionary periods even as aggregate leverage in the corporate sector remained elevated.

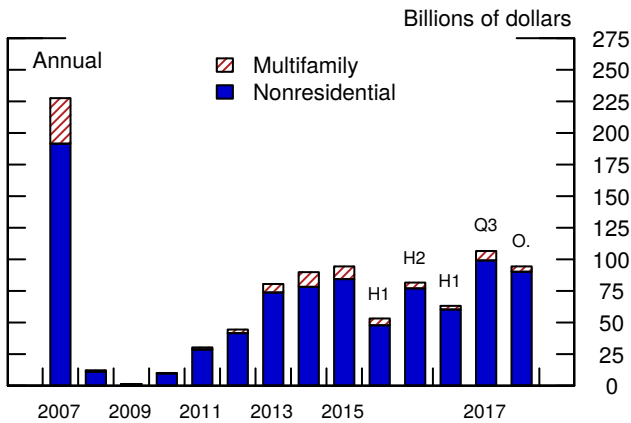
The third-quarter corporate earnings season drew to a close over the intermeeting period, and the reports for the quarter were generally consistent with the strong expectations of Wall Street analysts. Despite some notable losses in the insurance sector, which were partly due to recent hurricanes and other natural disasters, earnings per share for S&P 500 firms are estimated to have increased about 5 percent from the second quarter on a seasonally adjusted basis. The outlook for corporate earnings appears to have remained favorable, as the strong year-ahead projections by Wall Street analysts have been revised slightly higher.

Small Businesses

Overall, small business financing conditions appeared to have remained favorable over the intermeeting period. Small business lending activity has slowed modestly in recent months, and data from the Wells Fargo Small Business Index (WFSBI) survey for the fourth quarter suggest that this slowdown is due to weak loan demand among small business owners. With respect to credit supply, the fraction of respondents in the WFSBI survey who reported difficulty in obtaining credit over the past 12 months reached a new post-crisis low in the fourth quarter, and the October Senior Loan Officer Opinion Survey on Bank Lending Practices showed some net easing of standards and narrowing of spreads on loans to small businesses over the past three months. Indicators of loan performance remained strong, and credit quality concerns are not expected to significantly affect the ability of small businesses to obtain credit in the near term.

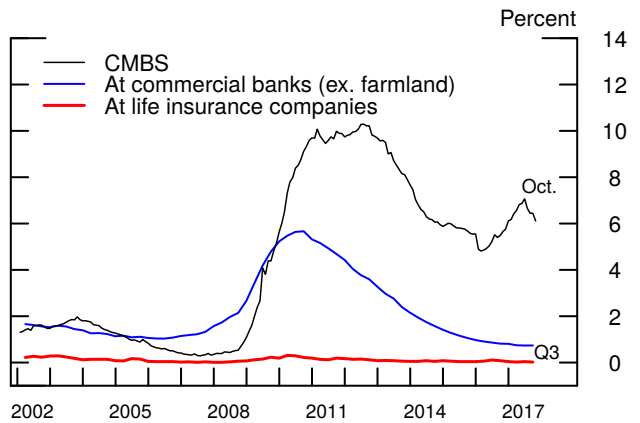
Commercial Real Estate and Bank Lending

Non-agency CMBS Issuance



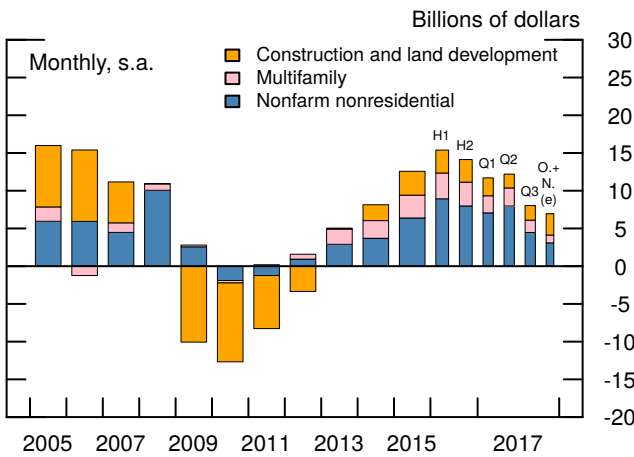
Note: CMBS is commercial mortgage-backed securities.
Source: Commercial Mortgage Alert.

Delinquency Rates on Commercial Mortgages on Existing Properties



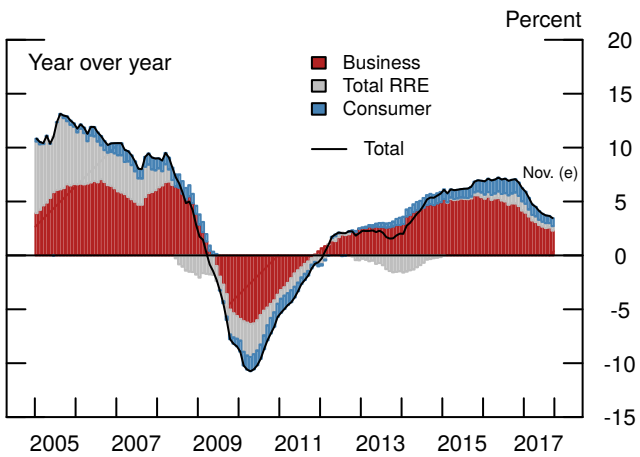
Note: For life insurance companies and commercial banks, the data are quarterly; for commercial mortgage-backed securities (CMBS), the data are monthly.
Source: Citigroup; Call Report; American Council of Life Insurers.

Commercial Real Estate Loans at Banks



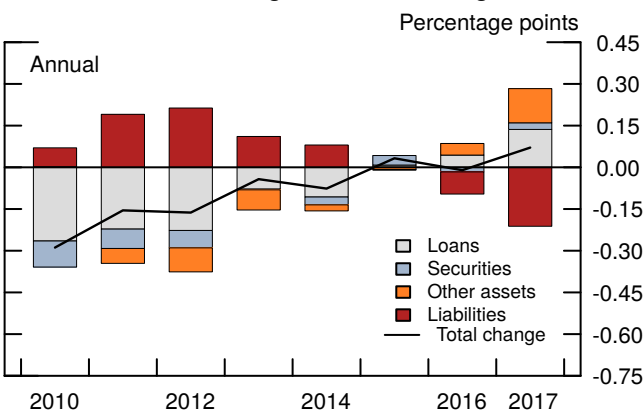
(e) Estimate.
Source: Staff calculations, Form FR 2644, Weekly Report of Selected Assets and Liabilities of Domestically Chartered Commercial Banks and U.S. Branches and Agencies of Foreign Banks.

Core Loan Growth



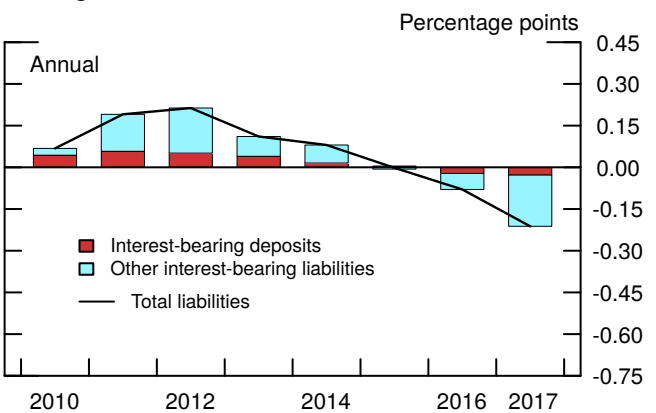
Note: Business loans include commercial and industrial loans and commercial real estate loans. Consumer loans include credit card, auto, and other consumer loans. RRE is residential real estate.
Source: Staff calculations, Form FR 2644, Weekly Report of Selected Assets and Liabilities of Domestically Chartered Commercial Banks and U.S. Branches and Agencies of Foreign Banks.

Contributions to Changes in NIM at Large BHCs



Note: NIM is net interest margin; BHC is bank holding company. The 2017 bar is based on data through the third quarter.
Source: Staff calculations, FR Y-9C, Consolidated Financial Statements for Holding Companies.

Liabilities' Contribution to Changes in NIM at Large BHCs



Note: NIM is net interest margin; BHC is bank holding company. The 2017 bar is based on data through the third quarter.
Source: Staff calculations, FR Y-9C, Consolidated Financial Statements for Holding Companies.

Commercial Real Estate

Financing conditions for CRE remained accommodative over the intermeeting period. CRE financing from capital markets remained more robust than that from banks, as CMBS were issued at a somewhat faster pace in the third quarter relative to the same period last year. Spreads on CMBS remained toward the lower end of the range seen since the financial crisis. Delinquency rates on loans in CMBS pools continued to decline in October, largely reflecting the shrinking share of loans that were originated before the financial crisis, which have much higher-than-average delinquency rates.

That said, the growth of CRE loans held by banks continued to decline in October and November. This slowdown has been concentrated at the largest banks, especially in the multifamily and nonfarm nonresidential loan categories; CRE loan growth at smaller banks has remained strong overall and even accelerated a bit in October. In addition, new CRE mortgages funded by insurance companies remained soft in the third quarter following a drop in the second quarter, consistent with anecdotal reports that insurance companies are pulling back a bit from lending to this sector.

Banking Conditions

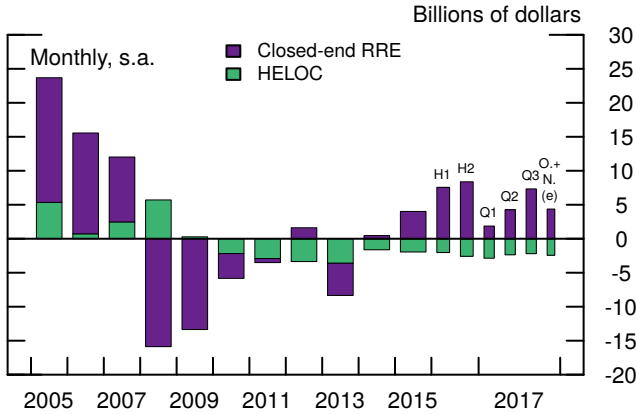
Despite the slowdown in core loan growth, net interest margins at banks, a measure of lending profitability, ticked up in the third quarter. So far this year, much of the boost to net interest margins has come from increased loan income from higher interest rates, especially on business loans with floating interest rates. While the cost of funding at banks has also increased this year, especially for nondeposit sources of bank financing, the additional income generated by loans and other assets has served to offset banks' higher funding costs.

MUNICIPAL GOVERNMENT FINANCING CONDITIONS

Financing conditions in municipal bond markets remained accommodative over the intermeeting period, on balance, and Puerto Rico's ongoing financial distress continued to have little effect on the broader municipal bond market. Gross issuance of municipal bonds was strong in October and the first few weeks of November. The credit quality of general obligation (GO) bonds remained stable, with the number of ratings upgrades slightly outpacing that of rating downgrades. Yields on GO bonds moved roughly in line with comparable-maturity Treasury securities.

Household Finance

Residential Real Estate Loans at Banks

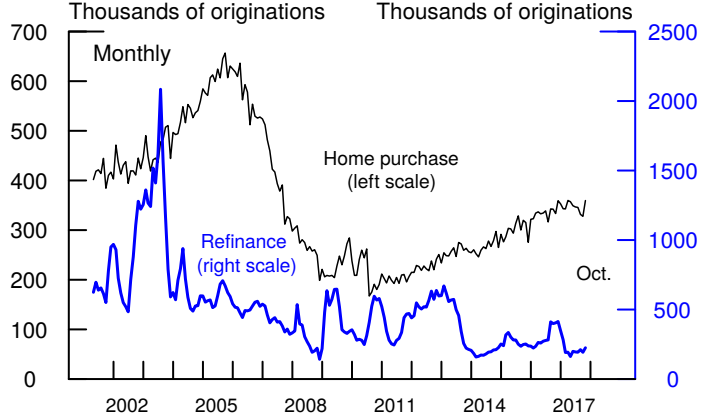


Note: RRE is residential real estate; HELOC is home equity line of credit.

(e) Estimate.

Source: Staff calculations, Form FR 2644, Weekly Report of Selected Assets and Liabilities of Domestically Chartered Commercial Banks and U.S. Branches and Agencies of Foreign Banks.

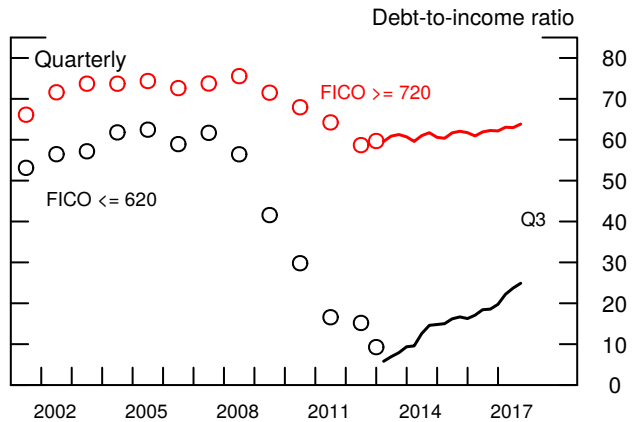
Purchase and Refinance Activity



Note: The data are seasonally adjusted by Federal Reserve Board staff.

Source: For values prior to 2017, data reported under the Home Mortgage Disclosure Act of 1975; for values in 2017, staff estimates.

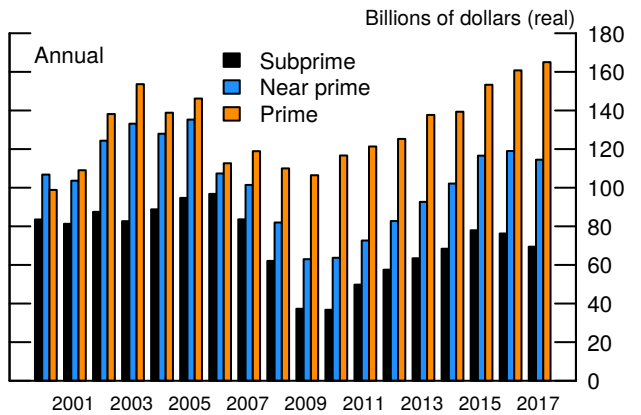
Mortgage Credit Summary Frontiers, by FICO Score



Note: Summary frontier is a weighted average of the individual frontiers associated with each loan-to-value ratio, property location, and FICO group.

Source: For frontiers shown with circles, McDash and CoreLogic; for frontiers shown with solid lines, Optimal Blue.

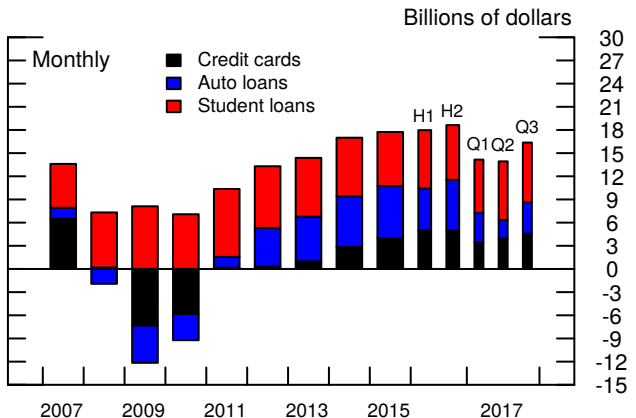
New Extensions: Auto



Note: New credit extensions in the past year; data for the 3rd quarter of each year. Near prime is between 620 and 719 and prime is greater than 719; scores were measured a year ago.

Source: Federal Reserve Bank of New York Consumer Credit Panel/Equifax.

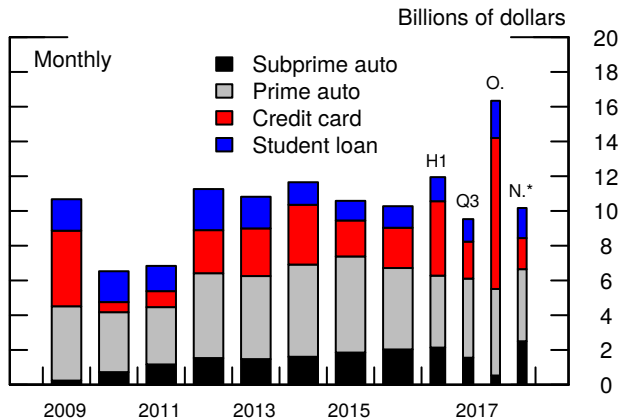
Consumer Credit Flows



Note: The data are seasonally adjusted by Federal Reserve Board staff.

Source: Federal Reserve Board.

Gross Consumer ABS Issuance



Note: ABS is asset-backed securities.

* Month to date.

Source: Inside MBS & ABS; Merrill Lynch; Bloomberg.

HOUSEHOLD FINANCING CONDITIONS

Residential Real Estate

In the residential mortgage market, financing conditions remained accommodative for most borrowers. Loan growth in the banking sector remained at a pace above that seen in the first half of the year, although it declined in October and November relative to the third quarter. More broadly, mortgage originations for home purchases rose in October, presumably as the drag on housing demand from the rise in mortgage rates toward the end of last year waned further. The rate on 30-year conforming mortgages offered to well-qualified borrowers continued to hover around 4 percent, which is quite low by historical standards. Credit standards are still tight for borrowers with low credit scores and hard-to-document incomes but have been loosening gradually for borrowers with low credit scores.

Consumer Credit

Financing conditions in consumer credit markets remained largely accommodative overall. Consumer credit has been readily available at relatively attractive terms to borrowers with strong credit histories, but conditions for borrowers with subprime credit scores remained tight in credit card markets and continued to tighten for auto loans. Indeed, credit bureau data indicate that new loan extensions to subprime borrowers fell over the past several quarters for auto loans and flattened this year for credit cards. Consistent with these developments, average credit scores for new and used auto loans stayed higher than a year ago, and credit card limits for borrowers with subprime credit scores remained at historically low levels.

Total consumer credit, driven mostly by robust credit expansion in September, expanded at a slightly faster pace in the third quarter compared to previous quarters. It is possible that this recent increase in consumer credit growth reflected sizable hurricane-related borrowing by households in the affected areas, although preliminary staff analysis has found only weak evidence to support this view. ABS issuance funding consumer loans was robust in recent months and a bit ahead of last year's pace, and ABS spreads were about unchanged over the intermeeting period.

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Risks and Uncertainty

ASSESSMENT OF RISKS

As in the October Tealbook, we view the uncertainty around our forecast of economic activity as being in line with the average over the past 20 years, the benchmark used by the FOMC. Many empirical indicators that are frequently interpreted as reflective of macroeconomic uncertainty remain subdued. For example, corporate bond spreads and the VIX continue to be near the low end of their historical ranges. At the same time, considerable uncertainty exists about the future direction of a number of federal government policies relevant for the economic outlook.

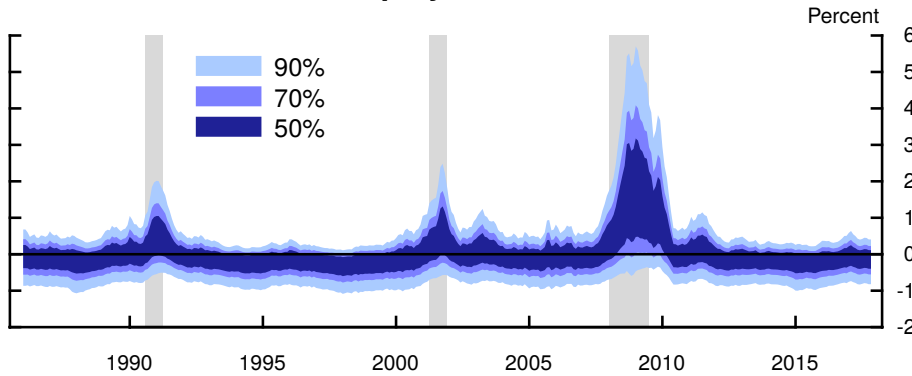
We continue to judge the risks around our projections for both real GDP growth and the unemployment rate as being balanced. Consistent with that view, estimates of the distribution of risks around those forecasts conditional on available indicators, shown in the exhibit “Time-Varying Macroeconomic Risk,” are not particularly skewed. Moreover, as presented in the exhibit “Effective Lower Bound Risk Estimate,” the risk of returning to the effective lower bound (ELB) sometime over the next three years is estimated from stochastic simulations in the FRB/US model to be about 14 percent.¹

With regard to inflation, we still see the current level of uncertainty around our projection as in line with the average over the past 20 years and the risks to the downside and upside as roughly balanced. This assessment is consistent with the estimates of the time-varying risks for the inflation forecast, as shown in the exhibit “Time-Varying Macroeconomic Risk.” To the downside, this year’s string of soft readings on inflation could prove to be more persistent than we have assumed. Also, inflation expectations relevant for wage and price setting could be lower currently than in the baseline or may not edge up in the coming years as the staff assumes. To the upside, with the economy projected to be moving further above its longer-run potential, inflation may increase more than in the staff forecast, consistent with the predictions of models that emphasize nonlinear effects of resource utilization on inflation.

¹ If the ELB risk were computed around a lower path for the federal funds rate, then the probability naturally would be higher. For example, the probability is 22 percent if calculated using the median federal funds rates from the FOMC’s September Survey of Economic Projections.

