

Prefatory Note

The attached document represents the most complete and accurate version available based on original files from the FOMC Secretariat at the Board of Governors of the Federal Reserve System.

Please note that some material may have been redacted from this document if that material was received on a confidential basis. Redacted material is indicated by occasional gaps in the text or by gray boxes around non-text content. All redacted passages are exempt from disclosure under applicable provisions of the Freedom of Information Act.

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

January 19, 2018

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

Although labor market information has come in very close to what we had anticipated in the December Tealbook, spending and production appear to be on stronger near-term trajectories than we had expected. In addition, our outlook for the economy over the medium term is markedly stronger, as the projected revenue reductions in the recently enacted Tax Cuts and Jobs Act (TCJA) are much larger over the next three years than we had assumed in the previous Tealbook.

We now estimate that real GDP increased at an annual rate of 3¼ percent in the second half of last year and forecast that it will rise at a 3 percent pace in the first half of this year. Although the unemployment rate remained at 4.1 percent in November and December, average monthly job gains have been solid and faster than what we judge would be consistent with unchanged labor utilization. We project the unemployment rate to move down gradually to 3.8 percent by the middle of this year as the economy continues to expand briskly, supported in part by the initial effects of the tax cuts.

Over the next few years, real GDP growth is projected to slow steadily from nearly 3 percent this year to 2 percent in 2020 as monetary policy tightens further. The tax changes are assumed to generate a small expansion in the productive capacity of the economy, but GDP growth is projected to nonetheless outpace that of potential over the next two years. As a result, the output gap widens to ¾ percent by late 2019 and remains at that level in 2020, ending the medium term about ¼ percentage points larger than in the December Tealbook forecast. The unemployment rate is projected to bottom out at ¾ percent in mid-2019 and remain at that level in 2020, about ½ percentage points below our estimate of its natural rate.

Inflation readings since the previous Tealbook have come in about as expected on balance. Over the 12 months ending in December, we estimate that total PCE prices rose 1.7 percent and core PCE prices rose 1.5 percent, both the same as in the December Tealbook forecast. We continue to think that last year's soft core inflation readings primarily reflect idiosyncratic factors that will not persist. As that transitory weakness passes and as resource utilization tightens more substantially than in our previous forecast, core PCE price inflation is projected to move a little above 2 percent by 2019, and total PCE price inflation is forecast to reach 2 percent in 2020.

Comparing the Staff Projection with Other Forecasts

The staff's projection for real GDP growth in 2017 is a touch above the projections from both the Survey of Professional Forecasters (SPF) and the Blue Chip consensus and somewhat above 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 both 2017 and 2018. The staff's projections for overall PCE price inflation and for core PCE inflation are a little higher than the SPF forecasts in both 2017 and 2018.

Comparison of Tealbook and Outside Forecasts

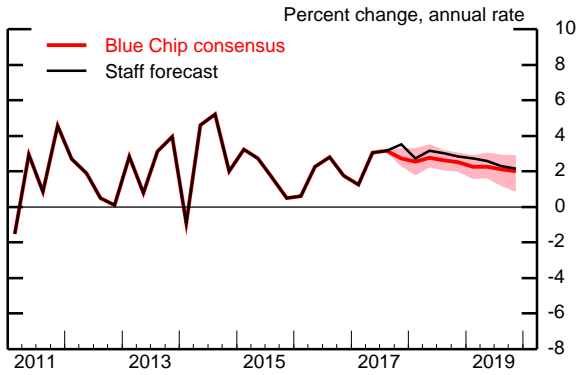
| | 2017 | 2018 |
|--|------|------|
| GDP (Q4/Q4 percent change) | | |
| January Tealbook | 2.7 | 2.9 |
| Blue Chip (01/10/18) | 2.6 | 2.6 |
| SPF median (11/13/17) | 2.6 | 2.3 |
| Unemployment rate (Q4 level) | | |
| January Tealbook | 4.1 | 3.4 |
| Blue Chip (01/10/18) | 4.1 | 3.8 |
| SPF median (11/13/17) | 4.2 | 4.0 |
| CPI inflation (Q4/Q4 percent change) | | |
| January Tealbook | 2.1 | 2.3 |
| Blue Chip (01/10/18) | 2.0 | 2.0 |
| SPF median (11/13/17) | 1.8 | 2.1 |
| PCE price inflation (Q4/Q4 percent change) | | |
| January Tealbook | 1.7 | 1.9 |
| SPF median (11/13/17) | 1.5 | 1.8 |
| Core PCE price inflation (Q4/Q4 percent change) | | |
| January Tealbook | 1.5 | 1.9 |
| 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 overall and core 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.

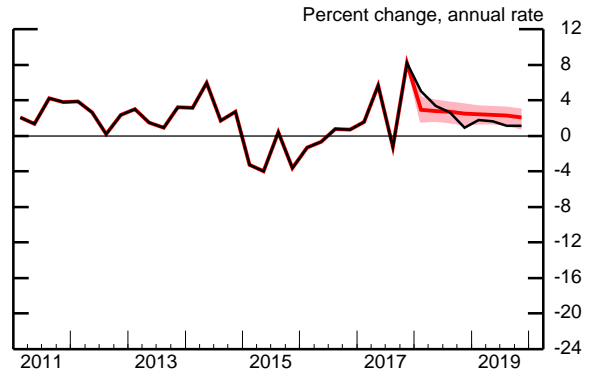
Source: Blue Chip Economic Indicators; Federal Reserve Bank of Philadelphia.

Tealbook Forecast Compared with Blue Chip (Blue Chip survey released January 10, 2018)

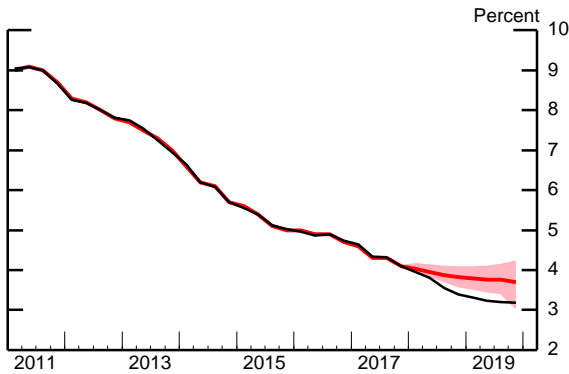
Real GDP



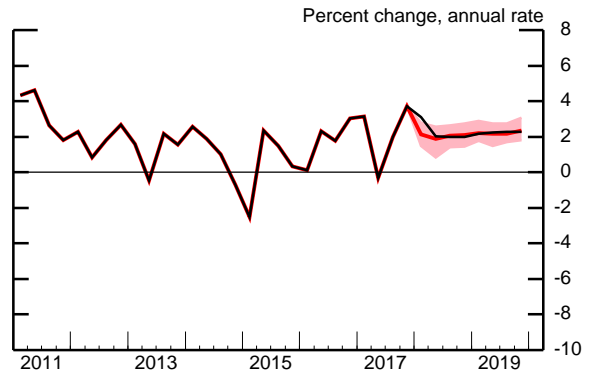
Industrial Production



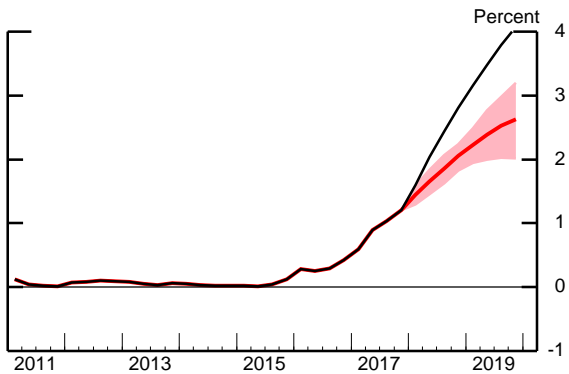
Unemployment Rate



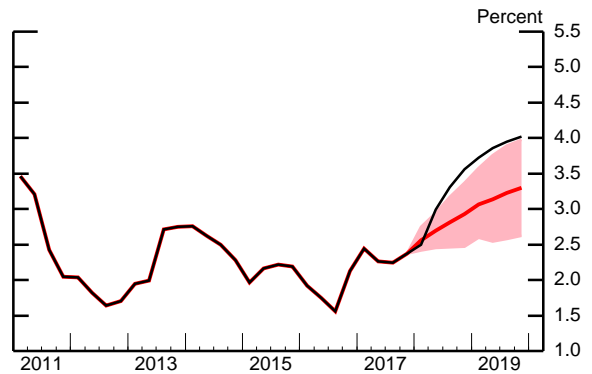
Consumer Price Index



Treasury Bill Rate



10-Year Treasury Yield

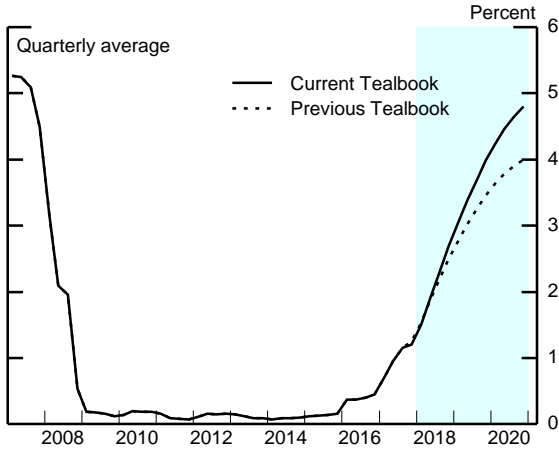


Note: The yield is for on-the-run Treasury securities. Over the forecast period, the staff's projected yield is assumed to be 15 basis points below the off-the-run yield.

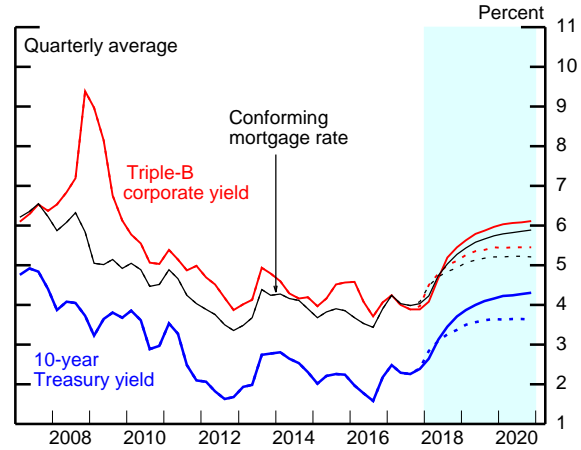
Note: The shaded area represents the area between the Blue Chip top 10 and bottom 10 averages.

Key Background Factors underlying the Baseline Staff Projection

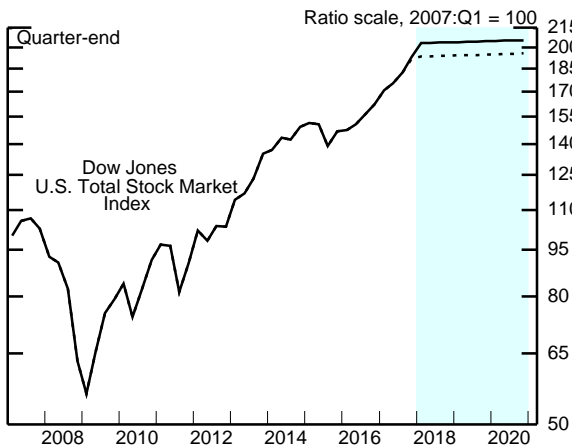
Federal Funds Rate



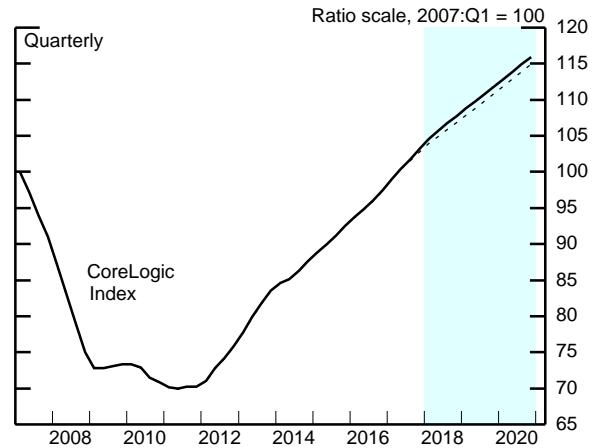
Long-Term Interest Rates



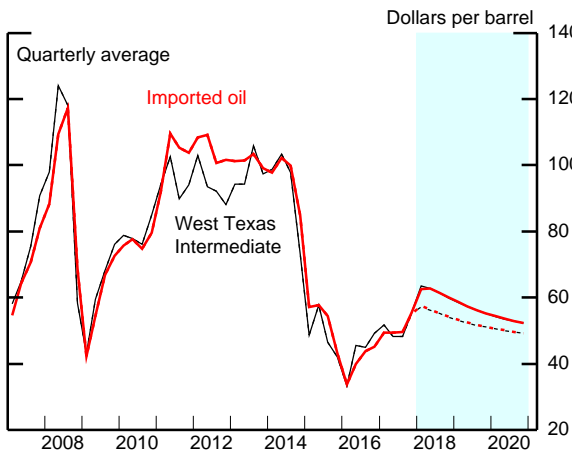
Equity Prices



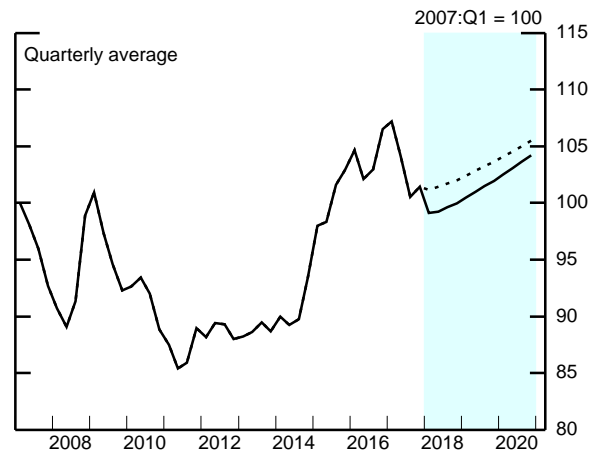
House Prices



Crude Oil Prices



Broad Real Dollar



KEY BACKGROUND FACTORS

Fiscal Policy

- We have updated our fiscal policy assumptions to incorporate the TCJA, which was enacted after the December Tealbook projection was finalized. We assume that this legislation will reduce average annual tax revenue by approximately 1¼ percent of GDP from 2018 through 2020. In turn, those tax reductions are projected to raise the level of real GDP 1¼ percent by the end of 2020. (For further analysis, see the box “Macroeconomic Effects of the Tax Cuts and Jobs Act.”)
 - We continue to assume that in five years, with an elevated and rising debt-to-GDP ratio, fiscal policymakers will begin to enact deficit-reduction measures that gradually bring annual deficits back to sustainable levels.
- We estimate that discretionary policy actions across all levels of government boosted aggregate demand less than ¼ percentage point in 2017. Looking ahead, we project that discretionary government policy actions will increase GDP growth about ½ percentage point per year from 2018 through 2020—exclusive of any multiplier effect and offsets from reactions in interest rates and the dollar—approximately ¼ percentage point more per year than in the December Tealbook, reflecting the larger-than-anticipated medium-term tax reductions in the TCJA.
- The federal government faces two key fiscal-related deadlines requiring near-term actions. The first is the need to enact appropriations to fund government operations by midnight tonight (January 19), when the current continuing resolution expires, to avoid a shutdown.¹ The second deadline is the lifting of the statutory federal debt limit, as we estimate that the Treasury Department will exhaust available “extraordinary measures” and cash in early March. (For further discussion of issues associated with the debt limit, see the box “Projections for Federal Debt Subject to Limit” in the Financial Market

¹ A lapse of appropriations that resulted in a short-term shutdown of the federal government would likely have only minor implications for the outlook. For example, we estimate that the 16-day shutdown in October 2013 reduced real GDP growth ¼ percentage point in the fourth quarter of that year and boosted it by an equal amount in the following quarter. That estimate embodies our judgment that there were no material effects on private investment or consumption due to reduced confidence or increased uncertainty.

Macroeconomic Effects of the Tax Cuts and Jobs Act

The Tax Cuts and Jobs Act (TCJA) was signed into law after the December Tealbook projection closed. The act is expected to reduce federal tax collections by roughly 1¼ percent of GDP, on average, over the next three years.¹ On the individual income side of the tax code, the legislation cuts marginal tax rates and broadens the tax base by ending or reducing deductions such as those for state and local taxes. In addition, it reduces the effective tax rate on income from certain pass-through businesses. The legislation also makes significant changes to the corporate income tax code: The top marginal tax rate is cut from 35 percent to 21 percent, and the tax base is broadened. Furthermore, full expensing of equipment and intangibles (E&I) investment is provided for the next several years, and the deductibility of net interest payments is restricted somewhat. Finally, the tax system is shifted from a worldwide tax base toward a territorial system.

We estimate that the key provisions of the legislation will provide an immediate boost to aggregate demand and will also lead to an increase in the productive capacity of the economy over time. Line 2 of the table on the next page shows that the direct aggregate demand effects of the legislation, which exclude general equilibrium effects—that is, follow-on multiplier effects and financial offsets such as the rise in interest rates implied by the intercept-adjusted inertial Taylor (1999) rule—are expected to raise the level of real GDP about 1 percent by the end of 2020.

These direct aggregate demand effects operate through multiple channels that affect personal consumption expenditures (PCE) and business fixed investment (BFI). PCE is expected to increase for two reasons. First, individual income tax cuts generate higher disposable personal income for individuals and pass-through businesses. Second, higher after-tax profits from the corporate tax cuts boost equity prices.² The resulting increase in household wealth raises consumption. BFI is expected to increase as a result of reductions in business income taxes. In particular, cuts in marginal corporate tax rates and, more importantly, full expensing of E&I investment reduce the user cost of capital.³ Moreover, there is a further increase in investment demand due to greater business cash flow. Overall, nearly three-fourths of the anticipated boost to aggregate demand is due to an increase in PCE, with the remainder attributable to BFI.

The TCJA is expected to raise potential output by the end of 2020 via two channels. First, lower marginal tax rates on labor income increase the supply of labor. Second,

¹ Under the assumption that the tax legislation has no effect on GDP (that is, a static estimate), the Joint Committee on Taxation estimates that over a 10-year budget window, the TCJA will reduce federal revenues by a bit more than ½ percent of GDP annually on average. But the tax cuts are much greater during the first 5 years of the 10-year budget window. Thereafter, many of the provisions of the TCJA phase out.

² The staff assumes that this effect has already been incorporated into equity prices.

³ With full expensing, marginal tax rates have only a limited effect on the user cost of capital. However, nonresidential structures are not eligible for full expensing under the TCJA; thus, the marginal tax rate cuts will significantly reduce the user cost of capital for these investments.

the additional investment induced by the tax legislation results in capital deepening and, therefore, higher structural productivity and potential output. Over this period, we estimate that the level of potential output will increase by 0.35 percent because of the tax legislation (line 3), mostly as a result of increased labor supply. The boost to potential output further increases demand as households begin to realize higher labor income; for that reason, the potential output effects on GDP are additive to the direct aggregate demand effects in line 2.

After the initial increase in aggregate demand, follow-on multiplier effects will further augment growth (line 4). However, some of the aggregate demand effects will be offset by higher interest rates and a stronger dollar as the widening of the output gap leads to a tightening of monetary policy (line 5). We estimate that, on net, the TCJA will boost the level of real GDP 1¼ percent by the end of 2020 (line 1). But, owing to the increase in potential, the output gap is projected to widen a bit less than 1 percent (line 8). Given the increase in the output gap, we also project that the unemployment rate will be 0.5 percentage point lower at the end of 2020, while core PCE price inflation will be about 0.1 percentage point higher.

These effects are significantly larger than the ones we built into the December Tealbook (line 7). And they are slightly larger than the effects in the December 7, 2017, memo to the FOMC, “Staff’s Revised Fiscal Policy Assumptions” (line 6), as the size of the medium-term tax cuts in the TCJA turned out to be a little larger than we had assumed in that memo.

Our estimates of the act’s effects draw on analyses by other government agencies as well as a careful reading of the relevant academic literature. Nonetheless, many judgment calls are required. Accordingly, there is considerable uncertainty surrounding the effects of this complex legislation.

Tax Cuts and Jobs Act's Effects on the U.S. GDP Outlook
(Percentage point contributions to Q4/Q4 percentage change)

| | 2017 | 2018 | 2019 | 2020 | 2017–20 |
|---|------|------|------|------|-------------|
| (1) Net fiscal policy: Current | .05 | .45 | .45 | .35 | 1.25 |
| (2) Direct aggregate demand | .05 | .35 | .35 | .25 | .95 |
| (3) Potential output | -- | .05 | .15 | .15 | .35 |
| (4) Follow-on multiplier | -- | .10 | .15 | .15 | .35 |
| (5) Financial offsets | -- | -.05 | -.20 | -.20 | -.45 |
| (6) Net fiscal policy: December 7 memo | .05 | .40 | .35 | .30 | 1.05 |
| (7) Net fiscal policy: December Tealbook | .05 | .15 | .10 | .10 | .40 |
| <i>Memo:</i> | | | | | |
| (8) Output gap* | .05 | .45 | .75 | .90 | |

Source: Staff estimates.

Note: Contributions may not sum due to rounding.

* Cumulative percentage point effect in Q4 of year shown.

Developments section.) We assume these deadlines will be navigated such that there are no significant disruptions to government operations or financial markets.

Monetary Policy

- The intercept-adjusted inertial version of the Taylor (1999) rule calls for the federal funds rate to rise 1.5 percentage points this year, with further increases averaging around 1.1 percentage points in each of the next two years, bringing the rate up to 4.8 percent in the fourth quarter of 2020. The federal funds rate is assumed to be 80 basis points higher at the end of the medium term than it was in the December Tealbook, primarily reflecting the larger positive output gap.
- The SOMA portfolio continues a gradual and predictable decline as securities are redeemed consistent with the Committee’s June 2017 Addendum to the Policy Normalization Principles and Plans and with the process initiated in October 2017.

Other Interest Rates

- The 10-year Treasury yield is projected to rise significantly over the medium term, from an average of 2.7 percent in the current quarter to 4.3 percent by the end of 2020, 0.7 percentage point higher than in our December projection. The upward revision to the path for the 10-year Treasury yield reflects the new path for the federal funds rate and a small upward revision to the term premium, the latter of which is a consequence of a larger projected stock of federal debt.
- The 30-year fixed mortgage rate and the triple-B corporate bond rate are also forecast to rise significantly over the medium term. The paths for these two rates were revised up mostly in line with revisions to the path of the 10-year Treasury yield.

Equity Prices and Home Prices

- The projected path of stock prices is about 5 percent higher than in the December Tealbook, reflecting recent increases in broad equity price indexes. As in previous projections, we assess that valuation pressures will limit the

scope for future stock price increases, and we expect equity prices to rise after the current quarter around 0.4 percent per year, about the same pace as in the December Tealbook.

- Incoming data on house prices have been slightly above our expectations. We estimate that house prices increased at an average rate of 6 percent last year and expect that the rate of increase will slow to about 4 percent over the next three years. Despite the brisk pace of house price increases, the ratio of house prices to rents is forecast to remain only somewhat above its estimated long-run trend.

Foreign Economic Activity and the Dollar

- We estimate that real GDP in foreign economies grew at an annual rate of about 3 percent in the fourth quarter of last year, rebounding from a temporarily weak 2½ percent pace in the third quarter. We see economic growth abroad continuing at around 3 percent in 2018 before edging down to 2¾ percent thereafter. This forecast is supported by buoyant financial markets, still-accommodative monetary policies, and positive spillovers from strong U.S. economic growth in the coming years. Relative to the December Tealbook, our outlook for foreign economic growth is about ¼ percentage point higher in 2018, with a slightly smaller revision over the remainder of the forecast period.
- The broad nominal dollar has depreciated about 2½ percent since the time of the December Tealbook amid positive foreign economic data and a slight firming of expectations for monetary policy normalization abroad. We expect the broad real dollar to appreciate at about a 2 percent annual rate over the medium term, a little faster than in the previous Tealbook, as market expectations for the federal funds rate are assumed to move up toward the upwardly revised staff forecast. The higher projected rate of appreciation offsets only some of the recent realized depreciation, leaving the level of the broad real dollar at the end of 2020 about 1¼ percent lower.

Oil Prices and Other Commodity Prices

- Since the December Tealbook forecast, the spot price of oil and prices for many industrial metals reached their highest levels in three years, supported

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 Jan. 17, 2018 |
|---|--|-----------------------------|
| Federal Reserve Bank | | |
| Boston | <ul style="list-style-type: none"> Mixed-frequency BVAR | 3.4 |
| New York | <ul style="list-style-type: none"> Factor-augmented autoregressive model combination Factor-augmented autoregressive model combination, financial factors only Dynamic factor model | 2.1 2.2 3.9 |
| Cleveland | <ul style="list-style-type: none"> Bayesian regressions with stochastic volatility Tracking model | 3.6 2.7 |
| 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) | 3.3 |
| Chicago | <ul style="list-style-type: none"> Dynamic factor models Bayesian VARs | 3.8 3.7 |
| St. Louis | <ul style="list-style-type: none"> Dynamic factor models News index model Let-the-data-decide regressions | 3.3 3.1 3.1 |
| 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) | 3.5 3.7 4.3 |
| Memo: Median of Federal Reserve System nowcasts | | 3.4 |

by both the strengthening global economic outlook and dollar depreciation. Brent crude oil prices closed most recently around \$69 per barrel, \$6 per barrel higher than at the time of the December Tealbook; those prices had also been boosted by concerns about political tensions with Iran. The price of the Brent December 2020 futures contract increased around \$3 per barrel, to about \$60 per barrel.

THE OUTLOOK FOR REAL GDP AND AGGREGATE SUPPLY

We estimate that real GDP rose at an annual rate of 3½ percent in the fourth quarter of last year, about 1¼ percentage points faster than in our previous projection.² The upward revision reflects positive incoming data on consumer expenditures, business spending, and residential investment, which more than offset data suggesting that net exports were a sizable drag on GDP last quarter. We took only limited signal from the fourth-quarter growth surprises going forward. As a result, first-half real GDP growth has been revised up only slightly, to 3 percent.

- Our near-term outlook for consumer spending is noticeably stronger than in the December Tealbook. We now estimate that real PCE rose 3¾ percent in the fourth quarter, an upward revision of 1¼ percentage points. Much of the revision reflects unusually strong retail sales in November and a solid increase in December, along with a jump in December vehicle sales that appears largely to have been fueled by incentives.³ Given solid fundamentals, we expect consumer spending to increase 2¾ percent in the first half of this year, boosted a bit by the initial effects of the personal tax cuts.
- Recent data suggest that business investment in equipment and intangibles (E&I) rose nearly 11 percent at an annual rate in the fourth quarter, continuing a string of sizable increases throughout 2017. Some of the recent strength is the result of a presumably transitory surge in purchases of transportation equipment, as well as both continued payback from an unusually weak 2016

² The BEA's advance estimate of GDP for the fourth quarter is scheduled to be published on January 26, the Friday before the FOMC meeting. We continue to estimate that the effects of the fall hurricanes subtracted ½ percentage point from real GDP growth in the third quarter and boosted it ¾ percentage point in the fourth.

³ We had expected vehicle sales to decline in December, consistent with anecdotal reports that suggested the impetus to sales from replacing hurricane-damaged vehicles was mostly completed in November.

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

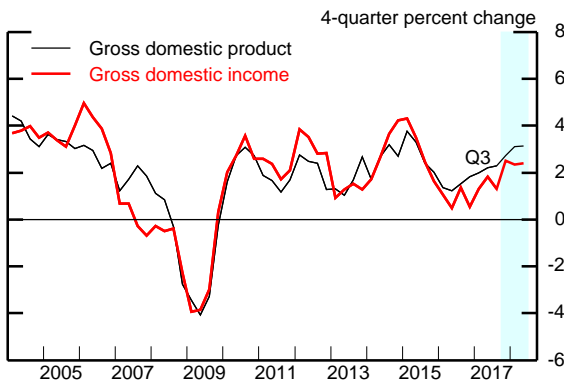
Domestic Econ Devel & Outlook

| Measure | 2017:Q4 | | 2018:Q1 | | 2018:Q2 | |
|--|-------------------|------------------|-------------------|------------------|-------------------|------------------|
| | Previous Tealbook | Current Tealbook | Previous Tealbook | Current Tealbook | Previous Tealbook | Current Tealbook |
| Real GDP | 2.2 | 3.5 | 2.7 | 2.7 | 2.4 | 3.2 |
| Private domestic final purchases | 2.9 | 4.9 | 2.8 | 2.7 | 3.0 | 3.5 |
| Personal consumption expenditures | 2.5 | 3.8 | 2.7 | 2.6 | 2.6 | 2.9 |
| Residential investment | 3.2 | 11.3 | 1.0 | -1.0 | 5.3 | 5.2 |
| Nonres. private fixed investment | 5.2 | 8.9 | 4.0 | 4.6 | 4.3 | 6.3 |
| Government purchases | .7 | 2.4 | .3 | -.1 | .3 | .4 |
| <i>Contributions to change in real GDP</i> | | | | | | |
| Inventory investment ¹ | -.5 | -.4 | .4 | .5 | -.1 | .1 |
| Net exports ¹ | .0 | -.6 | -.2 | -.1 | -.1 | .0 |
| Unemployment rate | 4.1 | 4.1 | 4.0 | 3.9 | 3.8 | 3.8 |
| PCE chain price index | 2.8 | 2.7 | 1.7 | 2.4 | 1.7 | 1.8 |
| Ex. food and energy | 1.9 | 1.8 | 1.9 | 2.1 | 2.0 | 2.0 |

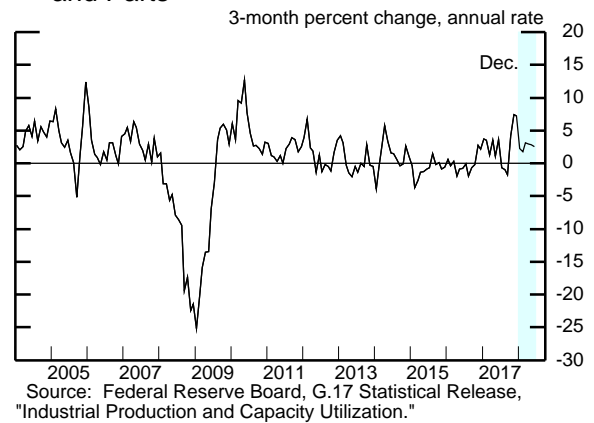
1. Percentage points.

Recent Nonfinancial Developments (1)

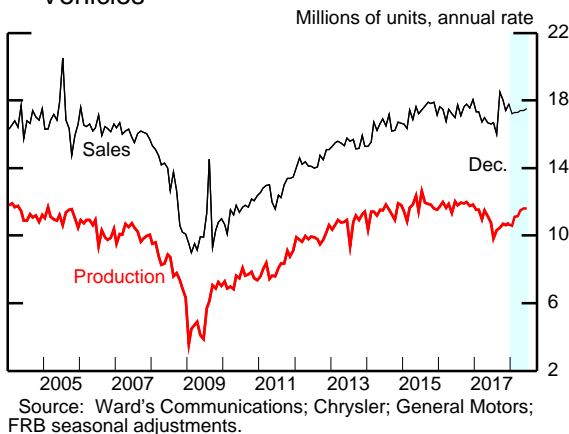
Real GDP and GDI



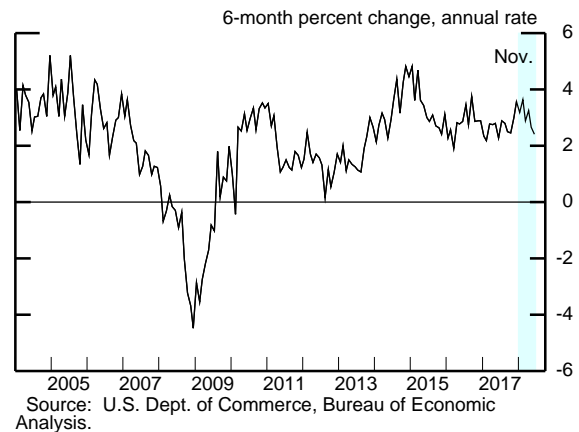
Manufacturing IP ex. Motor Vehicles and Parts



Sales and Production of Light Motor Vehicles

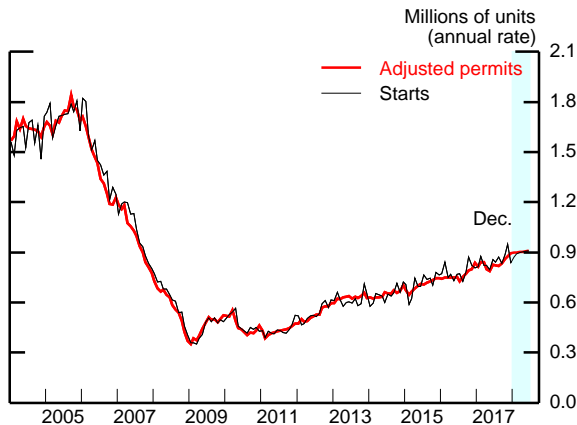


Real PCE Growth



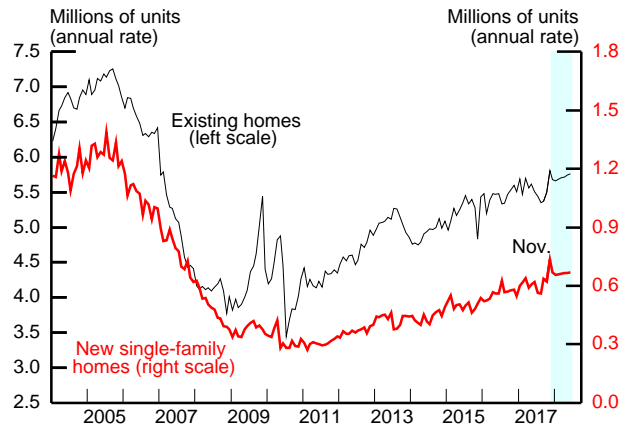
Recent Nonfinancial Developments (2)

Single-Family Housing Starts and Permits



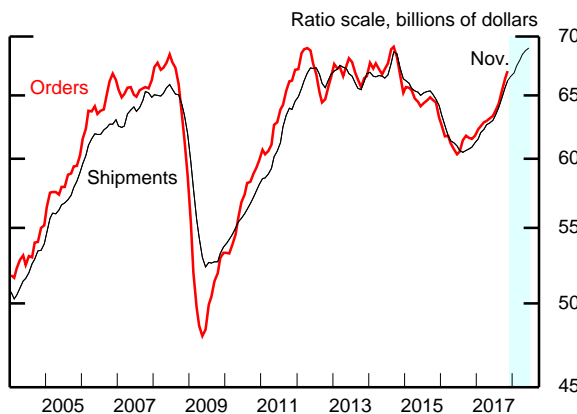
Note: Adjusted permits equal permit issuance plus starts outside of permit-issuing areas.
Source: U.S. Census Bureau.