Time-Varying Macroeconomic Risk

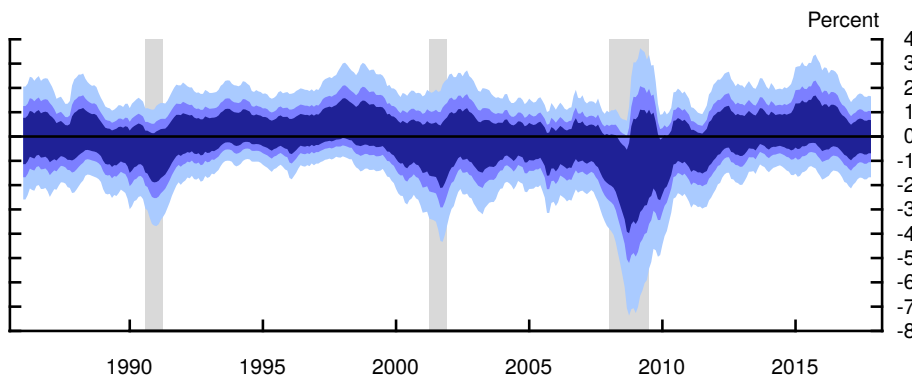
Unemployment Rate



November 2017

95th	0.4
85th	0.2
50th	-0.1
15th	-0.6
5th	-0.8

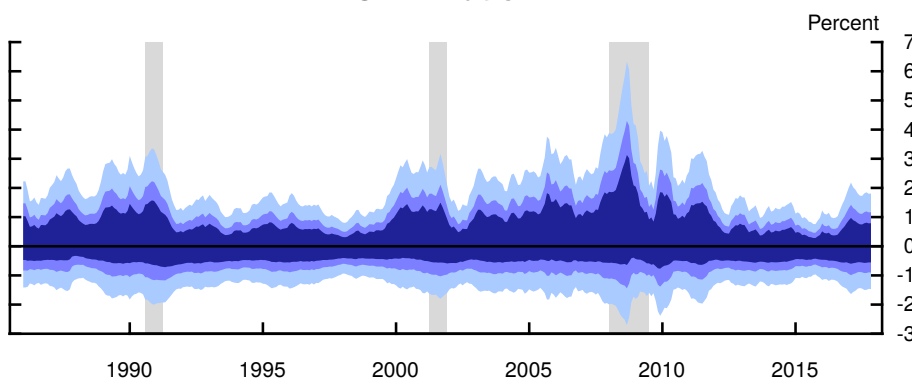
GDP Growth



November 2017

95th	1.7
85th	1.0
50th	0.0
15th	-1.1
5th	-1.7

CPI Inflation

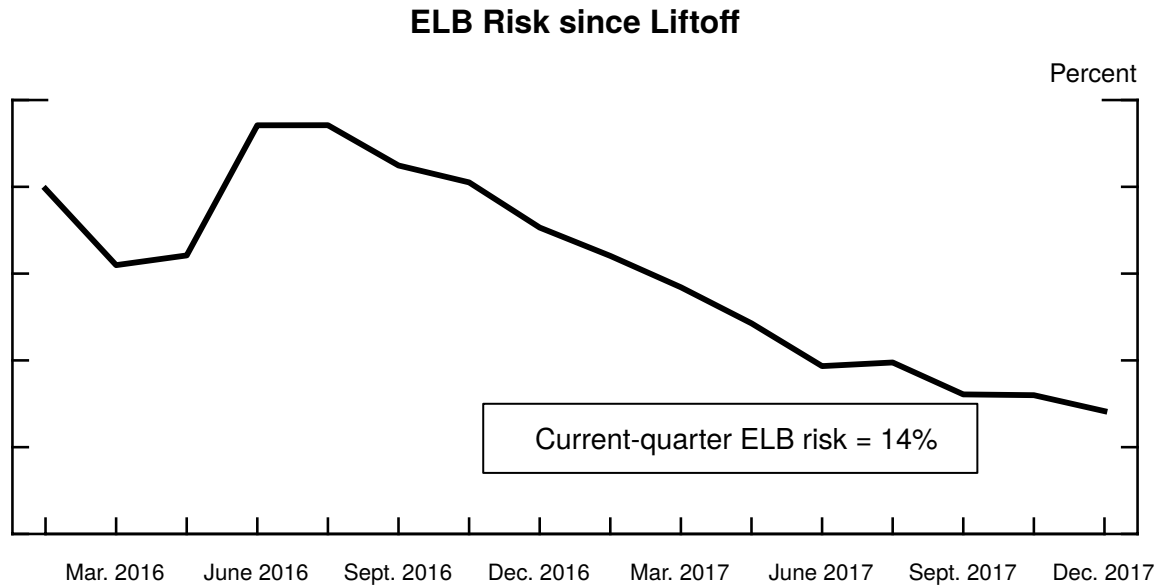


November 2017

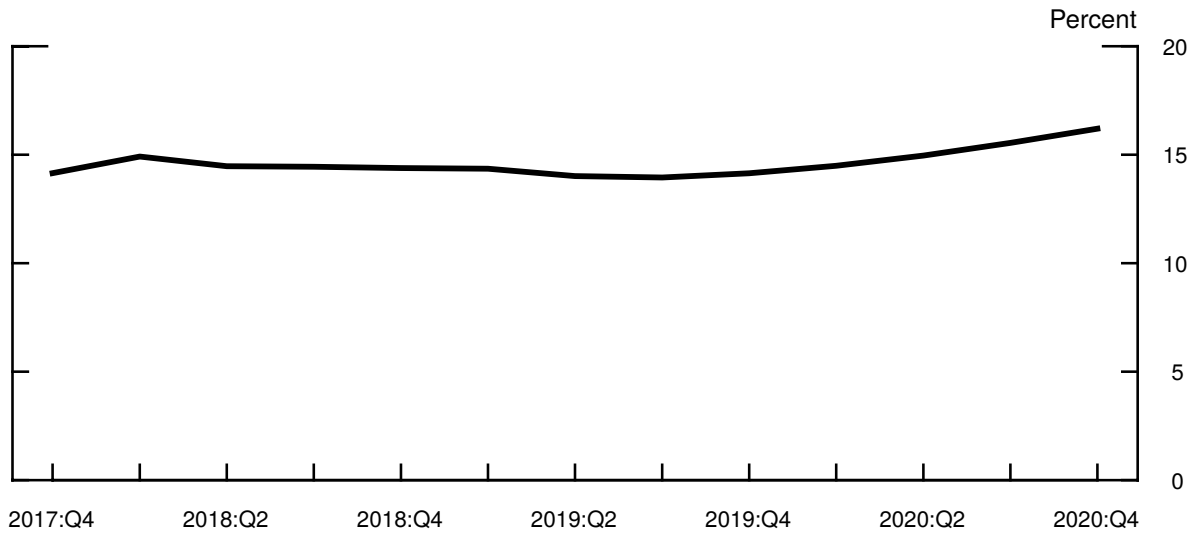
95th	1.8
85th	1.2
50th	0.1
15th	-0.9
5th	-1.5

Note: The exhibit shows estimates of quantiles of the distribution of errors for four-quarter-ahead staff forecasts. The estimates are conditioned on indicators of real activity, inflation, financial market strain, and the volatility of high-frequency macroeconomic indicators. The tables show selected quantiles of the predictive distributions for the respective variables as of the current Tealbook.

Effective Lower Bound Risk Estimate



ELB Risk over the Projection Period



Note: The figures show the probability that the federal funds rate reaches the effective lower bound (ELB) over the next 3 years starting in the given quarter. Details behind the computation of the ELB risk measure are provided in the box "A Guidepost for Dropping the Effective Lower Bound Risk from the Assessment of Risks" in the Risks and Uncertainty section of the April 2017 Tealbook A. The lower panel computes ELB risk over a forward-looking moving 3-year window using stochastic simulations in FRB/US beginning in the current quarter. The simulations are computed around the Tealbook baseline.

ALTERNATIVE SCENARIOS

To illustrate some of the risks to the outlook, we construct alternatives to the baseline projection using simulations of staff models. In the first scenario, we study a downside risk for inflation in which households and businesses have lower inflation expectations than in the baseline because they perceive that monetary policy will be too tight to return inflation to the FOMC's 2 percent objective over the medium term. In contrast, the second scenario examines the upside risk that the response of wages and prices to the further tightening of labor market conditions will be stronger than we have assumed and that inflation expectations will be more responsive to a rise in actual inflation. In the third scenario, we present the implications of a substantial correction in asset valuations. The fourth scenario illustrates the effects of a lower natural rate of unemployment that is initially misperceived by the central bank. The fifth scenario envisions that a pickup in global inflation driven by higher oil prices prompts faster monetary policy normalization in the advanced foreign economies (AFEs), thereby tightening financial conditions in the global economy. The last scenario considers the possibility that a slowdown in China's economy triggers financial turbulence in emerging market economies (EMEs), with significant spillovers to the global economy.

We simulate these scenarios using four staff models.² In all of the scenarios, the federal funds rate is governed by the same policy rule as in the baseline. In addition, the size and composition of the SOMA portfolio are assumed to follow the baseline paths in all of the scenarios.

Lower Inflation Expectations [Del Negro, Giannoni, Schorfheide Model]

Headline PCE price inflation has been below the Committee's 2 percent objective for most of the past five years. It has averaged about 1¼ percent during this period and has remained subdued more recently even though resource utilization now exceeds our estimate of its sustainable level. In the baseline projection, inflation is assumed to drift up to the 2 percent target by 2020, in part reflecting further tightening in resource utilization and a gradual rise in inflation expectations. However, especially in light of the persistently low inflation of the past several years, there is a risk that the public will perceive the stance of monetary policy as being too tight now and in the future to achieve

² The four models used are an estimated medium-scale New Keynesian DSGE model of the U.S. economy based on Del Negro, Giannoni, and Schorfheide (2015); FRB/US, which is a large-scale macroeconomic model of the U.S. economy; a calibrated DSGE model with search and matching frictions in the labor market; and SIGMA, which is a calibrated multicountry DSGE model.

the 2 percent target; for that reason, longer-run inflation expectations in this scenario are assumed to be $\frac{1}{4}$ percentage point lower than in the baseline.

Lower inflation expectations cause actual inflation to be lower than in the baseline and to reach only $1\frac{3}{4}$ percent in 2022. Consequently, the federal funds rate increases less than in the baseline, but real interest rates as perceived by the private sector are initially slightly higher. As a result, real GDP growth is a touch lower in 2018 than in the baseline. The unemployment rate runs about $\frac{1}{4}$ percentage point above the baseline in 2018 and remains above the baseline through 2022.³

Steeper Phillips Curve with More-Sensitive Inflation Expectations [FRB/US]

Alternatively, the further tightening of resource utilization in the baseline could cause inflation to rise much faster than projected. Some research suggests that the relationship between labor utilization and wage growth may become stronger—the Phillips curve may steepen—when the labor market is very tight.⁴ In FRB/US, faster wage growth implies higher price inflation as well. This scenario captures the risk of that nonlinearity by boosting the response of wages to tightening labor utilization and by assuming that longer-run inflation expectations become more sensitive to the higher realized price inflation that stems from faster wage growth.⁵

Inflation reaches 3 percent by mid-2021, compared with about 2 percent in the baseline. In response to the higher path of inflation, the federal funds rate rises more and peaks at 5 percent in 2022; real longer-term interest rates are also slightly higher. As a

³ The Phillips curve in this model is very flat, so it may seem surprising that inflation falls noticeably despite only a modest increase in the unemployment rate. That outcome arises because price setters in the model are very forward looking, and production costs fall little but persistently.

⁴ For evidence of a nonlinear relationship between wage growth and slack, see, for example, Richard W. Fisher and Evan F. Koenig (2014), “Are We There Yet? Assessing Progress toward Full Employment and Price Stability,” Dallas Fed Economic Letter, vol. 9 (Dallas: Federal Reserve Bank of Dallas, October), www.dallasfed.org/assets/documents/research/eclett/2014/el1413.pdf; and Jeremy Nalewaik (2016), “Non-Linear Phillips Curves with Inflation Regime-Switching,” Finance and Economics Discussion Series 2016-078 (Washington: Board of Governors of the Federal Reserve System, August), <http://dx.doi.org/10.17016/FEDS.2016.078>.

⁵ In the calibration of this scenario, we assume that both the slope of the wage Phillips curve and the sensitivity of long-run inflation expectations to realized inflation are four times larger than in the current version of the FRB/US model. The magnitude of the increase reflects a comparison between estimates of the recent past and those from a sample that covers the late 1980s to the late 1990s. Nevertheless, the magnitudes of the coefficients used in this scenario are well below those representing inflation dynamics in the 1970s.

Alternative Scenarios

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

Measure and scenario	2017	2018	2019	2020	2021- 22
	H2				
<i>Real GDP</i>					
Extended Tealbook baseline	2.7	2.4	2.0	1.7	1.3
Lower inflation expectations	2.7	2.0	2.1	1.7	1.3
Steeper Phillips curve	2.7	2.4	1.9	1.5	1.1
Market correction	2.7	1.7	1.7	1.8	1.5
Misperceived lower natural rate	2.7	2.4	2.1	1.8	1.3
Higher oil prices and faster AFE tightening	2.7	2.0	1.8	1.6	1.3
China-driven EME turbulence	2.7	1.4	1.4	1.8	1.5
<i>Unemployment rate¹</i>					
Extended Tealbook baseline	4.1	3.6	3.5	3.5	4.0
Lower inflation expectations	4.1	3.8	3.6	3.6	4.0
Steeper Phillips curve	4.1	3.7	3.6	3.7	4.3
Market correction	4.1	3.9	3.9	3.9	4.1
Misperceived lower natural rate	4.1	3.6	3.3	3.2	3.6
Higher oil prices and faster AFE tightening	4.1	3.8	3.7	3.7	4.1
China-driven EME turbulence	4.1	4.0	4.2	4.2	4.5
<i>Total PCE prices</i>					
Extended Tealbook baseline	2.2	1.7	1.9	2.0	2.1
Lower inflation expectations	2.2	1.3	1.6	1.6	1.8
Steeper Phillips curve	2.2	2.0	2.5	2.8	3.2
Market correction	2.2	1.7	1.9	1.9	2.1
Misperceived lower natural rate	2.2	1.6	1.7	1.7	2.0
Higher oil prices and faster AFE tightening	2.4	2.2	2.0	2.0	2.1
China-driven EME turbulence	2.0	.9	1.6	1.9	2.1
<i>Core PCE prices</i>					
Extended Tealbook baseline	1.6	1.8	2.0	2.0	2.1
Lower inflation expectations	1.6	1.5	1.6	1.6	1.7
Steeper Phillips curve	1.6	2.1	2.6	2.9	3.2
Market correction	1.6	1.8	2.0	2.0	2.1
Misperceived lower natural rate	1.6	1.8	1.8	1.8	1.9
Higher oil prices and faster AFE tightening	1.6	2.0	2.1	2.1	2.1
China-driven EME turbulence	1.5	1.2	1.7	1.9	2.0
<i>Federal funds rate¹</i>					
Extended Tealbook baseline	1.2	2.5	3.5	4.0	4.1
Lower inflation expectations	1.2	2.2	2.9	3.4	3.5
Steeper Phillips curve	1.2	2.6	3.8	4.7	5.0
Market correction	1.2	2.3	3.0	3.5	3.7
Misperceived lower natural rate	1.2	2.5	3.4	3.9	3.9
Higher oil prices and faster AFE tightening	1.2	2.6	3.4	3.9	3.9
China-driven EME turbulence	1.2	2.1	2.7	3.2	3.5

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

result, real GDP growth is a bit slower, and the unemployment rate is about $\frac{1}{4}$ percentage point above the baseline by the end of 2022.

Market Correction [FRB/US]

Broad equity market price indexes have increased significantly in recent years, and standard equity valuation measures, such as the price-to-earnings ratio, are high by historical standards. Moreover, interest rate spreads on both investment-grade and high-yield bonds currently are near their lowest levels since the financial crisis. While some of the decline in bond spreads reflects improvements in the credit quality of these borrowers, estimates of bond risk premiums suggest that bondholders are now more willing to take on risk. Also, the Treasury term premium is currently unusually low.

In this scenario, we assume that both equity and bond risk premiums move fairly quickly toward historically normal levels. By the end of next year, equity prices have fallen about 20 percent; the term premium on Treasury securities has risen halfway to its assumed long-run value; and the triple-B corporate bond spread has increased about 30 basis points above the baseline, enough to move it back close to its median historical value. That correction in asset values is assumed to also cause an erosion in consumer and business sentiment.

Real GDP growth slows to about $1\frac{3}{4}$ percent in 2018, roughly $\frac{3}{4}$ percentage point less than in the baseline. The unemployment rate remains around 4 percent through 2022. With labor utilization less tight and inflation slightly lower, the federal funds rate rises more gradually and is $3\frac{3}{4}$ percent at the end of 2022, about $\frac{1}{4}$ percentage point below the baseline.

Unlike the decrease in house prices before the Great Recession, the asset price declines in this scenario have relatively mild consequences. This outcome reflects in part our assumption in this scenario that the losses resulting from these market corrections do not induce significant disruptions to the broad functioning of the financial system.

Misperceived Lower Natural Rate of Unemployment [Search and Matching DSGE Model]

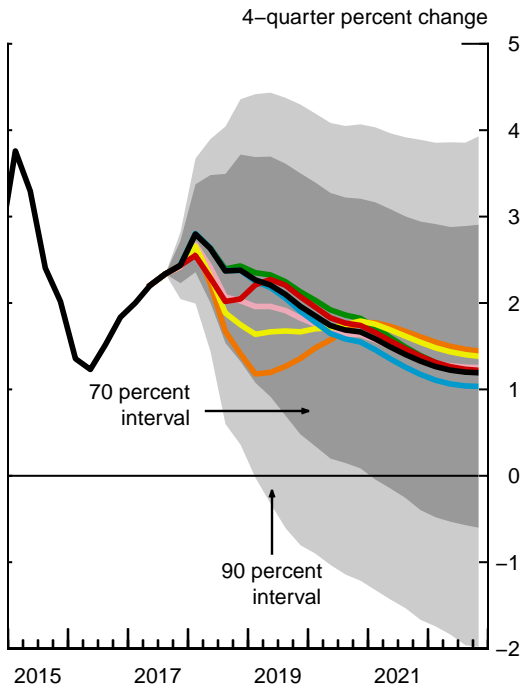
In the baseline forecast, the unemployment rate falls to 3.5 percent by the end of 2019, with the natural rate of unemployment assumed to hold steady at 4.7 percent through the projection period. However, the natural rate could be driven lower by a variety of influences, such as demographic factors or improvements in job-matching

Forecast Confidence Intervals and Alternative Scenarios

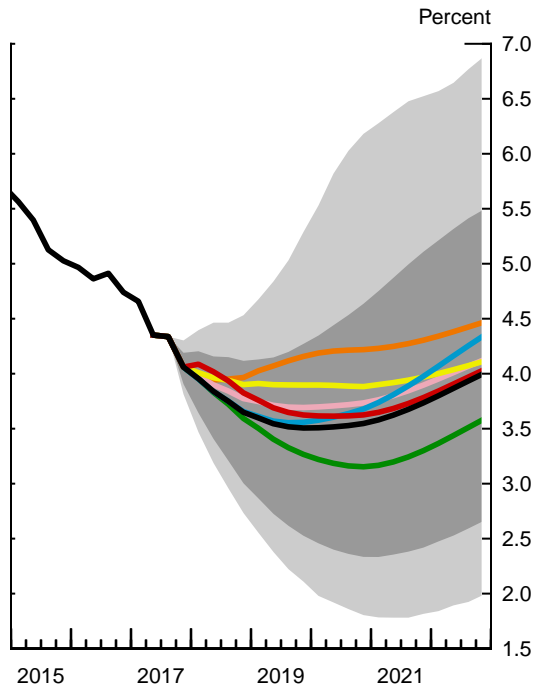
Confidence Intervals Based on FRB/US Stochastic Simulations

- Extended Tealbook baseline
- Market correction
- Higher oil prices and faster AFE tightening
- Lower inflation expectations
- Misperceived lower natural rate
- China-driven EME turbulence
- Steeper Phillips curve

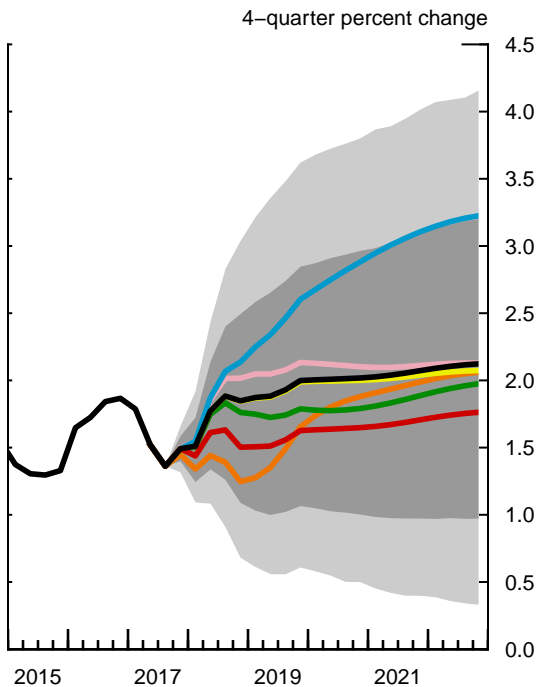
Real GDP



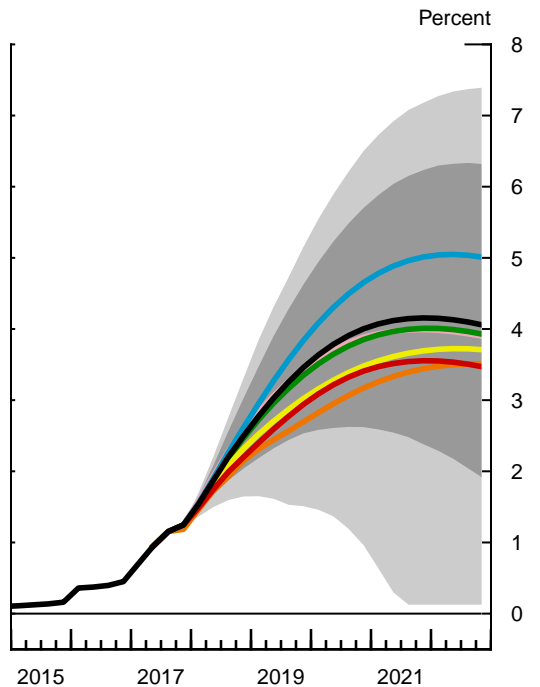
Unemployment Rate



PCE Prices excluding Food and Energy



Federal Funds Rate



efficiency. This scenario assumes that the natural rate of unemployment declines 1 percentage point over the next few years, and we assume that the source of a lower natural rate is a decline in worker bargaining power, which erodes wage inflation and, hence, price inflation relative to the baseline. In addition, we assume that learning by the central bank about the lower natural rate occurs only gradually and, thus, that a considerable gap between the actual and perceived natural rates persists through the end of 2022.⁶

Economic activity is somewhat stronger than in the baseline as firms create more jobs and expand production in response to lower wages. As a result, the unemployment rate falls to 3¼ percent by the end of 2019. However, because the unemployment rate does not decline as much relative to the baseline as the true natural rate does, resource utilization is less tight, and inflation remains persistently below the baseline through 2022. Despite the lower path for inflation in this scenario, the federal funds rate is only slightly lower than in the baseline because of the misperception of the degree of tightness in the labor market.

Higher Oil Prices and Faster Advanced Foreign Economy Tightening [SIGMA]

Although we project that oil prices will decline gradually from recent highs, political tensions in the Middle East could lead to oil supply disruptions that boost global oil prices substantially and put upward pressure on headline inflation.⁷ Our expectation is that most foreign central banks would look through an oil-driven rise in headline inflation and, hence, not adjust their policy stance materially. However, this scenario considers the plausible risk that a sharp and persistent rise in oil prices against the backdrop of fairly tight AFE labor markets could prompt noticeably faster monetary policy

⁶ Central bank learning about the true natural rate of unemployment is assumed to solve a signal extraction problem. Importantly, the amount of uncertainty is informed by the very wide confidence interval around estimates of the natural rate of unemployment in Douglas O. Staiger, James H. Stock, and Mark W. Watson (1997), “How Precise Are Estimates of the Natural Rate of Unemployment?” in Cristina D. Romer and David H. Romer, eds., *Reducing Inflation: Motivation and Strategy* (Chicago: University of Chicago Press), pp. 195–246. Thus, learning is slow and the central bank revises its estimate of the natural rate by only about ¼ percentage point by the beginning of 2020.

⁷ The Domestic Economic Developments and Outlook box in this Tealbook “The Limited Effectiveness of Shale Oil in Moderating Oil Price Fluctuations” argues that while an oil-supply disruption abroad would induce some expansion of oil production in the United States, this production response would provide only limited offset to the upward pressure on oil prices.

**Selected Tealbook Projections and 70 Percent Confidence Intervals Derived
from Historical Tealbook Forecast Errors and FRB/US Simulations**

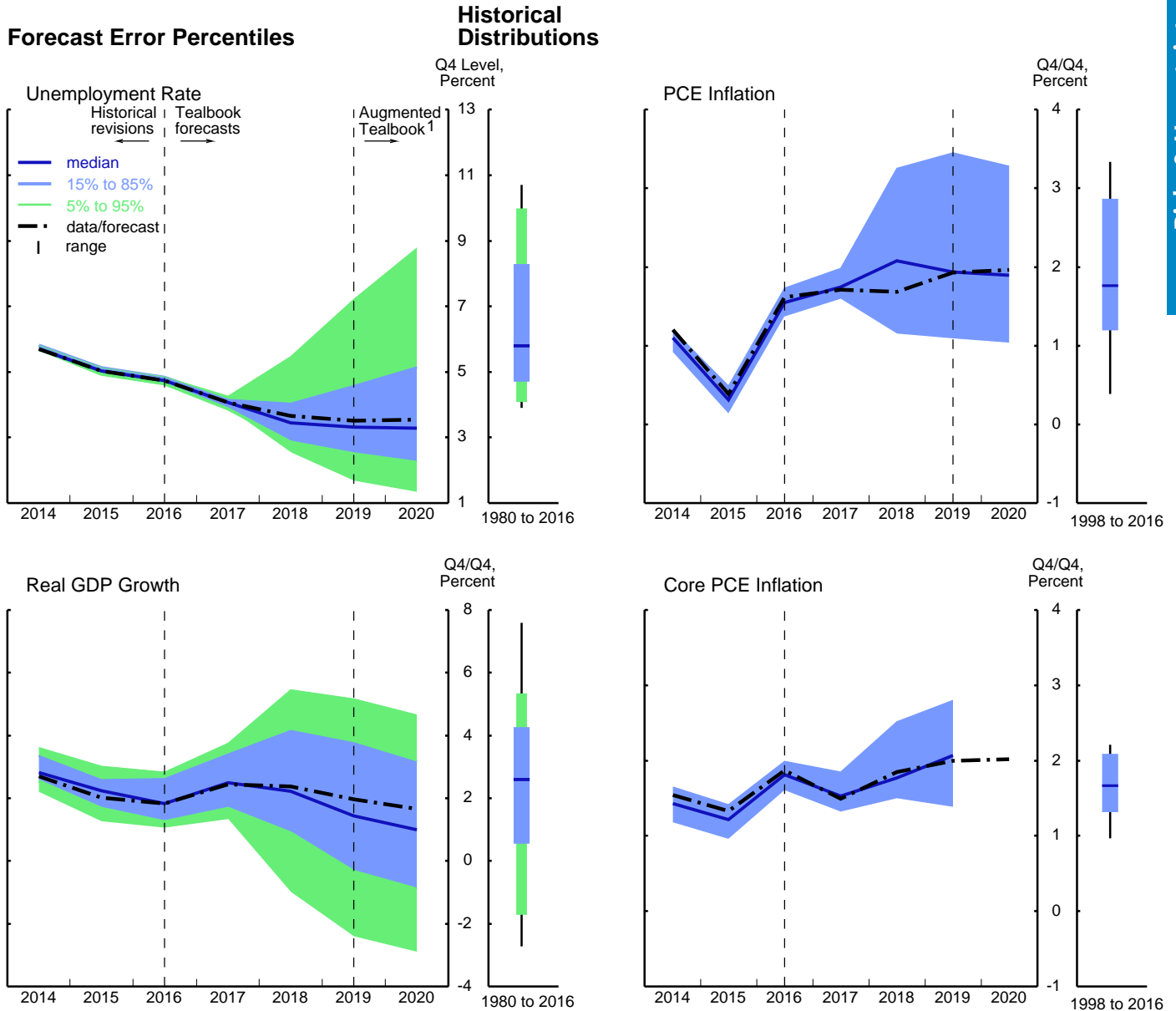
Measure	2017	2018	2019	2020	2021	2022
<i>Real GDP</i>						
<i>(percent change, Q4 to Q4)</i>						
Projection	2.4	2.4	2.0	1.7	1.3	1.2
Confidence interval						
Tealbook forecast errors	1.7–3.4	.9–4.2	-.3–3.8	-.9–3.2
FRB/US stochastic simulations	2.2–2.7	1.3–3.7	.5–3.5	.1–3.2	-.4–2.9	-.6–2.9
<i>Civilian unemployment rate</i>						
<i>(percent, Q4)</i>						
Projection	4.1	3.6	3.5	3.5	3.7	4.0
Confidence interval						
Tealbook forecast errors	3.9–4.2	2.8–4.0	2.5–4.6	2.2–5.2
FRB/US stochastic simulations	3.9–4.2	3.0–4.1	2.5–4.3	2.3–4.6	2.4–5.1	2.7–5.5
<i>PCE prices, total</i>						
<i>(percent change, Q4 to Q4)</i>						
Projection	1.7	1.7	1.9	2.0	2.1	2.1
Confidence interval						
Tealbook forecast errors	1.6–2.0	1.1–3.3	1.1–3.5	1.0–3.3
FRB/US stochastic simulations	1.6–1.8	.8–2.4	.9–2.9	.9–3.0	1.0–3.2	.9–3.3
<i>PCE prices excluding food and energy</i>						
<i>(percent change, Q4 to Q4)</i>						
Projection	1.5	1.8	2.0	2.0	2.1	2.1
Confidence interval						
Tealbook forecast errors	1.3–1.8	1.5–2.5	1.4–2.8
FRB/US stochastic simulations	1.4–1.6	1.1–2.5	1.1–2.8	1.0–3.0	1.0–3.1	1.0–3.2
<i>Federal funds rate</i>						
<i>(percent, Q4)</i>						
Projection	1.2	2.5	3.5	4.0	4.2	4.1
Confidence interval						
FRB/US stochastic simulations	1.2–1.3	2.0–3.0	2.5–4.6	2.6–5.7	2.4–6.2	1.9–6.3

Note: Shocks underlying FRB/US stochastic simulations are randomly drawn from the 1969–2016 set of model equation residuals. Intervals derived from Tealbook forecast errors are based on projections made from 1980 to 2016 for real GDP and unemployment and from 1998 to 2016 for PCE prices. The intervals for real GDP, unemployment, and total PCE prices are extended into 2020 using information from the Blue Chip survey and forecasts from the CBO and CEA.

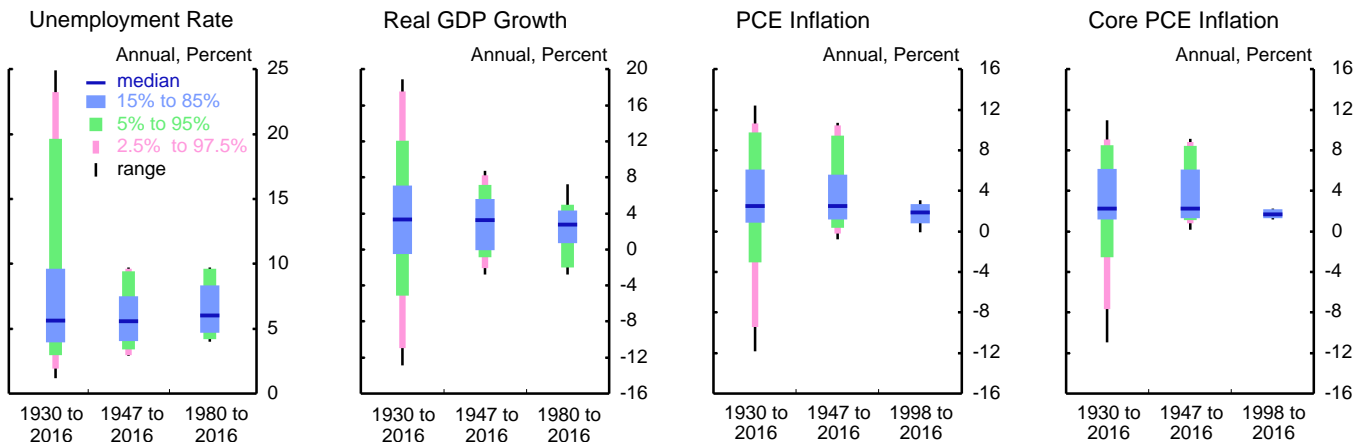
... Not applicable.

Prediction Intervals Derived from Historical Tealbook Forecast Errors

Risks & Uncertainty



Historical Distributions



Note: See the technical note in the appendix for more information on this exhibit.

1. Augmented Tealbook prediction intervals use 2- and 3-year-ahead forecast errors from Blue Chip, CBO, and CEA to extend the Tealbook prediction intervals through 2020.

normalization in the AFEs, tightening financial conditions both there and around the world.

Specifically, oil prices increase \$20 per barrel above the baseline by early next year and remain persistently elevated through the forecast horizon. Headline inflation in the AFEs rises $\frac{1}{2}$ percentage point relative to the baseline in the first half of 2018, inducing their central banks to increase policy rates more aggressively than what is prescribed by the baseline policy rule. The faster policy normalization triggers increases in AFE corporate borrowing spreads and sovereign bond term premiums. Tighter financial conditions in the AFEs spill over to the rest of the world, and the broad real dollar depreciates 3 percent.

Lower foreign demand, higher oil prices, and tighter financial conditions weigh on economic activity in the United States, notwithstanding the stimulus to net exports from the depreciation of the dollar. U.S. GDP growth moderates to 2 percent in 2018, about $\frac{1}{2}$ percentage point less than in the baseline. Given higher oil prices and the boost to import prices from the dollar's depreciation, core PCE inflation runs above 2 percent starting in the second half of 2018. Unlike foreign central banks, the Federal Reserve reacts according to the baseline inertial Taylor rule; with core inflation higher but resource utilization somewhat lower, the federal funds rate is little changed relative to the baseline.

China-Driven Emerging Market Economy Turbulence [SIGMA]

In our baseline forecast, we expect Chinese real GDP growth to gradually moderate from about $6\frac{1}{2}$ percent in the second half of this year to a still-solid $5\frac{3}{4}$ percent pace by the end of 2020. However, given China's underlying vulnerabilities—including high corporate debt and a large and opaque shadow banking system—adverse shocks could trigger a quicker and more pronounced slowdown of Chinese GDP growth and renewed pressures on the renminbi, with negative spillovers to other EMEs. In this scenario, we assume that GDP growth in China and other EMEs falls to only 3 percent and 1 percent, respectively, in 2018, as corporate borrowing spreads increase 150 basis points and confidence declines. The stresses in EMEs also trigger a sizable rise in borrowing spreads in the United States and in the AFEs, while flight-to-safety flows cause the broad real dollar to appreciate 10 percent and depress term premiums on U.S.

government bonds by 30 basis points.⁸ Despite weakening macroeconomic conditions, EME central banks are assumed to tighten monetary policy to mitigate upward pressure on inflation arising from the depreciation of their currencies.

The appreciation of the dollar, weaker foreign activity, and adverse financial spillovers cause U.S. GDP growth to moderate to about 1½ percent in 2018 and the unemployment rate to rise to 4½ percent in 2021. Weaker economic activity and lower import prices reduce core PCE price inflation to about 1¼ percent in 2018. The federal funds rate follows a shallower path than in the baseline, reaching only 3½ percent by the end of 2022.

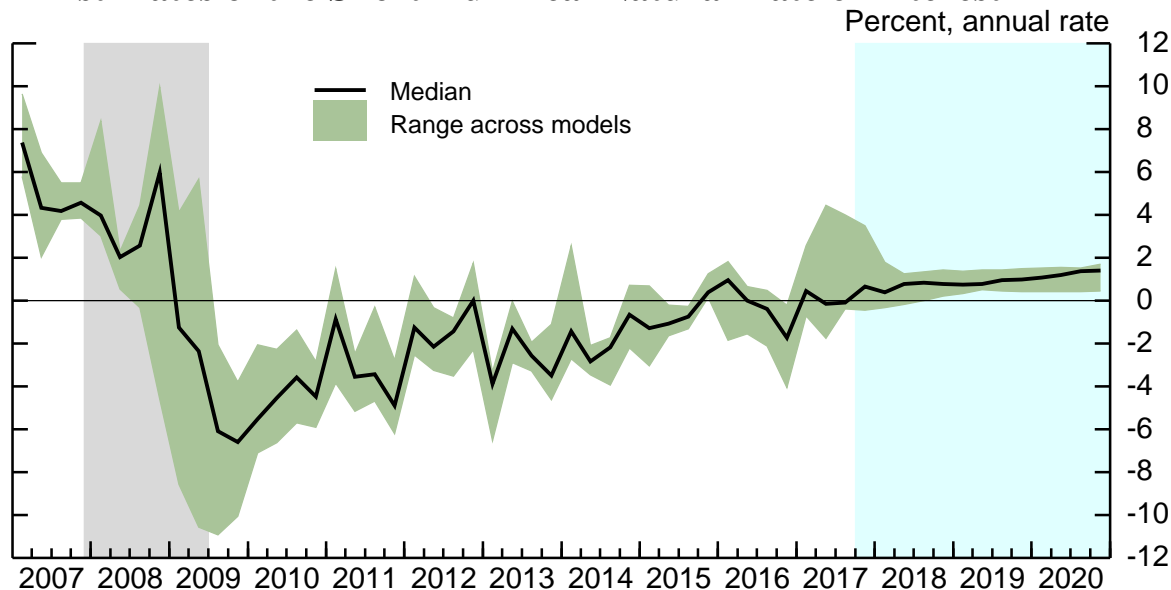
⁸ The calibration of the tightening of financial conditions in this scenario takes some important cues from developments starting in the summer of 2015 through early 2016, when concerns about a slowdown in China intensified.

Alternative Model Forecasts
(Percent change, Q4 to Q4, except as noted)

Measure and projection	2017		2018		2019	
	September Tealbook	Current Tealbook	September Tealbook	Current Tealbook	September Tealbook	Current Tealbook
<i>Real GDP</i>						
Staff	2.6	2.4	2.3	2.4	1.9	2.0
FRB/US	2.6	2.4	2.7	2.2	2.0	1.5
EDO	2.7	2.4	2.6	2.4	2.4	2.3
<i>Unemployment rate¹</i>						
Staff	4.2	4.1	3.8	3.6	3.7	3.5
FRB/US	4.2	4.1	3.9	3.9	3.9	4.0
EDO	4.3	4.2	4.4	4.3	4.6	4.5
<i>Total PCE prices</i>						
Staff	1.5	1.7	1.9	1.7	2.0	1.9
FRB/US	1.4	1.7	1.6	1.7	1.8	1.8
EDO	1.3	1.7	1.8	1.7	2.1	1.9
<i>Core PCE prices</i>						
Staff	1.5	1.5	1.9	1.8	2.0	2.0
FRB/US	1.4	1.5	1.7	1.8	1.9	1.8
EDO	1.3	1.5	1.8	1.7	2.1	1.9
<i>Federal funds rate¹</i>						
Staff	1.4	1.2	2.6	2.5	3.5	3.5
FRB/US	1.4	1.2	2.4	2.3	3.2	2.9
EDO	1.6	1.2	2.7	2.3	3.4	3.0

1. Percent, average for Q4.

Estimates of the Short-Run Real Natural Rate of Interest



Note: Estimates are based on the four models from the System DSGE project; for more information, see the box "Estimates of the Short-Run Real Natural Rate of Interest" in the March 2016 Tealbook. The gray shaded bar indicates a period of recession as defined by the National Bureau of Economic Research.

Assessment of Key Macroeconomic Risks

Probability of Inflation Events

(4 quarters ahead)

Probability that the 4-quarter change in total PCE prices will be . . .	Staff	FRB/US	EDO	BVAR
<i>Greater than 3 percent</i>				
Current Tealbook	.05	.04	.02	.10
Previous Tealbook	.06	.04	.01	.02
<i>Less than 1 percent</i>				
Current Tealbook	.19	.19	.13	.12
Previous Tealbook	.15	.21	.17	.27

Probability of Unemployment Events

(4 quarters ahead)

Probability that the unemployment rate will . . .	Staff	FRB/US	EDO	BVAR
<i>Increase by 1 percentage point</i>				
Current Tealbook	.01	.01	.18	.02
Previous Tealbook	.01	.01	.13	.01
<i>Decrease by 1 percentage point</i>				
Current Tealbook	.15	.06	.05	.16
Previous Tealbook	.21	.04	.09	.22

Probability of Near-Term Recession

Probability that real GDP declines in the next two quarters	Staff	FRB/US	EDO	BVAR	Factor Model
Current Tealbook	.01	.01	.05	.03	.00
Previous Tealbook	.01	.01	.03	.02	.02

Note: “Staff” represents stochastic simulations in FRB/US around the staff baseline; baselines for FRB/US, BVAR, EDO, and the factor model are generated by those models themselves, up to the current-quarter estimate. Data for the current quarter are taken from the staff estimate for the second Tealbook in each quarter; if the second Tealbook for the current quarter has not yet been published, the preceding quarter is taken as the latest historical observation.

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Appendix

Technical Note on “Prediction Intervals Derived from Historical Tealbook Forecast Errors”

This technical note provides additional details about the exhibit “Prediction Intervals Derived from Historical Tealbook Forecast Errors.” In the four large fan charts, the black dotted lines show staff projections and current estimates of recent values of four key economic variables: average unemployment rate in the fourth quarter of each year and the Q4/Q4 percent change for real GDP, total PCE prices, and core PCE prices. (The GDP series is adjusted to use GNP for those years when the staff forecast GNP and to strip out software and intellectual property products from the currently published data for years preceding their introduction. Similarly, the core PCE inflation series is adjusted to strip out the “food away from home” component for years before it was included in core.)