Home Sales



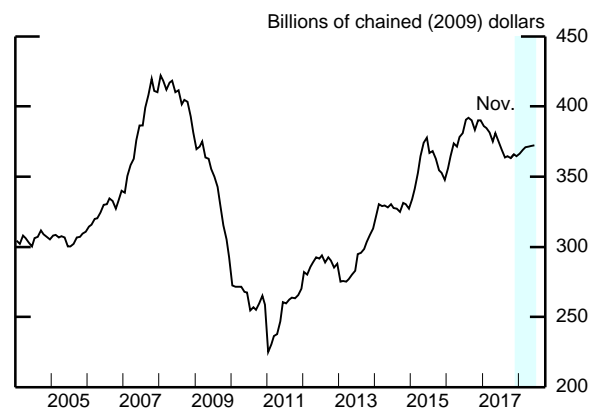
Source: For existing, National Association of Realtors; for new, U.S. Census Bureau.

Nondefense Capital Goods ex. Aircraft



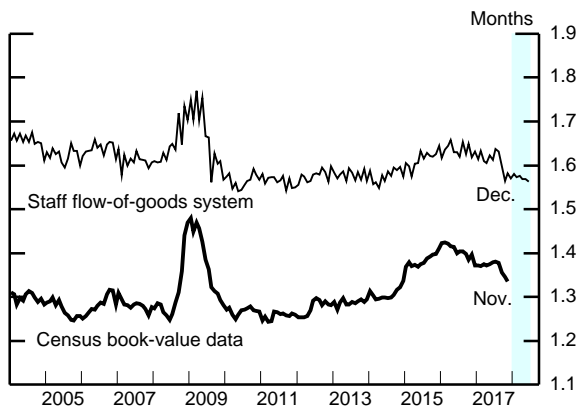
Note: Data are 3-month moving averages.
Source: U.S. Census Bureau.

Nonresidential Construction Put in Place



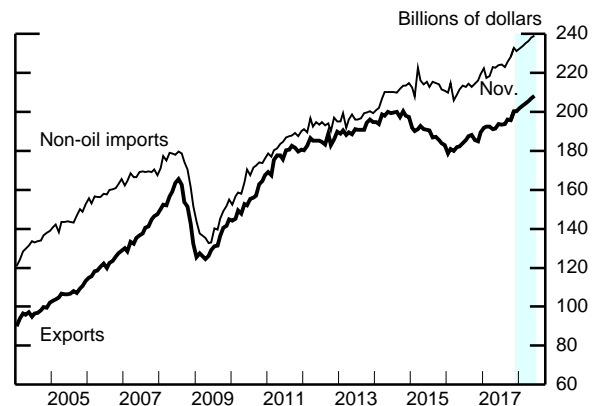
Note: Nominal CPIP deflated by BEA prices through 2017:Q3 and by the staff's estimated deflator thereafter.
Source: U.S. Census Bureau.

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.

and upbeat business sentiment and profit expectations. Although the indicators of future spending remain favorable, we expect E&I growth to moderate to a 6 percent pace in the first half of this year.

- In contrast, investment in nonresidential structures decreased in the second half of last year, as continued declines in investment in nondrilling structures more than offset the recovery in drilling activity. We expect spending to turn up in the coming quarters, driven primarily by a rebound of nondrilling structures.
- Nearly all of the data on housing activity received since the December Tealbook were considerably stronger than we expected. As a result, we now estimate that residential investment jumped at an annual rate of 11¼ percent in the fourth quarter of last year after declining in the previous two quarters. We have taken on board the higher level of housing activity in the forecast but expect just modest increases in the first half of this year as the impetus from population growth, demographic changes, and the healthy labor market is tempered by higher interest rates and the constrained supply of labor and of developed lots available for new construction.⁴
- Net exports are currently estimated to have subtracted more than ½ percentage point from real GDP growth in the fourth quarter—whereas we had expected trade to be a neutral factor in the December Tealbook—as import growth has rebounded following two very weak quarters. In the first half of 2018, net exports are expected to shift toward being neutral for GDP growth, as recent dollar depreciation supports exports and restrains imports.
- Manufacturing output jumped 7 percent in the fourth quarter of last year. Nearly half of the increase reflects the recovery from the fall hurricanes and a bounceback in motor vehicle assemblies after a third-quarter decline, but other segments of manufacturing production also expanded at a fairly brisk pace. Indicators of near-term manufacturing activity, such as the new orders indexes in the various surveys of purchasing managers, are generally upbeat, and automakers' assembly schedules call for light vehicle production to rise

⁴ Relevant demographic changes include the aging of the population (which is notable in part because of high homeownership rates among seniors) and a leveling out of the historically high share of young adults living with their parents.

further in the coming months. Consequently, we expect manufacturing production to increase at a solid pace of 3½ percent in the first half of this year.

We project real GDP to rise nearly 3 percent in 2018 and to decelerate steadily to 2 percent by 2020 as monetary policy tightens. The projected path of GDP growth is ¼ to ½ percentage point higher per year than in the December Tealbook, primarily reflecting the larger-than-anticipated tax cuts. The level of GDP at the end of 2020 in this projection is more than 1½ percent above the previous projection, but this higher level does not show through completely to the output gap, as we have also revised our aggregate supply assumptions in this forecast.

- We expect the lower marginal tax rates on labor income and the corporate tax cuts to boost the level of potential output in 2020 by 0.35 percent, about ¼ percentage point more than we assumed in the December Tealbook.⁵
- All told, potential GDP growth is projected to move up from about 1½ percent in 2017 to just under 2 percent by the end of the medium term.
- With the growth of real GDP substantially outpacing that of potential GDP throughout much of the projection, resource utilization tightens significantly further. At the end of 2020, real GDP is projected to exceed its potential level by 3¼ percent, 1¼ percentage points more than in the December projection.

THE OUTLOOK FOR THE LABOR MARKET

The two labor reports issued since the December Tealbook indicate that labor market conditions continued to strengthen through the end of the year.⁶ We expect further labor market tightening over the medium term, and to a greater extent than in the December Tealbook projection.

⁵ A higher level of business investment spending in this projection that is unrelated to the tax cuts also led us to raise slightly our estimate of capital deepening and structural productivity, which increases the level of potential output an additional 0.1 percent by the end of 2020.

⁶ The labor report for November was released on December 8, the Friday before the December FOMC meeting.

- After increasing 252,000 in November, payroll employment rose 148,000 in December.⁷ Over the final four months of 2017—a period of averaging that smooths through hurricane-related effects—monthly employment gains averaged 162,000, in line with our December Tealbook forecast. We expect payrolls to increase about 185,000 per month in the first half of this year, a touch above the December projection and well above the range of 80,000 to 120,000 per month that we judge to be consistent with unchanged labor market slack.
- The unemployment rate held steady in November and December at 4.1 percent; it decreased 0.6 percentage point over the course of 2017.⁸ We expect the unemployment rate to edge down over the next few months and to average 3.8 percent during the second quarter, the same as in the December Tealbook.
- The labor force participation rate (LFPR) also held steady in November and December at 62.7 percent. Despite fluctuating over the course of 2017, the LFPR ended the year at the same level as in December 2016; compared with its declining trend, this sideways movement represents a continued tightening along this margin.

Over the medium term, we expect the labor market to tighten significantly further.

- We have marked up the expected pace of payroll increases a fair bit with the stronger projected path for output. After having risen about 170,000 per month in 2017, total payroll employment gains are expected to pick up to an average monthly pace of about 195,000 this year, which is 15,000 higher than in the December Tealbook, and then to slow gradually, reaching 150,000 in 2020, in line with the deceleration in real GDP.
- Similarly, we have marked down the unemployment rate over the projection period. The jobless rate declines to 3.4 percent by the end of this year (and

⁷ For 2017 as a whole, monthly payroll gains averaged 171,000, down about 15,000 from 2016. The modest decline reflects a deceleration in government payrolls. Private payroll gains averaged 168,000, just 2,000 fewer than in 2016.

⁸ The decline over the past year was widespread across racial and ethnic groups, and the unemployment rate for African Americans in December, at 6.8 percent, was the lowest rate in the history of the series (back to 1972).

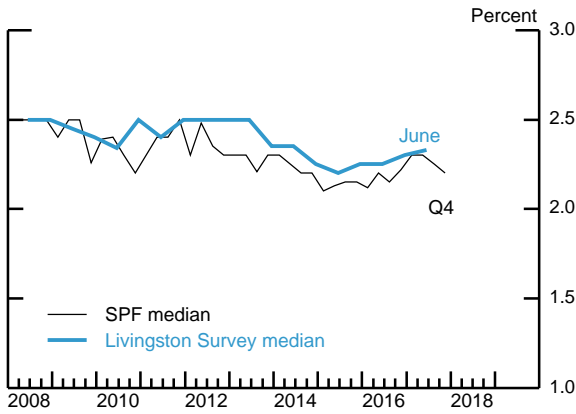
thus posts about the same annual decrease as last year) before moving down to 3.2 percent in mid-2019 and remaining at that level in 2020, 0.3 percentage point below the previous Tealbook and the lowest jobless rate since October 1953. At the end of the medium term, the unemployment rate is 1.5 percentage points below the natural rate.

- Strong job gains and rising real wages continue to draw individuals into the labor force while also slowing outflows, and we expect the LFPR to remain flat at its current level of 62.7 percent over the medium term, ending 2020 0.5 percentage point above our estimate of its trend and 0.3 percentage point above our projection in the December Tealbook.
- Over the medium term, the labor market continues to strengthen along many dimensions, including the unemployment rate, the LFPR, and the workweek. However, given how strained we think labor resources are likely to be in a couple of years, we elected to have a larger-than-usual amount of this improvement manifest in the LFPR and the workweek and less in the unemployment rate.⁹ We have not, however, assumed that labor resources will be sufficiently strained to importantly impinge on the overall GDP outlook.

⁹ Specifically, had we maintained our usual Okun’s law relationship throughout the medium term, revisions to the output gap since the December Tealbook would have led us to lower the unemployment rate to 3.0 percent in 2020. Deviating from our Okun’s law relationship in an especially tight economy is consistent with research showing that, in the very strong economies of the late 1960s and 1990s, additional output growth tended to reduce the unemployment rate by less. See Brent Meyer and Murat Tasci (2012), “An Unstable Okun’s Law, Not the Best Rule of Thumb,” Economic Commentary 2012-08 (Cleveland: Federal Reserve Bank of Cleveland, June), available at <https://www.clevelandfed.org/en/newsroom-and-events/publications/economic-commentary/economic-commentary-archives.aspx>; and Michael T. Owyang and Tatevik Sekhposyan (2012), “Okun’s Law over the Business Cycle: Was the Great Recession All That Different?” Federal Reserve Bank of St. Louis, *Review*, vol. 94 (September/October), pp. 399–418, available at <https://research.stlouisfed.org/publications/review/2012/09/04/okuns-law-over-the-business-cycle-was-the-great-recession-all-that-different>.

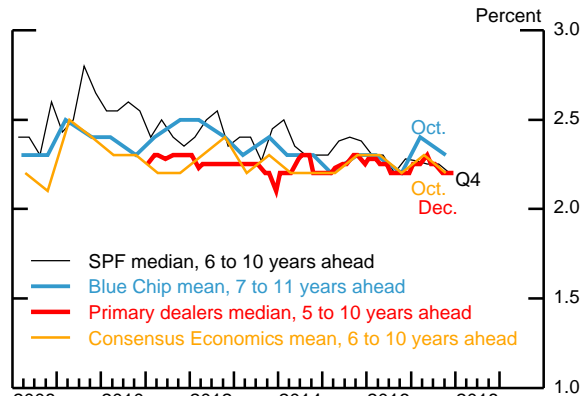
Survey Measures of Longer-Term Inflation Expectations

CPI Next 10 Years



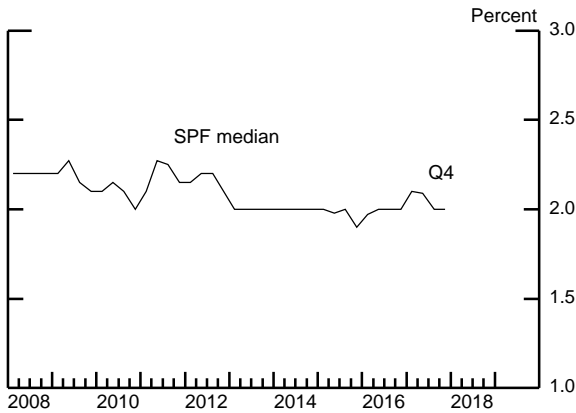
Note: SPF is Survey of Professional Forecasters.
Source: Federal Reserve Bank of Philadelphia.

CPI Forward Expectations



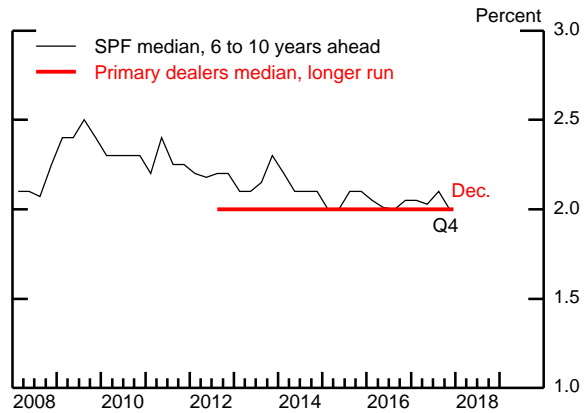
Source: Federal Reserve Bank of Philadelphia; Blue Chip Economic Indicators; Federal Reserve Bank of New York; Consensus Economics.

PCE Next 10 Years



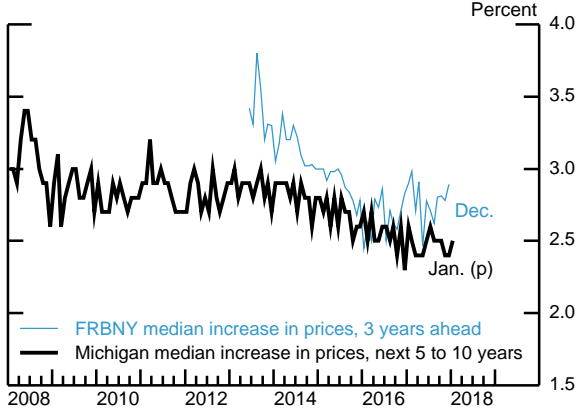
Source: Federal Reserve Bank of Philadelphia.

PCE Forward Expectations



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

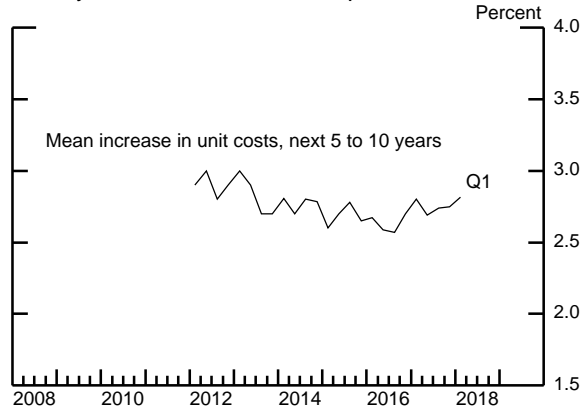
Surveys of Consumers



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.

(p) Preliminary.
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 OUTLOOK FOR INFLATION

On balance, the incoming information regarding core consumer prices has been about as we anticipated, with core PCE prices a little lower than expected in November and the core CPI in December somewhat higher.¹⁰

- We continue to estimate that core PCE prices increased 1.5 percent over the 12 months ending in December and that total PCE prices rose 1.7 percent, with each measure up about $\frac{1}{4}$ percentage point from its low last summer. We continue to think that the soft core inflation readings seen last year reflect idiosyncratic factors that will not persist, and we expect inflation to move higher this year.
- We expect the 12-month change in core PCE prices to fluctuate around its current level until March 2018, when it moves up to 1.7 percent, as the unusually low reading in that month last year drops out of the calculation; we then expect the 12-month change to edge up to 1.9 percent by midyear.
- Gasoline prices ended the year a little lower than projected in the December Tealbook, but oil prices have increased, which boosts the projection for PCE energy prices, and thus total PCE price inflation, in the coming months. We now expect the 12-month change in total PCE prices to rise from 1.7 percent in December to 2.2 percent in June and to then ease back a bit later in the year, in line with core inflation.
- Core import prices rose at an estimated $1\frac{1}{2}$ percent pace over the second half of 2017, less than would have been expected given last year's movements in the dollar and commodity prices; we expect core import price inflation to pick up to a $2\frac{3}{4}$ percent pace in the first half of 2018, supported by recent dollar depreciation and higher commodity prices. Thereafter, import price inflation slows to a $\frac{3}{4}$ percent pace, consistent with still-moderate foreign inflation, a gradually appreciating dollar, and slowly declining commodity prices.

¹⁰ The core CPI in December rose a relatively large 0.3 percent, but our translation of the CPI and low readings on the relevant PPI data point to a 0.1 percent increase in core PCE prices last month, only a couple of basis points higher than our December Tealbook projection.

- Survey-based measures of longer-term inflation expectations have moved little since the time of the December Tealbook and, on balance, relative to a year or so earlier. Median 10-year inflation expectations for PCE prices in the fourth-quarter Survey of Professional Forecasters were stable at 2.0 percent and have been essentially unchanged for the past several years. The median of expectations over the next 5 to 10 years from the Michigan survey ticked up to 2.5 percent in early January; this measure trended down from 2014 into 2016 but has been relatively stable since then. The 3-year-ahead measure of inflation expectations in the Federal Reserve Bank of New York’s Survey of Consumer Expectations, which also trended down into 2016 before moving up a bit, rose 0.1 percentage point in December to 2.9 percent, a value toward the higher end of its range of the past year or so. Finally, the TIPS-based measure of 5-to-10-year-forward inflation compensation increased 0.1 percentage point to about 2 percent over the intermeeting period, but it remains little changed, on net, since late 2016.

Core PCE price inflation is projected to move up from 1.5 percent in 2017 to 1.9 percent in 2018, with the increase reflecting the abating of last year’s surprising weakness and the tightening economy. We expect core inflation to move up to 2.1 percent in 2019 and 2020 as resource utilization tightens substantially further. Total PCE price inflation also rises over the medium term, from 1.9 percent this year and next to 2.0 percent in 2020. The medium-term forecast for core PCE price inflation is revised up 0.1 percentage point in each year in light of the stronger outlook for resource utilization in this projection.

The limited new information regarding labor compensation has been a bit weaker than we expected.

- The average hourly earnings of employees on private nonfarm payrolls rose 2.5 percent over the 12 months ending in December, a pace similar to that in 2016 and a bit less than we anticipated. The 12-month change in this measure is forecast to remain around 2½ percent over the next few months, above its average of roughly 2 percent earlier in the expansion.
- We estimate that compensation per hour (CPH) in the business sector rose 2½ percent over the four quarters of 2017. We currently project CPH growth

to move up to almost 4 percent by 2019— $\frac{1}{4}$ percentage point above the December Tealbook projection—reflecting the tighter labor market.

- The employment cost index (ECI) rose 2.5 percent over the 12 months ending in September and has shown some acceleration relative to its pace of recent years.¹¹ The ECI, which is less cyclically sensitive than CPH, is projected to increase $2\frac{1}{2}$ percent this year and to pick up to $2\frac{3}{4}$ percent in 2019 and 2020, a bit higher than in our previous projection.
- The Federal Reserve Bank of Atlanta’s Wage Growth Tracker was 3.2 percent in November, toward the low end of the range it has traversed during the past couple of years but up from earlier years.

THE LONG-TERM OUTLOOK

- We continue to assume that the natural rate of unemployment will be 4.7 percent and that potential output growth will be 1.7 percent in the longer run. However, we have adjusted up potential output growth from 2021 through 2023 to be consistent with the effects of the TCJA in the medium term.
- 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 stabilizes in the long run, although at a higher level. To reflect that higher level of federal debt, we have revised up the assumed term premium on 10-year Treasury yields in the longer run by 25 basis points.
- 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 mid-2021.

¹¹ The ECI for the period ending in December is scheduled to be published on January 31, the second day of the FOMC meeting.

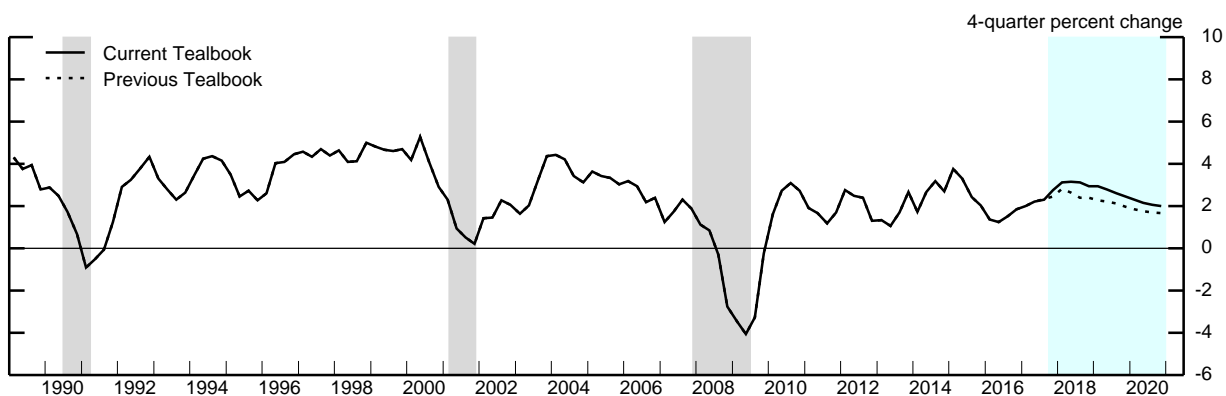
- Real GDP growth slows further to about 1½ percent in 2021 and 1 percent in 2022 and 2023, as the federal funds rate is above its neutral level. The unemployment rate moves up gradually from 3.2 percent in 2020 toward its assumed natural rate in subsequent years.
- PCE price inflation continues to gradually increase from 2021 through 2023, reaching 2.2 percent in 2023, before slowly edging back down to the Committee’s long-run objective in later years.
- With output materially above its potential level and inflation a bit over the Committee’s 2 percent objective, the nominal federal funds rate is more than 2½ percentage points above its long-run value of 2.5 percent in 2021. The federal funds rate 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 | 2017 | 2018 | | 2018 | 2019 | 2020 |
|--|------------|------------|------------|------------|------------|------------|
| | | H1 | H2 | | | |
| Real GDP | 2.7 | 3.0 | 2.9 | 2.9 | 2.4 | 2.0 |
| Previous Tealbook | 2.4 | 2.5 | 2.2 | 2.4 | 2.0 | 1.7 |
| Final sales | 3.0 | 2.7 | 3.2 | 2.9 | 2.4 | 2.0 |
| Previous Tealbook | 2.7 | 2.4 | 2.5 | 2.5 | 1.9 | 1.7 |
| Personal consumption expenditures | 2.8 | 2.8 | 3.0 | 2.9 | 2.8 | 2.5 |
| Previous Tealbook | 2.5 | 2.7 | 2.5 | 2.6 | 2.3 | 2.1 |
| Residential investment | 2.2 | 2.0 | 6.4 | 4.2 | .4 | 4.1 |
| Previous Tealbook | .2 | 3.1 | 4.6 | 3.9 | 2.0 | 3.4 |
| Nonresidential structures | 4.0 | 3.8 | 3.6 | 3.7 | 1.8 | .5 |
| Previous Tealbook | 2.1 | 3.0 | 2.0 | 2.5 | .7 | -6 |
| Equipment and intangibles | 7.7 | 5.9 | 5.5 | 5.7 | 3.8 | 2.1 |
| Previous Tealbook | 7.2 | 4.5 | 3.6 | 4.0 | 2.5 | 1.6 |
| Federal purchases | .8 | -1.6 | .0 | -.8 | .3 | .7 |
| Previous Tealbook | .2 | -1.3 | .5 | -.4 | .6 | .5 |
| State and local purchases | .4 | 1.2 | .8 | 1.0 | .8 | .9 |
| Previous Tealbook | .0 | 1.3 | .8 | 1.0 | .8 | .9 |
| Exports | 4.5 | 4.9 | 6.3 | 5.6 | 4.9 | 3.3 |
| Previous Tealbook | 4.4 | 3.8 | 5.3 | 4.5 | 4.2 | 3.1 |
| Imports | 3.3 | 4.0 | 4.4 | 4.2 | 4.4 | 4.5 |
| Previous Tealbook | 2.0 | 4.0 | 3.3 | 3.7 | 4.1 | 3.8 |
| Contributions to change in real GDP (percentage points) | | | | | | |
| Inventory change | -.3 | .3 | -.2 | .0 | .0 | .0 |
| Previous Tealbook | -.3 | .1 | -.3 | -.1 | .0 | .0 |
| Net exports | .0 | .0 | .1 | .0 | -.1 | -.3 |
| Previous Tealbook | .2 | -.1 | .1 | .0 | -.1 | -.2 |

Domestic Econ Devel & Outlook

Real GDP

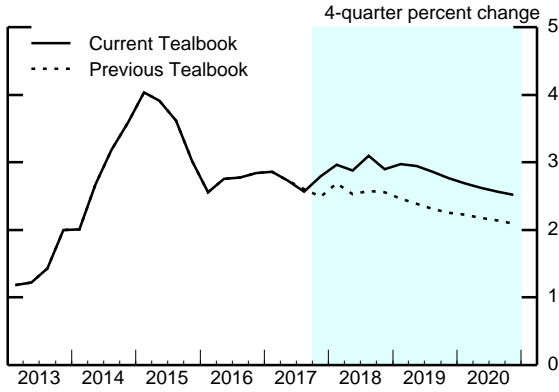


Note: The gray shaded bars indicate a period of business recession as defined by the National Bureau of Economic Research.

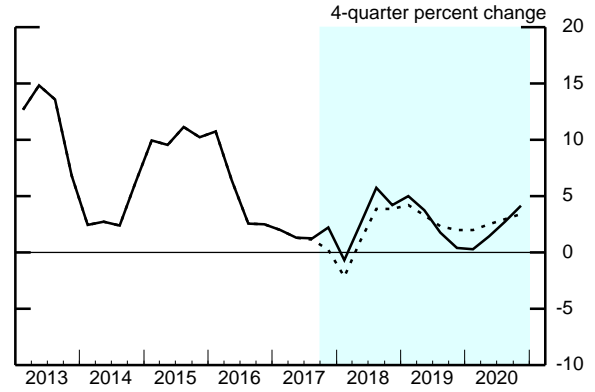
Source: U.S. Department of Commerce, Bureau of Economic Analysis.

Components of Final Demand

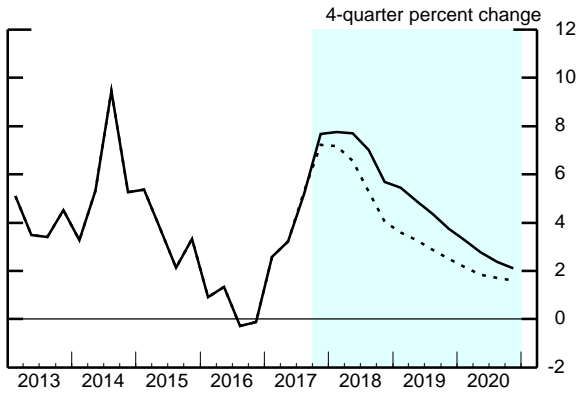
Personal Consumption Expenditures



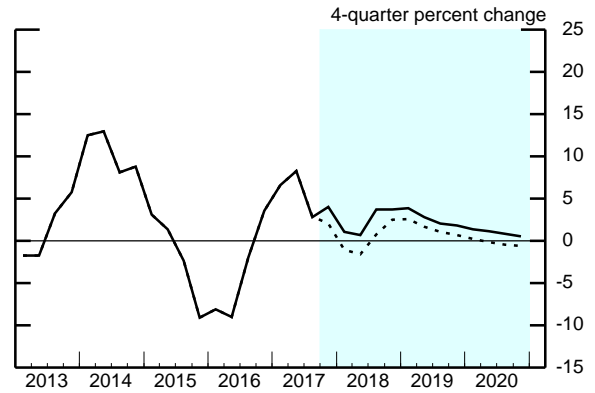
Residential Investment



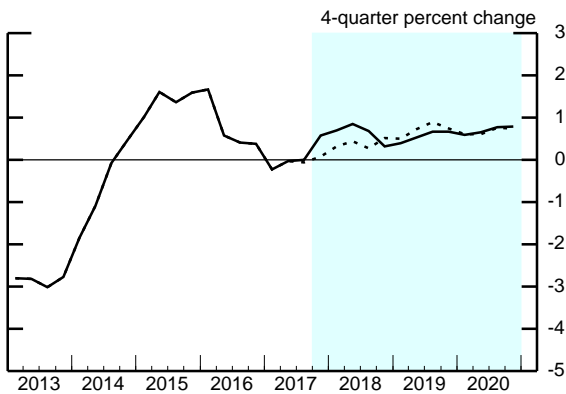
Equipment and Intangibles



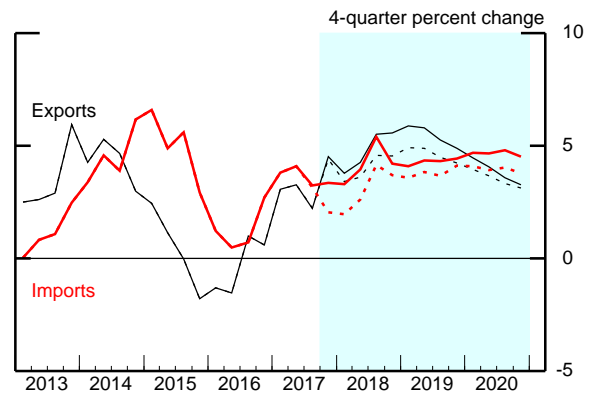
Nonresidential Structures



Government Consumption and Investment



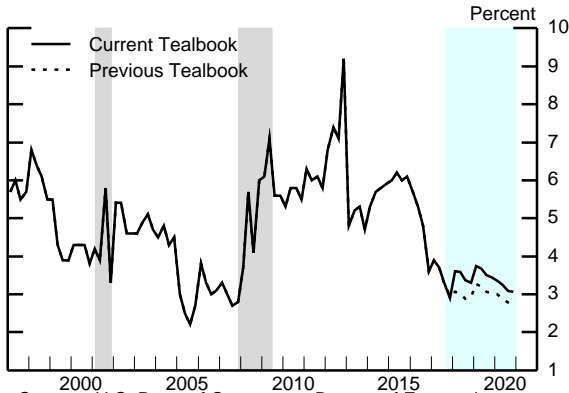
Exports and Imports



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

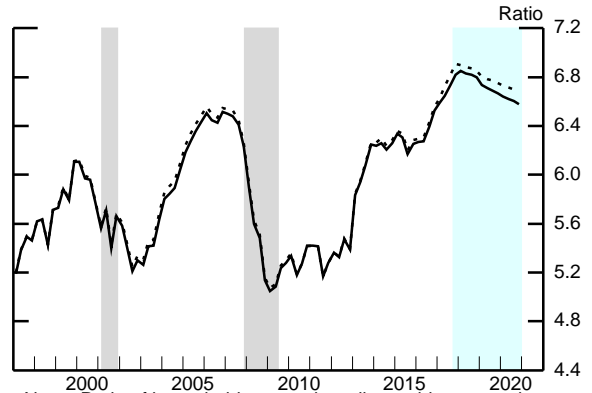
Aspects of the Medium-Term Projection

Personal Saving Rate



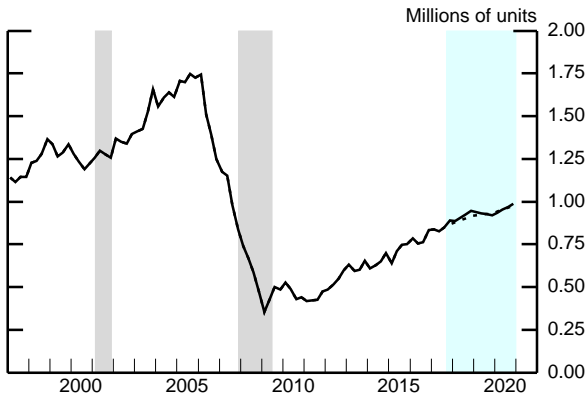
Source: U.S. Dept. of Commerce, Bureau of Economic Analysis.

Wealth-to-Income Ratio



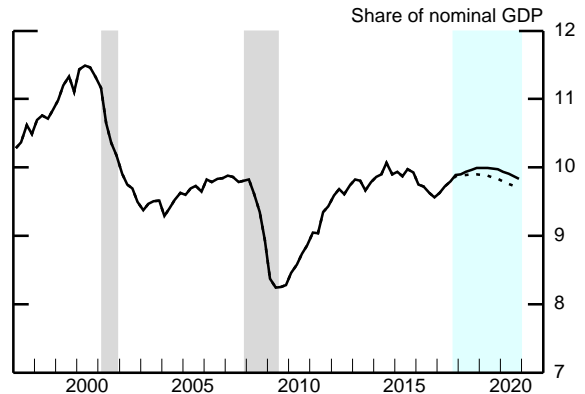
Note: Ratio of household net worth to disposable personal income.
Source: For net worth, Federal Reserve Board, Financial Accounts of the United States; for income, U.S. Dept. of Commerce, Bureau of Economic Analysis.

Single-Family Housing Starts



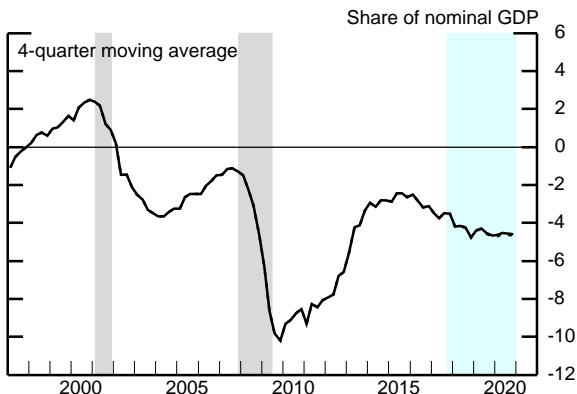
Source: U.S. Census Bureau.

Equipment and Intangibles Spending



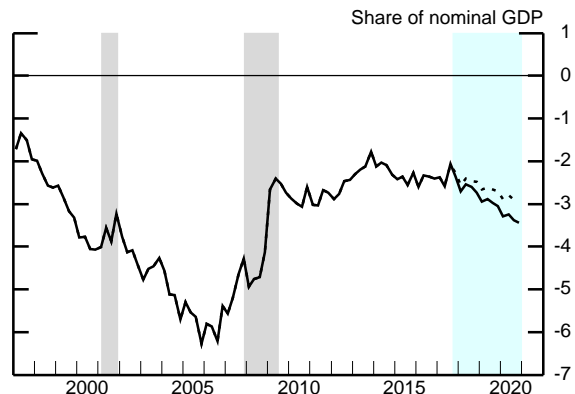
Source: U.S. Dept. of Commerce, Bureau of Economic Analysis.

Federal Surplus/Deficit



Source: Monthly Treasury Statement.