The historical distributions of the corresponding series (with the adjustments described above) are plotted immediately to the right of each of the fan charts. The thin black lines show the highest and lowest values of the series during the indicated time period. At the bottom of the page, the distributions over three different time periods are plotted for each series. To enable the use of data for years prior to 1947, we report annual-average data in this section. The annual data going back to 1930 for GDP growth, PCE inflation, and core PCE inflation are available in the conventional national accounts; we used estimates from Lebergott (1957) for the unemployment rate from 1930 to 1946.¹

The prediction intervals around the current and one-year-ahead forecasts are derived from historical staff forecast errors, comparing staff forecasts with the latest published data. For the unemployment rate and real GDP growth, errors were calculated for a sample starting in 1980, yielding percentiles of the sizes of the forecast errors. For PCE and core PCE inflation, errors based on a sample beginning in 1998 were used. This shorter range reflects both more limited data on staff forecasts of PCE inflation and the staff judgment that the distribution of inflation since the mid-1990s is more appropriate for the projection period than distributions of inflation reaching further back. In all cases, the prediction intervals are computed by adding the percentile bands of the errors onto the forecast. The blue bands encompass 70 percent prediction-interval ranges; adding the green bands expands this range to 90 percent. The dark blue line plots the median of the prediction intervals. There is not enough historical forecast data to calculate meaningful 90 percent ranges for the two inflation series. A median line above the staff forecast means that forecast errors were positive more than half of the time.

¹ Stanley Lebergott (1957), “Annual Estimates of Unemployment in the United States, 1900–1954,” in National Bureau of Economic Research, *The Measurement and Behavior of Unemployment* (Princeton, N.J.: Princeton University Press), pp. 213–41.

Because the staff has produced two-year-ahead forecasts for only a few years, the intervals around the two-year-ahead forecasts are constructed by augmenting the staff projection errors with information from outside forecasters: the Blue Chip consensus, the Council of Economic Advisers, and the Congressional Budget Office. Specifically, we calculate prediction intervals for outside forecasts in the same manner as for the staff forecasts. We then calculate the change in the error bands from outside forecasts from one year ahead to two years ahead and apply the average change to the staff's one-year-ahead error bands. That is, we assume that any deterioration in the performance between the one- and two-year-ahead projections of the outside forecasters would also apply to the Tealbook projections. Limitations on the availability of data mean that a slightly shorter sample is used for GDP and unemployment, and the outside projections may only be for a similar series, such as total CPI instead of total PCE prices or annual growth rates of GDP instead of four-quarter changes. In particular, because data on forecasts for core inflation by these outside forecasters are much more limited, we did not extrapolate the staff's errors for core PCE inflation two years ahead.

The intervals around the historical data in the four fan charts are based on the history of data revisions for each series. The previous-year, two-year-back, and three-year-back values as of the current Tealbook forecast are subtracted from the corresponding currently published estimates (adjusted as described earlier) to produce revisions, which are then combined into distributions and revision intervals in the same way that the prediction intervals are created.

Monetary Policy Strategies

In this section, we consider a range of strategies for setting the federal funds rate and compare the associated interest rate paths and macroeconomic outcomes with those in the Tealbook baseline projection. In the box “Substitutability of Policy Instruments,” we summarize an approach for estimating the policy tightening associated with the balance sheet normalization program initiated in October 2017.

NEAR-TERM PRESCRIPTIONS OF SELECTED SIMPLE POLICY RULES

The top panel of the first exhibit shows near-term prescriptions for the federal funds rate from four policy rules: the Taylor (1993) rule, the Taylor (1999) rule (also known as the “balanced approach” rule), a first-difference rule, and a nominal income (NI) targeting rule. These prescriptions take as given the staff’s baseline projections for the output gap and core inflation in the near term, shown in the middle panels. The top and middle panels also provide the staff’s baseline path for the federal funds rate, which is constructed using an inertial version of the Taylor (1999) rule.¹

- The prescriptions of the Taylor (1993) and Taylor (1999) rules, which do not feature interest rate smoothing terms, remain well above the corresponding policy rates in the Tealbook baseline. The prescriptions are a little higher than the previous Tealbook, reflecting a small upward revision to inflation.
- The prescriptions of the first-difference rule are essentially the same in the near term as the Tealbook baseline. The prescriptions are also essentially the same in the near term as the prescriptions of the first-difference rule in the October Tealbook, reflecting a virtually unchanged path for the output gap.
- Under the NI targeting rule, the federal funds rate responds to the current output gap and the shortfall of the level of the GDP price deflator from the path it would have attained had it increased at an annual rate of 2 percent since 2011:Q4; the current shortfall in the GDP price deflator is about 4 percent. Unlike the other rules and the Tealbook baseline policy, which call

¹ We provide details on each of these simple rules in the appendix to this section. Except for the first-difference rule, which has no intercept term, the simple rules examined here use intercept terms that are consistent with a real federal funds rate of 50 basis points in the longer run.

Substitutability of Policy Instruments

In October 2017 the Committee initiated its balance sheet normalization program, which gradually raises caps on redemptions of the Federal Reserve’s securities holdings. In this discussion, we use the FRB/US model and the staff’s balance sheet model to express the monetary tightening associated with the normalization program in terms of an alternative path of the federal funds rate that is consistent with nearly identical outcomes for inflation and unemployment.¹ Our main finding is that the balance sheet normalization program, in combination with the path for the federal funds rate assumed in the staff forecast, is likely to have about the same macroeconomic effects as a hypothetical alternative policy combination of continuing full reinvestment while raising the federal funds rate about 50 basis points more, over the next five years, than assumed in the staff forecast.

To evaluate the substitutability of the two policy instruments, we compare the path of the federal funds rate under two scenarios. In the Tealbook baseline, policymakers gradually reduce the size and duration of the System Open Market Account (SOMA) portfolio according to the normalization program announced by the Committee. In the alternative scenario, we assume that the Committee opted to continue reinvesting maturing securities until the date when demand for currency and reserves necessitates expanding the balance sheet from its current size. The path of the federal funds rate in the alternative scenario is constructed so as to keep the paths of inflation and the unemployment rate nearly identical to their paths in the Tealbook baseline.² By comparing the path for the federal funds rate in the alternative scenario with the corresponding path in the Tealbook baseline, we obtain an approximation of the tightening in monetary policy implied by balance sheet normalization expressed in terms of a revision in the path of the funds rate relative to the Tealbook baseline path.³

The left panel of the figure shows the estimated 10-year Treasury term premium effects (TPEs) for both scenarios.⁴ In the Tealbook baseline, the 10-year Treasury TPE is estimated to be negative 90 basis points at the time of the initiation of the program in October. In the alternative scenario, the larger size and longer duration of the balance sheet results in a contemporaneous 10-year TPE of negative 125 points. The difference between the two term

¹ We abstract from any costs or benefits of holding a larger balance sheet over the longer-term and focus solely on the term premium effects (TPEs) of changes in the Federal Reserve’s securities holdings. Unmodeled costs of a large balance sheet include the possibility that, in the event of a negative economic shock, a purchase program may be less likely to be adopted and could have smaller marginal TPEs.

² To construct this alternative scenario, we compute the optimal control path for the federal funds rate under a loss function that places equal weight on the unemployment gap and on deviations of inflation from 2 percent for both the baseline and alternative TPEs. We then add the difference in the federal funds rate paths to the Tealbook baseline policy rate path. This procedure keeps macroeconomic outcomes essentially unchanged.

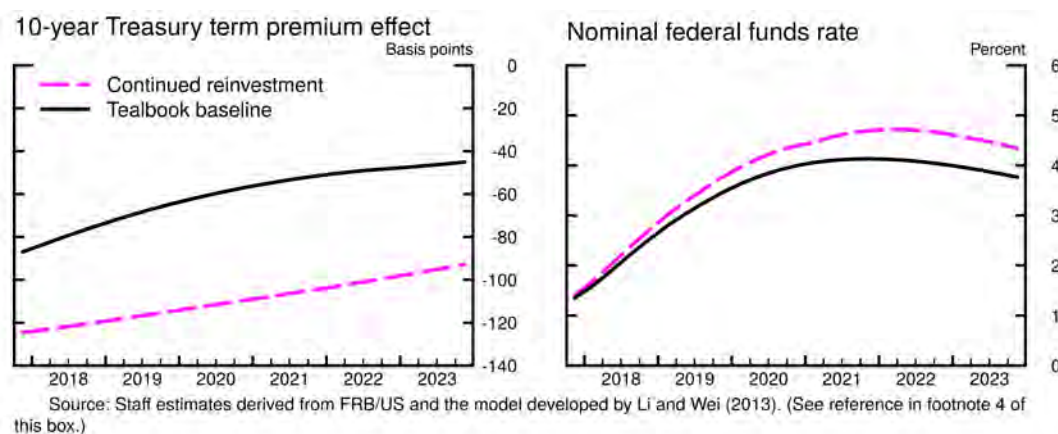
³ The alternative simulation begins in 2017:Q4, so that the deviation in policy rates from the Tealbook baseline quantifies the funds rate equivalent of the entire normalization program. The simulations embed the assumptions that financial market participants as well as price and wage setters have perfect foresight.

⁴ The Tealbook baseline balance sheet, income, and TPE projections are reported in the Balance Sheet Projections section of Tealbook B. The Tealbook baseline and alternative TPEs are constructed using an implementation of the term structure model developed by Li and Wei (2013) under the Tealbook baseline and alternative assumptions for the evolution of the balance sheet that would occur under continued reinvestment. See Canlin Li and Min Wei (2013), “Term Structure Modeling with Supply Factors and the Federal Reserve’s Large-Scale Asset Purchase Programs,” *International Journal of Central Banking*, vol. 9 (March), pp. 3–39.

premium paths widens to about 55 basis points as the alternative SOMA portfolio maintains its current size for a number of years and includes a larger amount of longer-term Treasury securities and agency mortgage-backed securities than in the baseline. Both TPE paths narrow over time because of the aging of the SOMA portfolio and as balance sheets move closer to their normalized sizes in proportion to nominal GDP.⁵

The right panel of the figure shows the baseline federal funds rate path and the alternative path that, by construction, generates nearly identical macroeconomic outcomes. Because the normalization in the size of the balance sheet under the Tealbook baseline gradually tightens financial conditions, the alternative path of the policy rate rises steadily above the baseline policy path so as to generate an equivalent gradual tightening in financial conditions. The offsetting federal funds rate path is, on average, about 40 basis points above the baseline over the horizon shown, compared with an average difference of 50 basis points for the 10-year TPEs.

Our results depend on several assumptions, three of which are particularly noteworthy. First, the staff's models postulate that balance sheet policies operate through term premium effects, estimates of which are subject to considerable uncertainty, and that those effects are transmitted to the real economy entirely via aggregate demand channels.⁶ Second, the effects of both balance sheet policy and federal funds rate policy—and therefore our policy-equivalence estimates—crucially depend on the modeling of the public's expectations. Third, the monetary accommodation associated with a particular reinvestment strategy could differ under a different composition of the SOMA portfolio or a different economic projection.⁷



⁵ Beyond the projection period, the TPEs converge to zero as the balance sheet ultimately expands in line with growth in Federal Reserve notes and Federal Reserve Bank capital.

⁶ If balance sheet policy also had implications for the economy's aggregate supply—for instance via unmodeled effects on financial market fluctuations—then policymakers might face a tradeoff between stabilizing prices and reaching full employment. Such considerations would, in turn, imply a different degree of substitutability between balance sheet policy and policy for the federal funds rate.

⁷ These results are valid in the neighborhood of the Tealbook baseline, in which the federal funds rate is projected to remain well away from the effective lower bound and mortgage rates are not projected to fall precipitously. The difference between the two reinvestment strategies would become more pronounced during an economic contraction because the rapid decline in the federal funds rate associated with such a scenario would induce prepayments of mortgages. As a result, the difference between the required federal funds rate paths across the alternative policies would increase.

for raising the federal funds rate in the near term, the NI targeting rule calls for keeping the federal funds rate near its current level to help eliminate the shortfall in the GDP price deflator.

A MEDIUM-TERM NOTION OF THE EQUILIBRIUM REAL FEDERAL FUNDS RATE

The bottom panel of the first exhibit reports estimates of a medium-term concept of the equilibrium real federal funds rate generated under two alternative baselines: the Tealbook baseline and a projection consistent with the medians in the September 2017 Summary of Economic Projections (SEP).² Both estimates use the FRB/US model to conduct the simulations. This concept, labeled “FRB/US r^* ,” corresponds to the level of the real federal funds rate that, if maintained over a 12-quarter period (starting in the current quarter), would bring the output gap to zero in the final quarter of that period.

- At 2.21 percent, the estimate of Tealbook-consistent FRB/US r^* is close to the corresponding value in the October Tealbook, reflecting a largely unrevised output gap in the medium term.³
- At 0.83 percent, the SEP-consistent FRB/US r^* is significantly lower than the Tealbook-consistent FRB/US r^* . The difference stems from the fact that the SEP-consistent projection has output running above potential by a considerably smaller amount in the coming years than in the Tealbook forecast despite the lower median path for the real federal funds rate in the SEP. The average projected real federal funds rate under the SEP-consistent baseline, at 0.34 percent, is 0.5 percentage point lower than the SEP-consistent FRB/US r^* .
- For each projection—the Tealbook baseline and the SEP-consistent baseline—FRB/US r^* is higher than the corresponding 12-quarter average projected real federal funds rate. The higher FRB/US r^* reflects factors other

² To construct a baseline projection consistent with median SEP responses for the FRB/US model, the staff interpolated annual SEP information to a quarterly frequency and assumed that, beyond 2020 (the final year reported in the September 2017 SEP), the economy transitions to the longer-run values in a smooth and monotonic way. The staff also posited economic relationships to project variables not covered in the SEP. For example, the staff assumed an Okun’s law relationship to recover an output gap from the deviation of the median SEP unemployment rate from the median SEP estimate of its longer-run value.

³ For comparability, the previous Tealbook value of FRB/US r^* is adjusted to be consistent with a minor revision in the model’s fiscal rules.

than the closing of the output gap in three years that are embedded in the Tealbook-baseline reaction function and in FOMC participants' views on the course of appropriate policy.

SIMPLE POLICY RULE SIMULATIONS

The second exhibit reports results from dynamic simulations of the FRB/US model under the Taylor (1993) rule, the Taylor (1999) rule, the first-difference rule, and the NI targeting rule. These simulations reflect the endogenous responses of the output gap and inflation to the different federal funds rate paths implied by each of the specified policy rules.⁴ The simulations are carried out under the assumptions that policymakers commit to following the prescriptions of each rule in the future and that financial market participants, price setters, and wage setters not only believe that policymakers will follow through on this commitment, but also understand the interest rate and macroeconomic implications of policymakers doing so.⁵ The policy rate paths prescribed by each rule are nearly the same in the medium term as those obtained conditional on the October Tealbook projection.

- Under the Tealbook baseline policy, the federal funds rate increases, on average, a little less than 1 percentage point per year through 2020. The federal funds rate peaks a little below 4¼ percent in 2021 before slowly moving down toward its longer-run level, which the staff assumes will be 2½ percent.
- The Taylor (1999) rule calls for an immediate and substantial increase in the federal funds rate to values that exceed the corresponding Tealbook baseline values by an average of about 1 percentage point over the next three years. This relatively sharp initial increase in the federal funds rate is followed by a slightly lower path for the federal funds rate beyond 2021 compared with the Tealbook baseline. In the next few years, the unemployment rate is no more

⁴ Because of the endogenous responses of the output gap and inflation to the different federal funds rate paths, the near-term prescriptions from the dynamic simulations can differ from those shown in the top panel of the first exhibit.

⁵ In generating these simulations, we assume that the public immediately and correctly understands the implications of the adoption of a particular policy strategy by the FOMC. In contrast to this modeling assumption, the adoption of a particular policy strategy by the FOMC might well entail a period during which the public learns the new strategy and its macroeconomic implications. We abstract here from considerations of this kind.

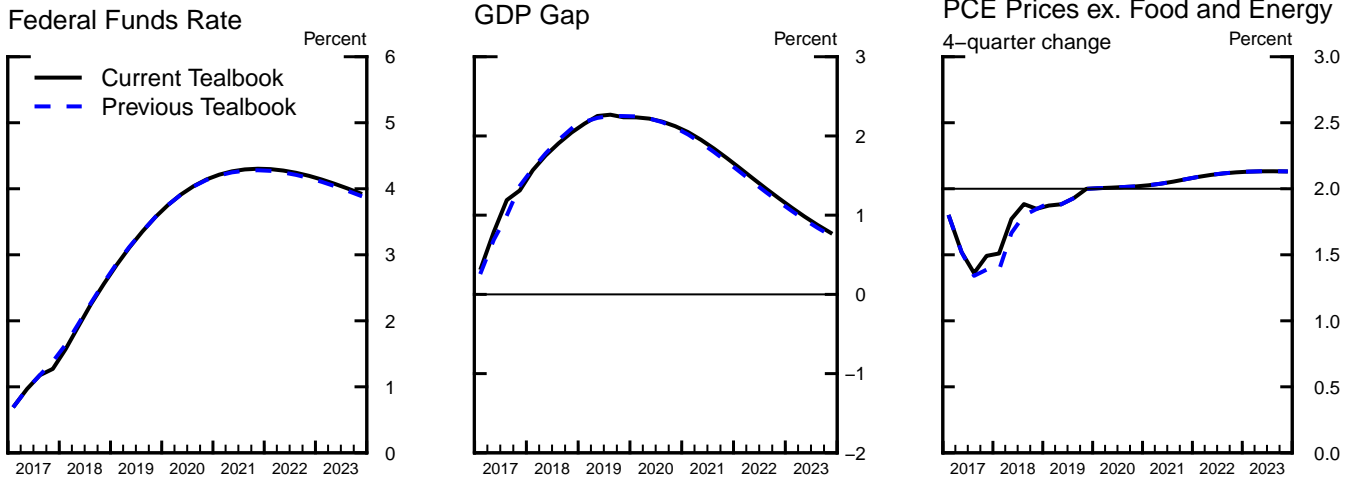
Policy Rules and the Staff Projection

Near-Term Prescriptions of Selected Simple Policy Rules¹

	(Percent)	
	2018:Q1	2018:Q2
Taylor (1993) rule	2.53	2.99
<i>Previous Tealbook</i>	2.36	2.85
Taylor (1999) rule	3.28	3.82
<i>Previous Tealbook</i>	3.12	3.70
First-difference rule	1.52	1.73
<i>Previous Tealbook projection</i>	1.52	1.74
Nominal income targeting rule	1.24	1.30
<i>Previous Tealbook projection</i>	1.20	1.23
<i>Addendum:</i>		
Tealbook baseline	1.54	1.87

Monetary Policy Strategies

Key Elements of the Staff Projection



A Medium-Term Notion of the Equilibrium Real Federal Funds Rate²

	(Percent)	
	Current Tealbook	Previous Tealbook
Tealbook baseline		
FRB/US r^*	2.21	2.31
Average projected real federal funds rate	.93	.99
SEP-consistent baseline		
FRB/US r^*	.83	
Average projected real federal funds rate	.34	

1. For rules that have a lagged policy rate as a right-hand-side variable, the lines denoted "Previous Tealbook projection" report prescriptions based on the previous Tealbook's staff outlook for inflation and the output gap, but conditional on the current-Tealbook value of the lagged policy rate.