Current Account Surplus/Deficit



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

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 | 1.5 | 1.7 | 1.8 | 1.9 |
| Previous Tealbook | 3.1 | 3.4 | 2.6 | 1.6 | 1.2 | 1.4 | 1.4 | 1.6 | 1.8 | 1.8 |
| <i>Selected contributions¹</i> | | | | | | | | | | |
| Structural labor productivity ² | 1.6 | 2.9 | 2.8 | 1.4 | .8 | .8 | 1.1 | 1.2 | 1.2 | 1.3 |
| Previous Tealbook | 1.6 | 2.9 | 2.8 | 1.4 | .8 | .8 | 1.0 | 1.1 | 1.3 | 1.3 |
| Capital deepening | .6 | 1.5 | 1.0 | .3 | .5 | .5 | .5 | .6 | .6 | .5 |
| Multifactor productivity | .7 | 1.0 | 1.5 | .9 | .1 | .1 | .4 | .5 | .5 | .6 |
| Structural hours | 1.6 | 1.2 | .8 | .0 | .6 | .8 | .2 | .5 | .6 | .6 |
| Previous Tealbook | 1.6 | 1.2 | .8 | .0 | .6 | .8 | .2 | .5 | .5 | .5 |
| Labor force participation | .4 | -.1 | -.2 | -.5 | -.6 | -.3 | -.3 | -.3 | -.2 | -.2 |
| Previous Tealbook | .4 | -.1 | -.2 | -.5 | -.6 | -.3 | -.3 | -.3 | -.3 | -.3 |
| Memo: | | | | | | | | | | |
| Output gap ³ | -1.9 | 2.4 | .8 | -4.2 | -.1 | .3 | 1.5 | 2.7 | 3.3 | 3.3 |
| Previous Tealbook | -1.9 | 2.4 | .8 | -4.2 | -.1 | .3 | 1.3 | 2.1 | 2.3 | 2.1 |

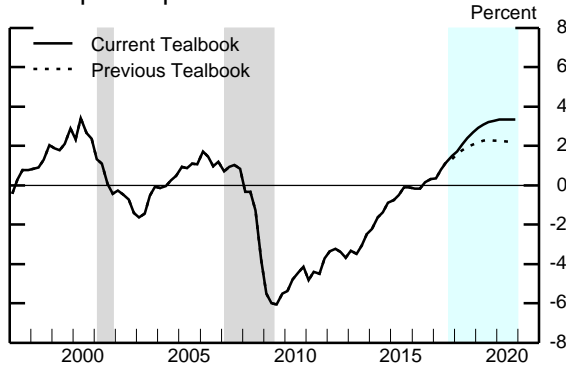
Note: For multiyear periods, the percent change is the annual average from Q4 of the year preceding the first year shown to Q4 of the last year shown.

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.

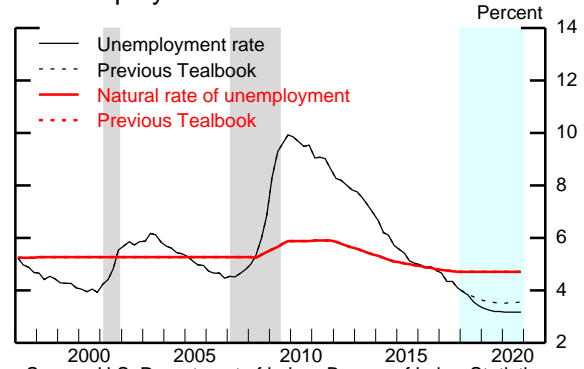
Output Gap



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

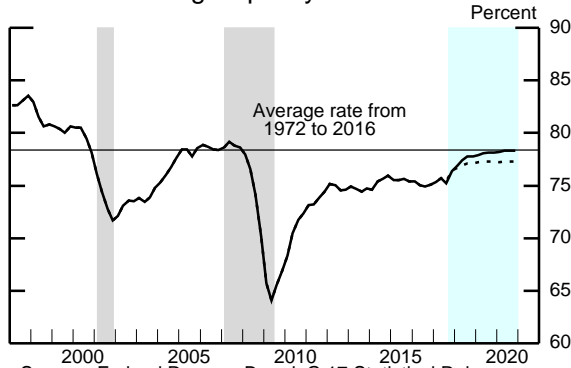
Source: U.S. Department of Commerce, Bureau of Economic Analysis; staff assumptions.

Unemployment Rate



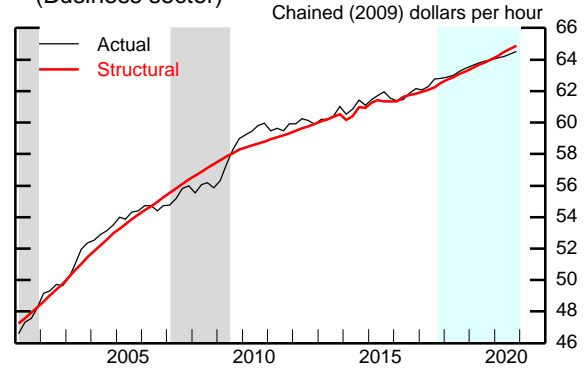
Source: U.S. Department of Labor, Bureau of Labor Statistics; staff assumptions.

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 | 2017 | 2018 | | 2018 | 2019 | 2020 |
|---|------|------|------|------|------|------|
| | | H1 | H2 | | | |
| Output per hour, business ¹ | 1.0 | .7 | 1.4 | 1.1 | .8 | .9 |
| Previous Tealbook | .8 | 1.2 | .9 | 1.0 | .9 | .9 |
| Nonfarm payroll employment ² | 171 | 186 | 203 | 194 | 179 | 149 |
| Previous Tealbook | 174 | 179 | 179 | 179 | 147 | 117 |
| Private employment ² | 168 | 178 | 195 | 186 | 170 | 140 |
| Previous Tealbook | 168 | 170 | 170 | 170 | 138 | 108 |
| Labor force participation rate ³ | 62.7 | 62.7 | 62.7 | 62.7 | 62.7 | 62.7 |
| Previous Tealbook | 62.7 | 62.7 | 62.6 | 62.6 | 62.5 | 62.4 |
| Civilian unemployment rate ³ | 4.1 | 3.8 | 3.4 | 3.4 | 3.2 | 3.2 |
| Previous Tealbook | 4.1 | 3.8 | 3.6 | 3.6 | 3.5 | 3.5 |

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 | 2017 | 2018 | | 2018 | 2019 | 2020 |
|---|------------------------|------------------------|------------------------|------------------------|------------------------|-----------------------|
| | | H1 | H2 | | | |
| <i>Percent change at annual rate from final quarter of preceding period</i> | | | | | | |
| PCE chain-weighted price index | 1.7 | 2.1 | 1.6 | 1.9 | 1.9 | 2.0 |
| Previous Tealbook | 1.7 | 1.7 | 1.7 | 1.7 | 1.9 | 2.0 |
| Food and beverages | .6 | 1.4 | 2.2 | 1.8 | 2.3 | 2.2 |
| Previous Tealbook | .9 | 2.1 | 2.2 | 2.1 | 2.3 | 2.2 |
| Energy | 8.2 | 3.8 | -2.2 | .8 | -1.1 | -.4 |
| Previous Tealbook | 8.3 | -3.4 | -1.6 | -2.5 | -.4 | .3 |
| Excluding food and energy | 1.5 | 2.1 | 1.8 | 1.9 | 2.1 | 2.1 |
| Previous Tealbook | 1.5 | 1.9 | 1.8 | 1.8 | 2.0 | 2.0 |
| Prices of core goods imports ¹ | 1.3 | 2.7 | .9 | 1.8 | .6 | .6 |
| Previous Tealbook | 1.6 | 1.0 | .8 | .9 | .7 | .7 |
| | Dec. 2017 ² | Jan. 2018 ² | Feb. 2018 ² | Mar. 2018 ² | Apr. 2018 ² | May 2018 ² |
| <i>12-month percent change</i> | | | | | | |
| PCE chain-weighted price index | 1.7 | 1.5 | 1.6 | 2.0 | 1.9 | 2.1 |
| Previous Tealbook | 1.7 | 1.5 | 1.5 | 1.8 | | |
| Excluding food and energy | 1.5 | 1.4 | 1.4 | 1.7 | 1.7 | 1.8 |
| Previous Tealbook | 1.5 | 1.4 | 1.4 | 1.7 | | |

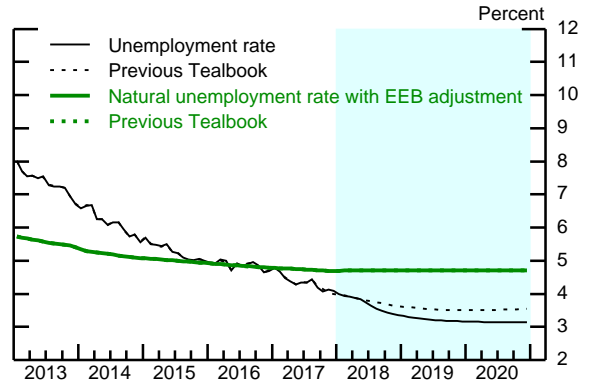
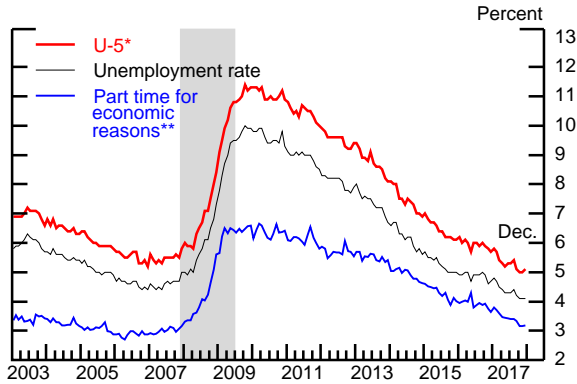
1. Core goods imports exclude computers, semiconductors, oil, and natural gas.

2. Staff forecast.

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

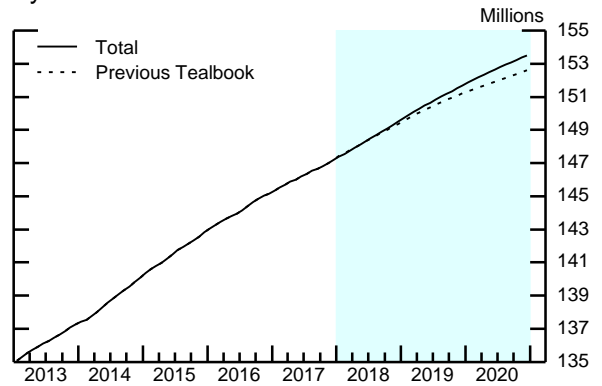
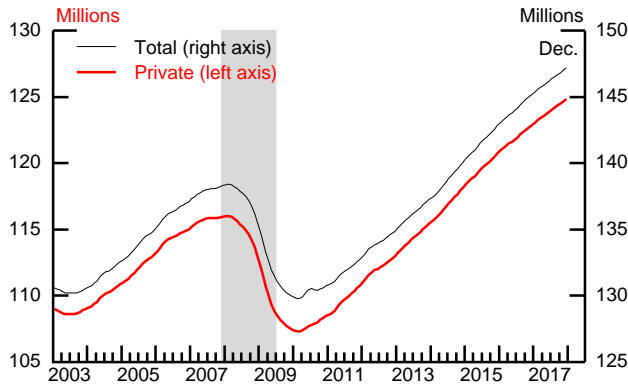
Labor Market Developments and Outlook (1)

Measures of Labor Underutilization



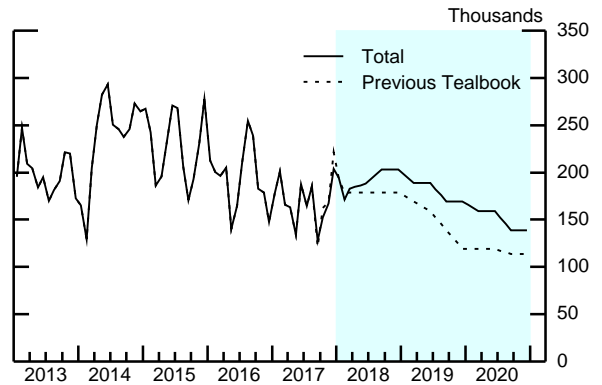
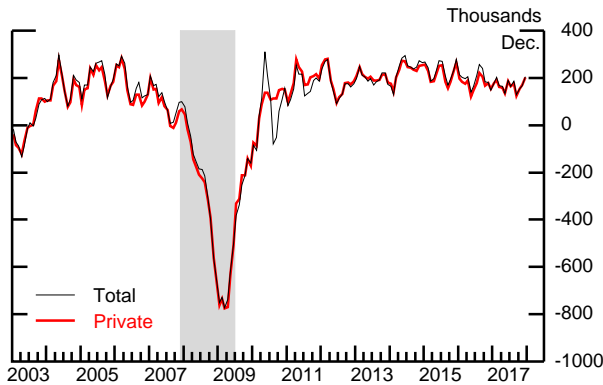
* U-5 measures total unemployed persons plus all marginally attached to the labor force, as a percent of the labor force plus persons marginally attached to the labor force.
 ** Percent of Current Population Survey employment.
 EEB Extended and emergency unemployment benefits.
 Source: U.S. Department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

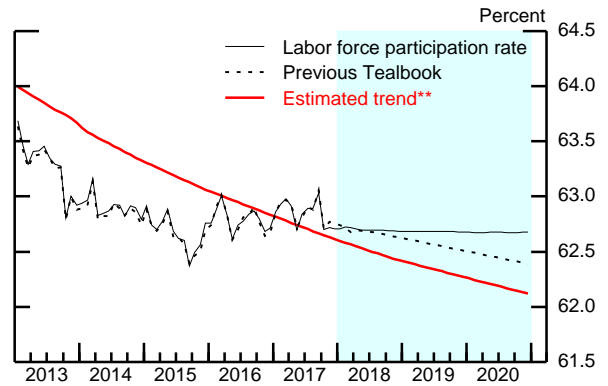
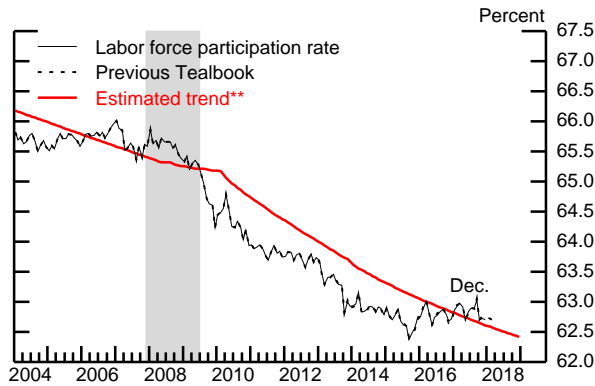


* 3-month moving averages.
 Source: U.S. Department of Labor, Bureau of Labor Statistics.

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

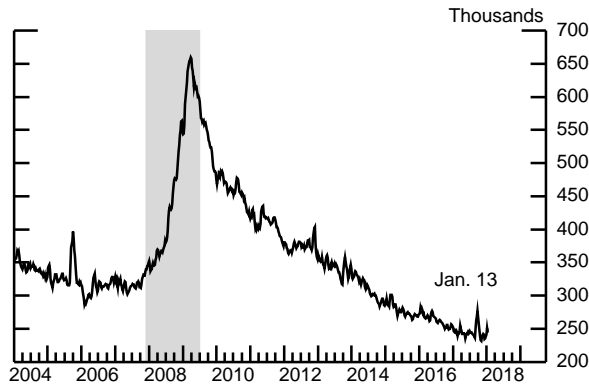
Labor Market Developments and Outlook (2)

Labor Force Participation Rate*



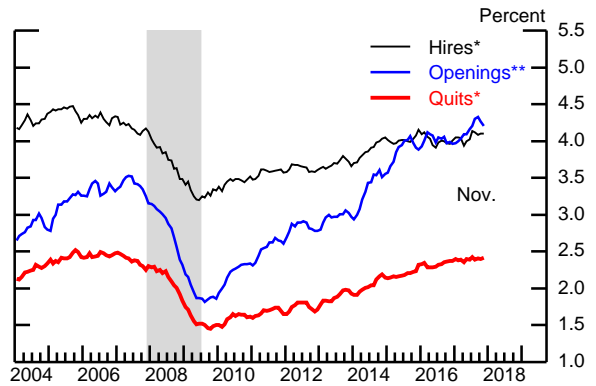
* Published data adjusted by staff to account for changes in population weights.
 ** Includes staff estimate of the effect of extended and emergency unemployment benefits.
 Source: U.S. Department of Labor, Bureau of Labor Statistics; staff assumptions.

Initial Unemployment Insurance Claims*



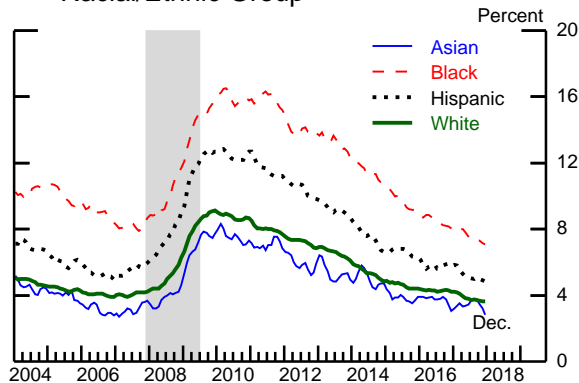
* 4-week moving average.
 Source: U.S. Department of Labor, Employment and Training Administration.

Hires, Quits, and Job Openings



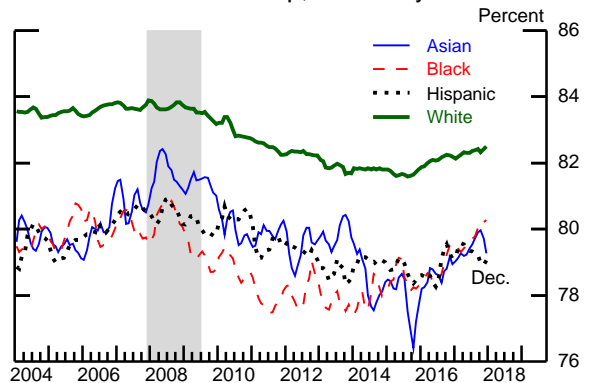
* Percent of private nonfarm payroll employment, 3-month moving average.
 ** Percent of private nonfarm payroll employment plus unfilled jobs, 3-month moving average.
 Source: Job Openings and Labor Turnover Survey.

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

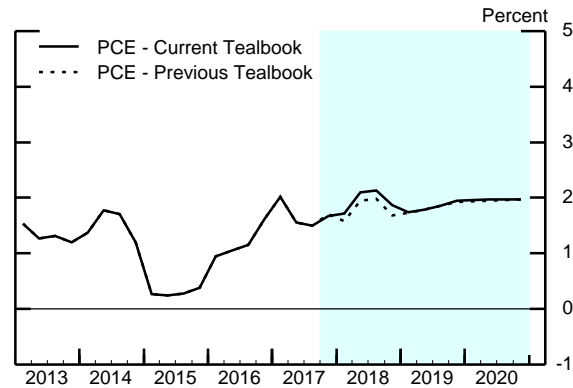
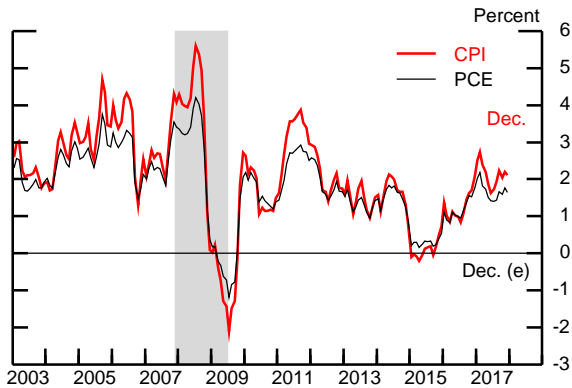


Note: These categories are not mutually exclusive, as the ethnicity Hispanic may include people of any race. The Current Population Survey defines Hispanic ethnicity as those who report their origin is Mexican, Puerto Rican, Cuban, Central American, or South American (and some others). 3-month moving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

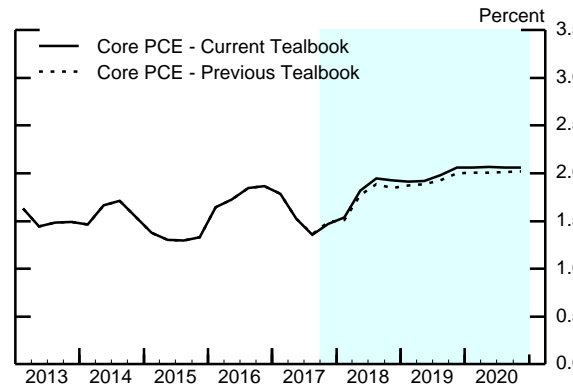
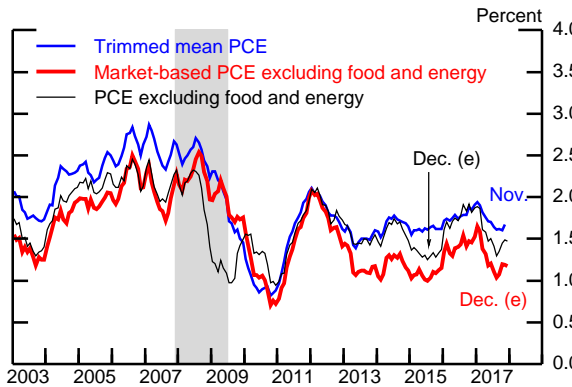
Headline Consumer Price Inflation



Note: PCE prices from October to December 2017 are staff estimates (e).

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

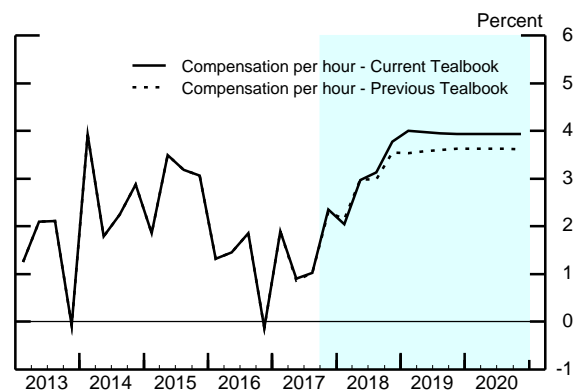
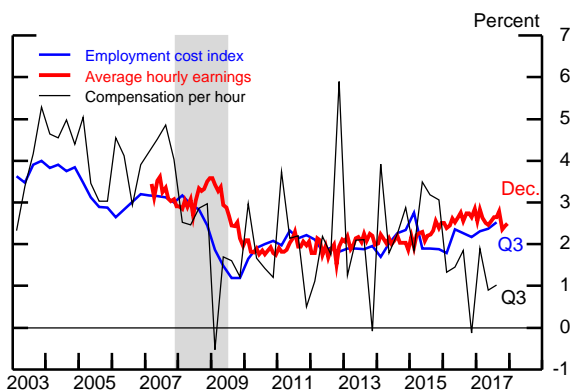
Measures of Underlying PCE Price Inflation



Note: Core PCE prices from October to December 2017 are staff estimates (e).

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.

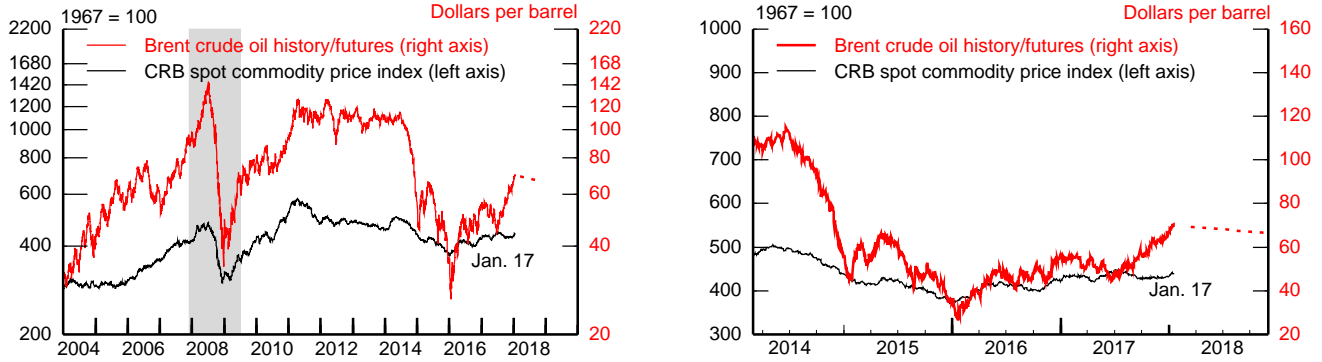
Source: U.S. Department of Labor, Bureau of Labor Statistics.

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)

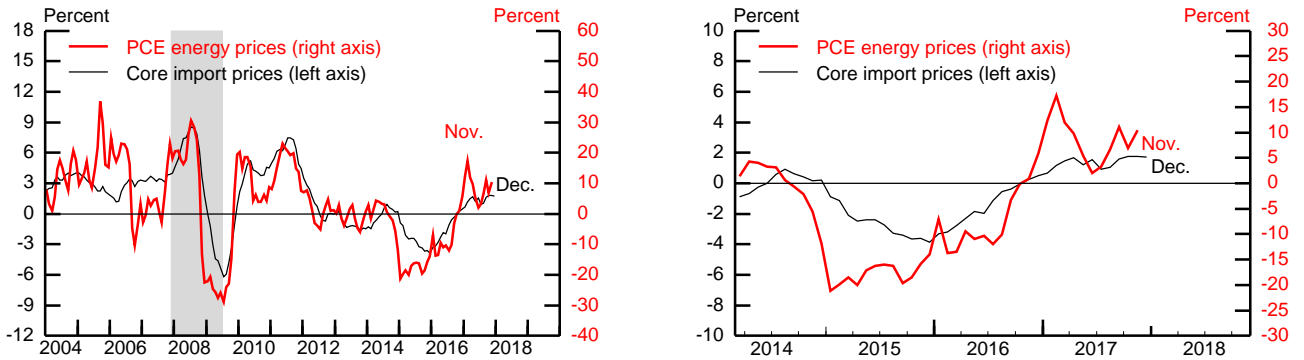
(Percent change from year-earlier period, except as noted)

Commodity and Oil Price Levels



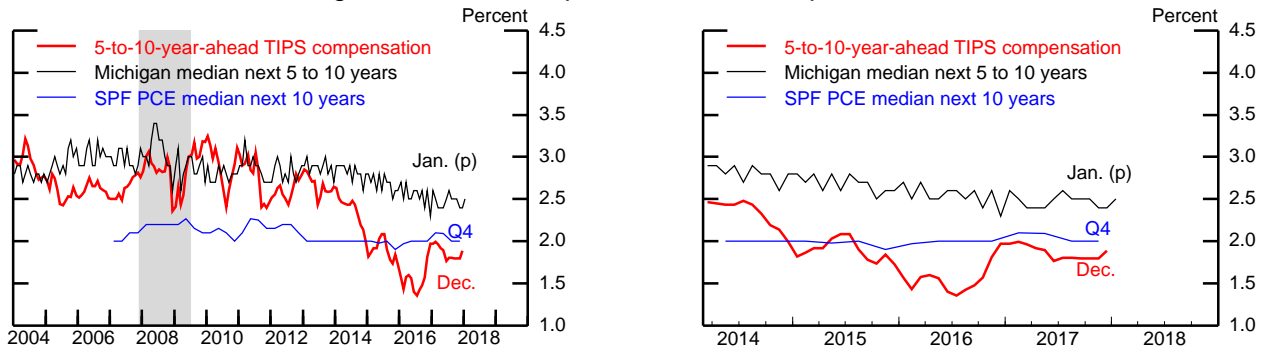
Note: Futures prices (dotted lines) are the latest observations on monthly futures contracts.
 Source: For oil prices, U.S. Department of Energy, Energy Information Agency; for commodity prices, Commodity Research Bureau (CRB).

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.
 (p) Preliminary.

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

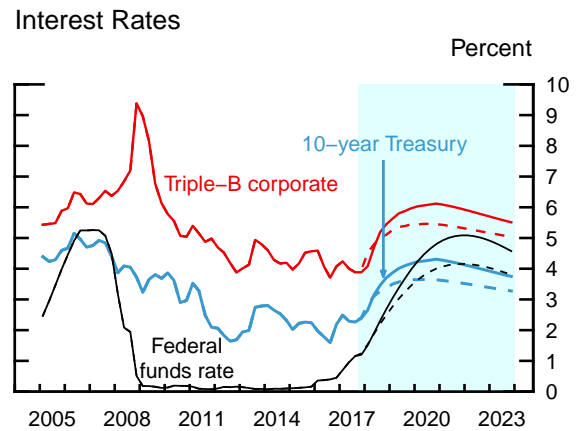
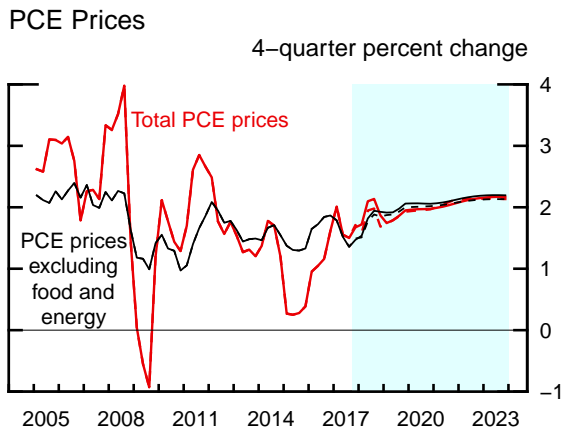
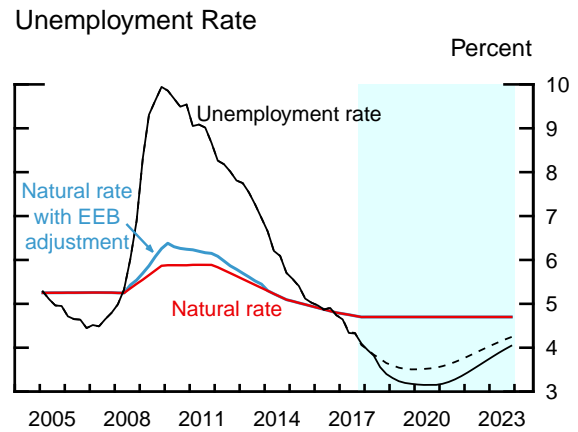
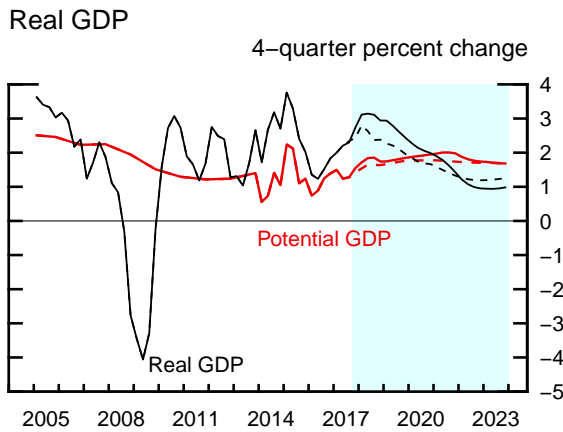
Note: The gray shaded bars indicate a period of business recession as defined by the National Bureau of Economic Research.

The Long-Term Outlook

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

| Measure | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | Longer run |
|---|------|------|------|------|------|------|------|------------|
| Real GDP | 2.7 | 2.9 | 2.4 | 2.0 | 1.4 | 1.0 | 1.0 | 1.7 |
| Previous Tealbook | 2.4 | 2.4 | 2.0 | 1.7 | 1.3 | 1.2 | 1.3 | 1.7 |
| Civilian unemployment rate ¹ | 4.1 | 3.4 | 3.2 | 3.2 | 3.4 | 3.7 | 4.0 | 4.7 |
| Previous Tealbook | 4.1 | 3.6 | 3.5 | 3.5 | 3.7 | 4.0 | 4.2 | 4.7 |
| PCE prices, total | 1.7 | 1.9 | 1.9 | 2.0 | 2.1 | 2.2 | 2.2 | 2.0 |
| Previous Tealbook | 1.7 | 1.7 | 1.9 | 2.0 | 2.1 | 2.1 | 2.1 | 2.0 |
| Core PCE prices | 1.5 | 1.9 | 2.1 | 2.1 | 2.1 | 2.2 | 2.2 | 2.0 |
| Previous Tealbook | 1.5 | 1.8 | 2.0 | 2.0 | 2.1 | 2.1 | 2.1 | 2.0 |
| Federal funds rate ¹ | 1.20 | 2.69 | 3.99 | 4.80 | 5.09 | 4.95 | 4.57 | 2.50 |
| Previous Tealbook | 1.25 | 2.50 | 3.46 | 4.00 | 4.16 | 4.05 | 3.80 | 2.50 |
| 10-year Treasury yield ¹ | 2.4 | 3.7 | 4.2 | 4.3 | 4.2 | 3.9 | 3.7 | 3.2 |
| Previous Tealbook | 2.4 | 3.4 | 3.7 | 3.6 | 3.5 | 3.4 | 3.3 | 2.9 |

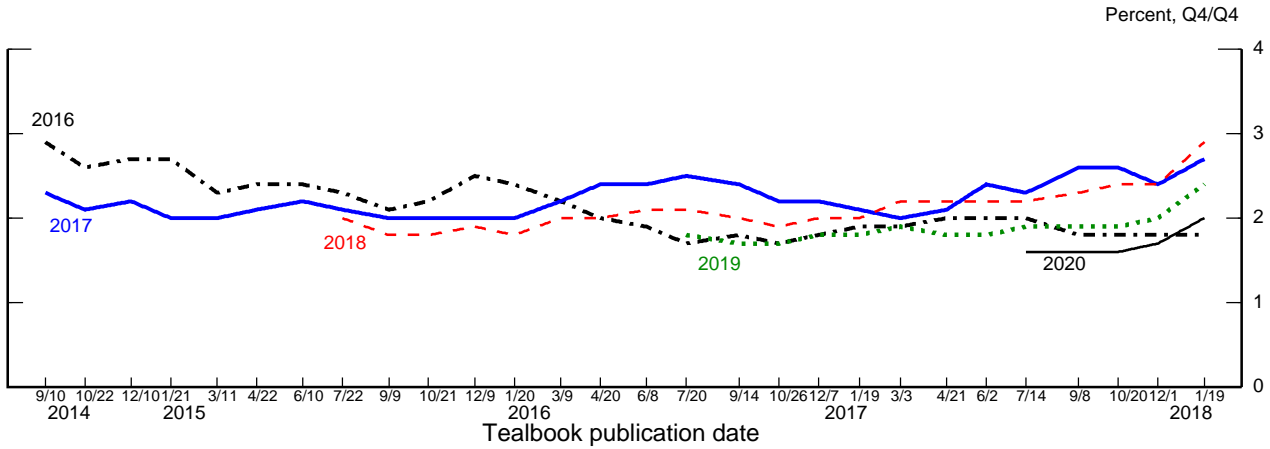
1. Percent, average for the final quarter of the period.



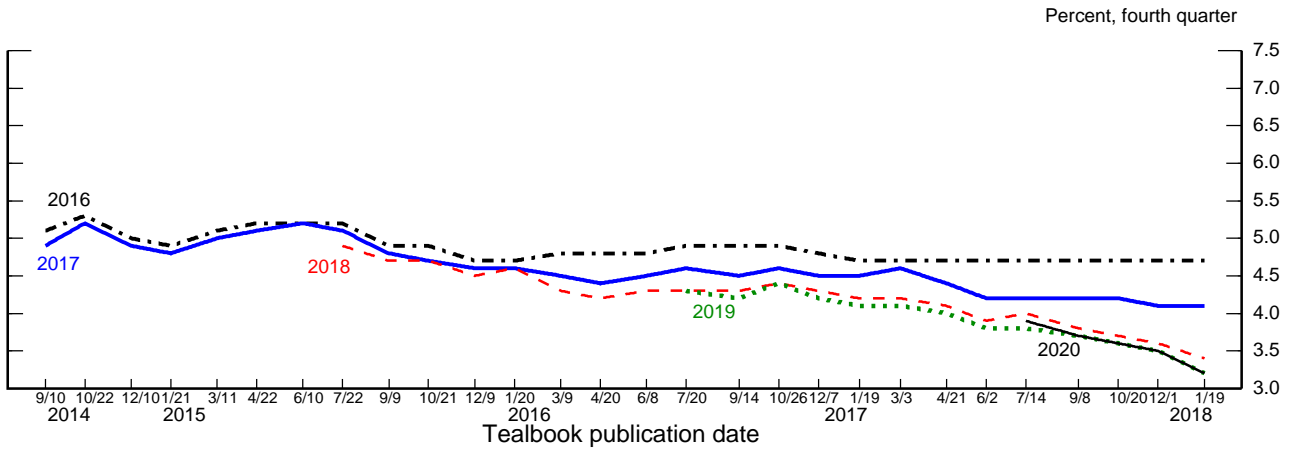
Note: In each panel, shading represents the projection period, and dashed lines are the previous Tealbook.

Evolution of the Staff Forecast

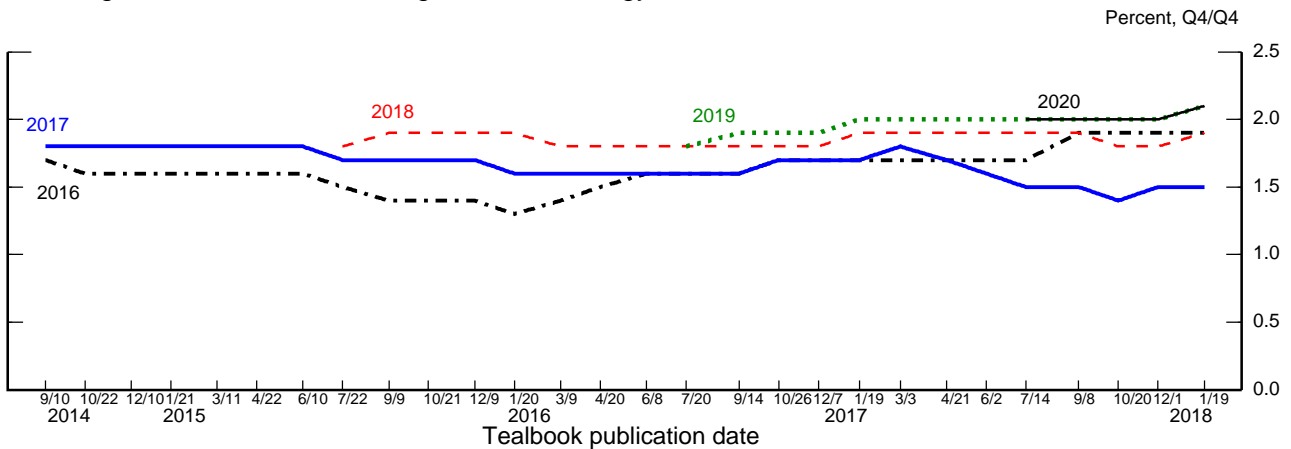
Change in Real GDP



Unemployment Rate



Change in PCE Prices excluding Food and Energy



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International Economic Developments and Outlook

The outlook for foreign growth remains upbeat and is notably stronger than we anticipated in the December Tealbook, reflecting solid incoming data and expectations of positive spillovers from the recently passed U.S. tax package. We estimate that real foreign GDP growth rose to 3 percent at an annual rate last quarter after dipping in the third quarter, held down by natural disasters in Mexico. We project that growth will remain near 3 percent in 2018 before moderating to 2¾ percent in 2019 and 2020, supported by buoyant financial markets, accommodative monetary policies, and a strong U.S. economy. Relative to the December Tealbook, our foreign growth outlook is about ¼ percentage point higher over the next few quarters and a bit less thereafter, reflecting stronger-than-expected data and the upward revision to the U.S. outlook.

In the advanced foreign economies (AFEs), despite the firm economic expansion, underlying inflation in some countries shows little sign of a sustained pickup. Strong global demand has boosted the price of oil and other commodities, helping raise aggregate AFE headline inflation to an annual rate above 2 percent in the fourth quarter, but core inflation moved lower in the euro area and appears to have remained near zero in Japan. Consequently, we still expect the Bank of Japan to leave its short-term rates unchanged over the forecast period. Recent communications from the European Central Bank (ECB) and the Bank of Canada (BOC) highlighted the strength of their economies, and we marked up the projected path of monetary policy in these economies a touch. We now project ECB liftoff in the first quarter of 2019, one quarter earlier than assumed in the December Tealbook, and we have penciled in an additional 25 basis point hike by the BOC in 2019.

In the emerging market economies, headline inflation has also been boosted by rising oil prices. Mexico's inflation is down since the beginning of last year but remains well above its 3 percent target, raising concerns about underlying inflationary pressures. Consequently, the Bank of Mexico (BOM) raised its policy rate another 25 basis points in December.

The upbeat foreign growth forecast is not without risks. In addition to perpetual concerns about a Chinese hard landing, with market valuations at high levels in many economies, financial markets could suffer a correction. We explore this risk in the

“Global Market Correction” alternative scenario in the Risks and Uncertainty section. But there is also upside potential to our outlook, as the strong momentum of the global economy suggests that foreign growth could again positively surprise us. In this case, AFE central banks might normalize monetary policy more aggressively than our baseline rules would call for, and we explore the potential ramifications of this situation in the “Stronger Foreign Growth and Tighter Policy” alternative scenario.

ADVANCED FOREIGN ECONOMIES

- **Canada.** We estimate that GDP growth edged up to 2 percent in the fourth quarter. Although this pace is slightly below our December forecast—partly reflecting disruptions in the auto and oil industries—indicators from late in the quarter, such as the December labor force survey, were buoyant. Boosted by domestic momentum and strong foreign demand, growth is expected to step up to 2¼ percent in 2018 before slowing to just below 2 percent in 2020. Relative to the December Tealbook, this projection is nearly ¼ percentage point higher over the next three years, largely because of stronger projected U.S. demand.

The BOC raised its policy rate 25 basis points to 1.25 percent at its January meeting, as we expected, alluding to rising inflation and diminishing labor market slack. Given the brighter growth outlook, we have added an additional rate hike of 25 basis points in 2019, taking our projection of the policy rate to 3 percent by mid-2020.

- **Euro area.** Economic indicators—including PMIs, confidence surveys, and industrial production—continue to point to surprising strength. We estimate that the euro-area economy expanded at a 2½ percent pace in the fourth quarter. We expect GDP growth to proceed at a similar pace this quarter before decelerating gradually to 1¾ percent in 2019, around our estimate of potential. Compared with December, this path is up ½ percentage point and nearly ¼ percentage point in 2018 and 2019, respectively, as a result of the stronger domestic momentum and external demand.

Despite robust growth and tightening labor markets, core inflation remained weak and dropped to 0.3 percent in the fourth quarter at an annual rate, in part because of idiosyncratic factors such as a one-off decline in education fees. In contrast, headline inflation jumped from 1 percent to 1.7 percent as a result of higher retail energy prices. Headline inflation is projected to fall back this year before gradually climbing

again to 1¾ percent by the end of the forecast period, still below the ECB’s target of 2 percent.

- **United Kingdom.** Solid economic indicators, including PMIs, consumer confidence, and industrial production, suggest that real GDP growth edged up slightly to 1¾ percent in the fourth quarter of 2017. We project that growth will stay close to this pace over the first half of 2018, decelerate modestly to about 1½ percent by the first quarter of 2019, and then stay at about that rate thereafter. Brexit will officially take effect in March 2019, followed by a transition period that is still being negotiated. We estimate Brexit should hold down potential growth about 0.3 percentage point in coming years.

Inflation is expected to inch down from 3 percent in the fourth quarter to 2¾ percent in the current quarter and to continue falling gradually—as the boost from higher oil prices and pass-through from earlier sterling depreciation fades—until reaching the Bank of England’s (BOE) 2 percent target in the second half of 2020. In line with its announced forward guidance, the BOE is expected to raise its policy rate only gradually over the next few years, reaching a mere 1¼ percent by the end of 2020.

- **Japan.** Even though we still see real GDP as having decelerated in the fourth quarter, the upbeat tone of recent data, including private consumption data through November, led us to substantially boost our fourth-quarter growth estimate to 2 percent, well above our potential growth estimate of ¾ percent. Given this stronger domestic momentum and the higher forecast for global growth, we also revised up our outlook for the Japanese economy a bit thereafter. Even so, we see growth moderating further to a more sustainable 1 percent pace in 2018 and, following the implementation of a long-planned consumption tax hike, temporarily falling to only ¼ percent in 2019.

We estimate that total inflation increased sharply to 2¼ percent at an annual rate in the fourth quarter from just 0.4 percent in the third, reflecting a surge in retail energy prices. Core inflation remained disappointingly weak at less than ½ percent. With extremely tight labor markets still failing to revive underlying inflation, we slightly lowered the forecast for 2018 and 2019 and have inflation rising to only 1 percent by the end of the forecast period. We continue to assume that monetary policy will remain highly accommodative throughout the forecast period.

EMERGING MARKET ECONOMIES

- **China.** Real GDP growth edged up to 6.8 percent in the fourth quarter, slightly above our December Tealbook forecast. Growth was boosted by relatively strong exports, which helped offset the drag from domestic credit tightening and curbs on production in heavily polluting industries. We expect domestic demand growth to continue to trend downward as Chinese authorities move cautiously to address risks in the financial sector and property market and to curtail local government spending. Slower domestic demand growth should be partly offset by strong external demand. As such, we see growth slowing only slightly this year to a bit above the authorities' reported 6½ percent growth target before edging down to 6 percent by 2020. This path is about ¼ percentage point above that in the December Tealbook as a result of incoming data and further projected strengthening of external demand.

We estimate that inflation rose to 3½ percent in the fourth quarter from very subdued levels earlier in 2017, as both food and energy inflation increased. We see inflation moving back down to its longer-term trend of 2½ percent by the middle of this year.

- **Other Emerging Asia.** We estimate that real GDP growth moderated to 4½ percent in the fourth quarter from 5.1 percent in the third quarter but is still above our estimate of trend growth. Although export growth stepped down after surging in the third quarter, strong PMI readings—including new export orders—suggest that manufacturing activity in emerging Asia retains plenty of momentum. This momentum, together with the stronger projected demand from the advanced economies, led us to revise up growth ¼ percentage point this year and a touch over the remainder of the forecast period. We now see growth at 4 percent this year before slowing to a trendlike 3¾ percent pace by 2020.
- **Mexico.** We estimate that real GDP growth rebounded to 2¾ percent last quarter following a contraction related to the hurricane and earthquake in September. This rebound is smaller than we had projected in December; while manufacturing exports have picked up and oil production has resumed, construction activity in the wake of the earthquake has remained weak. However, we see relatively strong 3¼ percent growth in the first half of this year, about ½ percentage point higher than our December Tealbook projection, reflecting the upward revisions to the forecast for U.S. manufacturing production. Thereafter, growth should moderate a bit as tighter Mexican monetary policy partially offsets the effects of stronger external demand.

Uncertainty about the future of NAFTA and the Mexican presidential election in July add significant downside risk to this outlook.

Although quarterly inflation rates have come down since early last year, they have done so only slowly, and base effects helped push 12-month inflation to a 17-year high of 6.8 percent in December. In response, the BOM raised its policy rate 25 basis points to 7¼ percent at its December meeting, the first meeting under its new governor, Alejandro Díaz de León. We expect the BOM to raise its policy rate further in its next two meetings by a cumulative 50 basis points. Next year, as inflation declines, we expect the BOM to begin easing policy.

- **Brazil.** Real GDP growth is estimated to have moved up to 1½ percent in the fourth quarter from only 0.6 percent in the third. Tumbling retail sales in October point to a weak start to the quarter, although subsequent data releases have been more positive. We expect growth to increase to 2½ percent in 2018, boosted by last year's considerable monetary policy easing but somewhat constrained by the short-run costs of fiscal reform efforts and political uncertainty stemming from elections this October. We see growth rising to 3 percent in 2019 as this uncertainty fades. Relative to the December Tealbook, growth is ½ percentage point higher in 2018 and 2019.

Headline inflation in Brazil was about 3 percent last year, well below the target of 4½ percent. Amid substantial resource slack, core inflation was subdued, while headline inflation was further restrained by falling food prices. As food prices normalize, we see inflation rising to a still-benign 4¼ percent in the current quarter and remaining around that pace over the forecast period. With inflation contained and activity weak, the Central Bank of Brazil cut its policy rate 50 basis points to 7 percent in December. We expect one more 25 basis point cut before the easing cycle ends, bringing the cumulative reduction in the policy rate since September 2016 to 7½ percentage points.

The Foreign GDP Outlook

Real GDP*

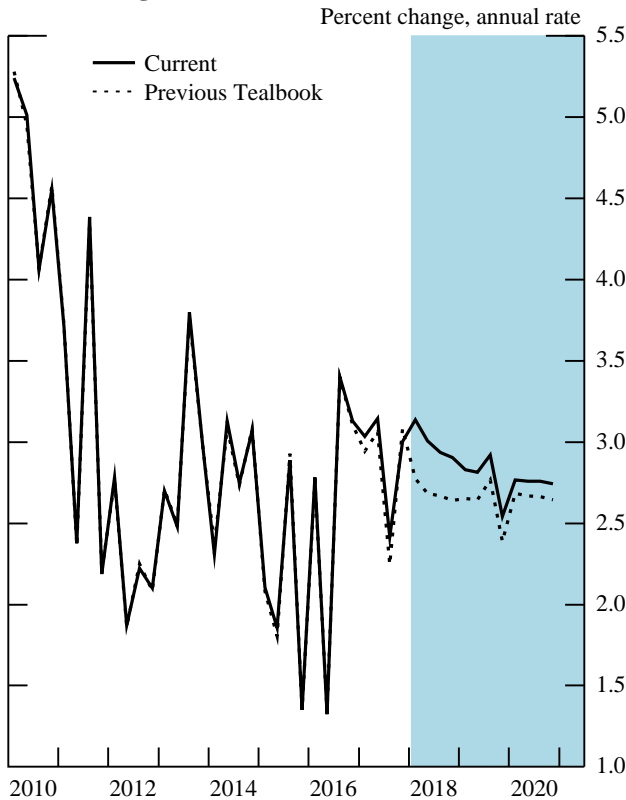
Percent change, annual rate

| | 2017 | | | 2018 | | | 2019 | 2020 |
|-------------------------------|------|------|-----|------|-----|-----|------|------|
| | H1 | Q3 | Q4 | Q1 | Q2 | H2 | | |
| 1. Total Foreign | 3.1 | 2.4 | 3.0 | 3.1 | 3.0 | 2.9 | 2.8 | 2.8 |
| Previous Tealbook | 3.0 | 2.2 | 3.1 | 2.8 | 2.7 | 2.7 | 2.6 | 2.7 |
| 2. Advanced Foreign Economies | 3.0 | 2.2 | 2.2 | 2.2 | 2.1 | 2.0 | 1.8 | 1.7 |
| Previous Tealbook | 2.9 | 2.0 | 2.1 | 2.0 | 1.8 | 1.7 | 1.6 | 1.7 |
| 3. Canada | 4.0 | 1.7 | 2.0 | 2.4 | 2.3 | 2.2 | 2.0 | 1.9 |
| 4. Euro Area | 2.7 | 2.9 | 2.6 | 2.4 | 2.1 | 2.1 | 1.8 | 1.7 |
| 5. Japan | 2.2 | 2.5 | 2.0 | 1.4 | 1.2 | 1.0 | .3 | .9 |
| 6. United Kingdom | 1.2 | 1.6 | 1.8 | 1.7 | 1.7 | 1.6 | 1.6 | 1.6 |
| 7. Emerging Market Economies | 3.1 | 2.6 | 3.8 | 4.0 | 3.9 | 3.8 | 3.8 | 3.8 |
| Previous Tealbook | 3.1 | 2.5 | 4.0 | 3.6 | 3.6 | 3.6 | 3.6 | 3.7 |
| 8. China | 6.9 | 6.5 | 6.8 | 6.7 | 6.6 | 6.4 | 6.2 | 5.9 |
| 9. Emerging Asia ex. China | 4.2 | 5.1 | 4.4 | 4.2 | 4.0 | 4.0 | 3.8 | 3.7 |
| 10. Mexico | 1.7 | -1.2 | 2.7 | 3.2 | 3.0 | 2.8 | 2.9 | 3.0 |
| 11. Brazil | 4.0 | .6 | 1.5 | 2.5 | 2.5 | 2.5 | 3.0 | 2.6 |

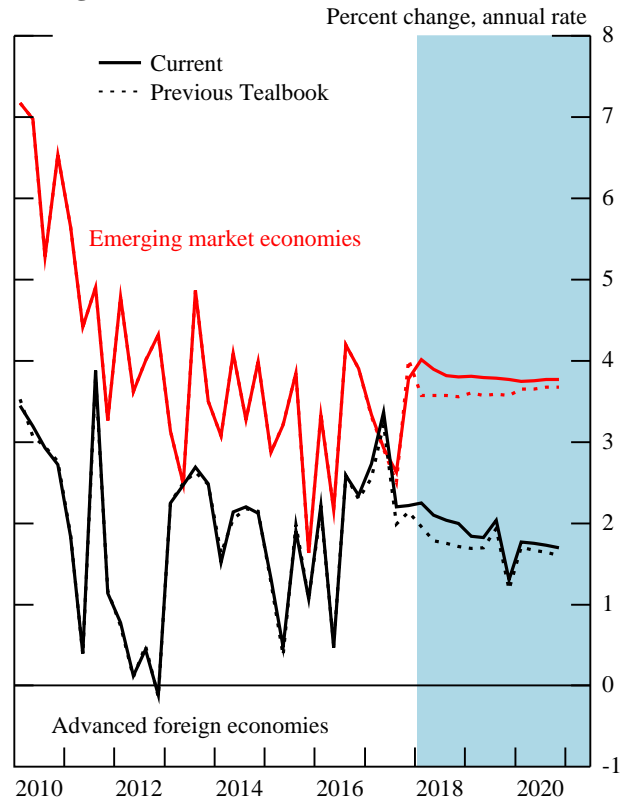
* GDP aggregates weighted by shares of U.S. merchandise exports.

Int'l Econ Devel & Outlook

Total Foreign GDP



Foreign GDP



The Foreign Inflation Outlook

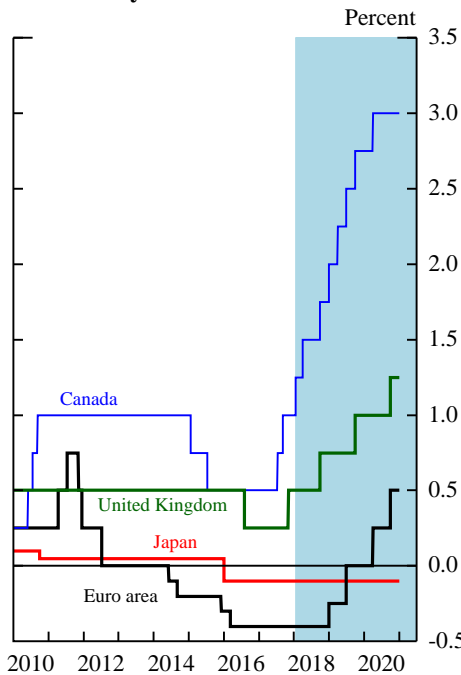
| Consumer Prices* | Percent change, annual rate | | | | | | | |
|-------------------------------|-----------------------------|-----|-----|------|-----|-----|------|------|
| | 2017 | | | 2018 | | | 2019 | 2020 |
| | H1 | Q3 | Q4 | Q1 | Q2 | H2 | | |
| 1. Total Foreign | 2.4 | 2.2 | 3.1 | 2.9 | 2.5 | 2.5 | 2.5 | 2.4 |
| Previous Tealbook | 2.4 | 2.2 | 2.6 | 2.5 | 2.5 | 2.5 | 2.5 | 2.4 |
| 2. Advanced Foreign Economies | 1.3 | 1.1 | 2.1 | 2.0 | 1.6 | 1.5 | 1.8 | 1.7 |
| Previous Tealbook | 1.3 | 1.1 | 1.8 | 1.7 | 1.6 | 1.6 | 1.9 | 1.7 |
| 3. Canada | 1.3 | 1.2 | 2.5 | 2.3 | 2.3 | 2.2 | 2.0 | 2.0 |
| 4. Euro Area | 1.5 | 1.0 | 1.7 | 1.9 | 1.3 | 1.4 | 1.5 | 1.7 |
| 5. Japan | -.2 | .4 | 2.3 | 1.3 | .6 | .6 | 2.2 | 1.0 |
| 6. United Kingdom | 3.4 | 2.4 | 2.9 | 2.8 | 2.3 | 2.2 | 2.2 | 2.1 |
| 7. Emerging Market Economies | 3.3 | 3.0 | 3.8 | 3.6 | 3.3 | 3.2 | 3.0 | 2.9 |
| Previous Tealbook | 3.3 | 3.0 | 3.1 | 3.0 | 3.1 | 3.1 | 3.0 | 2.9 |
| 8. China | .9 | 2.0 | 3.5 | 2.8 | 2.5 | 2.5 | 2.5 | 2.5 |
| 9. Emerging Asia ex. China | 2.0 | 2.1 | 3.1 | 3.5 | 3.3 | 3.2 | 3.1 | 3.0 |
| 10. Mexico | 8.4 | 5.1 | 4.5 | 4.4 | 3.7 | 3.6 | 3.2 | 3.2 |
| 11. Brazil | 2.7 | 2.3 | 3.6 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 |

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

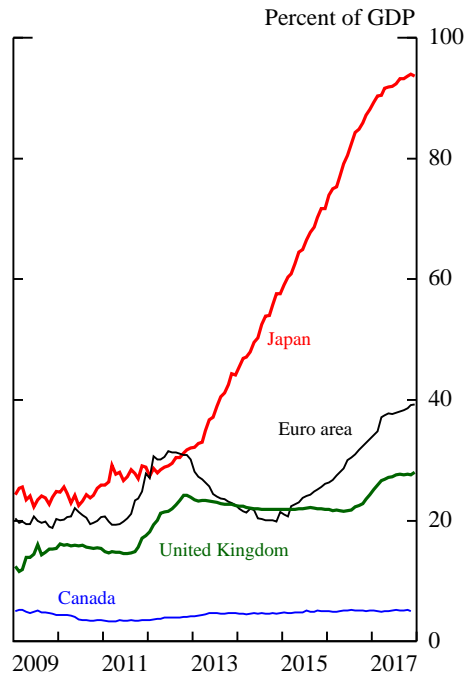
Int'l Econ Devel & Outlook

Foreign Monetary Policy

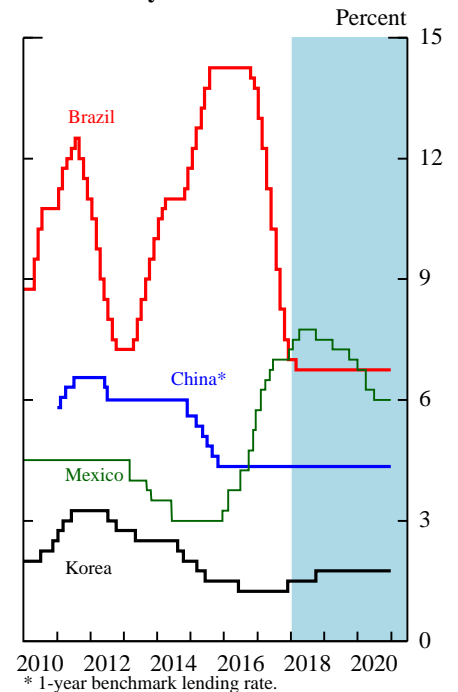
AFE Policy Rates



AFE Central Bank Balance Sheets

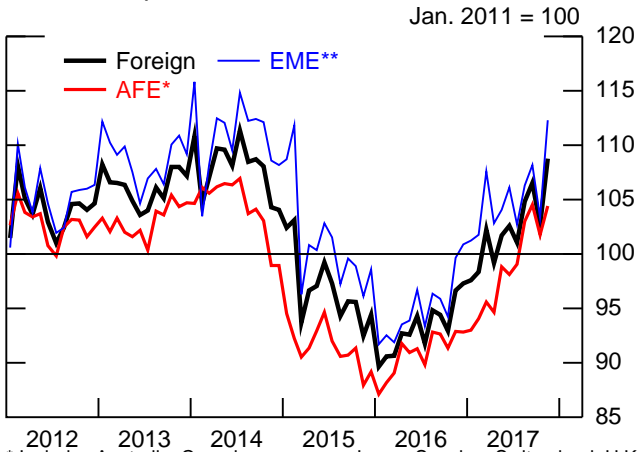


EME Policy Rates



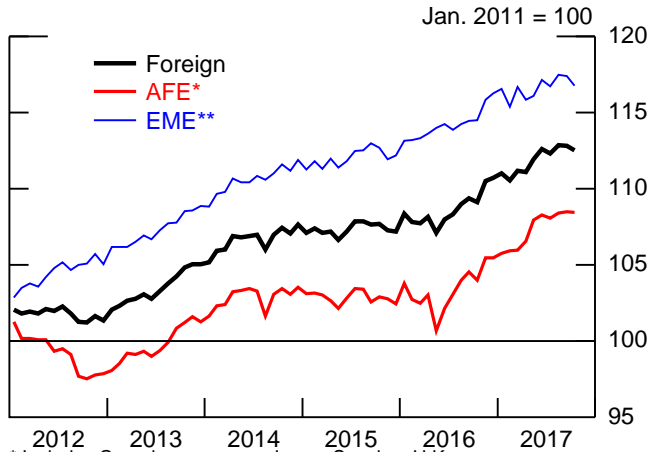
Recent Foreign Indicators

Nominal Exports



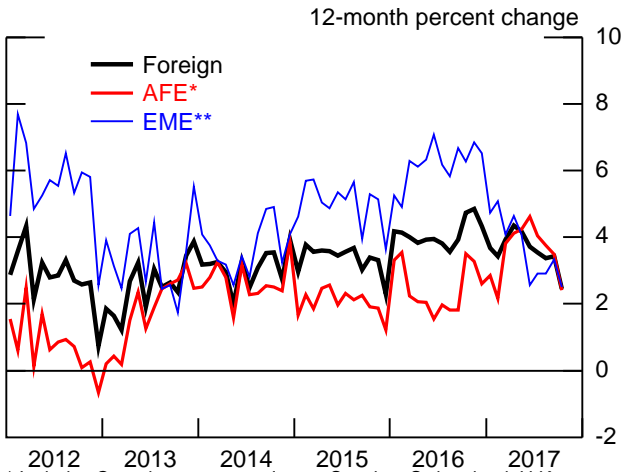
* Includes Australia, Canada, euro area, Japan, Sweden, Switzerland, U.K.
 ** Includes Argentina, Brazil, Chile, China, Colombia, Hong Kong, India, Indonesia, Israel, Korea, Malaysia, Mexico, Singapore, Taiwan, Thailand.

Industrial Production



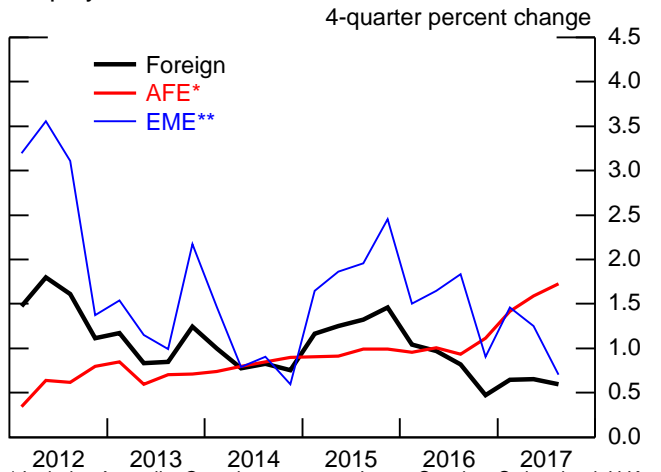
* Includes Canada, euro area, Japan, Sweden, U.K.
 ** Includes Argentina, Brazil, Chile, China, Colombia, India, Indonesia, Israel, Korea, Malaysia, Mexico, Philippines, Russia, Singapore, Taiwan, Thailand.

Retail Sales



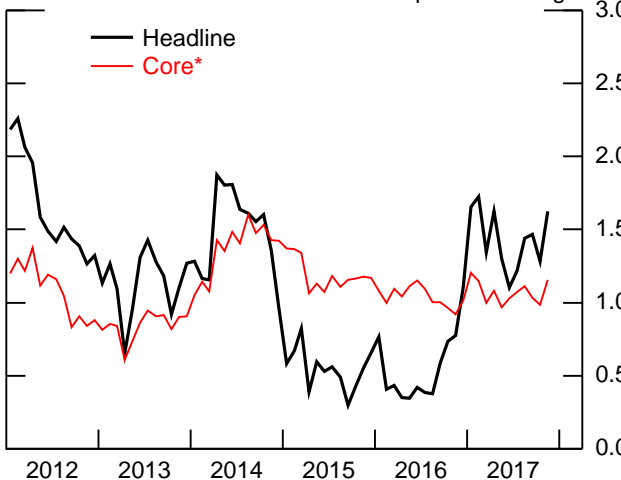
* Includes Canada, euro area, Japan, Sweden, Switzerland, U.K.
 ** Includes Brazil, Chile, China, Korea, Mexico, Singapore, Taiwan.

Employment



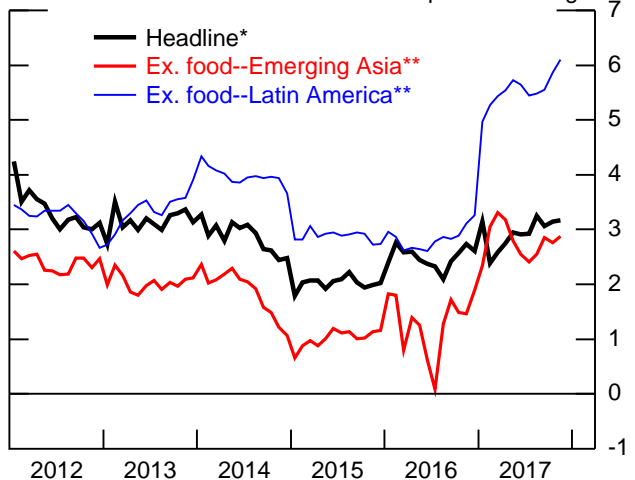
* Includes Australia, Canada, euro area, Japan, Sweden, Switzerland, U.K.
 ** Includes Chile, Colombia, Hong Kong, Israel, Korea, Mexico, Philippines, Russia, Singapore, Taiwan, Thailand, Turkey.

Consumer Prices: Advanced Foreign Economies
 12-month percent change



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

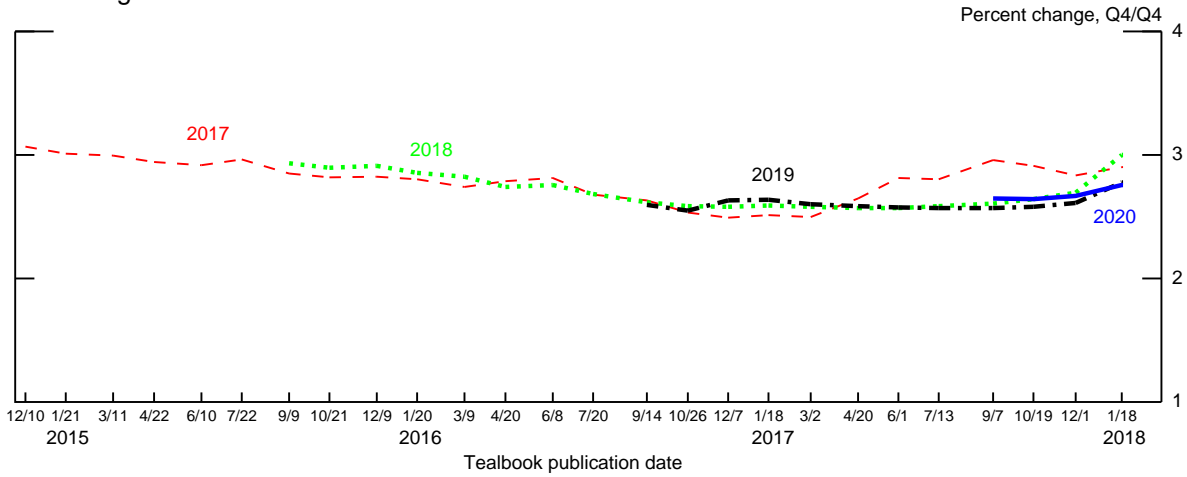
Consumer Prices: Emerging Market Economies
 12-month percent change



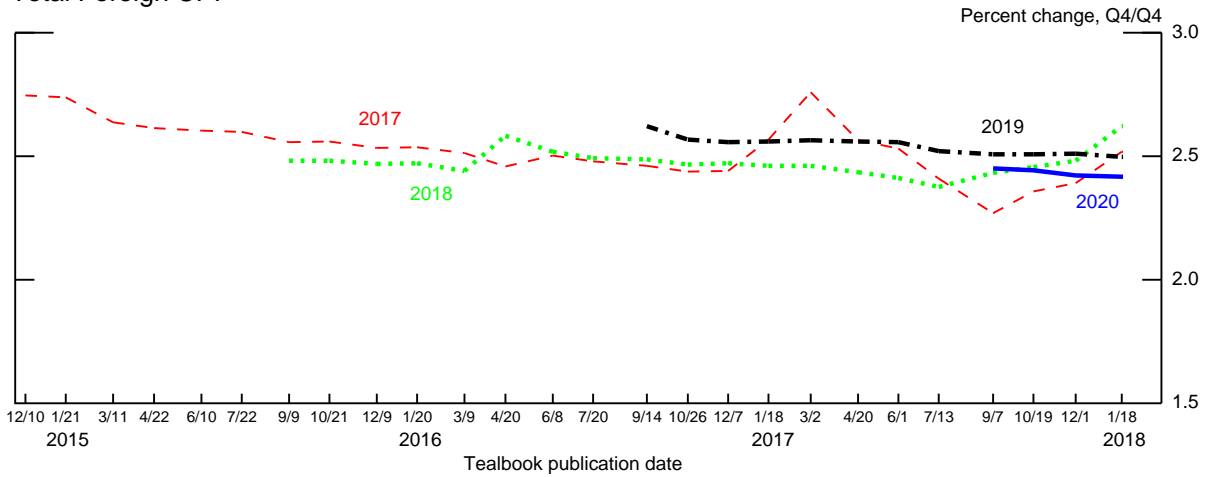
* Includes Brazil, Chile, China, Colombia, Hong Kong, India, Indonesia, Korea, Malaysia, Mexico, Philippines, Singapore, Taiwan, Thailand.
 ** Excludes all food; staff calculation. Excludes Argentina and Venezuela.