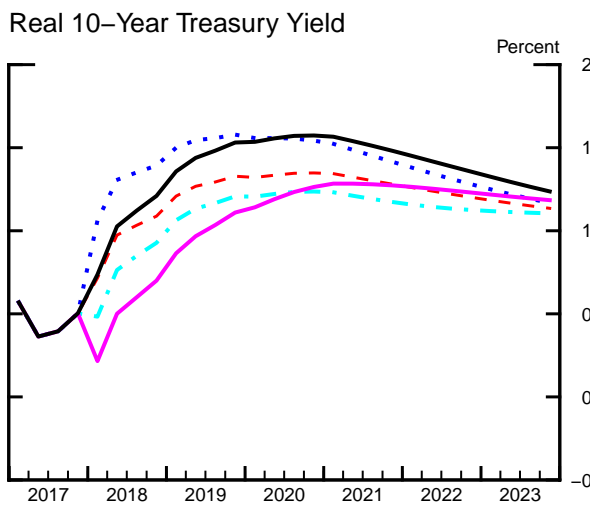
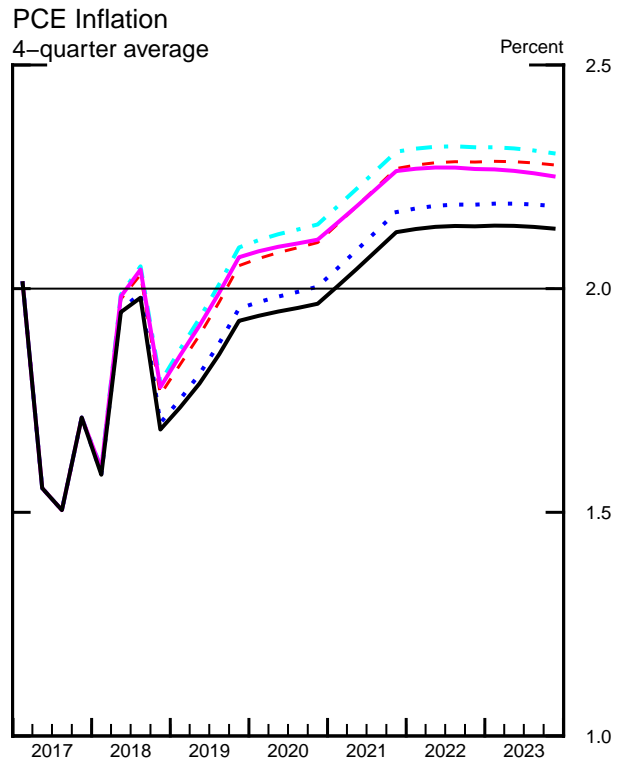
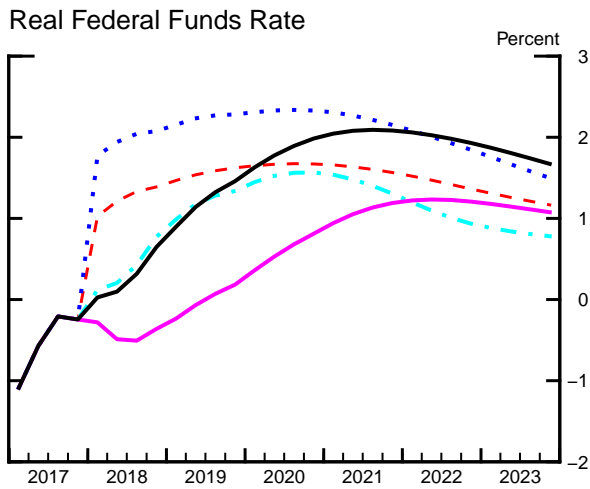
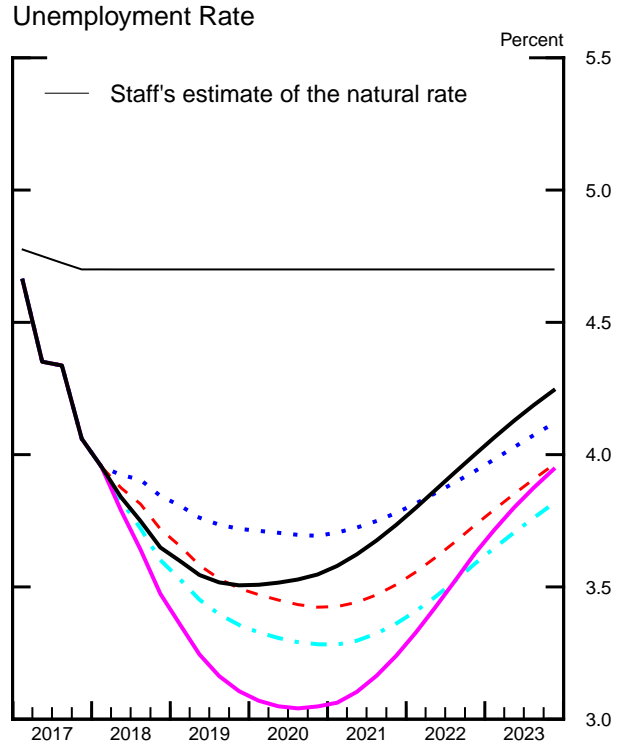
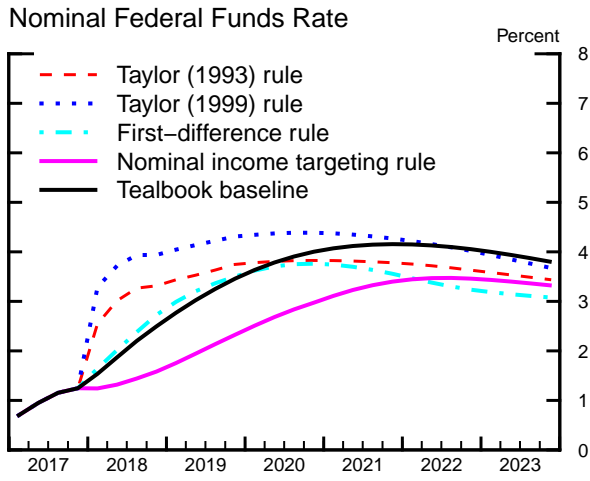
2. The "FRB/US r^* " is the level of the real federal funds rate that, if maintained over a 12-quarter period (beginning in the current quarter) in the FRB/US model, sets the output gap equal to zero in the final quarter of that period given either the Tealbook or SEP-consistent projection. The SEP-consistent baseline corresponds to the September 2017 median SEP responses. The "Average projected real federal funds rate" is calculated under the Tealbook and SEP-consistent baseline projections over the same 12-quarter period as FRB/US r^* . The previous-Tealbook r^* is adjusted to be consistent with a revision in the model's fiscal rules.

than ¼ percentage point higher under the Taylor (1999) rule than under the Tealbook baseline and runs below the baseline starting in mid-2022. Inflation under the Taylor (1999) rule runs a bit above its baseline path over the horizon shown. The reason the sharp increase in the federal funds rate under the Taylor (1999) rule is not associated with an appreciably weaker economy is that agents in the model are forward looking and correctly anticipate that the federal funds rate beyond the medium term will be lower than under the Tealbook baseline; the result is a path for the 10-year real Treasury yield that runs below that in the baseline over the majority of the next decade.

- The Taylor (1993) rule also calls for an immediate sharp increase in the federal funds rate. However, it prescribes lower federal funds rates than does the Taylor (1999) rule over the period shown, because the Taylor (1993) rule responds less strongly to the projected excess in output over its assumed potential level. As with the Taylor (1999) rule, the initial sharp increase in the federal funds rate under the Taylor (1993) rule is not associated with an appreciably weaker economy because agents in the model are forward looking and anticipate the lower federal funds rate path beyond the medium term. Indeed, beginning in 2020, the Taylor (1993) rule prescribes a path of the federal funds rate that runs below the Tealbook baseline for some time. As a result, there is a large and persistent decrease in the 10-year real Treasury yield relative to the baseline. Accordingly, inflation under the Taylor (1993) rule exceeds inflation under the Tealbook baseline by more than under the Taylor (1999) rule. The unemployment rate is closer to the Tealbook baseline path in the near term and is lower than the path implied by both the baseline and the Taylor (1999) rule over the remainder of the period shown.
- The path for the federal funds rates prescribed by the first-difference rule is similar to the path in the Tealbook baseline over the next two years but runs below the baseline path for some years thereafter. The latter 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 projected narrowing of the output gap beyond the next three years. The associated lower path of the federal funds rate, in conjunction with expectations of higher inflation in the future, implies lower longer-term real interest rates than in the Tealbook baseline and therefore higher levels of resource utilization and

Simple Policy Rule Simulations

Monetary Policy Strategies



Note: The policy rule simulations in this exhibit are based on rules that respond to core inflation rather than to headline 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.

inflation. Thus, the first-difference rule generates outcomes for the unemployment rate that are lower than, and inflation outcomes that exceed, the corresponding outcomes in the Tealbook baseline projection.

- The NI targeting rule calls for a markedly slower pace of increases in the federal funds rate than the other rules because this rule seeks to compensate for the cumulative shortfall of inflation (as measured by the rate of increase in the implicit price deflator for GDP) from an annual rate of 2 percent since the end of 2011. Because we assume that policymakers can credibly commit to closing this gap and that economic agents correctly anticipate the long period of low federal funds rates, the path of the real 10-year Treasury rate is lower than under the other policy rules and the Tealbook baseline for several years. Accordingly, the path for the unemployment rate is substantially lower than in all other simulations shown except the first-difference rule, dropping to just above 3 percent in 2020.

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.⁶ The concept of optimal control employed here corresponds to a commitment policy under which the plans that policymakers make today constrain future policy choices; such a constraint may result in improved economic outcomes.⁷ The federal funds rate paths prescribed by optimal control over the simulation period are similar to those obtained when conditioned on the October Tealbook projection.

- The first simulation, labeled “Equal weights,” presents the case in which policymakers are assumed to place equal weights on keeping headline PCE

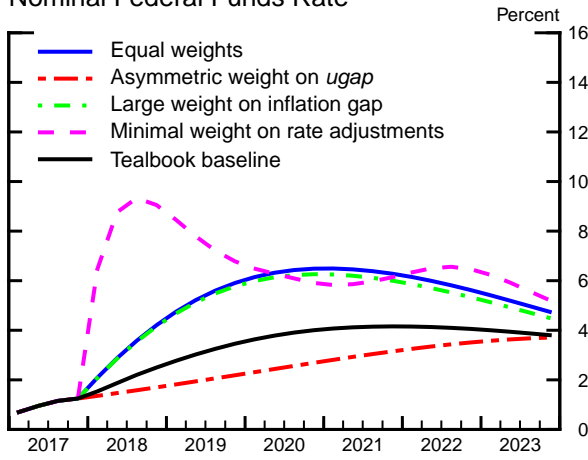
⁶ The box “Optimal Control and the Loss Function” in the Monetary Policy Strategies section of the June 2016 Tealbook B offers motivations for these specifications. The appendix in this Tealbook section provides technical details on the optimal control simulations.

⁷ Under the optimal control policies shown in the exhibit, policymakers achieve improved economic outcomes by making promises that bind future policymakers to take actions that will not be optimal from the perspective of those future policymakers (that is, the promises are time inconsistent). Furthermore, it is assumed that these promises are taken as credible by wage and price setters and by financial market participants. However, under the alternative assumption of optimal policy under discretion, which does not rely on the credibility of policymakers' promises, the results are similar for all specifications of the loss function except for that with an asymmetric weight on the unemployment gap.

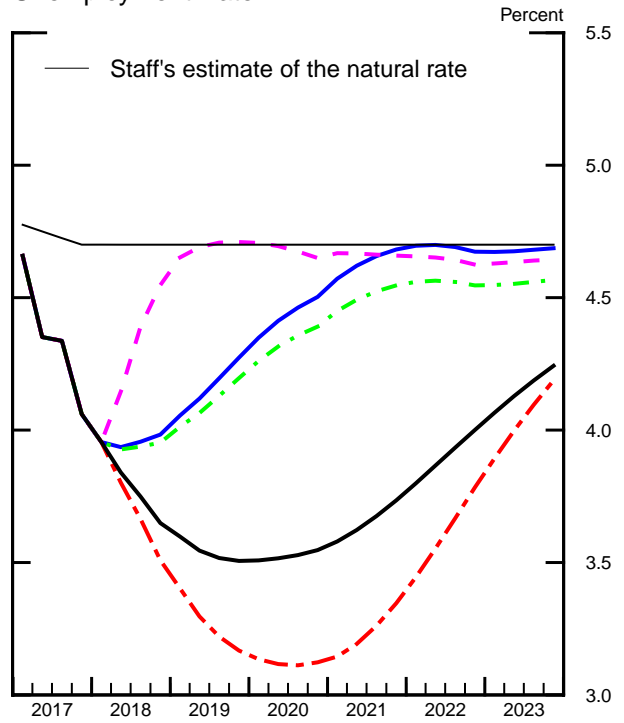
Optimal Control Simulations under Commitment

Monetary Policy Strategies

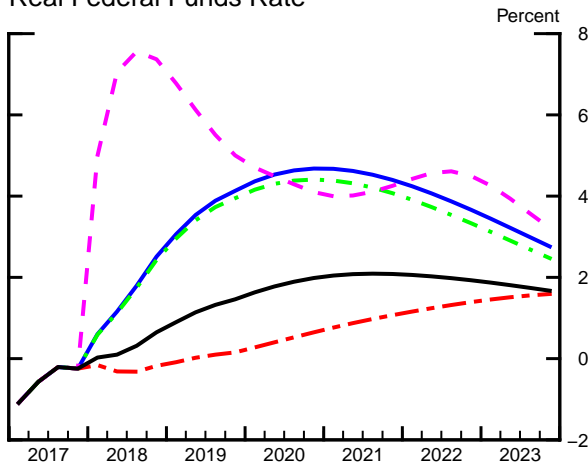
Nominal Federal Funds Rate



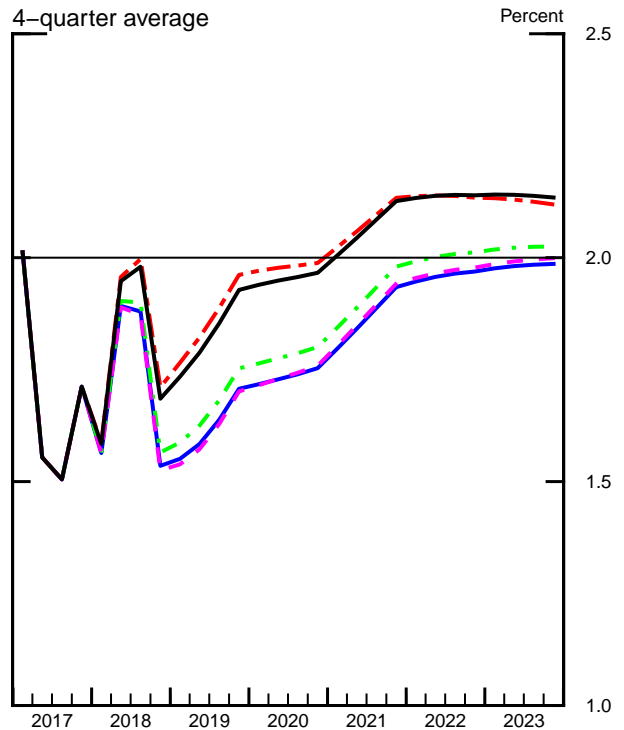
Unemployment Rate



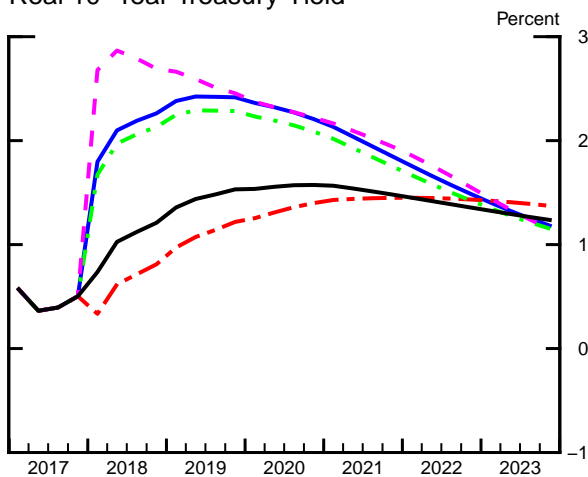
Real Federal Funds Rate



PCE Inflation
4-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 4-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.

inflation close to the Committee’s 2 percent objective, on keeping the unemployment rate close to the staff’s estimate of the natural rate of unemployment, and on keeping the federal funds rate close to its previous value. Under this strategy, the path for the federal funds rate is significantly higher than the Tealbook baseline policy rate path.⁸ This higher path arises because, in the baseline projection, the unemployment rate falls well below the staff’s estimate of the natural rate over the next several years—an outcome that policymakers with the equal weights cost function judge to be costly. The tighter policy results in a path for the unemployment rate that is substantially closer to the staff’s estimate of the natural rate and a path for headline PCE inflation that is somewhat lower than in the Tealbook baseline forecast over the period shown, consistent with the limited response of inflation to the level of resource utilization in the FRB/US model.

- The second simulation, “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 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 the path in the optimal control simulation with equal weights and below the Tealbook baseline path until the later part of the coming decade. With the asymmetric loss function, policymakers choose this initially more accommodative path for the policy rate because their desire to raise inflation to 2 percent is not tempered by an aversion to undershooting the natural rate of unemployment. Because the public believes that policymakers will follow through on this policy rate path even as the unemployment rate substantially undershoots its natural rate, the tighter labor market brings inflation to 2 percent more quickly than in the case of equal weights. Starting in the middle of the next decade (not shown), the unemployment rate runs a little above its natural rate for several years as policymakers act to contain the

⁸ When we use the SEP-consistent baseline as the underlying projection, the federal funds rate under the optimal control simulation with equal weights peaks at just below 4 percent in 2020:Q3 compared with 6½ percent at the beginning of 2021 under the Tealbook baseline.

inflationary pressures stemming from the prolonged period of elevated resource utilization.⁹

- The third simulation, “Large weight on inflation gap,” is based on a loss function that assigns a cost to deviations of inflation from 2 percent that is five times larger than the specification with equal weights but is otherwise identical to that specification. The resulting optimal strategy is only slightly more accommodative than in the “Equal weights” case, even though the losses associated with undershooting the inflation objective are larger in coming years. The reason is that, in the FRB/US model, policymakers face an unappealing tradeoff because inflation responds only weakly to resource utilization. Hence, to raise inflation in the near term by even a small amount, policymakers would need to engineer a substantial undershoot of the natural rate of unemployment—an outcome that this specification of the loss function regards as costly.
- The fourth simulation, “Minimal weight on rate adjustments,” uses a loss function that assigns only a very small cost to changes in the federal funds rate but that is otherwise identical to the loss function with equal weights. In the resulting optimal strategy, the federal funds rate soars to near 9½ percent in 2018 and then settles near 6 percent over much of the remainder of the period shown. This sharp tightening of policy reflects an effort to prevent the undershoot of the natural rate of unemployment projected by the staff. The paths for the real federal funds rate and the real 10-year Treasury yield are also notably higher for a couple of years than in the case of equal weights. Because the short-run Phillips curve is quite flat in the FRB/US model and agents in the model take the 2 percent inflation objective to be credible, this policy leaves the trajectory for inflation close to that in the equal-weights case over the period shown, even though, in the period through 2020, this policy

⁹ The simultaneous overshoot of the longer-run inflation objective and the undershoot of the natural rate of unemployment over the medium term under “Asymmetric weight on *ugap*” preferences is time inconsistent in the sense that, if given the opportunity to re-optimize the path of the federal funds rate without regard to past policy commitments, policymakers in the future would choose to pursue a tighter monetary policy. Under the alternative assumption of optimal control under discretion, which rules out time-inconsistent outcomes, policy rates and macroeconomic outcomes are between those under the Tealbook baseline and optimal control under commitment for this loss function.

keeps the unemployment rate much closer to the staff's estimate of the natural rate.¹⁰

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

¹⁰ From 2020 onward, the nominal and real federal funds rates for this simulation are sometimes above and sometimes below the corresponding values observed in the case of equal weights.

Outcomes of Simple Policy Rule Simulations

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

Outcome and strategy	2017	2018	2019	2020	2021	2022	2023
<i>Nominal federal funds rate¹</i>							
Taylor (1993)	1.2	3.3	3.7	3.8	3.8	3.6	3.4
Taylor (1999)	1.2	3.9	4.3	4.4	4.3	4.0	3.7
First-difference	1.2	2.7	3.5	3.8	3.6	3.2	3.1
Nominal income targeting	1.2	1.6	2.3	3.0	3.4	3.5	3.3
Extended Tealbook baseline	1.2	2.5	3.5	4.0	4.2	4.1	3.8
<i>Real GDP</i>							
Taylor (1993)	2.4	2.3	2.1	1.9	1.5	1.3	1.3
Taylor (1999)	2.4	2.1	1.9	1.8	1.5	1.4	1.3
First-difference	2.4	2.5	2.2	1.9	1.5	1.3	1.4
Nominal income targeting	2.4	2.8	2.4	1.9	1.3	1.0	1.2
Extended Tealbook baseline	2.4	2.4	2.0	1.7	1.3	1.2	1.3
<i>Unemployment rate¹</i>							
Taylor (1993)	4.1	3.7	3.5	3.4	3.5	3.7	4.0
Taylor (1999)	4.1	3.8	3.7	3.7	3.8	3.9	4.1
First-difference	4.1	3.6	3.4	3.3	3.4	3.6	3.8
Nominal income targeting	4.1	3.5	3.1	3.0	3.2	3.6	3.9
Extended Tealbook baseline	4.1	3.6	3.5	3.5	3.7	4.0	4.2
<i>Total PCE prices</i>							
Taylor (1993)	1.7	1.8	2.1	2.1	2.3	2.3	2.3
Taylor (1999)	1.7	1.7	2.0	2.0	2.2	2.2	2.2
First-difference	1.7	1.8	2.1	2.1	2.3	2.3	2.3
Nominal income targeting	1.7	1.8	2.1	2.1	2.3	2.3	2.3
Extended Tealbook baseline	1.7	1.7	1.9	2.0	2.1	2.1	2.1
<i>Core PCE prices</i>							
Taylor (1993)	1.5	1.9	2.1	2.2	2.2	2.3	2.3
Taylor (1999)	1.5	1.9	2.0	2.1	2.1	2.2	2.2
First-difference	1.5	2.0	2.2	2.2	2.3	2.3	2.3
Nominal income targeting	1.5	1.9	2.1	2.2	2.2	2.3	2.2
Extended Tealbook baseline	1.5	1.8	2.0	2.0	2.1	2.1	2.1

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

Outcomes of Simple Policy Rule Simulations, Quarterly

(4-quarter percent change, except as noted)

Outcome and strategy	2017		2018				2019	
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
<i>Nominal federal funds rate¹</i>								
Taylor (1993)	1.2	1.2	2.5	3.0	3.3	3.3	3.4	3.5
Taylor (1999)	1.2	1.2	3.3	3.7	3.9	3.9	4.0	4.1
First-difference	1.2	1.2	1.6	2.0	2.4	2.7	3.0	3.2
Nominal income targeting	1.2	1.2	1.2	1.3	1.4	1.6	1.8	1.9
Extended Tealbook baseline	1.2	1.2	1.5	1.9	2.2	2.5	2.8	3.0
<i>Real GDP</i>								
Taylor (1993)	2.3	2.4	2.8	2.6	2.3	2.3	2.2	2.2
Taylor (1999)	2.3	2.4	2.8	2.5	2.1	2.1	1.9	1.9
First-difference	2.3	2.4	2.8	2.7	2.5	2.5	2.5	2.4
Nominal income targeting	2.3	2.4	2.8	2.7	2.6	2.8	2.8	2.7
Extended Tealbook baseline	2.3	2.4	2.8	2.6	2.4	2.4	2.3	2.2
<i>Unemployment rate¹</i>								
Taylor (1993)	4.3	4.1	4.0	3.9	3.8	3.7	3.7	3.6
Taylor (1999)	4.3	4.1	4.0	3.9	3.9	3.8	3.8	3.8
First-difference	4.3	4.1	4.0	3.8	3.7	3.6	3.5	3.5
Nominal income targeting	4.3	4.1	4.0	3.8	3.6	3.5	3.4	3.2
Extended Tealbook baseline	4.3	4.1	4.0	3.8	3.7	3.6	3.6	3.5
<i>Total PCE prices</i>								
Taylor (1993)	1.5	1.7	1.6	2.0	2.0	1.8	1.8	1.9
Taylor (1999)	1.5	1.7	1.6	2.0	2.0	1.7	1.8	1.8
First-difference	1.5	1.7	1.6	2.0	2.0	1.8	1.9	1.9
Nominal income targeting	1.5	1.7	1.6	2.0	2.0	1.8	1.9	1.9
Extended Tealbook baseline	1.5	1.7	1.6	1.9	2.0	1.7	1.7	1.8
<i>Core PCE prices</i>								
Taylor (1993)	1.4	1.5	1.5	1.8	1.9	1.9	2.0	2.0
Taylor (1999)	1.4	1.5	1.5	1.8	1.9	1.9	1.9	1.9
First-difference	1.4	1.5	1.5	1.8	2.0	2.0	2.0	2.0
Nominal income targeting	1.4	1.5	1.5	1.8	1.9	1.9	2.0	2.0
Extended Tealbook baseline	1.4	1.5	1.5	1.8	1.9	1.8	1.9	1.9