Evolution of Staff's International Forecast

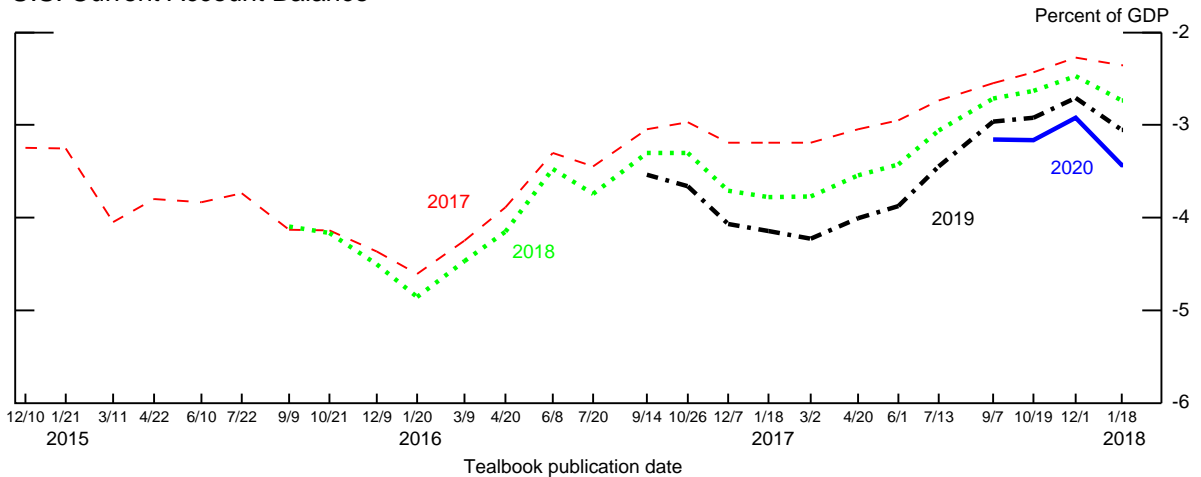
Total Foreign GDP



Total Foreign CPI



U.S. Current Account Balance



Int'l Econ Devel & Outlook

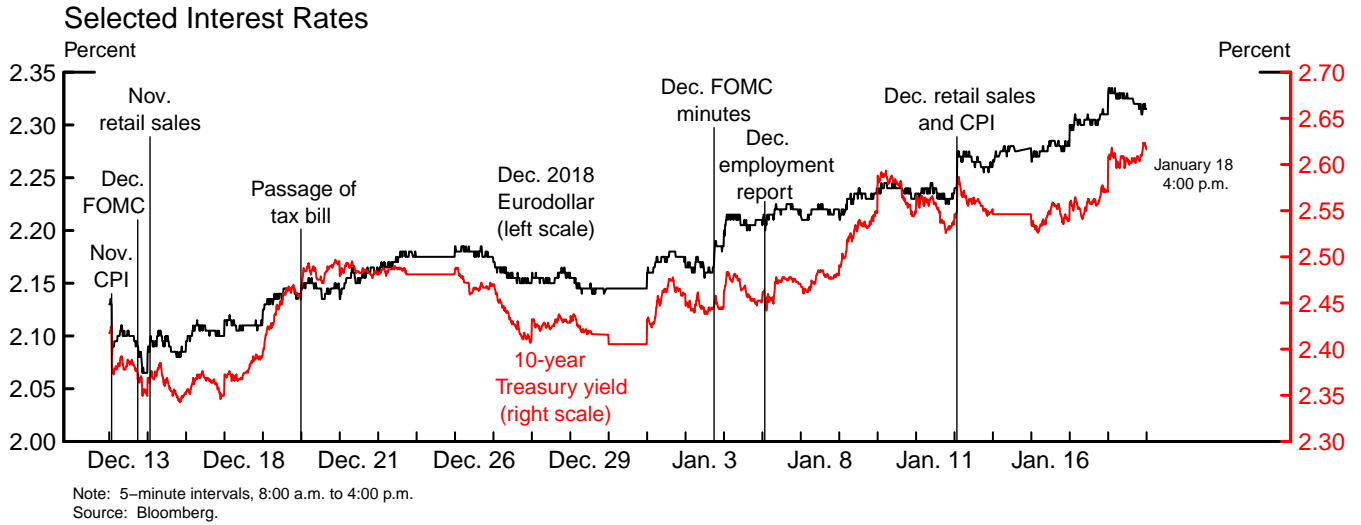
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Financial Market Developments

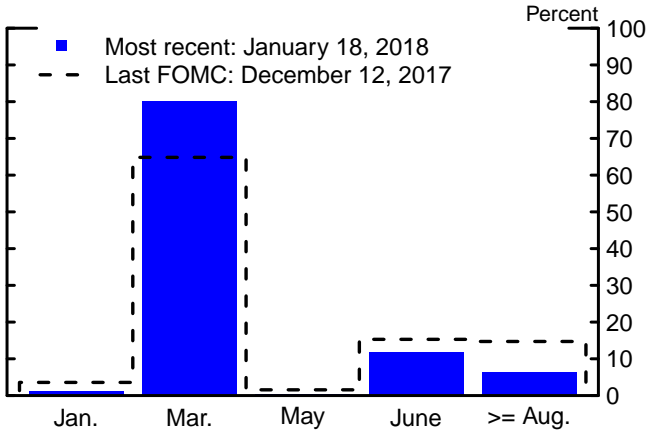
Treasury yields and prices of domestic equities have risen substantially on net since the December FOMC meeting, boosted in part by investor perceptions of a strengthening growth outlook in the United States and abroad. Measures of inflation compensation also rose amid further dollar depreciation and higher commodity prices. FOMC communications over the period appear to have had little effect on financial markets.

- A straight read of market quotes implies that the probability of a rate hike at the January FOMC meeting remained close to zero, while the probability of a rate increase in March rose to 80 percent.
- The nominal Treasury yield curve shifted up, with 2-, 5-, and 10-year Treasury yields all rising about 20 basis points on net.
- The rise in nominal yields was about evenly split between increases in real yields and inflation compensation, with TIPS-based measures of inflation compensation rising 10 basis points at the 5-year horizon and 16 basis points at the 5-to-10-year horizon.
- Broad U.S. equity price indexes increased about 5 percent, led by the energy and consumer retail sector. The VIX edged up but remained near its historical low. Credit spreads on both investment- and speculative-grade corporate bonds remained low.
- The broad dollar depreciated 3 percent amid strong foreign data releases and monetary policy communications that were less accommodative than expected in some economies. Foreign equity markets were buoyed by positive economic data and, especially in the emerging markets, rising commodity prices.
- Conditions in money markets were reported to have remained orderly over year-end, although offshore dollar funding markets were somewhat volatile.

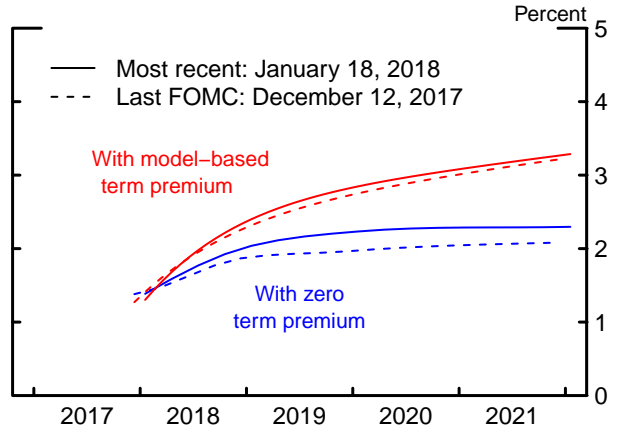
Policy Expectations and Treasury Yields



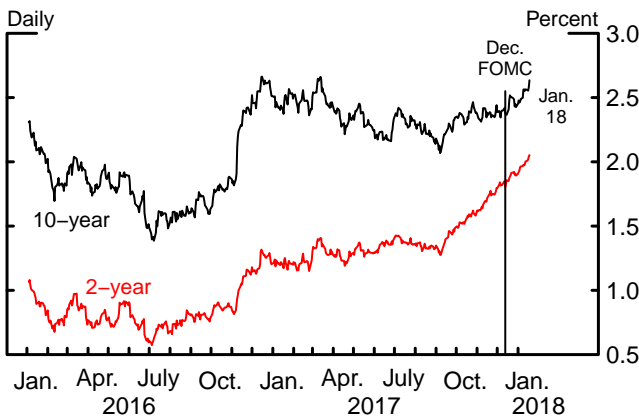
Market-Implied Probability Distribution of the Timing of Next Rate Increase



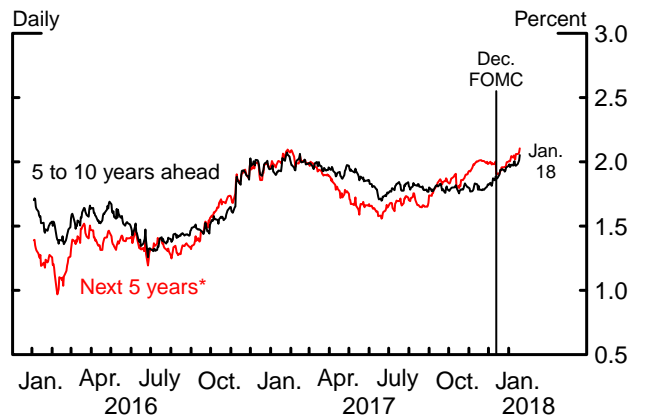
Implied Federal Funds Rate



Nominal Treasury Yields



Inflation Compensation



Financial Markets

POLICY EXPECTATIONS AND ASSET MARKET DEVELOPMENTS

Domestic Developments

Over the intermeeting period, FOMC communications were generally viewed by market participants as consistent with their expectations for continued gradual removal of monetary policy accommodation and did not prompt significant price action. The Committee's decision to raise the target range for the federal funds rate at the December meeting was widely expected. Nonetheless, market commentaries highlighted that the median projections in the Summary of Economic Projections for the federal funds rate at the end of 2018 and 2019 were unchanged from September, even though the median projections for real GDP growth over the next three years were revised up and the median projections for the unemployment rate were revised down.

Domestic data releases over this period were somewhat stronger than expected on balance. Both November and December retail sales printed above market consensus forecasts. Core CPI inflation was softer than expected for November but came in above expectations for December. The BLS Employment Situation release for December was seen as slightly weaker than expected, on net, but was not cited by investors as materially changing their outlook for the domestic economy or near-term monetary policy.

A straight read of quotes on federal funds futures contracts shows that market participants continued to place essentially zero probability on an increase in the target range for the federal funds rate at the January meeting. The probability of a rate hike at the March meeting increased from around 60 percent immediately following the December FOMC meeting to 80 percent. Further out, the OIS-implied federal funds rates at the end of 2018 and 2019 moved up 14 basis points and 26 basis points, respectively, with a staff model attributing about half of the increases to less negative term premiums.

The nominal Treasury yield curve shifted up over the intermeeting period amid investor perceptions of an improved domestic and foreign growth outlook and less accommodative monetary policy abroad, with the 2- and 10-year yields both increasing about 20 basis points. The 10-year yield is now at its highest level since March 2017, while the spread between 2- and 10-year yields remained at around the 40th percentile of its distribution since data first became available in August 1971 (see the box “The International Experience with Inverted Yield Curves” for an international perspective on the slope of the yield curve). Treasury yields rose noticeably over the two days leading up to the passage of the Tax Cuts and Jobs Act, but market reports did not point to the tax

The International Experience with Inverted Yield Curves

In the extended Tealbook outlook, the federal funds rate surpasses the 10-year Treasury yield starting in 2020, resulting in an inverted yield curve that lasts into 2026. While such prolonged yield curve inversion is unusual for the United States, some advanced foreign economies (AFEs) have had such inversions.¹ In this discussion, we examine these experiences as they relate both to recessions and to bank performance.

Over the past 20 years for which we have reliable data, we find nine episodes in five AFEs where the yield curve was inverted for eight months or longer (see the table).² As the academic literature suggests, inversion episodes are not perfect predictors of incipient recessions: Only three inversion episodes were associated with recessions.³ In all episodes, a monetary policy tightening coincided with or preceded an inversion episode. In addition, in some cases—for example, the mid-2000s inversions in Australia and the United Kingdom—a compression in term premiums contributed to yield curve inversions.⁴

Yield Curve Inversion Episodes: Duration, Policy Tightening (T), and Recessions (R)

| | Late 1990s to Early 2000s | Mid-2000s | Late 2000s | Early 2010s |
|----------------|---------------------------|---------------|----------------|-------------|
| Australia | 10 months, T | 4 years, T | | 1 year, T |
| Canada | | 11 months, T | | |
| Norway | 4 years, T | | 1 year, T, R | |
| Sweden | | | 8 months, T, R | |
| United Kingdom | 3 years, T | 3 years, T, R | | |

Source: Interest rate data used to identify inversion episodes and policy tightenings are from Bloomberg, and GDP data used to define recessions are from the International Monetary Fund.

Independent of whether prolonged inversions precede recessions, conventional wisdom suggests that yield curve inversions should reduce the profits from maturity transformation—borrowing money on a shorter time basis than it is lent, traditionally an important function performed by banks. To test this notion, we examine data for individual commercial banks in the countries with prolonged yield curve inversions starting in the mid-2000s.⁵ Our analysis

¹ The yield curve slope is defined as the spread between 10-year and 3-month sovereign yields.

² These and other AFEs experienced prolonged inversions in earlier periods, but data limitations and different banking environments make these inversions harder to analyze and less relevant.

³ Over the same period, the United States experienced three shorter yield curve inversions, all followed by recessions. Since 1962, in every U.S. episode when a yield curve inversion preceded a recession, the FOMC had increased the federal funds rate, in many instances with the goal of curbing significant inflation pressures even at the cost of a recession. For details, see the box “Why Is the Yield Curve Inverted in the Tealbook Projection?” in the December 2017 Tealbook.

⁴ The compressions were attributed to low term premiums around the world and heavy demand for longer-duration assets from institutional investors.

⁵ This period better captures more-recent bank business models and operating environments, the available bank data are more complete, and the level and slope of the yield curves in these episodes are comparable with those projected for the United States in the extended Tealbook outlook.

shows that the association between net interest rate margins (or broader profitability metrics) and the slope of the yield curve was positive but not statistically significant.⁶ The yield curve inversions also did not appear to adversely affect bank profitability. In addition, there is little or no systematic association between yield curve inversions and indicators of bank soundness, such as the ratio of nonperforming loans to gross loans and provisions for loan losses to gross loans, or reliable signs of capital erosion. Echoing this result, financial stability reports of the mid-2000s by the Reserve Bank of Australia and the Bank of England as well as contemporaneous International Monetary Fund reports do not mention yield curve inversion as a risk to banks.

A few factors may explain these benign outcomes. First, for the banking systems in these episodes, long-term loans are largely priced as a markup over benchmark short-term interest rates: Interest payments on such loans adjust on a set schedule so that they generally reflect changes in benchmark interest rates. In particular, residential mortgage loans (which account for the bulk of bank lending) and business loans tend to be variable-rate loans that are priced off short-term rates.⁷ Only holdings of securities and a moderate portion of loans are priced off longer-term rates. Second, banks' liabilities are also largely priced off short-term rates. For example, deposits, which mostly have short maturities, account for the bulk of banks' liabilities.⁸ In addition, larger banks reportedly swap fixed interest rate payments on their bonds to variable interest rate payments, which are tied to short-term interest rates. Therefore, because loans and, effectively, liabilities are generally priced off short-term interest rates, banks' profits tend to be insulated from changes in the slope of the yield curve.

Although these past international experiences are somewhat comforting, it is unclear how directly applicable they are for the implications of the extended Tealbook outlook. U.S. commercial banks operate in a different regulatory environment, face different competitive pressures, and have different business model and lending practices.⁹ For example, a larger portion of U.S. loan supply is likely priced off longer-term rates. That said, the foreign experiences do suggest that banks can operate in ways that limit the negative effects of prolonged yield curve inversions.

⁶ The analysis uses the methodology (clustering errors by country) of Stijn Claessens, Nicholas Coleman, and Michael Donnelly (2017), “‘Low-for-Long’ Interest Rates and Banks’ Interest Margins and Profitability: Cross-Country Evidence,” International Finance Discussion Papers 1197 (Washington: Board of Governors of the Federal Reserve System, February), <https://doi.org/10.17016/IFDP.2017.1197>; the Bank for International Settlements classification of developed countries; and unconsolidated commercial bank-level data from Bankscope from 2005 to 2015.

⁷ Interest rates on mortgage loans are variable in Australia, Norway, Sweden, and the United Kingdom, and fixed or variable in Canada. See Eugenio Cerutti, Jihad Dagher, and Giovanni Dell’Ariccia (2015), “Housing Finance and Real-Estate Booms: A Cross-Country Perspective,” IMF Staff Discussion Note SDN/15/12 (Washington: International Monetary Fund, June), www.imf.org/external/pubs/ft/sdn/2015/sdn1512.pdf.

⁸ In addition, deposit interest rates may adjust sluggishly to changes in policy rates, which may temporarily boost bank profitability.

⁹ For a discussion of the U.S. case, see the January 18, 2018, Board memo titled “Implications of U.S. Yield Curve Flattening or Inversion for U.S. Banks,” by Rebecca Zarutskie.

bill as a major driver for those increases, and the final passage of the tax bill did not prompt any reaction in Treasury markets. About half of the increases in nominal yields over the intermeeting period reflected higher real yields, as 5- and 10-year TIPS yields rose 13 basis points and 8 basis points, respectively. Measures of option-implied volatility on interest rates were little changed, on net, and remained near historically low levels. The Treasury bill market showed modest signs of pressure from concerns about the debt ceiling (see the box “Projections for Federal Debt Subject to Limit”).

TIPS-based measures of inflation compensation rose 10 basis points at the 5-year horizon and 16 basis points at the 5-to-10-year horizon. Both measures are now back to their levels in early 2017 before the start of the recent trend of mostly weaker-than-expected CPI readings. Inflation compensation fell in response to the November core CPI data release that came in below expectations but subsequently moved up against the backdrop of an improving global growth outlook, higher commodity prices, a weakening dollar, and the stronger-than-expected December core CPI release. Meanwhile, estimates of expected inflation based on the staff’s real term structure model edged up.

Option-adjusted spreads on production-coupon MBS over Treasury yields were little changed over the intermeeting period. Investors continued to see the ongoing normalization of the Federal Reserve’s balance sheet as leaving little imprint on MBS and Treasury yields.¹

Since the December FOMC meeting, the S&P 500 index has continued to post solid gains. Consistent with a stronger global economic outlook and higher commodity prices, stock prices of energy and consumer retail firms noticeably outperformed those of other firms. Even though stock prices of high-tax corporations moved roughly in line with those of low-tax firms over the intermeeting period, the final stages and actual passage of the new tax bill reportedly also supported positive investor sentiment.² One-month-ahead option-implied volatility on the S&P 500 index—the VIX—edged up but remained very low by historical standards.

¹ As part of the balance sheet normalization program, \$6 billion of Treasury securities and \$4 billion of MBS were redeemed during the latest reinvestment period. Following the Committee’s directive, monthly caps on SOMA securities reductions were increased to \$12 billion for Treasury securities and to \$8 billion for agency securities in January.

² Despite higher stock prices, the staff’s estimate of expected 10-year real return on the S&P 500 index—which increases when earnings rise faster than prices—ticked higher, reflecting an upward revision in the staff’s projection for after-tax earnings following the new tax legislation.

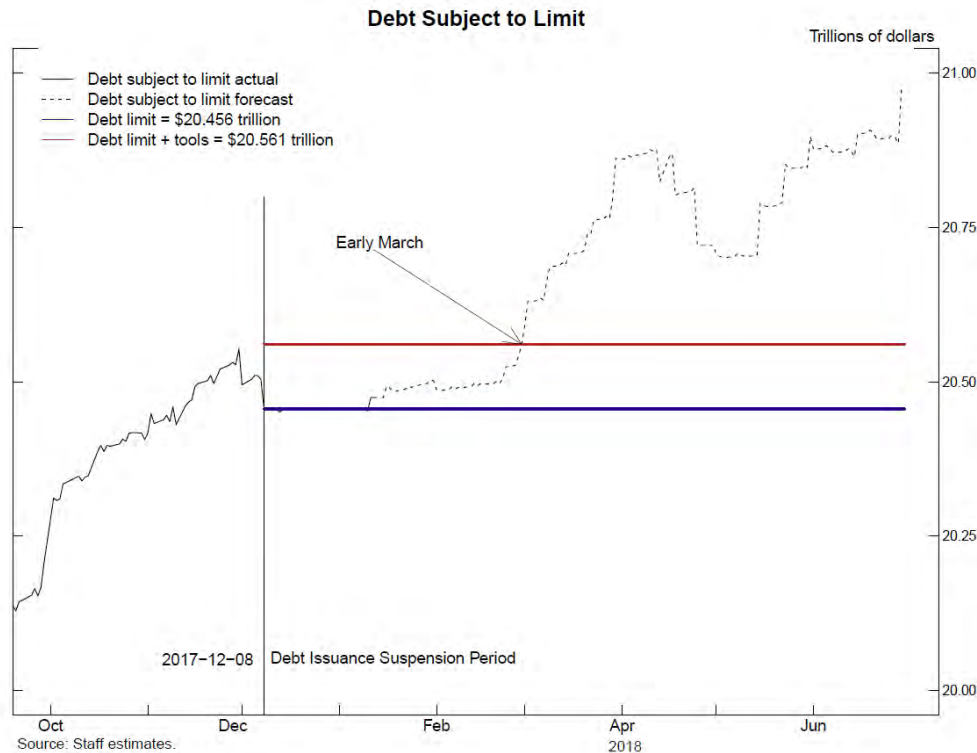
Projections for Federal Debt Subject to Limit

The statutory debt limit has been binding since December 8, 2017. The Treasury Department has been able to continue operations through its use of extraordinary measures.

Forecasts of when the Treasury will exhaust extraordinary measures and be unable to meet its obligations are subject to considerable uncertainty. The usual uncertainty associated with the timing of refunds during the spring tax-filing season is currently compounded by uncertainty created by the recently passed tax bill that will affect a variety of the Treasury’s cash flows.

The staff projection calls for the Treasury to deplete its remaining extraordinary measures by the end of February, assuming no legislation is passed.¹ By early March, the Treasury’s cash on hand is expected to cover payments for, at most, a few additional days (see figure).

At this point, pressures in financial markets related to the debt ceiling appear fairly modest. Yields on Treasury bills maturing in early March have risen and are currently 7 basis points higher than the mid-February bill; moreover, yields on potentially at-risk Treasury bills have moved higher than yields on agency discount notes with comparable maturity dates.

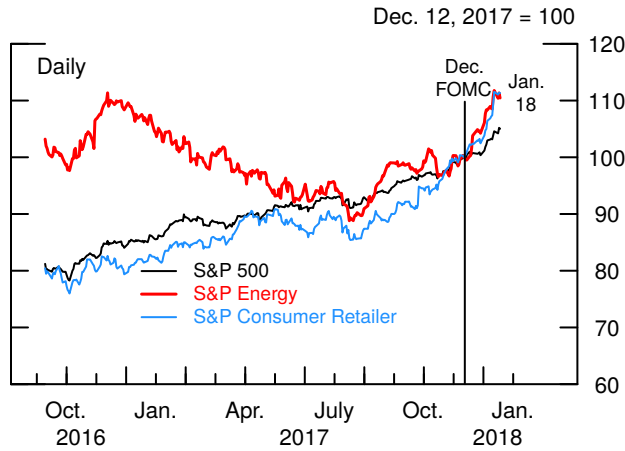


Financial Markets

¹ The Treasury is allowed to use extraordinary measures to avoid breaching the statutory debt limit. These measures include suspending and redeeming securities from government employee retirement accounts as well as suspending the daily reinvestment of dollar balances held by the Exchange Stabilization Fund.

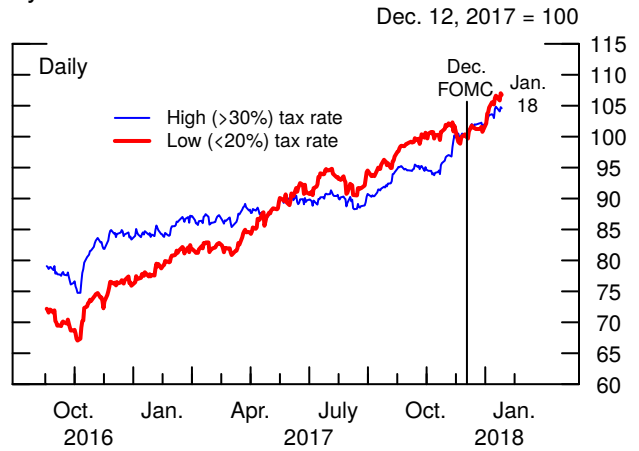
Corporate Asset Market Developments

S&P 500 Stock Price Index



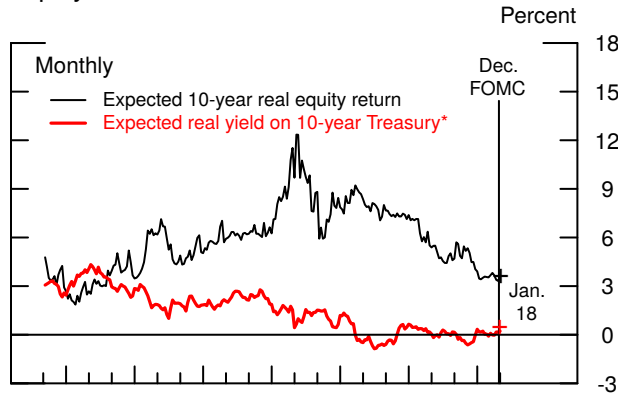
Source: Bloomberg.

Value-Weighted Stock Returns, by Domestic Tax Rate



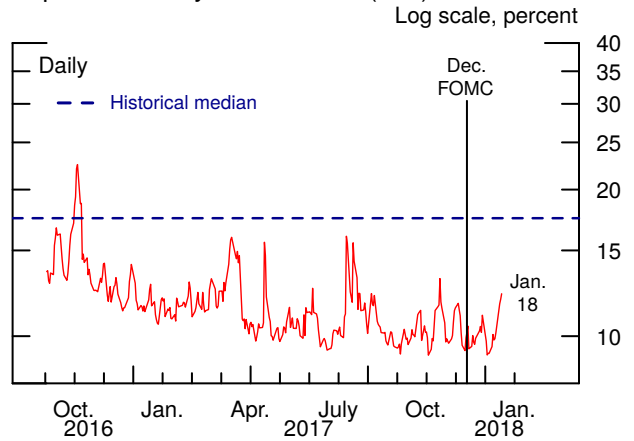
Note: The data include small firms excluding those in the financial and energy sectors. Tax rates are measured as U.S. taxes over pretax income.
Source: Compustat, Yahoo Finance.

Equity Risk Premium



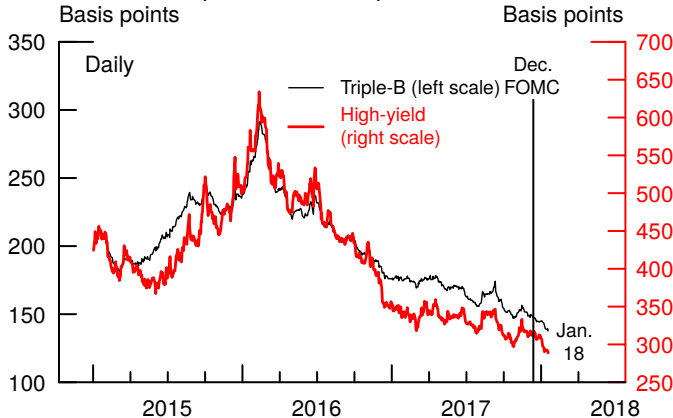
Note: The equity risk premium is the difference between the two data series.
* Off-the-run 10-year Treasury yield less Philadelphia Fed 10-year expected inflation.
+ Denotes latest observation using daily interest rates and stock prices as well as staff forecast of corporate profits.
Source: Bloomberg;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

Implied Volatility on S&P 500 (VIX)



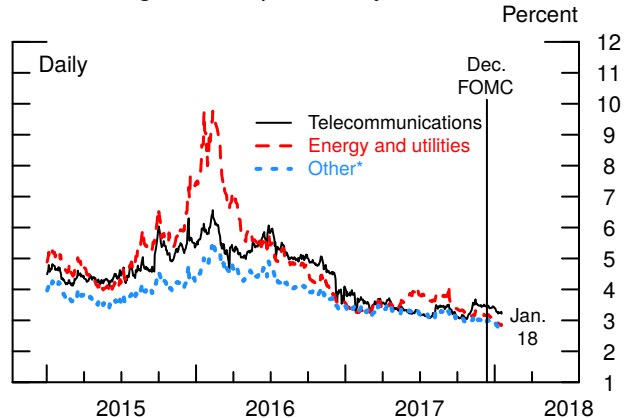
Note: Historical median is taken from 1990 onward.
Source: Chicago Board Options Exchange.

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

Yield spreads on triple-B-rated corporate bonds over comparable-maturity Treasury securities remained well below their historical median level, while spreads on speculative-grade bonds stayed near the bottom of their historical range.

Foreign Developments

Since the December FOMC meeting, positive foreign economic data and improved risk sentiment pushed risky asset prices higher. Against this backdrop, foreign yields rose, in some cases supported by central bank communications. These developments weighed on the dollar, which continued to depreciate against most currencies. On balance, the broad nominal dollar index declined 3 percent.

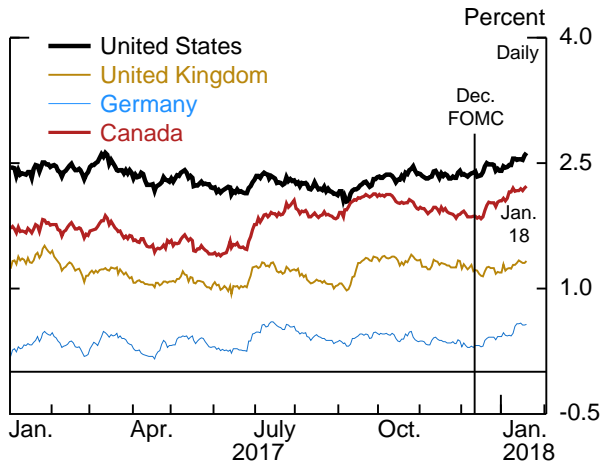
Longer-term sovereign yields moved up in most AFEs, especially in Canada and Germany, driven by both higher term premiums and expectations for less accommodative monetary policy. Market-based policy rate expectations for Canada moved up over the intermeeting period, especially in response to higher inflation and stronger employment data, and on January 17, the Bank of Canada raised its policy rate 25 basis points. The Bank of England, the Bank of Japan, and the European Central Bank (ECB) left their monetary policy stances unchanged. However, ECB communications were interpreted as less accommodative than expected, and market-based policy expectations moved up moderately in the euro area, though such measures continue to indicate a very gradual pace of monetary policy normalization.

Foreign equity prices registered robust gains. Equity prices in emerging market economies (EMEs) generally outperformed, as commodity prices increased substantially, while emerging market bond spreads narrowed moderately. Flows into EME bond and equity funds strengthened notably.

The cost of offshore dollar funding implied by currency swaps increased sharply in late December and reached multiyear highs, reportedly as several major financial institutions, including some U.S. banks, were reluctant to expand their balance sheets at year-end. Although market participants were surprised by the volatile funding costs, the volume traded at these high prices was reportedly low. Against this backdrop, the December take-up at the ECB swap facility was higher than in recent years, although it remained well below levels observed during the European debt crisis or the Global Financial Crisis. Measures of implied dollar funding costs quickly returned to more

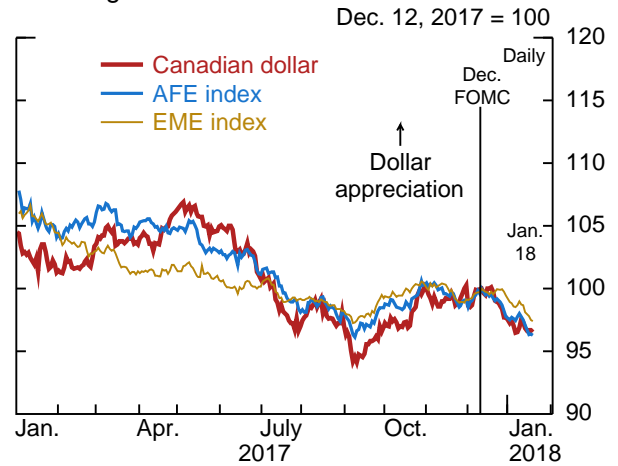
Foreign Developments

10-Year Nominal Yields



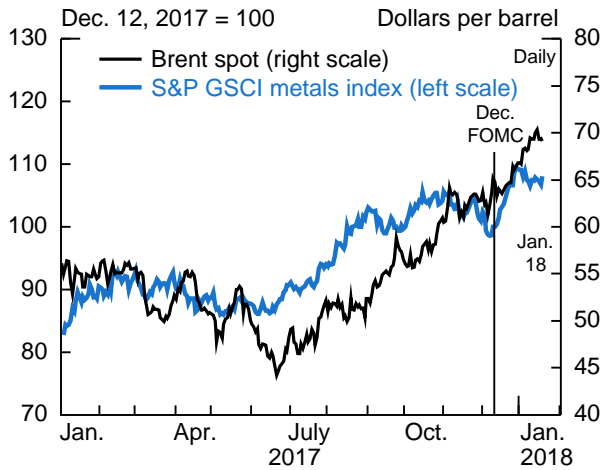
Source: Bloomberg.

Exchange Rates



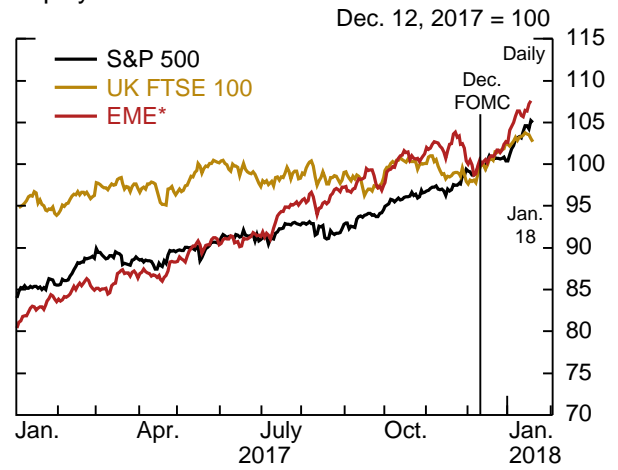
Source: Bloomberg.