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)

Outcome and strategy	2017	2018	2019	2020	2021	2022	2023
<i>Nominal federal funds rate¹</i>							
Equal weights	1.2	4.2	5.9	6.5	6.3	5.6	4.7
Asymmetric weight on <i>ugap</i>	1.2	1.7	2.2	2.7	3.1	3.5	3.7
Large weight on inflation gap	1.2	4.2	5.8	6.3	6.0	5.3	4.5
Minimal weight on rate adjustments	1.2	9.1	6.8	5.9	6.1	6.5	5.2
Extended Tealbook baseline	1.2	2.5	3.5	4.0	4.2	4.1	3.8
<i>Real GDP</i>							
Equal weights	2.4	1.6	1.1	1.3	1.4	1.6	1.5
Asymmetric weight on <i>ugap</i>	2.4	2.7	2.3	1.8	1.2	0.9	1.0
Large weight on inflation gap	2.4	1.7	1.2	1.4	1.4	1.6	1.5
Minimal weight on rate adjustments	2.4	0.8	1.1	1.8	1.7	1.6	1.4
Extended Tealbook baseline	2.4	2.4	2.0	1.7	1.3	1.2	1.3
<i>Unemployment rate¹</i>							
Equal weights	4.1	4.0	4.3	4.5	4.7	4.7	4.7
Asymmetric weight on <i>ugap</i>	4.1	3.5	3.2	3.1	3.3	3.8	4.2
Large weight on inflation gap	4.1	4.0	4.2	4.4	4.5	4.5	4.6
Minimal weight on rate adjustments	4.1	4.5	4.7	4.6	4.7	4.6	4.6
Extended Tealbook baseline	4.1	3.6	3.5	3.5	3.7	4.0	4.2
<i>Total PCE prices</i>							
Equal weights	1.7	1.5	1.7	1.8	1.9	2.0	2.0
Asymmetric weight on <i>ugap</i>	1.7	1.7	2.0	2.0	2.1	2.1	2.1
Large weight on inflation gap	1.7	1.6	1.8	1.8	2.0	2.0	2.0
Minimal weight on rate adjustments	1.7	1.5	1.7	1.8	1.9	2.0	2.0
Extended Tealbook baseline	1.7	1.7	1.9	2.0	2.1	2.1	2.1
<i>Core PCE prices</i>							
Equal weights	1.5	1.7	1.8	1.8	1.9	2.0	2.0
Asymmetric weight on <i>ugap</i>	1.5	1.9	2.0	2.0	2.1	2.1	2.1
Large weight on inflation gap	1.5	1.7	1.8	1.9	1.9	2.0	2.0
Minimal weight on rate adjustments	1.5	1.7	1.8	1.8	1.9	2.0	2.0
Extended Tealbook baseline	1.5	1.8	2.0	2.0	2.1	2.1	2.1

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

Outcomes of Optimal Control Simulations under Commitment, Quarterly

(4-quarter percent change, except as noted)

Outcome and strategy	2017		2018				2019	
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
<i>Nominal federal funds rate¹</i>								
Equal weights	1.2	1.2	2.1	2.9	3.6	4.2	4.8	5.2
Asymmetric weight on <i>ugap</i>	1.2	1.2	1.4	1.5	1.6	1.7	1.8	1.9
Large weight on inflation gap	1.2	1.2	2.1	2.9	3.5	4.2	4.7	5.1
Minimal weight on rate adjustments	1.2	1.2	6.5	8.8	9.3	9.1	8.5	7.8
Extended Tealbook baseline	1.2	1.2	1.5	1.9	2.2	2.5	2.8	3.0
<i>Real GDP</i>								
Equal weights	2.3	2.4	2.8	2.4	1.9	1.6	1.3	1.2
Asymmetric weight on <i>ugap</i>	2.3	2.4	2.8	2.7	2.6	2.7	2.7	2.6
Large weight on inflation gap	2.3	2.4	2.8	2.4	2.0	1.7	1.4	1.3
Minimal weight on rate adjustments	2.3	2.4	2.8	2.1	1.3	0.8	0.3	0.5
Extended Tealbook baseline	2.3	2.4	2.8	2.6	2.4	2.4	2.3	2.2
<i>Unemployment rate¹</i>								
Equal weights	4.3	4.1	4.0	3.9	4.0	4.0	4.1	4.1
Asymmetric weight on <i>ugap</i>	4.3	4.1	4.0	3.8	3.7	3.5	3.4	3.3
Large weight on inflation gap	4.3	4.1	4.0	3.9	3.9	4.0	4.0	4.1
Minimal weight on rate adjustments	4.3	4.1	4.0	4.1	4.4	4.5	4.7	4.7
Extended Tealbook baseline	4.3	4.1	4.0	3.8	3.7	3.6	3.6	3.5
<i>Total PCE prices</i>								
Equal weights	1.5	1.7	1.6	1.9	1.9	1.5	1.6	1.6
Asymmetric weight on <i>ugap</i>	1.5	1.7	1.6	2.0	2.0	1.7	1.8	1.8
Large weight on inflation gap	1.5	1.7	1.6	1.9	1.9	1.6	1.6	1.6
Minimal weight on rate adjustments	1.5	1.7	1.6	1.9	1.9	1.5	1.5	1.6
Extended Tealbook baseline	1.5	1.7	1.6	1.9	2.0	1.7	1.7	1.8
<i>Core PCE prices</i>								
Equal weights	1.4	1.5	1.5	1.7	1.8	1.7	1.7	1.7
Asymmetric weight on <i>ugap</i>	1.4	1.5	1.5	1.8	1.9	1.9	1.9	1.9
Large weight on inflation gap	1.4	1.5	1.5	1.7	1.8	1.7	1.7	1.7
Minimal weight on rate adjustments	1.4	1.5	1.5	1.7	1.8	1.7	1.7	1.7
Extended Tealbook baseline	1.4	1.5	1.5	1.8	1.9	1.8	1.9	1.9

1. Percent, average for the quarter.

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Appendix

Implementation of the Simple Rules and Optimal Control Simulations

The monetary policy strategies considered in this section of Tealbook A typically 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 embed the assumption 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 of policymakers doing so. 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 as a means to assess the various tradeoffs policymakers may face when pursuing their mandated objectives.

POLICY RULES USED IN THE MONETARY POLICY STRATEGIES SECTION

The table "Simple Rules" that follows gives expressions for four simple policy rules routinely reported in the Monetary Policy Strategies section. It also reports the expression for the inertial version of the Taylor (1999) rule; the staff uses that inertial version, augmented with a temporary intercept adjustment, in the construction of the Tealbook baseline projection. R_t denotes the nominal federal funds rate prescribed by a strategy for quarter t ; for quarters prior to the projection period under consideration, R_t corresponds to the historical data in the economic projection. The right-hand-side variables include the staff's projection of trailing four-quarter

core PCE price inflation for the current quarter and three quarters ahead (π_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 π^{LR} , is 2 percent.

The nominal income targeting rule responds to a nominal income gap, which is defined as the difference between nominal income, denoted yn_t and measured as 100 times the log of the level of nominal GDP, and a target value, denoted yn_t^* and measured as 100 times the log of target nominal GDP. Target nominal GDP in 2011:Q4 is set equal to the staff's current estimate of potential real GDP in that quarter multiplied by the GDP deflator in that quarter; subsequently, target nominal GDP grows 2 percentage points per year faster than the staff's estimate of potential GDP. These assumptions imply that the nominal income gap can be expressed as the sum of the current estimate of the output gap and the shortfall of the GDP deflator from the level it would have attained had it grown at a 2 percent annual pace since 2011:Q4.¹

Simple Rules

Taylor (1993) rule	$R_t = r^{LR} + \pi_t + 0.5(\pi_t - \pi^{LR}) + 0.5ygap_t$
Taylor (1999) rule	$R_t = r^{LR} + \pi_t + 0.5(\pi_t - \pi^{LR}) + ygap_t$
Inertial Taylor (1999) rule	$R_t = 0.85R_{t-1} + 0.15(r^{LR} + \pi_t + 0.5(\pi_t - \pi^{LR}) + ygap_t)$
First-difference rule	$R_t = R_{t-1} + 0.5(\pi_{t+3 t} - \pi^{LR}) + 0.5\Delta^4 ygap_{t+3 t}$
Nominal income targeting rule	$R_t = 0.85R_{t-1} + 0.15(r^{LR} + \pi_t + yn_t - yn_t^*)$

The first two of the selected rules were studied by Taylor (1993, 1999), whereas the inertial version of the Taylor (1999) rule and the nominal income targeting rules have been featured prominently in analysis by Board staff.²

Where applicable, the intercepts of the simple rules, denoted r^{LR} , are constant and chosen so that they are consistent with a 2 percent longer-run inflation objective and an equilibrium real federal funds rate in the longer run of 0.5 percent.³ The prescriptions of the first-difference rule

¹ That is, these assumptions imply that $yn_t - yn_t^* = ygap_t + \frac{1}{4} \sum_{s=2012:Q1}^t (\Delta GDPdef_s - 2)$, where $\Delta GDPdef_s$ denotes the annualized quarterly rate of growth of the GDP deflator for quarter s .

² For applications, see, for example, Erceg and others (2012).

³ 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.

do not depend on the level of the output gap or the longer-run real interest rate; see Orphanides (2003).

The “Near-Term Prescriptions of Selected Policy Rules” reported in the first exhibit 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 macroeconomic projections on the prescriptions of these inertial rules, the lines labeled “Previous Tealbook projection” report prescriptions that are conditional on the previous Tealbook projections for inflation and the output gap but that use the value of the lagged federal funds rate in the current Tealbook for the first quarter shown.

A MEDIUM-TERM NOTION OF THE EQUILIBRIUM REAL FEDERAL FUNDS RATE

The bottom panel of the exhibit “Policy Rules and the Staff Projection” provides estimates of one notion of the equilibrium real federal funds rate that uses alternative baselines: the Tealbook baseline and another one consistent with median responses to the latest Summary of Economic Projections (SEP). The simulations are conducted using the FRB/US model, the staff’s large-scale econometric model of the U.S. economy. “FRB/US r^* ” is 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 given either the Tealbook or the SEP-consistent economic projection.⁴ This measure depends on a broad array of economic factors, some of which take the form of projected values of the model’s exogenous variables. The measure is derived under the assumption that agents in the model form VAR-based expectations—that is, agents use small-scale statistical models so that their expectations of future variables are determined solely by historical relationships.

The “Average projected real federal funds rate” for the Tealbook baseline and the SEP-consistent baseline reported in the panel are the corresponding averages of the real federal funds rate under the Tealbook baseline projection and SEP-consistent projection, respectively, calculated over the same 12-quarter period as the Tealbook-consistent and SEP-consistent FRB/US r^* . For a given economic projection, the average projected real federal funds rates and the FRB/US r^* may be associated with somewhat different macroeconomic outcomes even when their values are identical. The reason is that, in the FRB/US r^* simulation, the real federal funds rate is held constant over the entire 12-quarter period, whereas in the economic projection, the real federal funds rate can vary over time.

⁴ For a discussion of the equilibrium real federal funds rates in the longer run and other concepts of equilibrium interest rates, see Gust and others (2016).

FRB/US MODEL SIMULATIONS

The results presented in the exhibits “Simple Policy Rule Simulations” and “Optimal Control Simulations under Commitment” are derived from dynamic simulations of the FRB/US model. Each simulated policy strategy 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 form model-consistent expectations 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 OPTIMAL CONTROL POLICIES 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 price inflation, π_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. In the following equation, the resulting loss function 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, “Equal weights,” assigns equal weights to all three components at all times. The second specification, “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, “Large weight on inflation gap,” attaches a relatively large weight to inflation gaps. The fourth specification, “Minimal weight on rate adjustments,” places almost no weight on changes in the federal funds rate.⁵ The table “Loss Functions” shows the weights used

⁵ The inclusion of a minimal but strictly positive weight on changes in the federal funds rate helps ensure a well-behaved numerical solution.

in the four specifications. The optimal control policy and associated outcomes depend on the relative (rather than the absolute) values of the weights.

	Loss Functions			
	λ_π	$\lambda_{u,t+\tau}$		λ_R
		$ugap_{t+\tau} < 0$	$ugap_{t+\tau} \geq 0$	
Equal weights	1	1	1	1
Asymmetric weight on <i>ugap</i>	1	0	1	1
Large weight on inflation gap	5	1	1	1
Minimal weight on rate adjustments	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 that market participants and wage and price setters employ model-consistent expectations 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 the public sees this path as a binding commitment on policymakers' future 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 horizon that ends sufficiently far in the future so that extending the horizon further would not affect the policy prescriptions shown in the exhibits.

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Changes in GDP, Prices, and Unemployment
(Percent, annual rate except as noted)

Interval	Nominal GDP		Real GDP		PCE price index		Core PCE price index		Unemployment rate ¹	
	10/20/17	12/01/17	10/20/17	12/01/17	10/20/17	12/01/17	10/20/17	12/01/17	10/20/17	12/01/17
<i>Quarterly</i>										
2017:Q1	3.3	3.3	1.2	1.2	2.2	2.2	1.8	1.8	4.7	4.7
2017:Q2	4.1	4.1	3.1	3.1	.3	.3	.9	.9	4.4	4.4
2017:Q3	4.8	5.5	2.9	3.3	1.5	1.5	1.3	1.4	4.3	4.3
2017:Q4	5.2	4.8	3.2	2.2	2.0	2.8	1.5	1.9	4.2	4.1
2018:Q1	4.4	4.5	2.5	2.7	1.6	1.7	1.8	1.9	4.1	4.0
2018:Q2	4.5	4.3	2.4	2.4	1.9	1.7	2.0	2.0	3.9	3.8
2018:Q3	4.3	4.2	2.3	2.3	1.7	1.7	1.8	1.8	3.8	3.7
2018:Q4	4.1	4.0	2.2	2.2	1.7	1.6	1.7	1.7	3.7	3.6
2019:Q1	4.3	4.4	2.1	2.2	1.9	1.9	2.0	2.0	3.7	3.6
2019:Q2	4.0	4.2	1.9	2.2	1.9	1.9	2.0	2.0	3.6	3.5
2019:Q3	3.9	3.9	1.8	1.8	2.0	1.9	2.0	2.0	3.6	3.5
2019:Q4	3.8	3.7	1.7	1.6	2.0	1.9	2.0	2.0	3.6	3.5
<i>Two-quarter²</i>										
2017:Q2	3.7	3.7	2.1	2.1	1.2	1.2	1.4	1.4	-3	-3
2017:Q4	5.0	5.1	3.1	2.7	1.7	2.2	1.4	1.6	-2	-3
2018:Q2	4.5	4.4	2.5	2.5	1.7	1.7	1.9	1.9	-3	-3
2018:Q4	4.2	4.1	2.3	2.2	1.7	1.7	1.8	1.8	-2	-2
2019:Q2	4.2	4.3	2.0	2.2	1.9	1.9	2.0	2.0	-1	-1
2019:Q4	3.9	3.8	1.8	1.7	2.0	1.9	2.0	2.0	.0	.0
<i>Four-quarter³</i>										
2016:Q4	3.4	3.4	1.8	1.8	1.6	1.6	1.9	1.9	-3	-3
2017:Q4	4.3	4.4	2.6	2.4	1.5	1.7	1.4	1.5	-5	-6
2018:Q4	4.3	4.2	2.4	2.4	1.7	1.7	1.8	1.8	-5	-5
2019:Q4	4.0	4.1	1.9	2.0	2.0	1.9	2.0	2.0	-1	-1
2020:Q4	3.7	3.8	1.6	1.7	2.0	2.0	2.0	2.0	.0	.0
<i>Annual</i>										
2016	2.8	2.8	1.5	1.5	1.2	1.2	1.8	1.8	4.9	4.9
2017	4.0	4.1	2.3	2.2	1.6	1.7	1.5	1.5	4.4	4.4
2018	4.6	4.5	2.7	2.5	1.6	1.8	1.7	1.8	3.9	3.8
2019	4.2	4.2	2.1	2.1	1.9	1.8	1.9	1.9	3.6	3.5
2020	3.8	3.9	1.7	1.7	2.0	2.0	2.0	2.0	3.6	3.5

1. Level, except for two-quarter and four-quarter intervals.
 2. Percent change from two quarters earlier; for unemployment rate, change is in percentage points.
 3. Percent change from four quarters earlier; for unemployment rate, change is in percentage points.

Changes in Real Gross Domestic Product and Related Items

(Percent, annual rate except as noted)

Item	2017				2018				2019				2017 ¹	2018 ¹	2019 ¹	2020 ¹
	Q2	Q3	Q4		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4				
Real GDP	3.1	3.3	2.2		2.7	2.4	2.3	2.2	2.2	2.2	1.8	1.6	2.4	2.0	1.7	
<i>Previous Tealbook</i>	3.1	2.9	3.2		2.5	2.4	2.3	2.2	2.1	1.9	1.8	1.7	2.4	1.9	1.6	
Final sales	3.0	2.5	2.6		2.3	2.5	2.4	2.7	2.3	1.9	1.8	1.9	2.5	1.9	1.7	
<i>Previous Tealbook</i>	3.0	2.5	3.2		2.3	2.4	2.3	2.6	2.4	1.8	1.8	1.8	2.4	1.9	1.6	
Priv. dom. final purch.	3.3	2.4	2.9		2.8	3.0	2.8	2.5	2.4	2.3	2.1	2.1	2.8	2.2	2.0	
<i>Previous Tealbook</i>	3.3	2.4	3.3		2.9	2.8	2.8	2.5	2.3	2.2	2.2	2.1	2.7	2.2	1.9	
Personal cons. expend.	3.3	2.3	2.5		2.7	2.6	2.5	2.4	2.3	2.3	2.2	2.2	2.5	2.3	2.1	
<i>Previous Tealbook</i>	3.3	2.3	3.3		2.8	2.6	2.6	2.5	2.4	2.4	2.3	2.3	2.7	2.3	2.1	
Durables	7.6	8.1	4.6		2.2	4.7	4.2	3.7	1.8	1.8	1.7	1.7	5.0	1.8	1.5	
Nondurables	4.2	2.0	3.9		2.8	2.8	2.7	2.6	2.4	2.4	2.3	2.3	2.8	2.3	2.2	
Services	2.3	1.5	1.7		2.7	2.2	2.2	2.1	2.4	2.3	2.3	2.3	2.0	2.3	2.1	
Residential investment	-7.3	-5.1	3.2		1.0	5.3	6.1	3.2	2.4	1.7	2.1	1.8	.2	2.0	3.4	
<i>Previous Tealbook</i>	-7.3	-6.2	-6		1.6	5.5	6.2	2.4	2.0	1.8	2.7	2.6	-1.0	2.3	2.7	
Nonres. priv. fixed invest.	6.7	5.1	5.2		4.0	4.3	3.5	2.9	2.7	2.5	1.8	1.4	6.0	2.1	1.1	
<i>Previous Tealbook</i>	6.7	5.6	5.0		3.8	3.4	2.6	2.4	2.0	1.7	1.3	1.0	6.1	1.5	.7	
Equipment & intangibles	6.6	8.9	8.4		4.8	4.1	3.8	3.4	3.1	2.9	2.2	1.8	7.2	2.5	1.6	
<i>Previous Tealbook</i>	6.6	8.4	7.8		4.6	3.4	2.9	2.6	2.3	2.1	1.8	1.5	7.0	1.9	1.2	
Nonres. structures	7.0	-6.8	-5.2		1.3	4.7	2.6	1.4	1.4	1.0	.4	.0	2.1	.7	-6	
<i>Previous Tealbook</i>	7.0	-3.1	-4.0		1.1	3.4	1.7	1.8	1.0	.4	-3	-7	3.4	.1	-1.2	
Net exports ²	-614	-594	-594		-604	-608	-610	-597	-595	-607	-614	-619	-606	-609	-643	
<i>Previous Tealbook</i> ²	-614	-586	-579		-591	-596	-601	-589	-591	-602	-610	-616	-600	-605	-645	
Exports	3.5	2.2	4.6		3.3	4.4	6.0	4.5	4.7	4.3	4.3	3.5	4.4	4.2	3.1	
Imports	1.5	-1.1	3.6		4.0	4.1	5.0	1.7	3.6	5.1	4.3	3.5	2.0	4.1	3.8	
Gov't. cons. & invest.	-2	.4	.7		.3	.3	-.3	1.7	.3	1.2	.4	1.0	.1	.7	.7	
<i>Previous Tealbook</i>	-2	-1.0	.8		.4	.3	.0	1.1	1.0	.9	.5	.8	-2	.8	.8	
Federal	1.9	1.3	.0		-1.4	-1.1	-1.9	3.0	-7	1.6	.0	1.3	.2	.6	.5	
Defense	4.7	2.4	1.1		-1.7	-1	-1.4	5.2	-4	2.6	1.5	2.4	1.2	1.5	.9	
Nondefense	-1.9	-.3	-1.6		-1.1	-2.6	-2.6	-.1	-1.2	.1	-2.1	-.3	-1.3	-9	.1	
State & local	-1.5	-.1	1.2		1.4	1.1	.7	.9	.9	1.0	.6	.9	.0	.8	.9	
Change in priv. inventories ²	5	37	17		34	29	25	2	5	14	16	6	15	10	12	
<i>Previous Tealbook</i> ²	5	24	26		36	37	40	25	23	27	29	25	14	26	29	

1. Change from fourth quarter of previous year to fourth quarter of year indicated.

2. Billions of chained (2009) dollars.

Changes in Real Gross Domestic Product and Related Items
(Change from fourth quarter of previous year to fourth quarter of year indicated, unless otherwise noted)

Item	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Real GDP	1.7	1.3	2.7	2.7	2.0	1.8	2.4	2.4	2.0	1.7
<i>Previous Tealbook</i>	1.7	1.3	2.7	2.7	2.0	1.8	2.4	2.4	1.9	1.6
Final sales	1.5	1.7	2.0	2.9	2.0	1.9	2.7	2.5	1.9	1.7
<i>Previous Tealbook</i>	1.5	1.7	2.0	2.9	2.0	1.9	2.8	2.4	1.9	1.6
Priv. dom. final purch.	2.6	2.3	2.6	4.1	2.9	2.5	2.9	2.8	2.2	2.0
<i>Previous Tealbook</i>	2.6	2.3	2.6	4.1	2.9	2.5	3.0	2.7	2.2	1.9
Personal cons. expend.	1.5	1.3	2.0	3.6	3.0	2.8	2.5	2.6	2.3	2.1
<i>Previous Tealbook</i>	1.5	1.3	2.0	3.6	3.0	2.8	2.7	2.6	2.3	2.1
Durables	4.8	7.2	5.2	8.7	6.4	7.0	5.0	3.7	1.8	1.5
Nondurables	.4	.8	2.6	2.8	2.8	2.5	2.8	2.7	2.3	2.2
Services	1.4	.6	1.3	3.0	2.6	2.3	2.0	2.3	2.3	2.1
Residential investment	6.0	15.7	6.8	6.3	10.3	2.5	.2	3.9	2.0	3.4
<i>Previous Tealbook</i>	6.0	15.7	6.8	6.3	10.3	2.5	-1.0	3.9	2.3	2.7
Nonres. priv. fixed invest.	9.0	5.2	4.8	6.1	.3	.7	6.0	3.7	2.1	1.1
<i>Previous Tealbook</i>	9.0	5.2	4.8	6.1	.3	.7	6.1	3.1	1.5	.7
Equipment & intangibles	9.2	5.5	4.5	5.3	3.3	-1	7.2	4.0	2.5	1.6
<i>Previous Tealbook</i>	9.2	5.5	4.5	5.3	3.3	-1	7.0	3.4	1.9	1.2
Nonres. structures	8.0	4.1	5.8	8.8	-9.1	3.5	2.1	2.5	.7	-6
<i>Previous Tealbook</i>	8.0	4.1	5.8	8.8	-9.1	3.5	3.4	2.0	.1	-1.2
Net exports ¹	-459	-447	-405	-428	-545	-586	-606	-605	-609	-643
<i>Previous Tealbook¹</i>	-459	-447	-405	-428	-545	-586	-600	-594	-605	-645
Exports	4.2	2.2	5.9	3.0	-1.8	.6	4.4	4.5	4.2	3.1
Imports	3.5	.3	2.5	6.2	2.9	2.7	2.0	3.7	4.1	3.8
Gov't. cons. & invest.	-3.0	-2.2	-2.8	.5	1.6	.4	.1	.5	.7	.7
<i>Previous Tealbook</i>	-3.0	-2.2	-2.8	.5	1.6	.4	-2	.4	.8	.8
Federal	-4.0	-2.1	-6.7	-1.2	1.2	-3	.2	-4	.6	.5
Defense	-4.1	-3.9	-7.1	-4.0	.0	-1.4	1.2	.5	1.5	.9
Nondefense	-3.9	1.0	-6.0	3.5	2.9	1.2	-1.3	-1.6	-9	.1
State & local	-2.3	-2.3	-1	1.5	1.9	.8	.0	1.0	.8	.9
Change in priv. inventories ¹	38	55	79	68	101	33	15	22	10	12
<i>Previous Tealbook¹</i>	38	55	79	68	101	33	14	35	26	29

1. Billions of chained (2009) dollars.

Contributions to Changes in Real Gross Domestic Product
(Percentage points, annual rate except as noted)

Item	2017				2018				2019				2017 ¹	2018 ¹	2019 ¹	2020 ¹	
	Q2	Q3	Q4		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4					
Real GDP <i>Previous Tealbook</i>	3.1 3.1	3.3 2.9	2.2 3.2		2.7 2.5	2.4 2.4	2.3 2.3	2.2 2.2		2.2 2.1	2.2 1.9	1.8 1.8	1.6 1.7	2.4 2.6	2.4 2.4	2.0 1.9	1.7 1.6
Final sales <i>Previous Tealbook</i>	2.9 2.9	2.5 2.5	2.6 3.2		2.3 2.3	2.5 2.4	2.4 2.3	2.7 2.6		2.1 2.1	1.9 1.8	1.8 1.8	1.9 1.8	2.7 2.8	2.5 2.4	1.9 1.9	1.7 1.6
Priv. dom. final purch. <i>Previous Tealbook</i>	2.8 2.8	2.1 2.1	2.5 2.9		2.4 2.4	2.5 2.4	2.4 2.3	2.2 2.1		2.0 2.0	2.0 1.9	1.8 1.9	1.8 1.8	2.5 2.6	2.4 2.3	1.9 1.9	1.7 1.7
Personal cons. expend. <i>Previous Tealbook</i>	2.2 2.2	1.6 1.6	1.7 2.3		1.9 1.9	1.8 1.8	1.7 1.7	1.7 1.7		1.6 1.6	1.6 1.6	1.5 1.6	1.5 1.6	1.7 1.9	1.8 1.8	1.6 1.6	1.4 1.5
Durables	.6	.6	.3		.2	.3	.3	.3		.1	.1	.1	.1	.4	.3	.1	.1
Nondurables	.6	.3	.6		.4	.4	.4	.4		.3	.3	.3	.3	.4	.4	.3	.3
Services	1.1	.7	.8		1.3	1.1	1.0	1.0		1.1	1.1	1.1	1.1	.9	1.1	1.1	1.0
Residential investment <i>Previous Tealbook</i>	-.3 -.3	-.2 -.2	.1 .0		.0 .1	.2 .2	.2 .1	.1 .1		.1 .1	.1 .1	.1 .1	.1 .1	.0 .0	.1 .1	.1 .1	.1 .1
Nonres. priv. fixed invest. <i>Previous Tealbook</i>	.8 .8	.6 .7	.6 .6		.5 .5	.4 .4	.3 .3	.4 .3		.3 .3	.2 .2	.2 .2	.2 .1	.7 .8	.5 .4	.3 .2	.1 .1
Equipment & intangibles <i>Previous Tealbook</i>	.6 .6	.8 .8	.8 .8		.4 .4	.3 .3	.3 .3	.3 .3		.2 .2	.2 .2	.2 .2	.1 .1	.7 .7	.4 .3	.2 .2	.2 .1
Nonres. structures <i>Previous Tealbook</i>	.2 .2	-.2 -.1	-.2 -.1		.0 .0	.1 .1	.0 .1	.0 .1		.0 .0	.0 .0	.0 .0	.0 .0	.1 .1	.1 .1	.0 .0	.0 .0
Net exports <i>Previous Tealbook</i>	.2 .2	.4 .6	.0 .2		-.2 -.2	-.1 -.1	.0 -.1	.3 .3		.1 .0	-.2 -.2	-.1 -.1	-.1 -.1	.2 .3	.0 .0	-.1 -.1	-.2 -.2
Exports	.4	.3	.5		.4	.5	.7	.5		.6	.5	.5	.4	.5	.5	.5	.4
Imports	-.2	.2	-.5		-.6	-.6	-.7	-.3		-.5	-.7	-.6	-.5	-.3	-.5	-.6	-.6
Gov't. cons. & invest. <i>Previous Tealbook</i>	.0 .0	.1 -.2	.1 .1		.1 .1	.1 .1	.0 .0	.3 .2		.1 .2	.2 .1	.1 .1	.2 .1	.0 .0	.1 .1	.1 .1	.1 .1
Federal	.1	.1	.0		-.1	-.1	-.1	.2		.0	.1	.0	.1	.0	.0	.0	.0
Defense	.2	.1	.0		-.1	.0	-.1	.2		.0	.1	.1	.1	.0	.0	.1	.0
Nondefense	-.1	.0	.0		.0	-.1	-.1	.0		.0	.0	-.1	.0	.0	.0	.0	.0
State & local	-.2	.0	.1		.2	.1	.1	.1		.1	.1	.1	.1	.0	.1	.1	.1
Change in priv. inventories <i>Previous Tealbook</i>	.1 .1	.8 .4	-.5 .1		.4 .2	-.1 .0	-.1 .1	-.5 -.3		.1 -.1	.2 .1	.0 .0	-.2 -.1	-.3 -.2	-.1 .0	.0 .0	.0 .0

1. Change from fourth quarter of previous year to fourth quarter of year indicated.

Changes in Prices and Costs
(Percent, annual rate except as noted)

Item	2017				2018				2019				2017 ¹	2018 ¹	2019 ¹	2020 ¹
	Q2	Q3	Q4		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4				
GDP chain-wt. price index <i>Previous Tealbook</i>	1.0	2.1	2.6		1.7	1.9	1.9	1.8	2.2	2.0	2.0	2.0	1.9	1.8	2.1	2.1
PCE chain-wt. price index <i>Previous Tealbook</i>	.3	1.5	2.8		1.7	1.7	1.7	1.6	1.9	1.9	1.9	1.9	1.7	1.7	1.9	2.0
Energy <i>Previous Tealbook</i>	-16.0	8.3	31.2		-2.6	-4.2	-2.1	-1.2	-7	-5	-2	-2	8.3	-2.5	-4	.3
Food <i>Previous Tealbook</i>	-16.0	8.5	14.0		-4.0	-1.7	-5	-1	.1	.0	.2	.3	4.6	-1.6	.2	.7
Ex. food & energy <i>Previous Tealbook</i>	2.0	.2	.9		2.0	2.1	2.1	2.3	2.3	2.3	2.3	2.3	.9	2.1	2.3	2.2
Ex. food & energy, market based <i>Previous Tealbook</i>	2.0	.2	1.5		2.0	2.1	2.1	2.3	2.3	2.3	2.3	2.3	1.0	2.1	2.3	2.2
CPI <i>Previous Tealbook</i>	.9	1.4	1.9		1.9	2.0	1.8	1.7	2.0	2.0	2.0	2.0	1.5	1.8	2.0	2.0
ECI, hourly compensation ² <i>Previous Tealbook</i>	.9	1.3	1.5		1.8	2.0	1.8	1.7	2.0	2.0	2.0	2.0	1.4	1.8	2.0	2.0
Business sector Output per hour <i>Previous Tealbook</i>	.3	1.0	1.5		1.6	1.7	1.6	1.5	1.8	1.8	1.8	1.8	1.2	1.6	1.8	1.9
Compensation per hour <i>Previous Tealbook</i>	.3	1.0	1.5		1.6	1.8	1.6	1.5	1.8	1.8	1.8	1.8	1.2	1.6	1.8	1.9
Unit labor costs <i>Previous Tealbook</i>	-3	2.0	3.7		1.9	1.9	2.0	2.0	2.2	2.3	2.3	2.3	2.1	2.0	2.3	2.4
Core goods imports chain-wt. price index ³ <i>Previous Tealbook</i>	-3	2.0	2.8		1.8	2.1	2.1	2.1	2.3	2.3	2.3	2.3	1.9	2.1	2.3	2.4
Business sector Output per hour <i>Previous Tealbook</i>	.6	1.7	2.2		2.2	2.3	2.3	2.2	2.4	2.4	2.4	2.5	1.7	2.2	2.4	2.5
Compensation per hour <i>Previous Tealbook</i>	.6	1.7	2.0		2.2	2.4	2.3	2.2	2.4	2.4	2.4	2.5	1.7	2.2	2.4	2.5
Unit labor costs <i>Previous Tealbook</i>	2.2	3.1	2.5		2.6	2.4	2.4	2.4	2.5	2.5	2.6	2.6	2.8	2.5	2.5	2.6
Core goods imports chain-wt. price index ³ <i>Previous Tealbook</i>	2.2	2.3	2.4		2.6	2.4	2.5	2.5	2.6	2.6	2.6	2.6	2.5	2.5	2.6	2.6
Business sector Output per hour <i>Previous Tealbook</i>	1.4	3.8	-1.1		1.3	1.1	.9	.9	1.1	1.0	.8	.8	.8	1.0	.9	.9
Compensation per hour <i>Previous Tealbook</i>	1.3	4.3	.1		1.1	1.0	1.0	.9	1.1	.9	.7	.7	1.2	1.0	.8	.9
Unit labor costs <i>Previous Tealbook</i>	.2	3.5	1.3		3.6	3.5	3.5	3.5	3.6	3.6	3.6	3.6	2.3	3.5	3.6	3.6
Core goods imports chain-wt. price index ³ <i>Previous Tealbook</i>	1.8	3.4	3.3		3.6	3.5	3.5	3.5	3.6	3.6	3.6	3.6	3.2	3.5	3.6	3.6
Business sector Output per hour <i>Previous Tealbook</i>	-1.2	-2	2.4		2.3	2.4	2.6	2.6	2.5	2.6	2.8	2.9	1.5	2.5	2.7	2.7
Compensation per hour <i>Previous Tealbook</i>	.5	-8	3.2		2.5	2.4	2.4	2.6	2.6	2.7	2.9	2.9	2.0	2.5	2.8	2.7
Unit labor costs <i>Previous Tealbook</i>	2.5	1.2	2.6		.8	1.2	.8	.8	.8	.7	.7	.7	1.6	.9	.7	.7
Core goods imports chain-wt. price index ³ <i>Previous Tealbook</i>	2.5	1.5	3.2		.8	1.0	.8	.8	.8	.7	.7	.7	1.8	.9	.7	.7

1. Change from fourth quarter of previous year to fourth quarter of year indicated.
 2. Private-industry workers.
 3. Core goods imports exclude computers, semiconductors, oil, and natural gas.

Greensheets

Changes in Prices and Costs

(Change from fourth quarter of previous year to fourth quarter of year indicated, unless otherwise noted)

Item	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
GDP chain-wt. price index <i>Previous Tealbook</i>	1.9 1.9	1.9 1.9	1.6 1.6	1.6 1.6	1.0 1.0	1.5 1.5	1.9 1.7	1.8 1.9	2.1 2.1	2.1 2.1
PCE chain-wt. price index <i>Previous Tealbook</i>	2.7 2.7	1.8 1.8	1.2 1.2	1.2 1.2	.4 .4	1.6 1.6	1.7 1.5	1.7 1.7	1.9 2.0	2.0 2.0
Energy <i>Previous Tealbook</i>	12.0 12.0	2.3 2.3	-2.5 -2.5	-6.5 -6.5	-16.2 -16.2	2.2 2.2	8.3 4.6	-2.5 -1.6	-4 .2	.3 .7
Food <i>Previous Tealbook</i>	5.1 5.1	1.2 1.2	.7 .7	2.6 2.6	.3 .3	-1.7 -1.7	.9 1.0	2.1 2.1	2.3 2.3	2.2 2.2
Ex. food & energy <i>Previous Tealbook</i>	1.9 1.9	1.8 1.8	1.5 1.5	1.5 1.5	1.3 1.3	1.9 1.9	1.5 1.4	1.8 1.8	2.0 2.0	2.0 2.0
Ex. food & energy, market based <i>Previous Tealbook</i>	1.9 1.9	1.5 1.5	1.1 1.1	1.2 1.2	1.1 1.1	1.5 1.5	1.2 1.2	1.6 1.6	1.8 1.8	1.9 1.9
CPI <i>Previous Tealbook</i>	3.3 3.3	1.9 1.9	1.2 1.2	1.2 1.2	.4 .4	1.8 1.8	2.1 1.9	2.0 2.1	2.3 2.3	2.4 2.4
Ex. food & energy <i>Previous Tealbook</i>	2.2 2.2	1.9 1.9	1.7 1.7	1.7 1.7	2.0 2.0	2.2 2.2	1.7 1.7	2.2 2.3	2.4 2.4	2.5 2.5
ECI, hourly compensation ¹ <i>Previous Tealbook</i> ¹	2.2 2.2	1.8 1.8	2.0 2.0	2.3 2.3	1.9 1.9	2.2 2.2	2.8 2.5	2.5 2.5	2.5 2.6	2.6 2.6
Business sector Output per hour <i>Previous Tealbook</i>	-1 -1	-1 -1	1.9 1.9	.1 .1	.7 .7	1.0 1.0	.8 1.2	1.0 1.0	.9 .8	.9 .9
Compensation per hour <i>Previous Tealbook</i>	.5 .5	5.9 5.9	-1 -1	2.9 2.9	3.1 3.1	-1 -1	2.3 3.2	3.5 3.5	3.6 3.6	3.6 3.6
Unit labor costs <i>Previous Tealbook</i>	.6 .6	6.0 6.0	-2.0 -2.0	2.8 2.8	2.4 2.4	-1.2 -1.2	1.5 2.0	2.5 2.5	2.7 2.8	2.7 2.7
Core goods imports chain-wt. price index ² <i>Previous Tealbook</i> ²	4.3 4.3	.1 .1	-1.5 -1.5	.3 .3	-3.7 -3.7	-2 -2	1.6 1.8	.9 .9	.7 .7	.7 .7

1. Private-industry workers.

2. Core goods imports exclude computers, semiconductors, oil, and natural gas.

Other Macroeconomic Indicators

Item	2017				2018				2019				2017 ¹	2018 ¹	2019 ¹	2020 ¹
	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4					
	<i>Employment and production</i>	187	121	221	179	179	179	179	169	159	139	119				
Nonfarm payroll employment ²	44	43	41	40	38	37	36	36	35	35	35	41	36	35	35	
Unemployment rate ³	4.4	4.3	4.2	4.1	3.9	3.8	3.7	3.7	3.6	3.6	3.6	4.2	3.7	3.6	3.6	
<i>Previous Tealbook³</i>	4.8	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	
Natural rate of unemployment ³	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	
<i>Previous Tealbook³</i>	60.1	60.2	60.2	60.2	60.3	60.3	60.4	60.4	60.4	60.4	60.3	60.2	60.4	60.3	60.2	
Employment-to-Population Ratio ³	59.8	59.7	59.7	59.6	59.6	59.5	59.5	59.4	59.4	59.3	59.3	59.7	59.5	59.3	59.1	
Employment-to-Population Trend ³	.8	1.2	1.3	1.6	1.8	1.9	2.1	2.2	2.3	2.3	2.3	1.3	2.1	2.3	2.1	
Output gap ⁴	.7	1.0	1.4	1.6	1.8	2.0	2.1	2.2	2.3	2.3	2.3	1.4	2.1	2.3	2.1	
<i>Previous Tealbook⁴</i>	5.6	-3	5.5	3.5	2.4	1.1	1.1	1.2	.9	.6	.4	3.1	2.0	.8	.5	
Industrial production ⁵	5.6	-1.5	4.3	3.1	2.4	1.0	1.1	1.1	.9	.7	.6	2.4	1.9	.8	.5	
<i>Previous Tealbook⁵</i>	2.6	-1.2	6.3	2.1	2.0	1.3	.9	.9	.8	.6	.2	2.5	1.6	.6	.2	
Manufacturing industr. prod. ⁵	2.5	-2.2	2.7	2.1	2.0	1.3	.9	.7	.9	.7	.3	1.3	1.6	.6	.2	
<i>Previous Tealbook⁵</i>	75.7	75.4	76.4	76.7	76.9	77.1	77.1	77.2	77.3	77.3	77.3	76.4	77.1	77.3	77.3	
Capacity utilization rate - mfg. ³	75.7	75.2	75.6	75.8	76.1	76.2	76.2	76.3	76.4	76.4	76.4	75.6	76.2	76.4	76.4	
<i>Previous Tealbook³</i>	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.3	1.3	1.4	
Housing starts ⁶	16.8	17.1	17.4	16.9	16.9	16.8	16.8	16.8	16.7	16.7	16.7	17.1	16.9	16.7	16.6	
Light motor vehicle sales ⁶																
<i>Income and saving</i>																
Nominal GDP ⁵	4.1	5.5	4.8	4.5	4.3	4.2	4.0	4.4	4.2	3.9	3.7	4.4	4.2	4.1	3.8	
Real disposable pers. income ⁵	2.7	.4	1.1	3.1	2.3	1.9	2.6	3.7	1.9	1.7	1.9	1.8	2.5	2.3	1.8	
<i>Previous Tealbook⁵</i>	3.3	.7	2.0	5.3	2.5	1.8	2.6	3.4	1.8	1.6	1.9	2.2	3.0	2.2	1.8	
Personal saving rate ³	3.7	3.3	3.0	3.1	3.0	2.9	2.9	3.3	3.2	3.1	3.0	3.0	2.9	3.0	2.7	
<i>Previous Tealbook³</i>	3.8	3.4	3.1	3.7	3.7	3.6	3.6	3.8	3.7	3.6	3.5	3.1	3.6	3.5	3.1	
Corporate profits ⁷	2.8	18.4	14.5	.1	6.1	3.1	1.4	2.5	4.2	3.7	2.3	6.3	2.7	3.2	4.2	
Profit share of GNP ³	10.9	11.2	11.5	11.4	11.4	11.4	11.4	11.3	11.3	11.3	11.3	11.5	11.4	11.3	11.4	
Gross national saving rate ³	17.2	17.4	17.3	17.1	17.2	17.2	17.2	17.2	17.2	17.1	17.1	17.3	17.2	17.1	16.9	
Net national saving rate ³	2.0	2.4	2.3	2.2	2.3	2.3	2.2	2.1	2.1	2.0	1.9	2.3	2.2	1.9	1.6	

1. Change from fourth quarter of previous year to fourth quarter of year indicated, unless otherwise indicated.

2. Average monthly change, thousands.

3. Percent; annual values are for the fourth quarter of the year indicated.

4. Percent difference between actual and potential GDP; a negative number indicates that the economy is operating below potential.