Commodities



Source: Bloomberg; Haver.

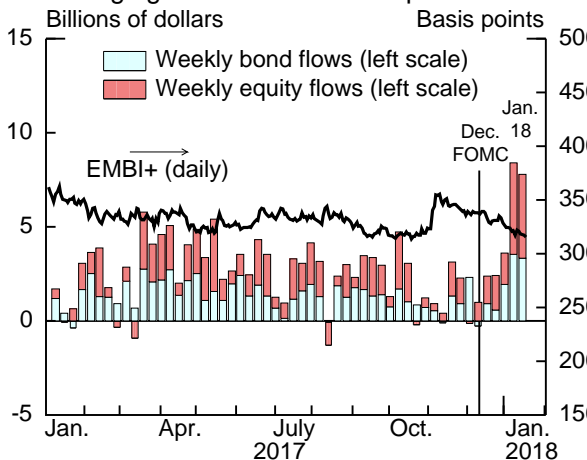
Equity Market Indexes



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

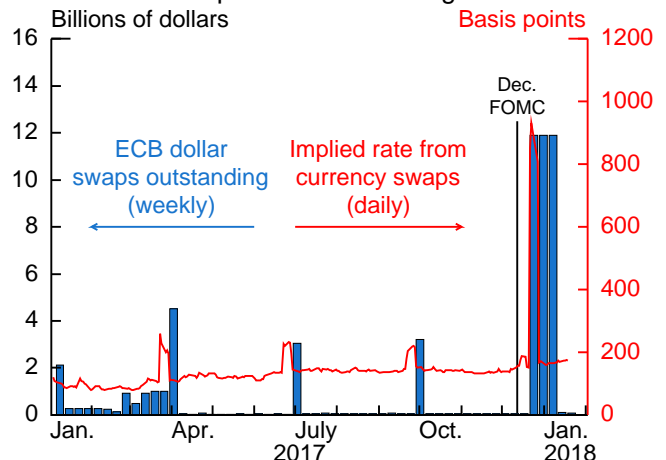
Financial Markets

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.

One-Week Implied Dollar Funding Cost



Source: Staff calculation; Bloomberg; ECB.

typical values after the turn of the year, and the take-up at the ECB swap facility reverted to very modest levels in the second week of January.

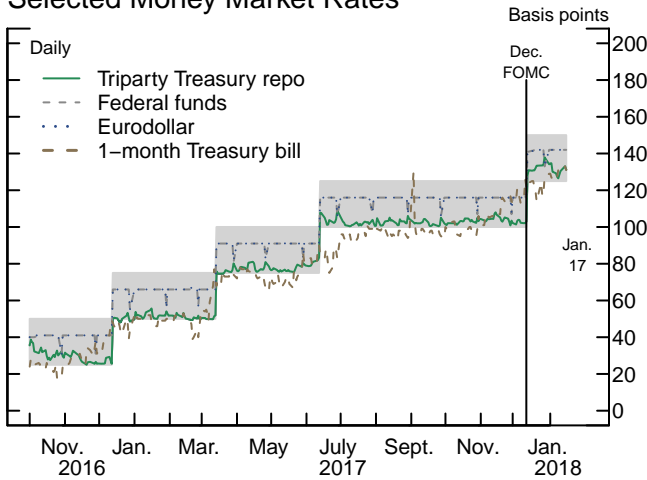
SHORT-TERM FUNDING MARKETS AND FEDERAL RESERVE OPERATIONS

Similar to previous increases in the target range for the federal funds rate, the December policy rate increase was transmitted smoothly to money market rates. Overall, both the effective federal funds rate and the overnight bank funding rate held steady at around 1.42 percent except at year-end. Since year-end, take-up at the ON RRP facility has remained close to the lower end of its historical range, reportedly because strong demand from dealers for repo financing has pushed market repo rates higher relative to the ON RRP rate.

Money market rates and volumes exhibited typical year-end dynamics that quickly faded. Similar to recent year-ends, rates and volumes in federal funds and Eurodollar markets declined on December 29, while in secured markets, Treasury repo rates increased. Spreads between longer-term unsecured commercial paper rates and the corresponding OIS rates widened somewhat toward the end of 2017 amid low volumes. At year-end, ON RRP take-up increased \$162 billion from the previous day operation, to \$320 billion, roughly in line with recent quarter-ends. As expected, government MMFs were the predominant participants in the operation, given the reduction in dealer borrowing on financial reporting days. After year-end, pressures in money markets abated quickly, and rates and volumes returned to recent non-year-end ranges.

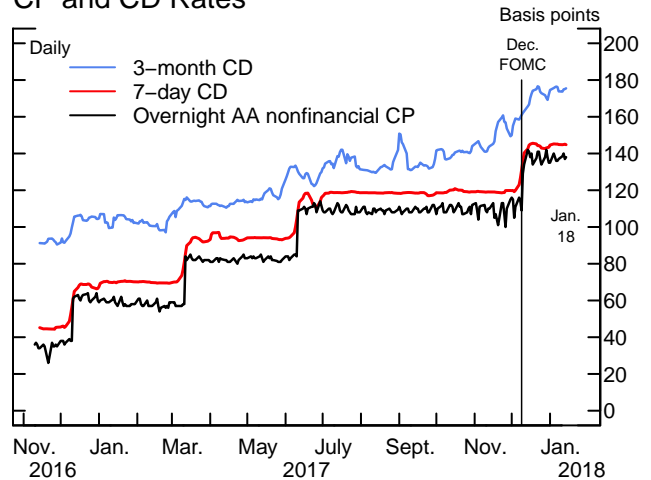
Short-Term Funding Markets and Federal Reserve Operations

Selected Money Market Rates



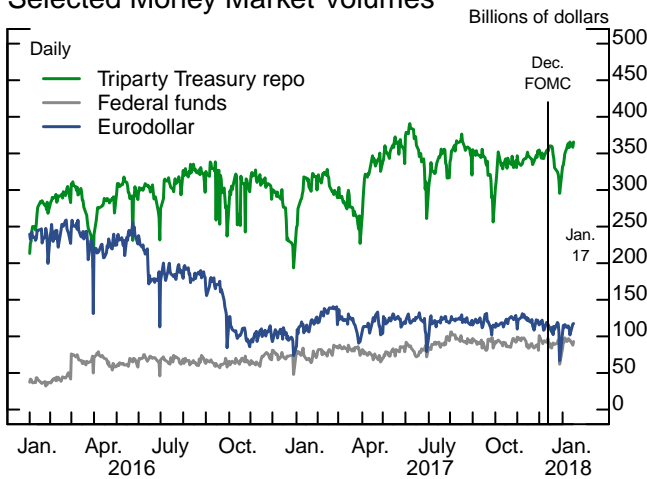
Note: Federal funds rate is a weighted median. Shaded area is the target range for the federal funds rate. Repo is repurchase agreement.
 Source: Federal Reserve Bank of New York; Federal Reserve Board, Form FR 2420, Report of Selected Money Market Rates.

CP and CD Rates



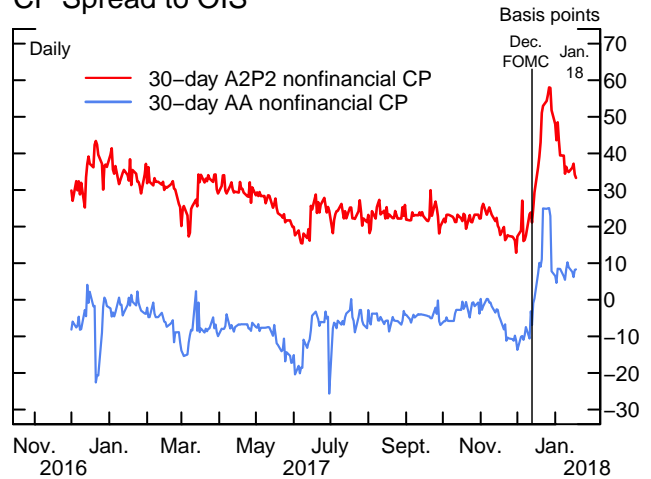
Note: CD rates are a 5-day moving average. CP is commercial paper and CD is certificate of deposit.
 Source: Depository Trust & Clearing Corporation.

Selected Money Market Volumes



Note: Repo is repurchase agreement.
 Source: Federal Reserve Bank of New York; Federal Reserve Board, Form FR 2420, Report of Selected Money Market Rates.

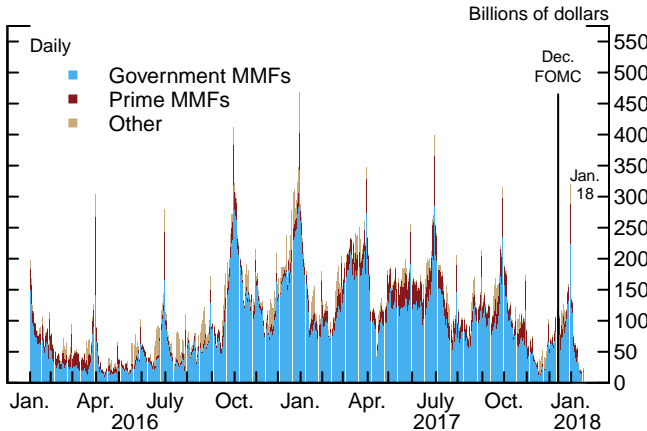
CP Spread to OIS



Note: CP is commercial paper and OIS is overnight indexed swap.
 Source: Depository Trust & Clearing Corporation.

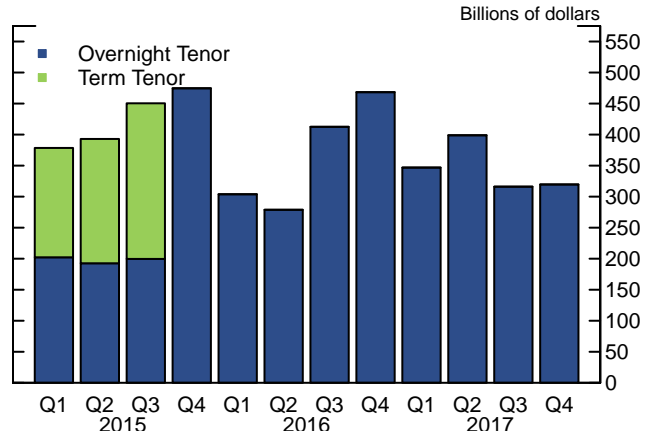
Financial Markets

ON RRP Take-Up, by Type



Note: ON RRP is overnight reverse repurchase agreement; MMF is money market fund.
 Source: Federal Reserve Bank of New York.

RRP Take-Up on Quarter-Ends



Source: Federal Reserve Bank of New York

Financing Conditions for Businesses and Households

Financing conditions for nonfinancial businesses and households remained generally accommodative over the intermeeting period and continued to be supportive of economic activity.

- Net debt financing flows to nonfinancial firms turned negative in December, but the weakness appears to be demand driven and concentrated among larger, higher-rated firms.
- The January Senior Loan Officer Opinion Survey on Bank Lending Practices (SLOOS) suggests that the sluggish commercial and industrial (C&I) loan growth over the past quarter was demand driven: Banks reported weaker demand from medium and large borrowers while also reporting easing of standards on these loans.¹
- Outstanding consumer credit accelerated in November—following the robust growth observed earlier in the fall—mainly reflecting a very large expansion in revolving credit balances.

BUSINESS FINANCING CONDITIONS

Nonfinancial Corporations

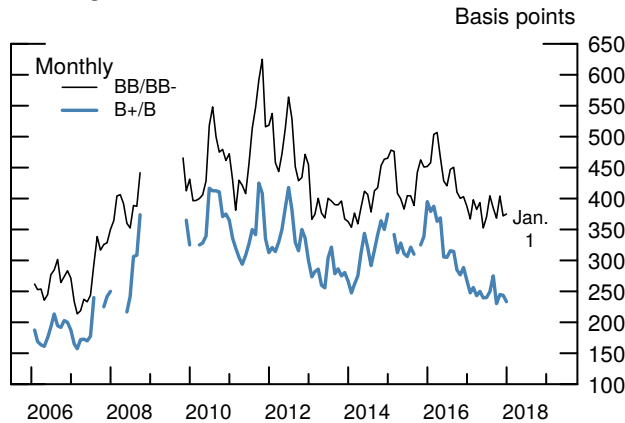
Overall, financing conditions for nonfinancial corporations remained quite accommodative over the intermeeting period. Spreads on both high-yield bonds and on newly issued institutional leveraged loans have remained near their post-crisis lows. In addition, respondents to the SLOOS indicated a net easing of standards and terms on C&I loans due in part to increased competition from other lenders.

Despite accommodative conditions, net funds raised by nonfinancial corporations through debt instruments turned decidedly negative in December. The overall decline in

¹ For each loan category, SLOOS results are calculated by weighting each bank's response by the size of its loan portfolio in that category. For detailed information on the results of the January survey, see David Glancy (2018), "Senior Loan Officer Opinion Survey on Bank Lending Practices," memorandum to the FOMC, Board of Governors of the Federal Reserve System, Monetary Affairs, January.

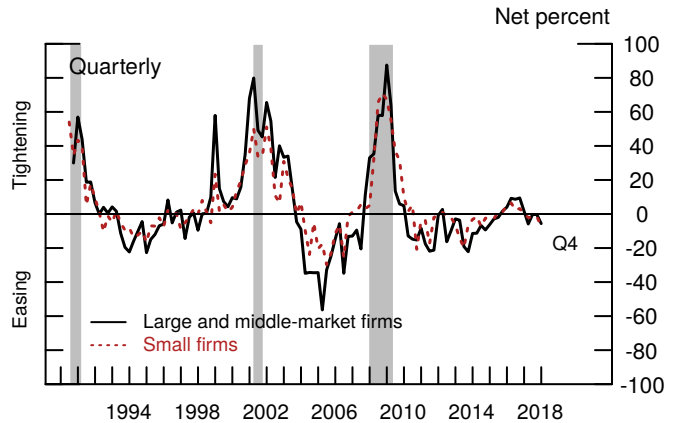
Business Finance

Average Spread of New-Issue Institutional Leveraged Loans



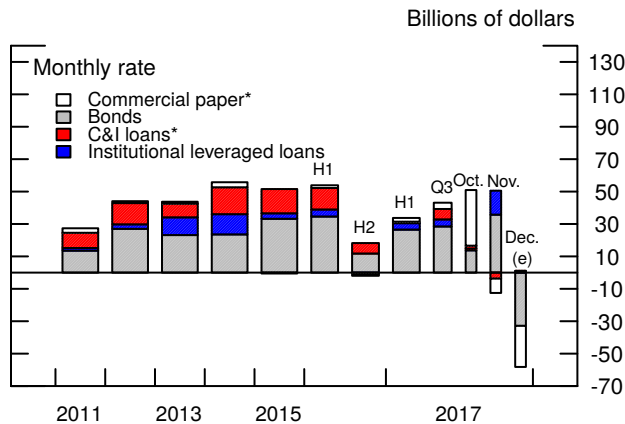
Note: Breaks in the series represent periods with no issuance. Spreads are calculated against 3-month LIBOR. The spreads do not include up-front fees. Source: S&P LCD.

Standards for C&I Loans



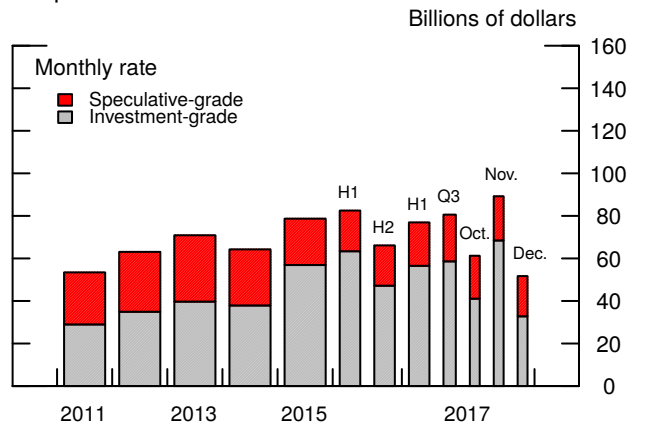
Note: C&I is commercial and industrial. The shaded bars indicate periods of business recession as defined by the National Bureau of Economic Research. Source: Federal Reserve Board, Senior Loan Officer Opinion Survey on Bank Lending Practices.

Selected Components of Net Debt Financing, Nonfinancial Firms



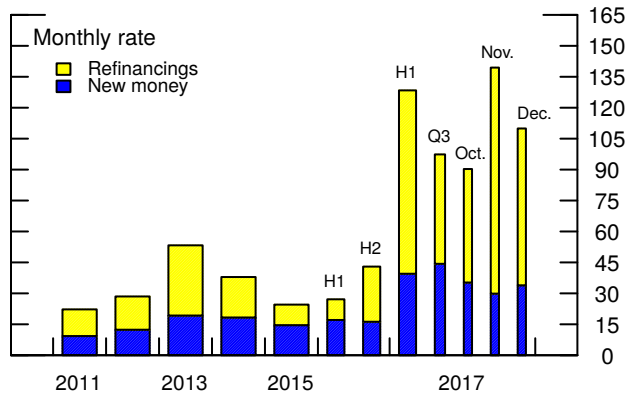
Note: C&I is commercial and industrial. * Period-end basis. (e) Estimate. Source: Depository Trust & Clearing Corporation; Mergent Fixed Income Securities Database; Federal Reserve Board; Thomson Reuters LPC.

Gross Issuance of Nonfinancial Corporate Bonds



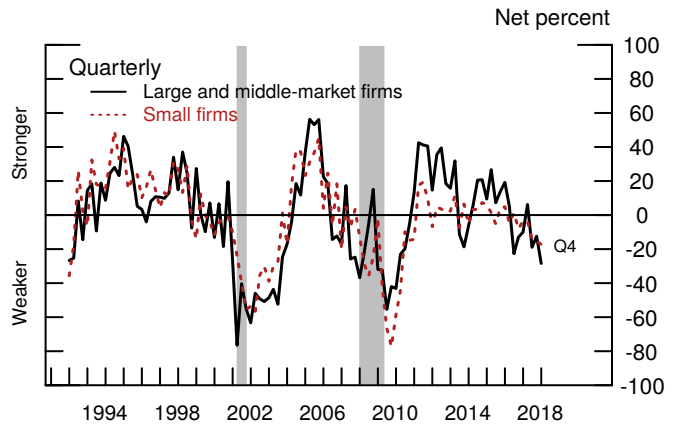
Note: Bonds are categorized by Moody's, Standard & Poor's, and Fitch. Source: Mergent Fixed Income Securities Database.

Institutional Leveraged Loan Issuance, by Purpose



Source: Thomson Reuters LPC LoanConnector.

Demand for C&I Loans



Note: C&I is commercial and industrial. The shaded bars indicate periods of business recession as defined by the National Bureau of Economic Research. Source: Federal Reserve Board, Senior Loan Officer Opinion Survey on Bank Lending Practices.

that month reflects negative net bond issuance and a drop in outstanding commercial paper, whereas C&I and leveraged loans were both about unchanged over the month.

While the negative net debt financing in December may have been driven in part by unusually severe year-end effects, it could also reflect a softening in the demand for credit, possibly related to the anticipation of higher post-tax cash flows and repatriation of foreign funds. Indeed, the decline in gross issuance of corporate bonds in December was in the investment-grade segment only, where issuance is more likely driven by shifts in financing demand than credit supply. In contrast, gross issuance of speculative-grade bonds and institutional leveraged loans both remained strong. SLOOS respondents widely reported weak demand for C&I loans in the fourth quarter, particularly from large firms. Respondents attributed this weak demand in part to firms drawing on internally generated funds.

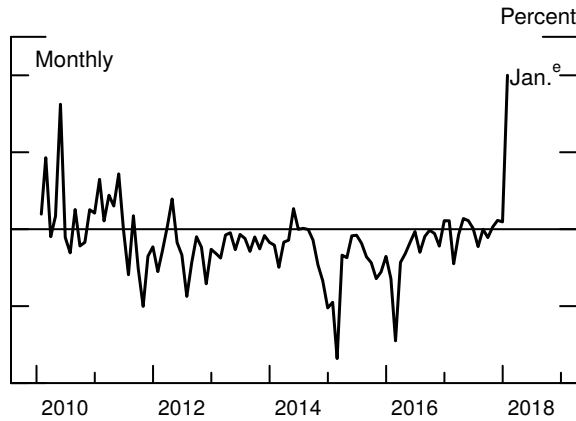
In a set of special questions in the SLOOS inquiring about the outlook for 2018, respondent banks forecast that demand for C&I loans from small firms would rise over the next year but would remain basically unchanged, on net, for large and middle-market firms. Banks also indicated that in 2018 they expected to further ease standards for larger firms but leave lending standards for small firms basically unchanged.

Corporate earnings growth is estimated to have been sizable in the fourth quarter. Wall Street analyst forecasts for fourth-quarter earnings and reports to date imply about a 5 percent (seasonally adjusted) earnings-per-share gain among S&P 500 firms, or 20 percent at an annual rate. The rise in part reflects a jump in energy-sector earnings from the recent upswing in oil prices. Looking forward, analysts have been revising projections of year-ahead earnings notably higher as they incorporate the effects of the passage of the tax bill. These upward revisions are expected to continue for some time, as forecast adjustments have not yet fully incorporated the direct effects of the tax legislation on after-tax earnings.

Nonfinancial corporations deployed available funds more aggressively over the last quarter of 2017, with the volume of announced stock repurchases coming in notably higher than in the previous few quarters and the volume of announced and completed mergers and acquisitions remaining robust. Still, on balance, the credit quality of nonfinancial corporations appeared to stay solid amid few ratings changes over the intermeeting period, and bond defaults and C&I delinquencies remained very low by historical standards.

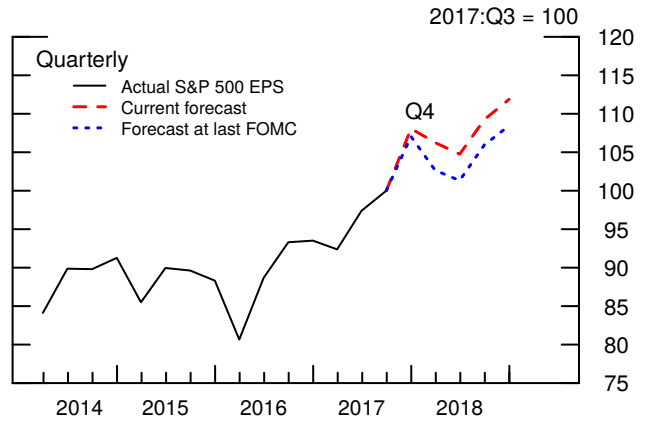
Corporate Profits, Credit Quality, and Commercial Real Estate Lending

Revisions to S&P 500 Year-Ahead Earnings per Share



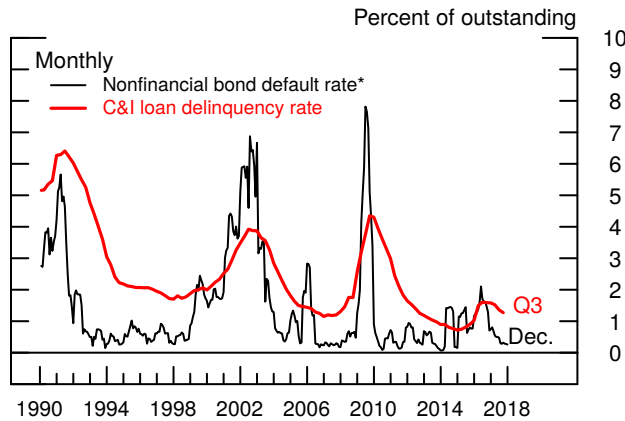
Note: Weighted average of the percent change in the consensus forecasts of current-year and following-year earnings per share.
e Estimate.
Source: Thomson Reuters Financial.

S&P 500 Quarterly Earnings per Share and Analyst Forecasts



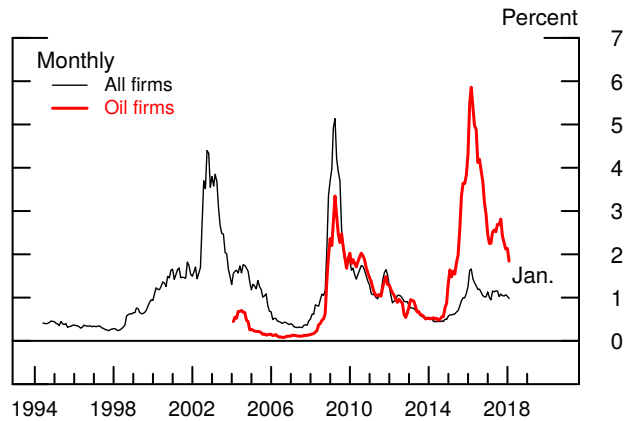
Note: Forecasts are adjusted for bias and seasonality.
Source: Thomson Reuters Financial.

Selected Default and Delinquency Rates



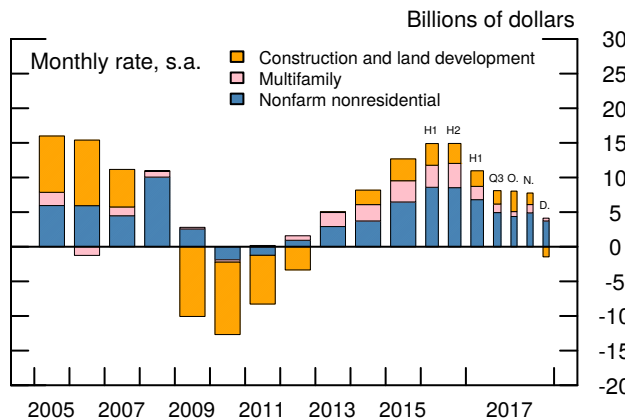
* 6-month trailing defaults divided by beginning-of-period outstanding, at an annual rate.
Source: For default rate and outstanding amount of nonfinancial bonds, Moody's Investors Service; for delinquency rate and outstanding amount of commercial and industrial (C&I) loans, Call Report.

Expected Nonfinancial Year-Ahead Defaults



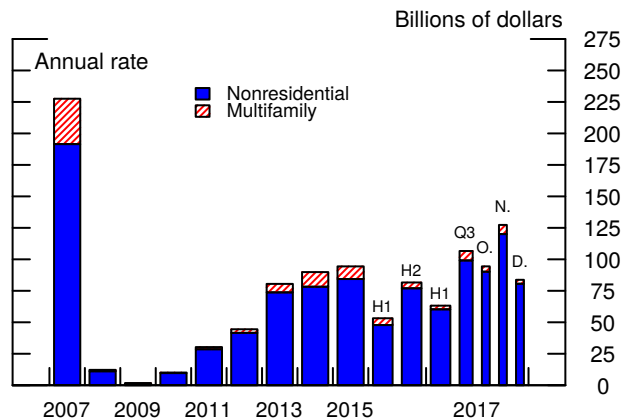
Note: Firm-level estimates of default weighted by firm liabilities as a percent of total liabilities, excluding defaulted firms.
Source: Calculated using firm-level data from Moody's KMV.

Commercial Real Estate Loans



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.

CMBS Issuance



Note: CMBS is commercial mortgage-backed securities. Multifamily excludes agency issuance.
Source: Consumer Mortgage Alert.

Small Businesses

Overall, small business credit market conditions were little changed and still relatively accommodative over the intermeeting period. Recent indicators of loan performance have remained strong, and credit quality concerns are not expected to be a significant factor affecting the ability of small businesses to obtain credit in the near term. However, credit growth remained sluggish, with data suggesting this sluggishness is largely due to continued weak demand for credit by small businesses.

Commercial Real Estate

Growth of commercial real estate (CRE) loans held by banks slowed further in the fourth quarter. Growth of multifamily and nonfarm nonresidential loans from large banks, which had been slowing all year, turned negative in the fourth quarter. In contrast, CRE loans from small banks and construction loans from large banks expanded at a more robust pace. On balance, SLOOS respondents did not indicate any significant changes in demand or lending standards for CRE loans over the fourth quarter, nor did they indicate that they expected to change their standards for CRE loans this year.

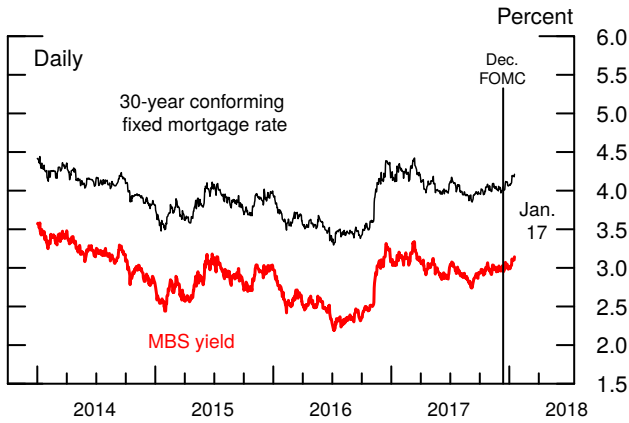
Financing conditions in the commercial mortgage-backed securities (CMBS) market remained accommodative, and CMBS issuance continued at a robust pace in the fourth quarter. Spreads on CMBS generally held steady during the intermeeting period, near their lowest levels since the financial crisis. Also, delinquency rates on loans in CMBS pools continued to decline in November, largely reflecting the shrinking share of risky loans that originated before the financial crisis. However, in contrast to the largely sanguine conditions, spreads on junior tranches of CMBX that are heavily exposed to the challenged brick-and-mortar retail sector remained high but tightened modestly.

MUNICIPAL GOVERNMENT FINANCING CONDITIONS

Credit conditions in municipal bond markets also remained accommodative on balance. In the final stages of the new tax bill, uncertainty over the tax-exempt status of the interest earned on private activity bonds (PABs) led to a surge in municipal bond issuance in December on the presumption that these bonds would have been grandfathered in.² However, the final tax bill preserved the tax-exempt status of PABs.

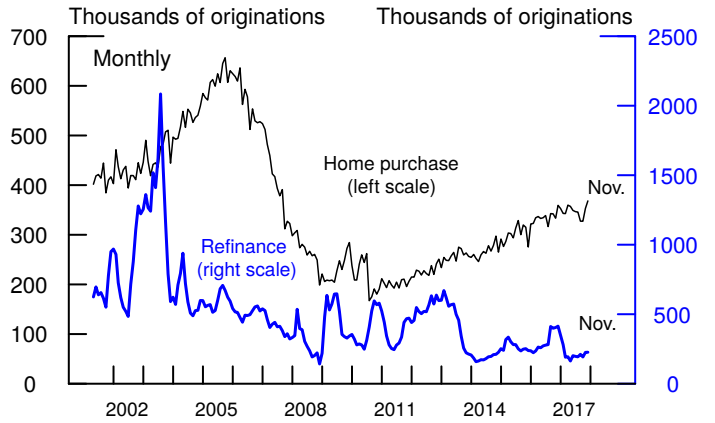
² A PAB is a bond issued by or on behalf of local or state government for the purpose of financing the project of a private user. For example, these bonds can be used to fund manufacturing plants, airports, docks, parking garages, or water and sewage plants.

Mortgage Rate and MBS Yield



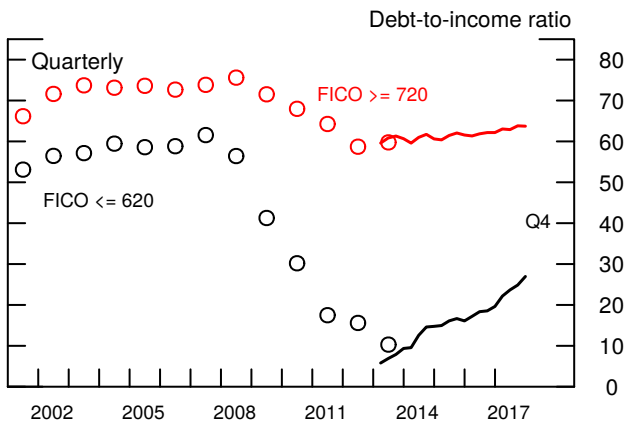
Note: The mortgage-backed securities (MBS) yield is the Fannie Mae 30-year current-coupon rate.
 Source: For MBS yield, Barclays; for mortgage rate, Optimal Blue.

Purchase and Refinance Activity



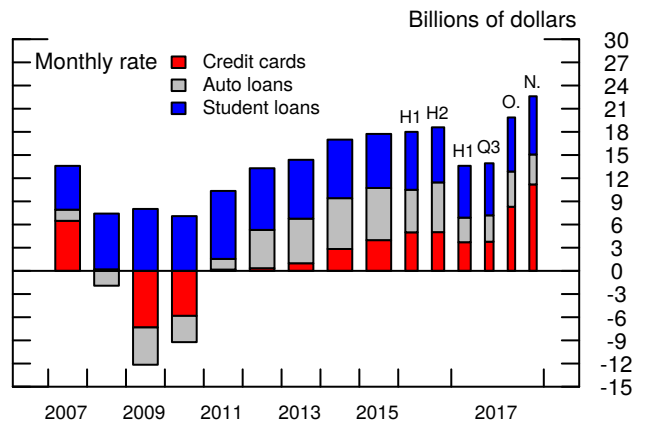
Note: The data are seasonally adjusted by Federal Reserve Board staff.
 Source: For values prior to 2017, data reported under the Home Mortgage Disclosure Act of 1975; for values in 2017, staff estimates.

Mortgage Credit Summary Frontiers, by FICO Score



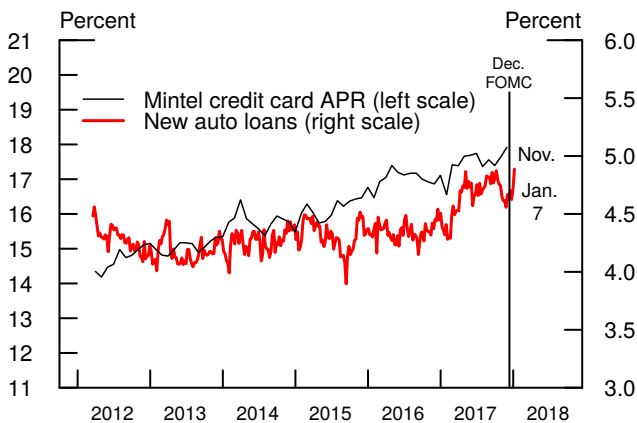
Note: Summary frontier is a weighted average of the individual frontiers associated with each loan-to-value ratio, property location, and FICO group.
 Source: For frontiers shown with circles, McDash and CoreLogic; for frontiers shown with solid lines, Optimal Blue.

Consumer Credit Flows



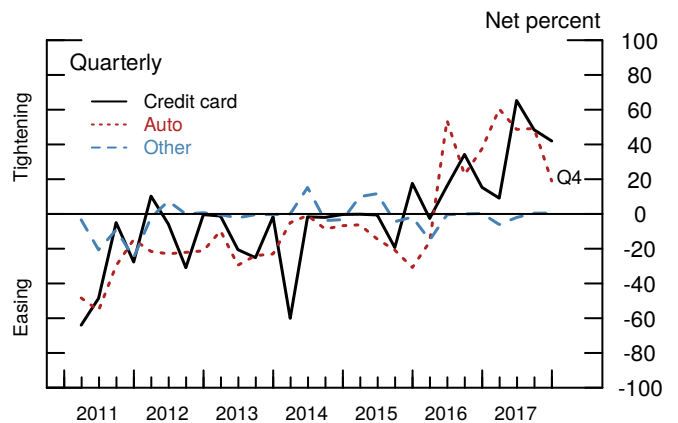
Note: The data are seasonally adjusted by Federal Reserve Board staff.
 Source: Federal Reserve Board.

Consumer Interest Rates



Note: Series are seasonally adjusted. For credit cards, the data are monthly; for auto loans, the data are weekly. APR is annual percentage rate.
 Source: For credit cards, Mintel; for auto loans, PIN.

Standards for Consumer Loans



Source: Federal Reserve Board, Senior Loan Officer Opinion Survey on Bank Lending Practices.

In December, the credit quality of municipal bonds held steady, with the number of ratings upgrades slightly outpacing that of rating downgrades.

HOUSEHOLD FINANCING CONDITIONS

Residential Real Estate

Financing conditions in the residential mortgage market remained accommodative for most borrowers. Although the rate on 30-year conforming mortgages offered to well-qualified borrowers rose 16 basis points over the intermeeting period (in line with benchmark yields), the rate remained quite low by historical standards. Mortgage originations for home purchases continued to rebound in November and, after having stepped down over the summer, came back in line with the steady growth trend of recent years. Originations of loans with a high debt-to-income ratio have picked up some in recent months, reflecting an easing of credit standards for well-qualified borrowers instituted by Fannie Mae last July.³ However, credit standards remained tight for borrowers with low credit scores or with hard-to-document incomes. Banks reported that demand and lending standards for most mortgage categories were little changed in recent months, although demand for jumbo loans reportedly weakened.

Consumer Credit

Overall, financing conditions in consumer credit markets remained largely supportive of economic activity. Indeed, as retail sales posted strong growth in recent months, consumer credit increased notably in November, exceeding the more moderate volume of borrowing observed earlier in the year. Revolving credit expanded at a particularly brisk pace in November, while nonrevolving credit also grew robustly, mainly driven by expansion in student and other consumer loans. In contrast, auto lending flows slowed in recent months, consistent with the weakening demand for such loans in the fourth quarter as reported in the January SLOOS.

Credit card interest rates continued to trend up over the past few months, consistent with short-term market interest rates. Auto loan interest rates reported by car dealers also edged up, on net, during the intermeeting period.

³ In late July 2017, Fannie Mae lifted certain restrictions on loans to borrowers with debt-to-income (DTI) ratios between 45 and 50 percent. The share of new mortgage originations with a DTI ratio above 45 percent then climbed from about 20 percent in July to over 25 percent in December.

For subprime borrowers, conditions in the credit card market remained tight, while conditions in the market for auto loans have tightened considerably over the past year. Indeed, the January SLOOS indicated that banks' standards on both credit card and auto loans were reportedly tightened in the fourth quarter. Over the coming year, banks expect to continue to tighten standards on credit card and auto loans and also anticipate that the credit performance of these types of loans will deteriorate.

Risks and Uncertainty

ASSESSMENT OF RISKS

As in the December 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. Corporate bond spreads and the VIX remain near the low end of their historical ranges. The enactment of the Tax Cuts and Jobs Act, following the December Tealbook, has diminished the uncertainty regarding fiscal policy effects, although ambiguity remains about the future direction of a number of other federal policies.

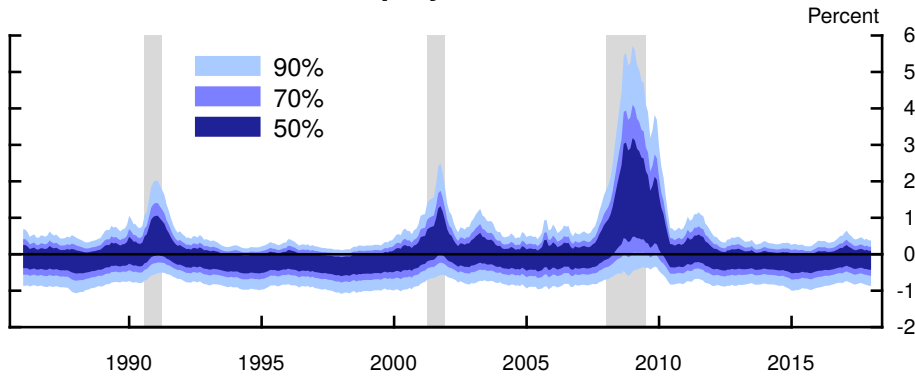
We continue to judge the risks around our projections for both real GDP growth and the unemployment rate as being balanced. Consistent with that view, estimates of the distribution of risks around those forecasts conditional on available indicators, shown in the exhibit “Time-Varying Macroeconomic Risk,” 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 around the baseline path in the FRB/US model to be about 11 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. To the downside, last year’s string of soft readings on inflation could prove to be more persistent than we have assumed. Also, we think there is a risk that 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 we have assumed. To the upside, with the economy projected to be moving further above its long-run potential, inflation may increase more than in the staff forecast, consistent with the predictions of models that emphasize nonlinear effects of economic slack 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 December Survey of Economic Projections.

Time-Varying Macroeconomic Risk

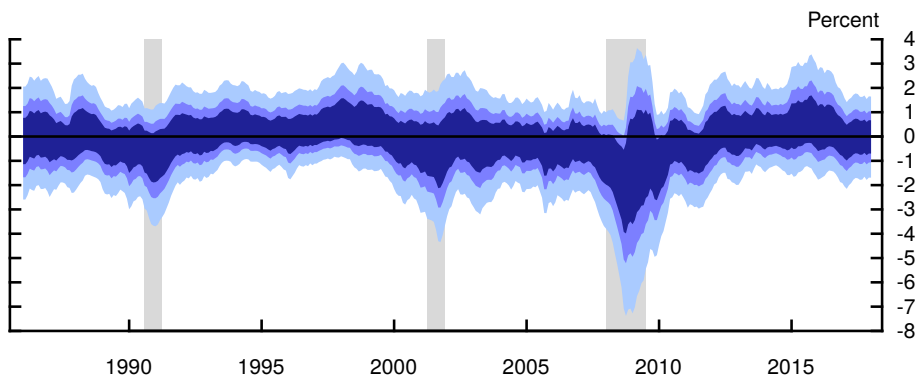
Unemployment Rate



January 2018

| | |
|------|------|
| 95th | 0.4 |
| 85th | 0.2 |
| 50th | -0.1 |
| 15th | -0.6 |
| 5th | -0.9 |

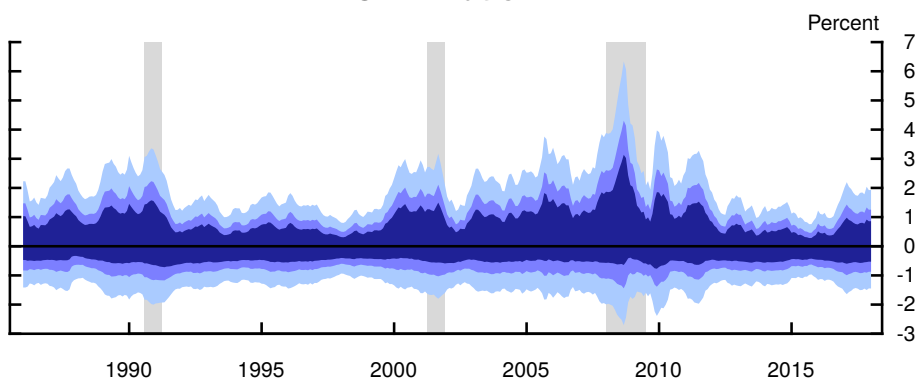
GDP Growth



January 2018

| | |
|------|------|
| 95th | 1.6 |
| 85th | 1.0 |
| 50th | 0.0 |
| 15th | -1.1 |
| 5th | -1.7 |

CPI Inflation

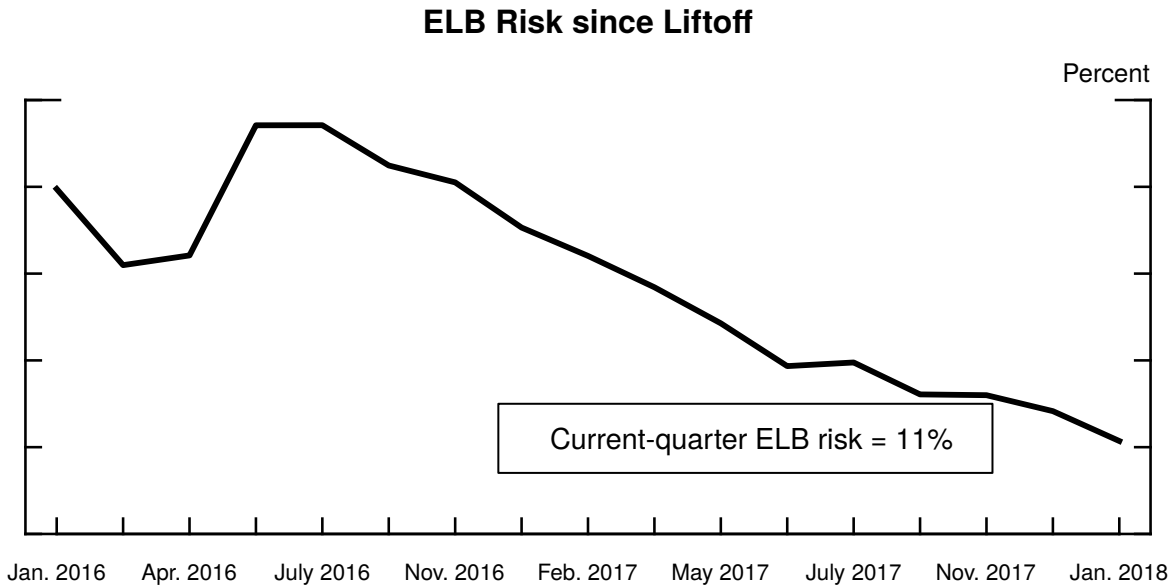


January 2018

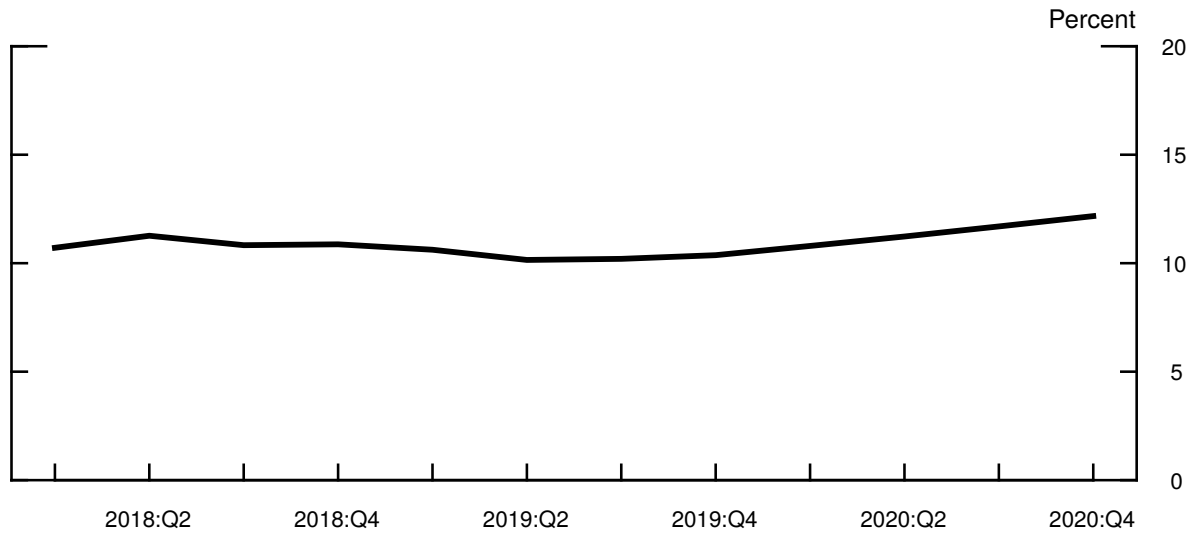
| | |
|------|------|
| 95th | 1.9 |
| 85th | 1.3 |
| 50th | 0.1 |
| 15th | -0.9 |
| 5th | -1.4 |

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.

Our judgmental assessments of typical uncertainty and balanced risks are consistent with the statistical estimates of the time-varying risks for the inflation forecast.

Our view of the risks to the economic outlook is informed by the staff's quarterly quantitative surveillance assessment, which judges the overall financial vulnerabilities in the United States and overseas to be moderate. Asset valuations have increased further from already elevated levels both here and in a number of foreign economies. However, these valuation pressures have generally not been accompanied by an increase in other vulnerabilities. While leverage in the U.S. nonfinancial business sector remained elevated in the fourth quarter with additional net issuance of risky debt, overall borrowing in the nonfinancial sector continued to advance at a slower pace than nominal GDP. Vulnerabilities from leverage in the financial system appear low, as both banks and insurance companies are highly capitalized by historical standards. Nevertheless, there is some evidence that dealers have eased price terms to hedge funds and real estate investment trusts, or REITs, and that leverage used by hedge funds has gradually increased. Vulnerabilities from liquidity and maturity transformation remain low, partly because banks continue to hold substantial amounts of high-quality liquid assets that exceed their liquidity coverage ratio requirements. Moreover, the level of assets under management at prime money market funds has held steady since the October 2016 reform, and growth of alternative short-term investment vehicles appears to have been weak.

ALTERNATIVE SCENARIOS

To illustrate some of the risks to the outlook, we construct alternatives to the baseline projection using simulations of staff models. The first two scenarios illustrate some of the uncertainty surrounding the macroeconomic effects of the Tax Cut and Jobs Act. In the first scenario, the effects on the economy are larger as investment and labor supply respond more than in the baseline. In contrast, in the second scenario, supply constraints in tight labor and product markets, together with a lower marginal propensity to consume, weaken the economic effects of the tax reform. The third scenario illustrates the consequences of a lower natural rate of unemployment that is initially misperceived by the central bank. In the fourth 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 fifth 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 sixth scenario, we present the implications of a substantial correction in global asset valuations. The last scenario considers the effects of stronger foreign economic growth in combination with a faster normalization of monetary policy in the advanced foreign economies (AFEs).

We simulate these scenarios using three 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.

Larger Effects of the Tax Reform [FRB/US]

There is considerable uncertainty about the macroeconomic effects of the recent tax reform. This scenario illustrates the possibility that the effects could be stronger than we have projected. We assume that the reduction in personal income taxes raises labor supply faster than in the baseline. In particular, the total increase in labor supply is completed by the end of 2020, three years earlier than in the baseline. In addition, investment is assumed to be more responsive to the change in the user cost of capital than in the judgmental projection, similar to the parameterization in FRB/US and some outside estimates. Furthermore, the tax legislation leads to a small boost in the trend growth of multifactor productivity, linked to an increase in firm entry that the reform is assumed to elicit.³

The stronger increase in aggregate supply boosts economic activity. However, resource utilization is modestly tighter than in the baseline for some time, as actual output rises more quickly than potential, raising the output gap about ½ percentage point above the baseline in 2021. Real GDP growth peaks at 3¼ percent in mid-2018, and the unemployment rate falls to 3 percent in mid-2020. With a relatively flat Phillips curve,

² The three models used are an estimated medium-scale New Keynesian DSGE model of the U.S. economy based on Marco Del Negro, Marc P. Giannoni, and Frank Schorfheide (2015), “Inflation in the Great Recession and New Keynesian Models,” *American Economic Journal: Macroeconomics*, vol. 7 (January), pp. 168–96 ; FRB/US, which is a large-scale macroeconometric model of the U.S. economy; and SIGMA, which is a calibrated multicountry DSGE model.

³ For research that finds positive effects of corporate tax rate reductions on entrepreneurial activity, see E. Mark Curtis and Ryan A. Decker (2018), “Entrepreneurship and State Taxation,” Finance and Economics Discussion Series 2018-003 (Washington: Board of Governors of the Federal Reserve System, January), <https://www.federalreserve.gov/econres/feds/files/2018003pap.pdf>.

Alternative Scenarios

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

| Measure and scenario | 2018 | | 2019 | 2020 | 2021 | 2022- 23 |
|--|------|-----|------|------|------|-------------|
| | H1 | H2 | | | | |
| <i>Real GDP</i> | | | | | | |
| Extended Tealbook baseline | 3.0 | 2.9 | 2.4 | 2.0 | 1.4 | 1.0 |
| Larger effects of the tax reform | 3.0 | 3.2 | 2.8 | 2.2 | 1.6 | 1.1 |
| Smaller effects of the tax reform | 2.8 | 2.8 | 2.3 | 1.9 | 1.4 | 1.0 |
| Misperceived lower natural rate | 3.0 | 3.0 | 2.6 | 2.1 | 1.5 | 1.1 |
| Lower inflation expectations | 2.3 | 2.9 | 2.5 | 2.1 | 1.5 | 1.0 |
| Steeper Phillips curve | 3.0 | 2.9 | 2.4 | 1.9 | 1.2 | .8 |
| Global market correction | 1.6 | 1.5 | 2.1 | 2.3 | 1.8 | 1.2 |
| Faster foreign growth and tighter policy | 3.3 | 3.4 | 2.6 | 1.5 | 1.1 | 1.0 |
| <i>Unemployment rate¹</i> | | | | | | |
| Extended Tealbook baseline | 3.8 | 3.4 | 3.2 | 3.2 | 3.4 | 4.0 |
| Larger effects of the tax reform | 3.8 | 3.4 | 3.1 | 3.0 | 3.1 | 3.9 |
| Smaller effects of the tax reform | 3.8 | 3.4 | 3.3 | 3.3 | 3.5 | 4.1 |
| Misperceived lower natural rate | 3.7 | 3.2 | 2.8 | 2.7 | 2.8 | 3.3 |
| Lower inflation expectations | 4.0 | 3.6 | 3.3 | 3.2 | 3.4 | 4.1 |
| Steeper Phillips curve | 3.8 | 3.4 | 3.2 | 3.3 | 3.6 | 4.6 |
| Global market correction | 4.0 | 3.8 | 3.9 | 3.8 | 3.9 | 4.4 |
| Faster foreign growth and tighter policy | 3.8 | 3.3 | 2.9 | 3.0 | 3.3 | 4.0 |
| <i>Total PCE prices</i> | | | | | | |
| Extended Tealbook baseline | 2.1 | 1.6 | 1.9 | 2.0 | 2.1 | 2.2 |
| Larger effects of the tax reform | 2.1 | 1.6 | 1.9 | 2.0 | 2.1 | 2.2 |
| Smaller effects of the tax reform | 2.1 | 1.6 | 1.9 | 1.9 | 2.0 | 2.1 |
| Misperceived lower natural rate | 2.1 | 1.6 | 1.9 | 1.9 | 2.0 | 2.1 |
| Lower inflation expectations | 1.8 | 1.3 | 1.6 | 1.6 | 1.7 | 1.8 |
| Steeper Phillips curve | 2.3 | 2.1 | 2.7 | 3.0 | 3.3 | 3.5 |
| Global market correction | 1.6 | 1.0 | 1.6 | 1.8 | 2.0 | 2.1 |
| Faster foreign growth and tighter policy | 2.3 | 2.0 | 2.3 | 1.9 | 2.0 | 2.2 |
| <i>Core PCE prices</i> | | | | | | |
| Extended Tealbook baseline | 2.1 | 1.8 | 2.1 | 2.1 | 2.1 | 2.2 |
| Larger effects of the tax reform | 2.1 | 1.8 | 2.1 | 2.1 | 2.1 | 2.2 |
| Smaller effects of the tax reform | 2.0 | 1.8 | 2.0 | 2.0 | 2.1 | 2.1 |
| Misperceived lower natural rate | 2.1 | 1.8 | 2.0 | 2.0 | 2.1 | 2.1 |
| Lower inflation expectations | 1.8 | 1.4 | 1.7 | 1.7 | 1.8 | 1.9 |
| Steeper Phillips curve | 2.3 | 2.2 | 2.8 | 3.1 | 3.4 | 3.5 |
| Global market correction | 1.8 | 1.3 | 1.7 | 1.9 | 2.0 | 2.1 |
| Faster foreign growth and tighter policy | 2.2 | 2.0 | 2.3 | 2.1 | 2.1 | 2.2 |
| <i>Federal funds rate¹</i> | | | | | | |
| Extended Tealbook baseline | 1.9 | 2.7 | 4.0 | 4.8 | 5.1 | 4.6 |
| Larger effects of the tax reform | 1.9 | 2.7 | 4.0 | 4.9 | 5.3 | 4.9 |
| Smaller effects of the tax reform | 1.9 | 2.6 | 3.9 | 4.6 | 4.9 | 4.3 |
| Misperceived lower natural rate | 1.9 | 2.7 | 4.0 | 4.9 | 5.1 | 4.6 |
| Lower inflation expectations | 1.8 | 2.4 | 3.5 | 4.3 | 4.5 | 4.0 |
| Steeper Phillips curve | 1.9 | 2.8 | 4.4 | 5.6 | 6.1 | 5.7 |
| Global market correction | 1.9 | 2.4 | 2.9 | 3.7 | 4.2 | 4.2 |
| Faster foreign growth and tighter policy | 2.0 | 2.9 | 4.6 | 5.1 | 5.0 | 4.4 |

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

inflation is only a touch higher. The higher output gap drives the federal funds rate to 5¼ percent in 2021, ¼ percentage point above the baseline.

Smaller Effects of the Tax Reform [FRB/US]

Alternatively, the macroeconomic effects of the tax legislation may turn out to be smaller than in the baseline. In an economy with already hot labor and product markets, supply constraints might limit the fiscal impetus. Furthermore, consumers may spend less and save more of the extra income from lower taxes than we assume in the baseline. For instance, the personal income tax cuts are skewed toward high-income individuals who may have a lower marginal propensity to consume, and we may have insufficiently taken account of that distributional effect in the baseline. In this scenario, we assume the reform boosts aggregate demand by half as much as in the baseline projection and that the labor supply effect built into the baseline does not materialize.

Under these circumstances, the level of real GDP stands about ½ percent below the baseline; the unemployment rate is 0.1 percentage point higher and the labor force participation rate is 0.1 percentage point lower in 2021. Inflation is essentially unchanged, while the narrower output gap leads to the federal funds rate being below the baseline.

Misperceived Lower Natural Rate of Unemployment [FRB/US]

In the baseline forecast, the unemployment rate falls to 3.2 percent in 2019, with the natural rate of unemployment assumed to hold steady at 4.7 percent through the projection period. However, the natural rate is estimated with considerable uncertainty and could be lower. In this scenario, we assume that the natural rate has been 3¾ percent for the past few years and will remain at that level in the future. Furthermore, we assume that policymakers and the staff continue, for a time, to misperceive the level of the natural rate; their perceptions converge to its true level only gradually and that convergence is not complete by the end of 2023.

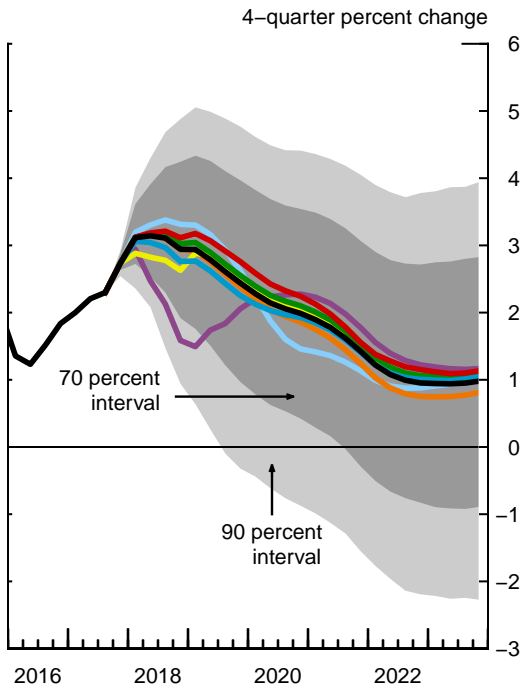
Given the lower natural rate, the unemployment rate in the scenario is below the baseline path, falling to 2¾ percent in 2020, ½ percentage point below the baseline. Over time, policymakers revise their view of the natural rate downward, but the gap between the unemployment rate and the perceived natural rate is similar to the baseline. Given that inflation is only a touch lower and the perceived output gap is about the same as in the baseline, the path for the federal funds rate is little changed. Had policymakers fully

Forecast Confidence Intervals and Alternative Scenarios

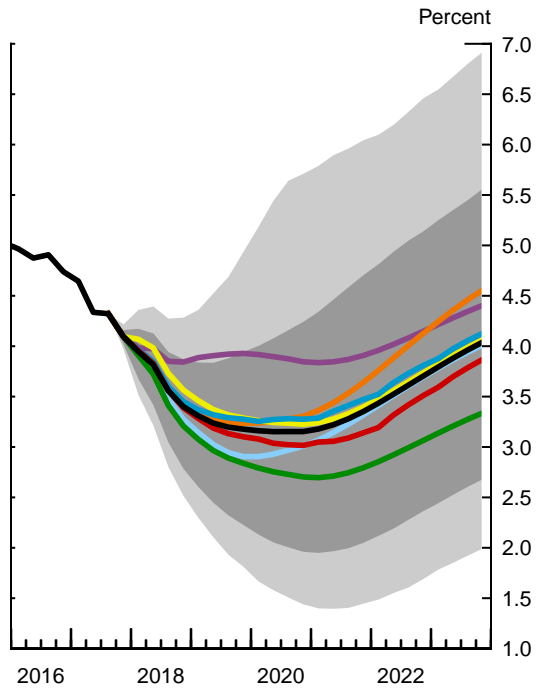
Confidence Intervals Based on FRB/US Stochastic Simulations

- Extended Tealbook baseline
- Misperceived lower natural rate
- Global market correction
- Larger effects of the tax reform
- Lower inflation expectations
- Faster foreign growth and tighter policy
- Smaller effects of the tax reform
- Steeper Phillips curve

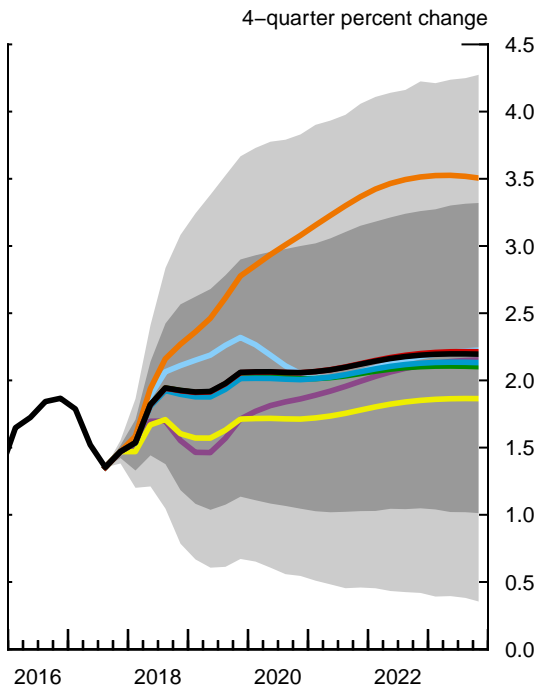
Real GDP



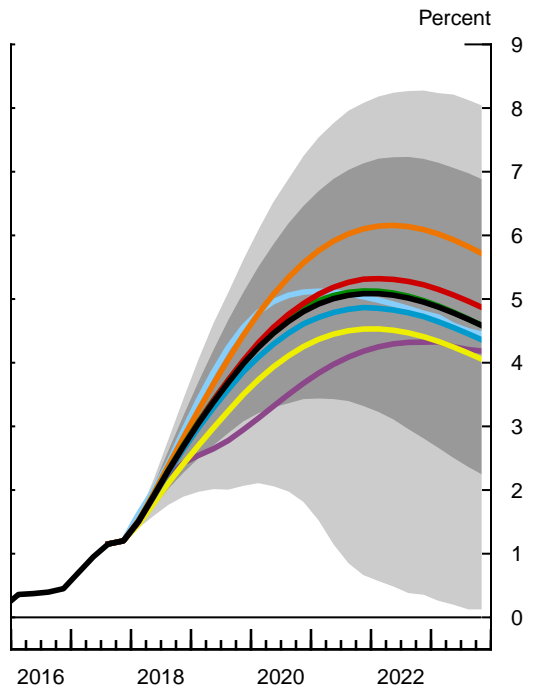
Unemployment Rate



PCE Prices excluding Food and Energy



Federal Funds Rate



and immediately recognized the lower natural rate, the perceived output gap would have been substantially smaller and the federal funds rate would have been about $\frac{1}{4}$ percentage point lower during the first two years of the simulation. The unemployment rate would have fallen $\frac{3}{4}$ percentage point below the baseline in 2020, $\frac{1}{4}$ percentage point further than in the case of misperception.

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

Headline inflation, as measured by the change in personal consumption expenditures (PCE) prices, has been below the Committee's 2 percent objective for most of the past five years. It has averaged about $1\frac{1}{4}$ percent during this period and has remained subdued more recently even as resource utilization has exceeded our estimate of its sustainable level. In the baseline projection, inflation is assumed to rebound this year and to reach 2 percent in 2020, in part reflecting further tightening in resource utilization and a small gradual rise in inflation expectations. However, in light of the persistently low inflation of the past several years, there is a risk that the public perceives the stance of monetary policy currently as being too tight, and as likely to remain so in the future, to achieve 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 1.7 percent in 2020. Consequently, the federal funds rate increases less than in the baseline, but given the inertia in the assumed policy rule, 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 and the unemployment rate runs about $\frac{1}{4}$ percentage point higher in 2018 and remains above the baseline through 2022.⁴

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

⁴ 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 the downward deviation of production costs from the baseline—while small—is very persistent.

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

Risks & Uncertainty

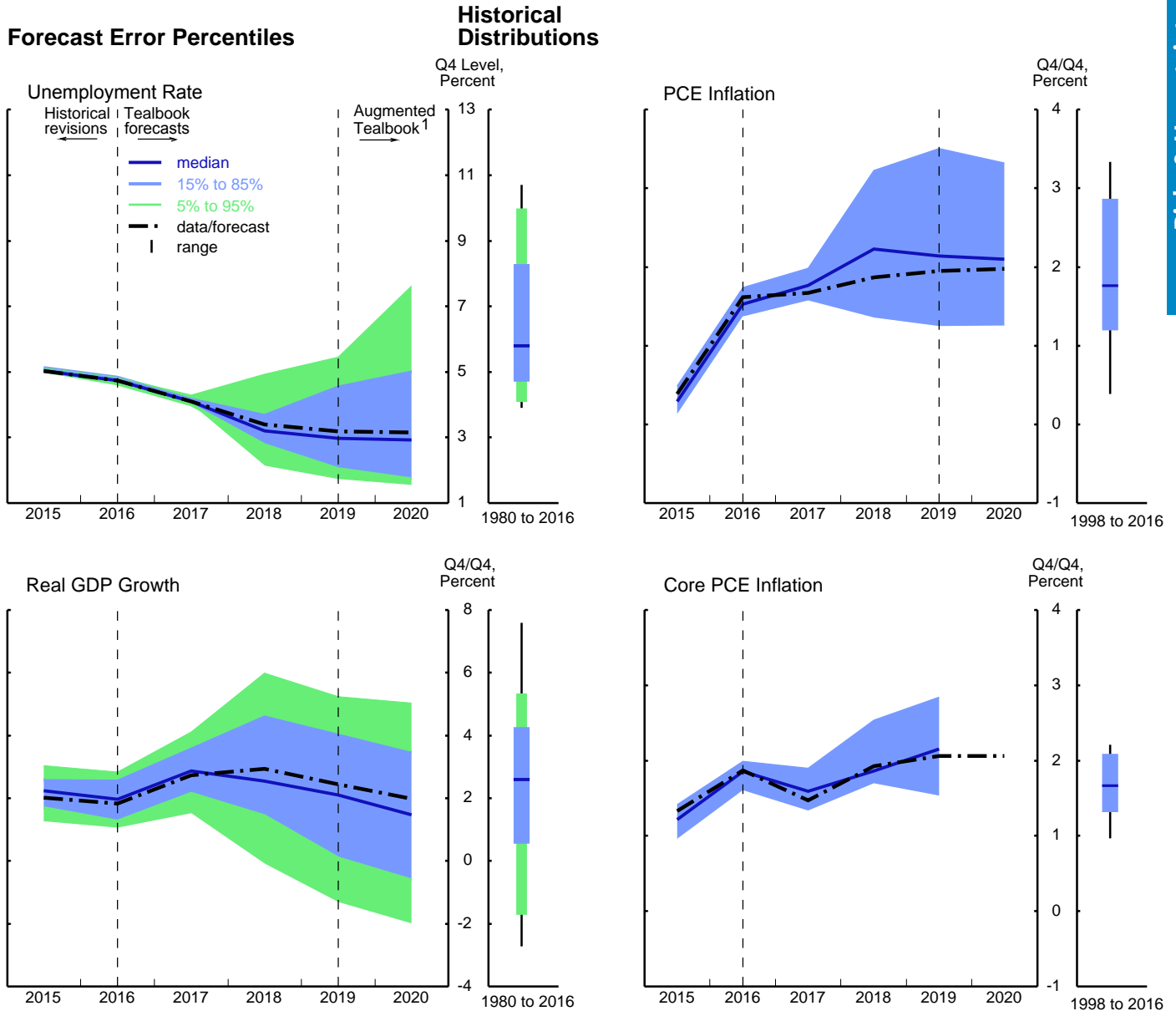
| Measure | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---------|---------|---------|---------|---------|---------|
| <i>Real GDP</i> | | | | | | |
| <i>(percent change, Q4 to Q4)</i> | | | | | | |
| Projection | 2.7 | 2.9 | 2.4 | 2.0 | 1.4 | 1.0 |
| Confidence interval | | | | | | |
| Tealbook forecast errors | 2.2–3.6 | 1.4–4.6 | .1–4.0 | -.6–3.5 | ... | ... |
| FRB/US stochastic simulations | 2.6–2.9 | 1.9–4.2 | 1.0–4.0 | .4–3.5 | -.3–3.1 | -.8–2.7 |
| <i>Civilian unemployment rate</i> | | | | | | |
| <i>(percent, Q4)</i> | | | | | | |
| Projection | 4.1 | 3.4 | 3.2 | 3.2 | 3.4 | 3.7 |
| Confidence interval | | | | | | |
| Tealbook forecast errors | 4.0–4.2 | 2.8–3.7 | 2.0–4.6 | 1.7–5.0 | ... | ... |
| FRB/US stochastic simulations | 4.0–4.2 | 2.8–3.9 | 2.2–3.9 | 2.0–4.2 | 2.0–4.7 | 2.4–5.1 |
| <i>PCE prices, total</i> | | | | | | |
| <i>(percent change, Q4 to Q4)</i> | | | | | | |
| Projection | 1.7 | 1.9 | 1.9 | 2.0 | 2.1 | 2.2 |
| Confidence interval | | | | | | |
| Tealbook forecast errors | 1.6–2.0 | 1.4–3.2 | 1.2–3.5 | 1.2–3.3 | ... | ... |
| FRB/US stochastic simulations | 1.6–1.7 | 1.0–2.6 | .9–2.9 | .9–3.0 | .9–3.2 | .9–3.3 |
| <i>PCE prices excluding food and energy</i> | | | | | | |
| <i>(percent change, Q4 to Q4)</i> | | | | | | |
| Projection | 1.5 | 1.9 | 2.1 | 2.1 | 2.1 | 2.2 |
| Confidence interval | | | | | | |
| Tealbook forecast errors | 1.3–1.9 | 1.7–2.5 | 1.5–2.8 | ... | ... | ... |
| FRB/US stochastic simulations | 1.4–1.5 | 1.2–2.6 | 1.1–2.9 | 1.0–3.0 | 1.0–3.2 | 1.0–3.3 |
| <i>Federal funds rate</i> | | | | | | |
| <i>(percent, Q4)</i> | | | | | | |
| Projection | 1.2 | 2.7 | 4.0 | 4.8 | 5.1 | 5.0 |
| Confidence interval | | | | | | |
| FRB/US stochastic simulations | 1.2–1.2 | 2.3–3.2 | 3.1–5.1 | 3.4–6.5 | 3.3–7.1 | 2.8–7.2 |

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.