5. Annual values are for the fourth quarter of the year indicated.

6. Level, millions; annual values are annual averages.

7. Percent change, annual rate, with inventory valuation and capital consumption adjustments.

Greensheets

Other Macroeconomic Indicators

(Change from fourth quarter of previous year to fourth quarter of year indicated, unless otherwise noted)

Item	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<i>Employment and production</i>										
Nonfarm payroll employment ¹	174	179	192	250	226	187	174	179	147	117
Unemployment rate ²	8.7	7.8	7.0	5.7	5.0	4.7	4.1	3.6	3.5	3.5
<i>Previous Tealbook²</i>	8.7	7.8	7.0	5.7	5.0	4.7	4.2	3.7	3.6	3.6
Natural rate of unemployment ²	5.9	5.6	5.4	5.1	4.9	4.8	4.7	4.7	4.7	4.7
<i>Previous Tealbook²</i>	5.9	5.6	5.4	5.1	4.9	4.8	4.8	4.8	4.8	4.8
Employment-to-Population Ratio ²	58.5	58.7	58.5	59.2	59.4	59.7	60.2	60.4	60.3	60.2
Employment-to-Population Trend ²	60.7	60.3	60.2	60.1	59.9	59.8	59.7	59.5	59.3	59.1
Output gap ³	-3.7	-3.7	-2.5	-9	-1	.3	1.3	2.1	2.3	2.1
<i>Previous Tealbook³</i>	-3.7	-3.7	-2.5	-9	-1	.3	1.4	2.1	2.3	2.1
Industrial production ⁴	2.8	2.3	2.2	3.4	-2.7	-1	3.1	2.0	.8	.5
<i>Previous Tealbook⁴</i>	2.8	2.3	2.2	3.4	-2.7	-1	2.4	1.9	.8	.5
Manufacturing industr. prod. ⁴	2.5	1.7	.9	1.5	-6	.3	2.5	1.6	.6	.2
<i>Previous Tealbook⁴</i>	2.5	1.7	.9	1.5	-6	.3	1.3	1.6	.6	.2
Capacity utilization rate - mfg. ²	74.4	74.6	74.7	75.9	75.4	75.1	76.4	77.1	77.3	77.3
<i>Previous Tealbook²</i>	74.4	74.6	74.7	75.9	75.4	75.1	75.6	76.2	76.4	76.4
Housing starts ⁵	.6	.8	.9	1.0	1.1	1.2	1.2	1.3	1.3	1.4
Light motor vehicle sales ⁵	12.7	14.4	15.5	16.5	17.4	17.5	17.1	16.9	16.7	16.6
<i>Income and saving</i>										
Nominal GDP ⁴	3.6	3.2	4.3	4.3	3.1	3.4	4.4	4.2	4.1	3.8
Real disposable pers. income ⁴	1.7	5.1	-2.8	4.9	3.2	.2	1.8	2.5	2.3	1.8
<i>Previous Tealbook⁴</i>	1.7	5.1	-2.8	4.9	3.2	.2	2.2	3.0	2.2	1.8
Personal saving rate ²	5.8	9.2	4.7	5.9	6.1	3.6	3.0	2.9	3.0	2.7
<i>Previous Tealbook²</i>	5.8	9.2	4.7	5.9	6.1	3.6	3.1	3.6	3.5	3.1
Corporate profits ⁶	6.8	.6	4.7	7.4	-11.1	8.7	6.3	2.7	3.2	4.2
Profit share of GNP ²	12.3	12.0	12.0	12.4	10.7	11.3	11.5	11.4	11.3	11.4
Gross national saving rate ²	16.1	18.0	18.2	19.5	19.0	17.2	17.3	17.2	17.1	16.9
Net national saving rate ²	.8	2.9	3.1	4.7	4.1	2.1	2.3	2.2	1.9	1.6

1. Average monthly change, thousands.

2. Percent; values are for the fourth quarter of the year indicated.

3. Percent difference between actual and potential GDP; a negative number indicates that the economy is operating below potential. Values are for the fourth quarter of the year indicated.

4. Percent change.

5. Level, millions; values are annual averages.

6. Percent change, with inventory valuation and capital consumption adjustments.

Staff Projections of Government-Sector Accounts and Related Items

Item	2015	2016	2017	2018	2019	2020	2017			2018
							Q2	Q3	Q4	Q1
Unified federal budget¹										
Receipts	3,250	3,268	3,315	3,413	3,595	3,795	1,035	807	793	682
Outlays	3,688	3,853	3,981	4,128	4,404	4,664	1,031	950	1,011	1,124
Surplus/deficit	-438	-585	-666	-715	-809	-869	4	-143	-218	-442
<i>Percent of GDP</i>										
Surplus/deficit	-2.4	-3.2	-3.5	-3.6	-3.9	-4.0	.1	-2.9	-4.4	-8.9
<i>Previous Tealbook</i>	-2.4	-3.2	-3.3	-3.6	-3.7	-3.9	.1	-2.9	-4.4	-8.9
Primary surplus/deficit	-1.2	-1.9	-2.0	-1.9	-2.0	-1.8	1.8	-2.0	-2.5	-7.2
Net interest	1.2	1.3	1.4	1.6	1.9	2.2	1.7	.9	1.9	1.7
Cyclically adjusted surplus/deficit	-1.9	-2.8	-3.3	-3.9	-4.6	-4.8	.2	-3.0	-4.6	-9.1
Federal debt held by public	72.9	76.7	76.5	77.4	78.9	80.5	74.6	75.2	74.8	76.6
Government in the NIPA²										
Purchases	1.6	.4	.1	.5	.7	.7	-.2	.4	.7	.3
Consumption	1.9	.6	.1	.1	.4	.4	.4	1.7	.2	-.2
Investment	.4	-.5	-.2	2.4	2.2	1.9	-3.2	-3.0	3.1	2.6
State and local construction	.0	-2.3	-6.4	2.1	1.0	1.0	-17.8	-8.2	4.3	4.3
Real disposable personal income	3.2	.2	1.8	2.5	2.3	1.8	2.7	.4	1.1	3.1
Contribution from transfers ³	.7	.3	.3	.8	.8	.7	.1	.2	.5	1.4
Contribution from taxes ³	-1.4	.2	-.8	-.8	-.7	-.7	.1	-1.1	-.4	-.6
Government employment										
Federal	3	4	-0	0	0	0	-1	-0	2	0
State and local	10	13	7	9	9	9	4	11	5	9
Fiscal indicators²										
Fiscal effect (FE) ⁴	.3	.3	.0	.3	.5	.3	.1	-.1	.0	.4
Discretionary policy actions (FI)	.4	.2	.1	.3	.3	.2	.0	.1	.2	.4
<i>Previous Tealbook</i>	.4	.2	.0	.3	.3	.2	.0	-.2	.2	.5
Federal purchases	.1	.0	.0	.0	.0	.0	.1	.1	.0	-.1
State and local purchases	.2	.1	.0	.1	.1	.1	-.2	.0	.1	.2
Taxes and transfers	.1	.1	.0	.2	.2	.1	.1	.1	.1	.3
Cyclical	-.2	.0	-.2	-.2	-.1	.0	-.2	-.3	-.2	-.2
Other	.1	.2	.1	.2	.3	.1	.3	.1	.0	.2

1. Annual values stated on a fiscal year basis. Quarterly values not seasonally adjusted.
 2. Annual values refer to the change from fourth quarter of previous year to fourth quarter of year indicated.
 3. Percentage point contribution to change in real disposable personal income, annual basis.
 4. The FE measure captures the total contribution of the government sector to the growth of real GDP (excluding multiplier effects). It equals the sum of the direct contributions to real GDP growth from all changes in federal purchases and state and local purchases, plus the estimated contribution to real household consumption and business investment that is induced by changes in transfer and tax policies. FI (fiscal impetus) is the portion of FE attributable to discretionary fiscal policy actions (for example, a legislated change in tax revenues).

Foreign Real GDP and Consumer Prices: Selected Countries

(Quarterly percent changes at an annual rate)

Measure and country	2017				2018				2019			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Real GDP¹												
Total foreign	2.9	3.1	2.2	3.1	2.8	2.7	2.7	2.6	2.7	2.6	2.8	2.4
<i>Previous Tealbook</i>	3.0	3.2	2.7	2.8	2.7	2.7	2.6	2.6	2.6	2.6	2.8	2.3
Advanced foreign economies	2.6	3.2	2.0	2.1	2.0	1.8	1.8	1.7	1.7	1.7	1.9	1.2
Canada	3.7	4.3	1.7	2.2	2.1	2.0	2.0	1.9	1.8	1.8	1.8	1.7
Japan	1.0	2.6	1.4	1.4	1.2	1.1	.8	.8	.8	.8	3.2	-3.8
United Kingdom	1.0	1.2	1.6	1.7	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Euro area	2.2	2.6	2.5	2.4	2.0	1.6	1.7	1.7	1.7	1.7	1.7	1.7
Germany	3.6	2.6	3.3	2.3	1.8	1.4	1.4	1.3	1.4	1.4	1.4	1.4
Emerging market economies	3.3	2.9	2.5	4.0	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Asia	5.4	5.1	5.6	5.1	4.8	4.7	4.7	4.7	4.6	4.6	4.6	4.5
Korea	4.3	2.4	6.3	3.6	3.1	3.1	3.1	3.1	3.0	3.0	3.0	3.0
China	7.1	6.8	6.5	6.6	6.3	6.3	6.2	6.1	6.1	6.0	6.0	5.9
Latin America	2.1	1.3	-5	3.1	2.5	2.5	2.6	2.6	2.7	2.7	2.7	2.7
Mexico	2.2	1.1	-1.2	3.5	2.6	2.6	2.6	2.6	2.7	2.7	2.7	2.7
Brazil	5.3	2.7	.6	1.9	2.0	2.0	2.0	2.0	2.5	2.5	2.5	2.5
Consumer prices²												
Total foreign	2.9	2.0	2.2	2.6	2.5	2.5	2.5	2.5	2.4	2.4	2.4	2.8
<i>Previous Tealbook</i>	2.8	2.0	2.2	2.4	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.8
Advanced foreign economies	2.3	.3	1.1	1.8	1.7	1.6	1.6	1.6	1.6	1.7	1.7	2.6
Canada	2.6	.1	1.2	2.1	2.4	2.4	2.4	2.2	2.1	2.1	2.1	2.0
Japan	-1	-3	.4	1.3	.9	.8	.8	.9	.9	1.0	1.0	6.3
United Kingdom	3.8	3.0	2.3	2.8	2.5	2.3	2.2	2.2	2.2	2.2	2.2	2.2
Euro area	2.8	.2	1.0	1.6	1.5	1.3	1.4	1.5	1.5	1.5	1.6	1.7
Germany	2.0	.2	1.7	1.9	1.9	1.8	1.8	1.9	2.0	2.0	2.1	2.2
Emerging market economies	3.3	3.3	3.0	3.1	3.0	3.1	3.1	3.1	3.0	3.0	3.0	3.0
Asia	.8	1.7	2.1	2.8	2.6	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Korea	2.6	.7	2.2	.3	2.4	3.4	3.4	3.3	3.2	3.1	3.1	3.1
China	-6	2.3	2.0	3.0	2.3	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Latin America	9.1	7.0	5.2	4.0	3.9	3.8	3.8	3.8	3.6	3.5	3.4	3.4
Mexico	9.9	6.9	5.1	3.5	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Brazil	3.2	2.3	2.3	3.8	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3

¹ Foreign GDP aggregates calculated using shares of U.S. exports.

² Foreign CPI aggregates calculated using shares of U.S. non-oil imports.

Foreign Real GDP and Consumer Prices: Selected Countries
(Percent change, Q4 to Q4)

Measure and country	-----Projected-----									
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Real GDP¹										
Total foreign	3.2	2.2	3.0	2.8	2.0	2.6	2.8	2.7	2.6	2.7
<i>Previous Tealbook</i>	3.2	2.3	3.0	2.6	2.0	2.5	2.9	2.7	2.6	2.7
Advanced foreign economies	1.8	.3	2.5	2.0	1.2	1.9	2.5	1.8	1.6	1.7
Canada	3.1	.7	3.6	2.5	.3	2.0	3.0	2.0	1.8	1.7
Japan	.2	.3	2.8	-.2	1.0	1.7	1.6	1.0	.2	.8
United Kingdom	1.3	1.5	2.6	3.3	2.1	1.6	1.4	1.5	1.5	1.7
Euro area	.5	-1.1	.8	1.5	2.0	1.9	2.4	1.7	1.7	1.7
Germany	2.4	.2	1.6	1.9	1.3	1.9	2.9	1.5	1.4	1.4
Emerging market economies	4.6	4.2	3.5	3.6	2.9	3.4	3.2	3.6	3.6	3.7
Asia	5.1	5.7	5.4	5.0	4.4	4.8	5.3	4.7	4.6	4.5
Korea	2.9	2.1	3.5	2.8	3.3	2.4	4.1	3.1	3.0	2.9
China	8.7	8.0	7.6	7.1	6.8	6.8	6.7	6.2	6.0	5.8
Latin America	4.0	3.1	1.7	2.5	1.6	2.1	1.5	2.5	2.7	2.9
Mexico	3.9	3.0	1.2	3.5	2.7	3.3	1.4	2.6	2.7	2.9
Brazil	2.6	2.6	2.6	-.1	-5.5	-2.4	2.6	2.0	2.5	2.5
Consumer prices²										
Total foreign	3.4	2.3	2.4	2.0	1.4	1.9	2.4	2.5	2.5	2.4
<i>Previous Tealbook</i>	3.4	2.3	2.4	2.0	1.4	1.9	2.3	2.4	2.5	2.4
Advanced foreign economies	2.2	1.3	1.0	1.2	.5	.9	1.3	1.7	1.9	1.7
Canada	2.7	1.0	1.0	2.0	1.3	1.4	1.5	2.3	2.1	2.0
Japan	-.3	-.2	1.4	2.6	.2	.3	.3	.9	2.3	1.0
United Kingdom	4.6	2.6	2.1	.9	.1	1.2	3.0	2.3	2.2	2.1
Euro area	2.9	2.3	.8	.2	.2	.7	1.4	1.4	1.6	1.7
Germany	2.6	1.9	1.4	.4	.2	1.0	1.5	1.8	2.1	2.2
Emerging market economies	4.3	3.1	3.4	2.7	2.1	2.7	3.2	3.1	3.0	2.9
Asia	4.4	2.6	3.1	1.8	1.5	2.0	1.8	2.8	2.8	2.7
Korea	3.9	1.7	1.1	1.0	.9	1.5	1.4	3.1	3.2	3.0
China	4.6	2.1	2.9	1.5	1.5	2.2	1.7	2.5	2.5	2.5
Latin America	4.1	4.4	4.1	4.8	3.4	4.2	6.3	3.8	3.5	3.4
Mexico	3.5	4.1	3.6	4.2	2.3	3.2	6.3	3.2	3.2	3.2
Brazil	6.7	5.6	5.8	6.5	10.4	7.1	2.9	4.3	4.3	4.3

¹ Foreign GDP aggregates calculated using shares of U.S. exports.

² Foreign CPI aggregates calculated using shares of U.S. non-oil imports.

Greensheets

U.S. Current Account

Quarterly Data

	2017				2018				Projected			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
U.S. current account balance	-454.1	-492.5	-408.8	-448.0	-508.8	-484.7	-501.8	-509.5	-554.6	-550.3	-564.8	-580.4
<i>Previous Tealbook</i>	<i>-454.1</i>	<i>-492.5</i>	<i>-455.6</i>	<i>-482.1</i>	<i>-530.5</i>	<i>-513.6</i>	<i>-536.0</i>	<i>-545.9</i>	<i>-595.0</i>	<i>-594.3</i>	<i>-613.8</i>	<i>-632.5</i>
Current account as percent of GDP	-2.4	-2.6	-2.1	-2.3	-2.5	-2.4	-2.5	-2.5	-2.7	-2.6	-2.7	-2.7
<i>Previous Tealbook</i>	<i>-2.4</i>	<i>-2.6</i>	<i>-2.3</i>	<i>-2.4</i>	<i>-2.7</i>	<i>-2.5</i>	<i>-2.6</i>	<i>-2.7</i>	<i>-2.9</i>	<i>-2.8</i>	<i>-2.9</i>	<i>-3.0</i>
Net goods & services	-552.4	-549.2	-519.3	-530.9	-567.2	-543.8	-534.8	-523.0	-537.5	-524.3	-522.5	-532.3
Investment income, net	213.7	202.8	240.8	213.3	197.7	187.5	167.5	144.0	122.3	102.3	92.1	82.4
Direct, net	295.7	278.6	314.2	292.4	296.7	304.8	305.3	302.1	300.0	299.1	307.9	316.1
Portfolio, net	-82.1	-75.8	-73.4	-79.0	-99.1	-117.3	-137.9	-158.1	-177.8	-196.8	-215.8	-233.8
Other income and transfers, net	-115.4	-146.1	-130.3	-130.4	-139.3	-128.3	-134.4	-130.4	-139.3	-128.3	-134.4	-130.4

Billions of dollars, *s.a.a.r.*

Annual Data

	Projected									
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
U.S. current account balance	-444.6	-426.2	-349.5	-373.0	-434.6	-451.7	-450.9	-501.2	-562.5	-630.7
<i>Previous Tealbook</i>	<i>-444.6</i>	<i>-426.2</i>	<i>-349.5</i>	<i>-373.0</i>	<i>-434.6</i>	<i>-451.7</i>	<i>-471.1</i>	<i>-531.5</i>	<i>-608.9</i>	<i>-690.6</i>
Current account as percent of GDP	-2.9	-2.6	-2.1	-2.1	-2.4	-2.4	-2.3	-2.5	-2.7	-2.9
<i>Previous Tealbook</i>	<i>-2.9</i>	<i>-2.6</i>	<i>-2.1</i>	<i>-2.1</i>	<i>-2.4</i>	<i>-2.4</i>	<i>-2.4</i>	<i>-2.6</i>	<i>-2.9</i>	<i>-3.2</i>
Net goods & services	-548.6	-536.8	-461.9	-489.5	-500.4	-504.8	-537.9	-542.2	-529.2	-557.5
Investment income, net	219.2	216.1	215.4	221.3	192.7	186.8	217.7	174.2	99.8	59.9
Direct, net	288.7	285.5	283.3	276.7	266.5	258.8	295.2	302.2	305.8	333.7
Portfolio, net	-69.5	-69.4	-67.9	-55.4	-73.8	-72.0	-77.6	-128.1	-206.0	-273.7
Other income and transfers, net	-115.1	-105.5	-103.1	-104.8	-126.9	-133.7	-130.6	-133.1	-133.1	-133.1

Billions of dollars

Abbreviations

ABS	asset-backed securities
AFE	advanced foreign economy
BOC	Bank of Canada
BOE	Bank of England
C&I	commercial and industrial
CMBS	commercial mortgage-backed securities
CP	commercial paper
CPI	consumer price index
CRE	commercial real estate
ECB	European Central Bank
E&I	equipment and intangibles
ELB	effective lower bound
EME	emerging market economy
EU	European Union
FOMC	Federal Open Market Committee; also, the Committee
GCF	General Collateral Finance
GDP	gross domestic product
GO	general obligation
LFPR	labor force participation rate
M&A	mergers and acquisitions
MBS	mortgage-backed securities
MMF	money market fund
NAFTA	North American Free Trade Agreement
NI	nominal income
OIS	overnight index swap

ON RRP	overnight reverse repurchase agreement
PCE	personal consumption expenditures
PMI	purchasing managers index
repo	repurchase agreement
SEP	Summary of Economic Projections
SOMA	System Open Market Account
S&P	Standard & Poor's
TIPS	Treasury Inflation-Protected Securities
VIX	One-month-ahead option-implied volatility on the S&P 500 index
WFSBI	Wells Fargo Small Business Index