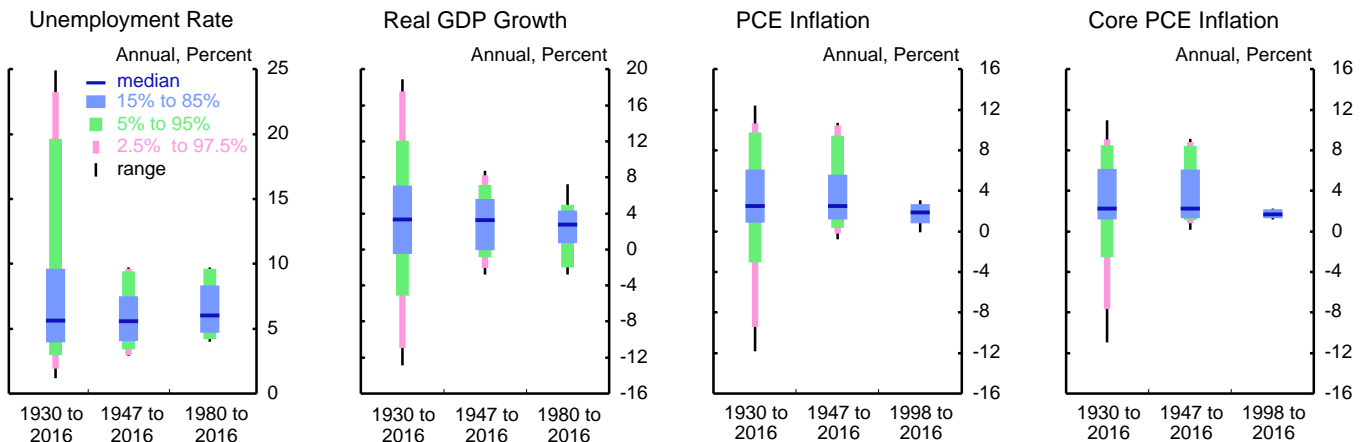
... Not applicable.

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

Phillips curve may steepen—when the labor market is very tight.⁵ 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.⁶

Inflation reaches 3 percent by the end of 2020, compared with about 2 percent in the baseline. In response to the higher path of inflation, the federal funds rate rises more and peaks slightly above 6 percent in 2022. As a result, real GDP rises a bit more slowly and the unemployment rate is about ½ percentage point above the baseline by the end of 2023 (though still slightly below the level of the natural rate).

Global Market Correction [SIGMA]

Asset valuation pressures in the United States and in many foreign economies remain noticeably elevated, with equity price-to-earnings ratios high by historical standards, interest rate spreads on corporate debt narrow, and term premiums on sovereign debt unusually compressed. In this scenario, we assume that investors become very concerned about stretched valuations, and a widespread market correction ensues over the course of 2018. Specifically, equity prices fall 20 percent and corporate borrowing spreads increase 45 basis points in both the United States and abroad. While term premiums on foreign sovereign bonds increase 30 basis points, term premiums on U.S. Treasury securities rise only about half as much as investors rebalance their portfolios toward dollar-denominated assets; these flight-to-safety flows cause the broad real dollar to appreciate about 5 percent. The fall in global asset prices weakens household and corporate balance sheets and weighs on confidence.

⁵ 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>.

⁶ 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 these increases 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.

Tighter financial conditions, weaker foreign activity, and the appreciation of the dollar restrain the pace of economic expansion in the United States. U.S. GDP growth moderates to 1½ percent in 2018, about 1½ percentage points lower than in the baseline. The unemployment rate runs ½ percentage point, on average, above the baseline through the end of 2023. Lower import prices and weaker activity reduce core PCE price inflation to 1¼ percent by the end of 2018. The federal funds rate follows a shallower path than in the baseline.

The macroeconomic effects in our scenario are only moderate. This outcome reflects our assumption that the asset price correction is fairly contained and, in particular, does not induce the widespread disruption to the broader functioning of financial markets that occurred during the Global Financial Crisis. Nonetheless, U.S. activity and inflation in the current scenario are lower than in the domestic “Market Correction” scenario featured in the December Tealbook because of the adverse effects stemming from weaker foreign activity and the stronger dollar.

Stronger Foreign Growth and Tighter Policy [SIGMA]

Our baseline forecast incorporates a slow policy normalization abroad as central banks continue to face muted inflationary pressures. However, foreign economic growth, especially in the AFEs, has been stronger than expected in recent quarters, and recent communication by some AFE central banks has pointed to a less accommodative policy stance. This scenario assumes that foreign GDP growth runs at an average pace of 3½ percent per year in 2018 and 2019, about ¾ percentage point above the baseline. These improved macroeconomic conditions lead AFE central banks to fear they are “behind the curve” and prompt them to tighten their policy rates more aggressively than what is prescribed by the baseline policy rule. Higher interest rates abroad—including from a rise in term premiums—along with some reversal of earlier flight-to-safety flows into U.S. assets contribute to a 5 percent depreciation of the broad real dollar.

Despite the tightening of monetary policy abroad and some spillovers of that tightening into U.S. interest rates, U.S. activity benefits as stronger foreign growth and the weaker dollar boost net exports. U.S. real GDP expands 3¼ percent in 2018 and 2½ percent in 2019, about ¼ percentage point more than in the baseline. The unemployment rate falls to just under 3 percent by the end of 2019. Higher import prices and stronger economic activity cause core PCE price inflation to run ¼ percentage point above the baseline in 2018 and 2019. The federal funds rate rises more quickly than in the baseline, increasing to 5 percent by the end of 2020.

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 | .06 | .05 | .01 | .09 |
| Previous Tealbook | .05 | .04 | .02 | .10 |
| <i>Less than 1 percent</i> | | | | |
| Current Tealbook | .12 | .17 | .20 | .13 |
| Previous Tealbook | .19 | .19 | .13 | .12 |

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 | .00 | .01 | .15 | .01 |
| Previous Tealbook | .01 | .01 | .18 | .02 |
| <i>Decrease by 1 percentage point</i> | | | | |
| Current Tealbook | .35 | .17 | .06 | .17 |
| Previous Tealbook | .15 | .06 | .05 | .16 |

Probability of Near-Term Recession

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

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.

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 discuss 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. As discussed in the Domestic Economic Developments and Outlook section of Tealbook A, the output gap is considerably wider in the staff's medium-term projection than in the December Tealbook. Reflecting the staff's revised projection for the output gap, the paths for the federal funds rate prescribed by simple rules and optimal control policies are noticeably higher than in December. A special exhibit reports the changes from the previous Tealbook in prescriptions of simple rules and optimal control policies as well as in their associated macroeconomic outcomes.

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 targeting (NIT) rule. These near-term prescriptions take as given the staff's baseline projections for the output gap and core inflation, 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 all of the simple policy rules are somewhat higher than in the previous Tealbook, reflecting the upward revision to the staff's near-term forecast for the output gap.
- 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 of the first-difference rule are modestly higher in the near term than those in the Tealbook baseline.

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.

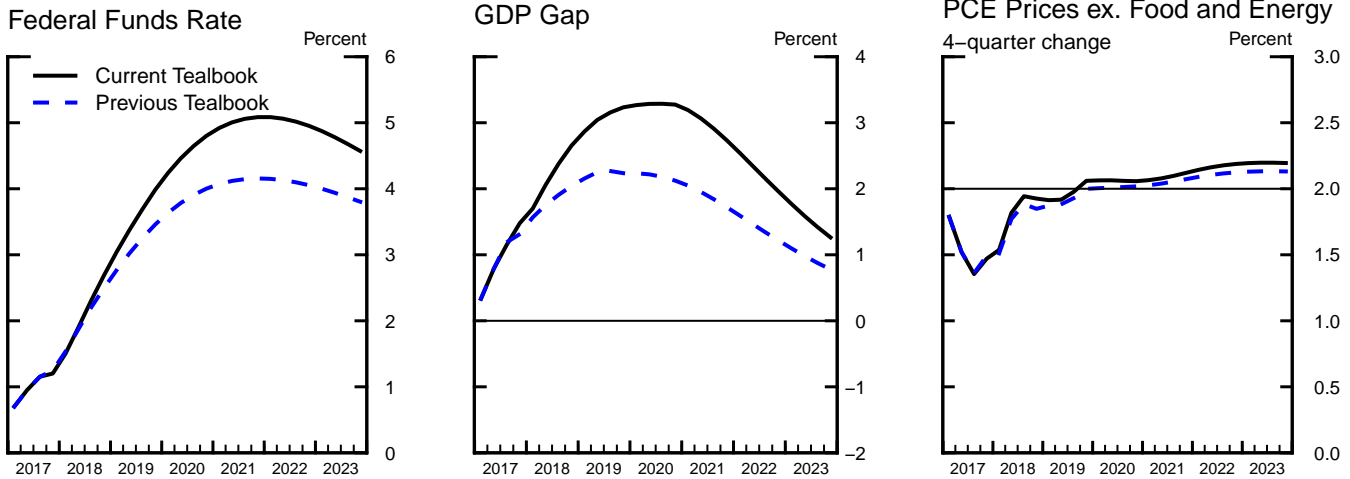
Policy Rules and the Staff Projection

Near-Term Prescriptions of Selected Simple Policy Rules¹

| | (Percent) | |
|-------------------------------------|-------------|-------------|
| | 2018:Q1 | 2018:Q2 |
| Taylor (1993) rule | 2.63 | 3.20 |
| <i>Previous Tealbook</i> | 2.53 | 2.99 |
| Taylor (1999) rule | 3.45 | 4.18 |
| <i>Previous Tealbook</i> | 3.28 | 3.82 |
| First-difference rule | 1.73 | 2.24 |
| <i>Previous Tealbook projection</i> | 1.48 | 1.69 |
| Nominal income targeting rule | 1.23 | 1.34 |
| <i>Previous Tealbook projection</i> | 1.21 | 1.27 |
| <i>Addendum:</i> | | |
| Tealbook baseline | 1.50 | 1.90 |

Monetary Policy Strategies

Key Elements of the Staff Projection



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

| | (Percent) | | |
|---|------------------|---|-------------------|
| | Current Tealbook | Current-Quarter Estimate Based on Previous Tealbook | Previous Tealbook |
| Tealbook baseline | | | |
| FRB/US r^* | 3.43 | 2.38 | 2.21 |
| Average projected real federal funds rate | 1.46 | 1.12 | .93 |
| SEP-consistent baseline | | | |
| FRB/US r^* | 1.09 | | |
| Average projected real federal funds rate | .46 | | |

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.

- Under the NIT 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 for raising the federal funds rate in the near term, the NIT rule prescribes a level for the federal funds rate in this quarter and the next that is near the low end of the current target range 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 baselines: the Tealbook baseline and a projection consistent with the medians in the December 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. This concept of r^* is a summary of the projected underlying strength of the real economy; consequently, it is based on a single criterion and does not take into account other considerations, such as achieving the inflation objective or avoiding sharp changes in the federal funds rate.

- At 3.43 percent, the estimate of Tealbook-consistent FRB/US r^* in this quarter is about 1 percentage point above the corresponding value in the December Tealbook. The estimate of Tealbook-consistent FRB/US r^* has not been revised up so sharply since 2010 and has not been above 3 percent since 2007. The large upward revision reflects the fact that the medium-term output

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 December 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.

gap in the current staff forecast is notably wider than in the December Tealbook.³

- At 1.09 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, based on information available at the time of the December meeting, has output exceeding potential by a considerably smaller amount from 2018 through 2020 than does the current Tealbook forecast despite the lower median path for the real federal funds rate in the SEP.

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 NIT 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 believe that monetary policy will follow through on this commitment and are aware of the implications for interest rates and the macroeconomy of such a policy.⁵ The exhibit also reports the Tealbook baseline projection.

- Under the Tealbook baseline policy, the federal funds rate increases, on average, about 1.2 percentage points per year through 2020. The federal funds rate peaks at 5 percent in 2021 before slowly moving down to its longer-run level, which the staff assumes will be 2½ percent.

³ In the previous Tealbook, the estimate of Tealbook-consistent FRB/US r^* for the current quarter was 17 basis points higher than for the previous quarter, reflecting the continued strengthening of the economy already embedded in the December Tealbook baseline.

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.

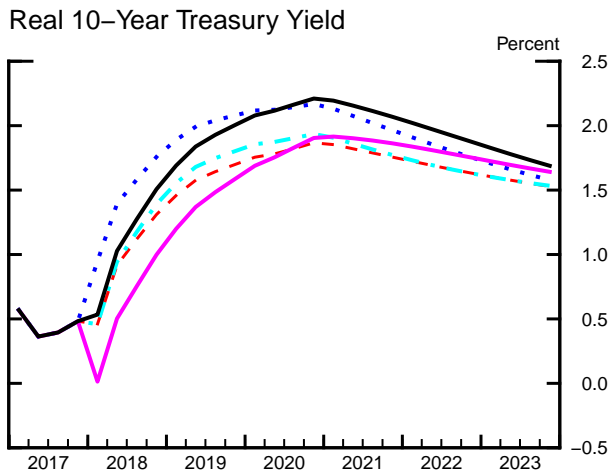
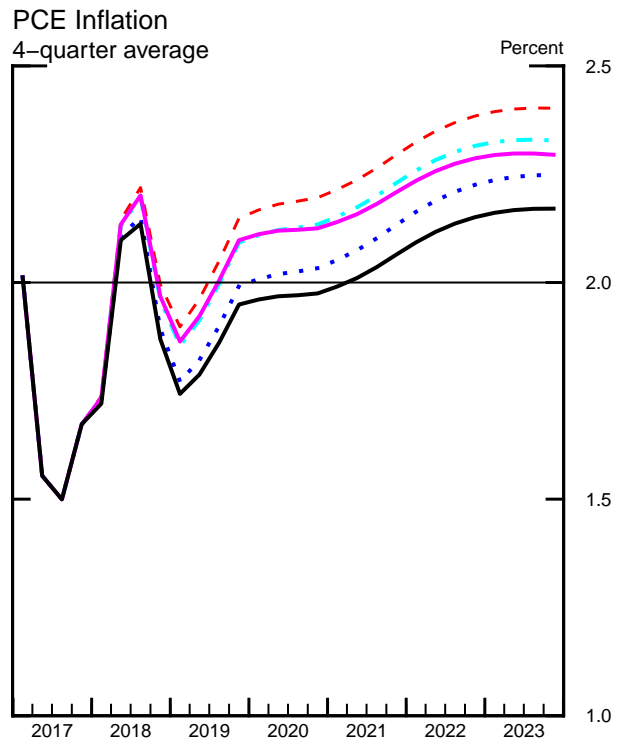
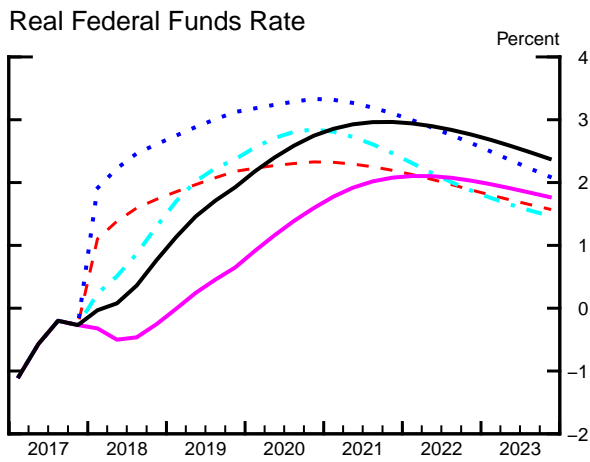
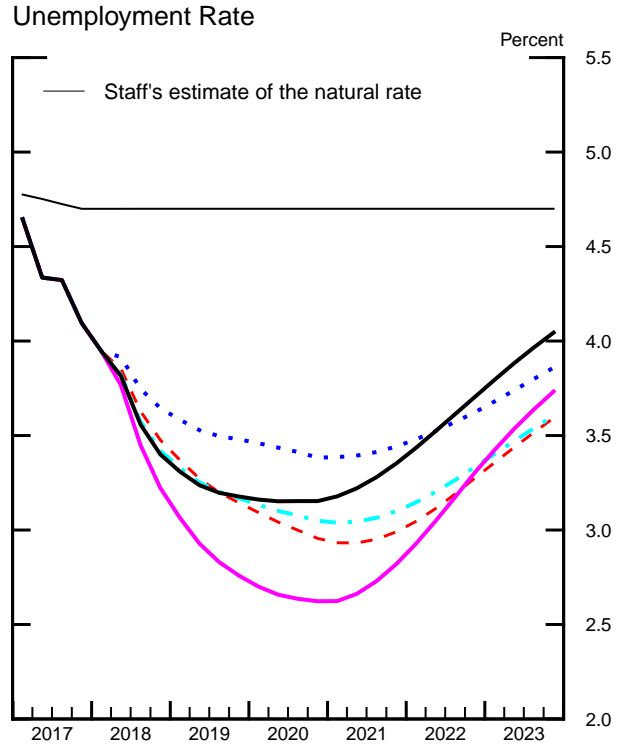
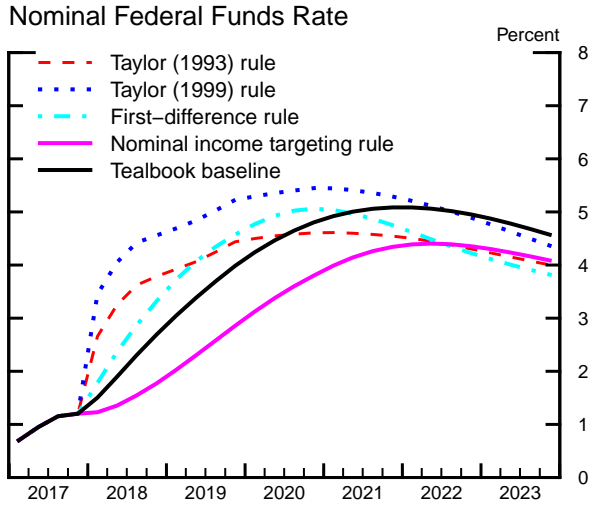
⁵ In generating these simulations, we assume that the public immediately and correctly understands the implications of the FOMC adopting a particular policy strategy. In the real world, the adoption of a particular policy strategy by the FOMC might well entail a period during which the public learns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

- The Taylor (1999) rule calls for an immediate and substantial increase in the federal funds rate, and the prescribed values exceed the corresponding Tealbook baseline values by about 1.4 percentage points per year, on average, over the next three years. These relatively high values for the federal funds rate are followed by slightly lower values than in the Tealbook baseline beyond 2022. The unemployment rate under the Taylor (1999) rule runs somewhat higher than the Tealbook baseline through 2021; the unemployment rate runs lower than in the baseline starting in 2022. Inflation under the Taylor (1999) rule runs a bit above its baseline path over the period shown in the figures. The reason that the sharp increase in the federal funds rate under the Taylor (1999) rule is not associated with an appreciably weaker economy is because agents in the model are forward looking and thus 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, thereby supporting economic activity and inflation.⁶
- The Taylor (1993) rule also calls for an immediate sharp increase in the federal funds rate. The prescriptions of the Taylor (1993) rule are higher than the Tealbook baseline over the next two years, though they are lower than those of 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. Accordingly, inflation under the Taylor (1993) rule exceeds inflation under the Tealbook baseline by more than under the Taylor (1999) rule, whereas the unemployment rate falls below the path in the Tealbook baseline sooner.
- The path for the federal funds rate prescribed by the first-difference rule is somewhat above the path in the Tealbook baseline over the next three years but runs below the baseline path for some years thereafter. The latter divergence occurs because the first-difference rule, which responds to the

⁶ In the FRB/US model, inflation tends to respond more strongly than the unemployment rate to longer-run developments. In the case of the Taylor (1999) rule, beyond 2022 the rule prescribes a path of the federal funds rate that runs, for a time, lower than the Tealbook baseline path. As a result, there is a long period during which the 10-year real Treasury yield under the Taylor (1999) rule is relatively low. Because agents in the model anticipate this period of low real 10-year Treasury rates, inflation under the Taylor (1999) rule exceeds inflation in the Tealbook baseline.

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.

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

- The NIT rule seeks to compensate for the cumulative shortfall of inflation (as measured by the rate of increase in the GDP price deflator) from an annual rate of 2 percent since the end of 2011. Compared with the Tealbook baseline policy, the NIT rule calls for a markedly slower pace of increases in the federal funds rate because the cumulative shortfall of inflation from 2 percent since the end of 2011 is currently large, at about 4 percent. Because the simulation embeds the assumption that policymakers can credibly commit to closing this gap and that financial market participants and price and wage setters correctly anticipate the ensuing 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 the Tealbook baseline and all other simulations shown, dropping to about 2.6 percent in 2021.

OPTIMAL CONTROL SIMULATIONS UNDER COMMITMENT

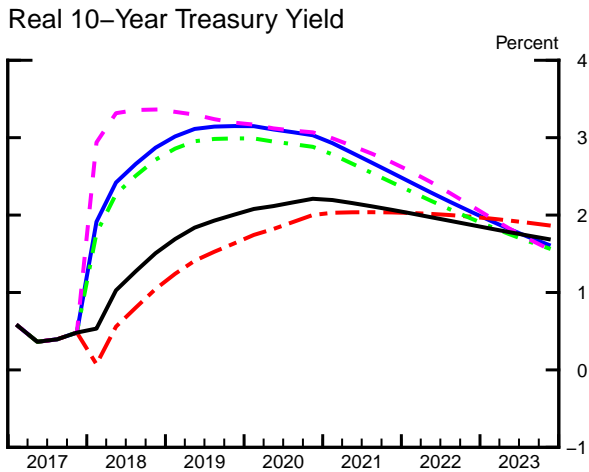
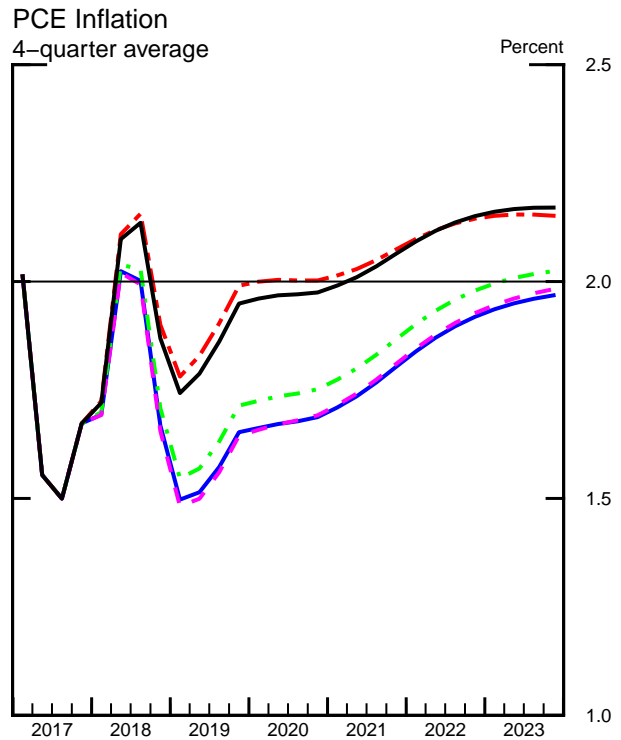
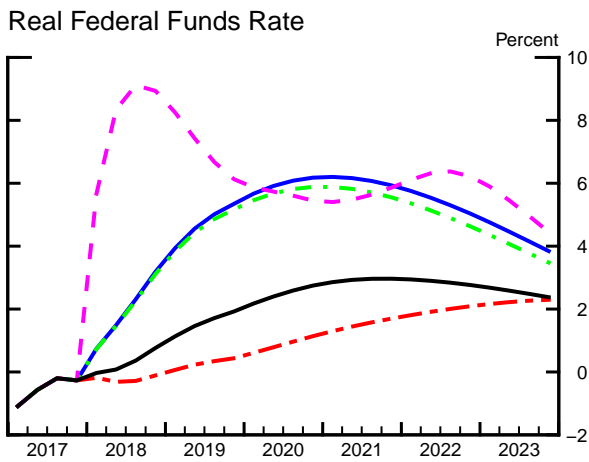
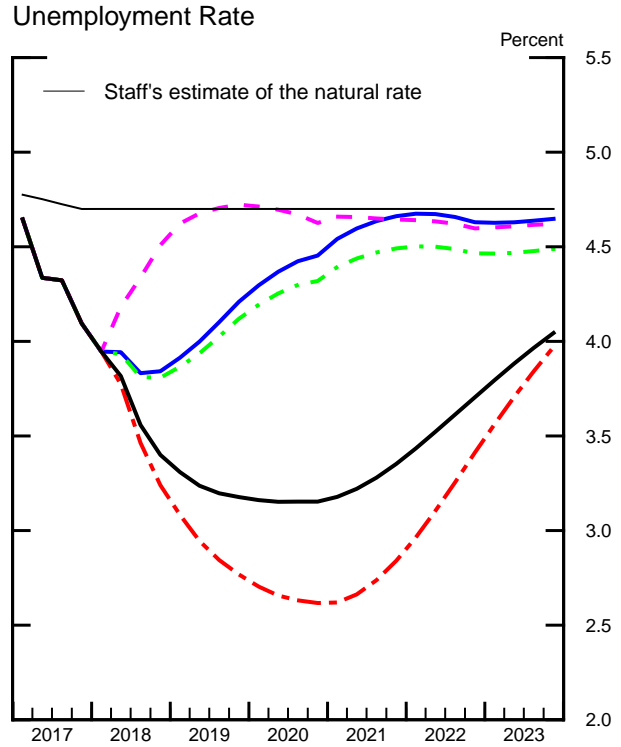
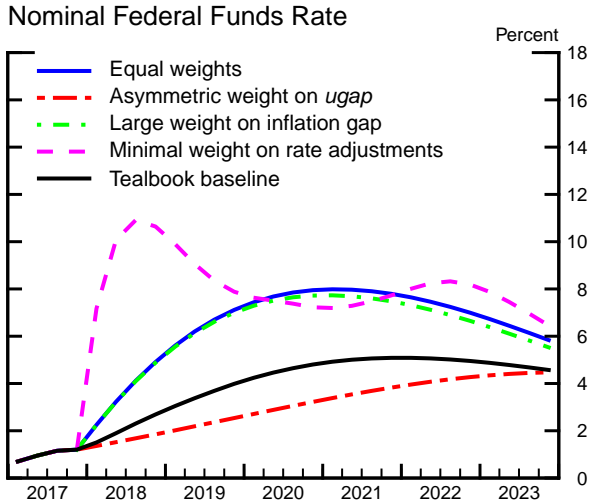
The third exhibit displays optimal control simulations under various assumptions about policymakers' preferences, as captured by four specifications of the loss function.⁷ The concept of optimal control employed here corresponds to a commitment policy under which the plans that policymakers make today constrain future policy choices; such a constraint may result in improved economic outcomes.⁸

⁷ 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.

⁸ Under the optimal control policies, policymakers achieve the displayed economic outcomes by making promises that bind future policymakers to take actions that will not be optimal from the perspective

Optimal Control Simulations under Commitment

Monetary Policy Strategies



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.

Three of the four optimal control policies prescribe much higher paths for the federal funds rate than the path in the baseline staff projection. High levels of the real federal funds rate are necessary in order to return the unemployment rate to its natural rate relatively quickly because, in the FRB/US model, the unemployment rate does not respond strongly to changes in real interest rates, a feature that appears to be consistent with recent historical experience. However, if the FOMC were to raise the real federal funds rate quickly to the high levels prescribed by most optimal control policies, macroeconomic outcomes may well be appreciably different than the benign outcomes predicted by the FRB/US model. The simulation results hinge on the assumptions that agents in the model have perfect foresight and that the public believes with certainty that policymakers will implement the path for the federal funds rate prescribed by the optimal control exercises. While these assumptions may be a reasonable approximation under some circumstances, they may not be valid for historically extreme changes in the federal funds rate, particularly those prescribed by the optimal control exercise that places only a minimal penalty on adjustments in the federal funds rate.

Nevertheless, the three optimal control policies that prescribe high paths for the federal funds rate have prescribed tighter policy than the Tealbook baseline for several years. Taken at face value, the additional economic strength embedded in the current Tealbook baseline increases the motivation of policymakers to raise the federal funds rate relatively quickly so as to keep the unemployment rate from falling further below its natural rate.

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

of those future policymakers (that is, the promises are time inconsistent). It is assumed that these promises are taken as credible by wage and price setters and by financial market participants.

weights cost function judge to be costly.⁹ 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 throughout the period shown. 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 inflationary pressures stemming from the prolonged period of elevated resource utilization.
- 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

⁹ When we use the SEP-consistent baseline as the underlying projection, the federal funds rate under the optimal control simulation with equal weights peaks below 5 percent, compared with nearly 8 percent under the Tealbook baseline.

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 by the unemployment rate of its natural rate—an outcome that this specification of the loss function also 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 11 percent in 2018 and then settles between 7 and 9 percent over much of the remainder of the period shown. This sharp tightening of policy reflects an effort to forestall the projected undershoot by the unemployment rate of its natural rate in the Tealbook baseline. 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 keeps the unemployment rate much closer to the staff’s estimate of the natural rate.¹⁰

CHANGES IN PRESCRIPTIONS AND OUTCOMES FROM THE DECEMBER TEALBOOK

The stronger economic outlook embedded in the staff’s baseline forecast implies large upward revisions to the paths for the federal funds rate prescribed by simple policy rules and the optimal control policies. Changes from the December Tealbook in the federal funds rate prescriptions as well as in the unemployment rate and inflation outcomes are shown in the fourth exhibit. The three panels to the left show these changes under the simple policy rules, whereas the panels to the right show these changes under the optimal control policies.

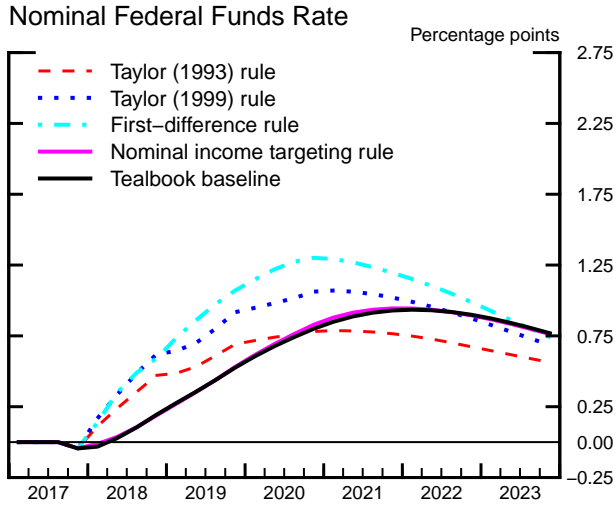
- The simple policy rules now prescribe levels for the federal funds rate that are, on average over the projection period shown, between $\frac{1}{2}$ and 1 percentage

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.

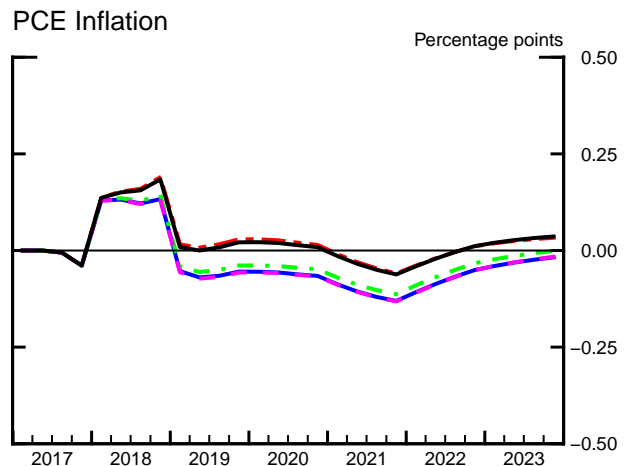
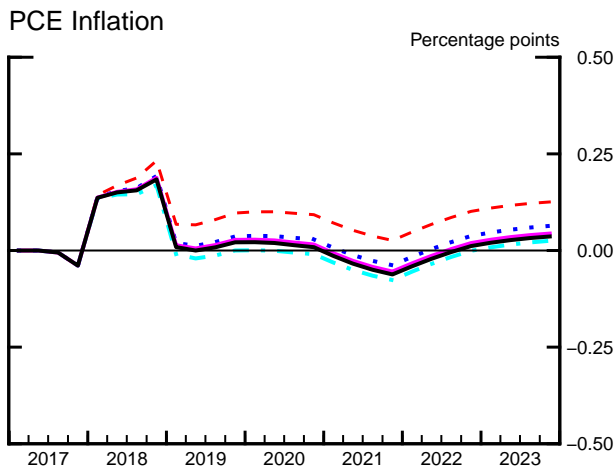
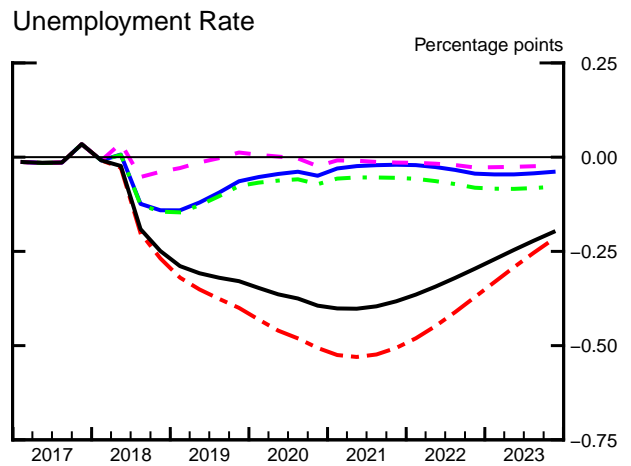
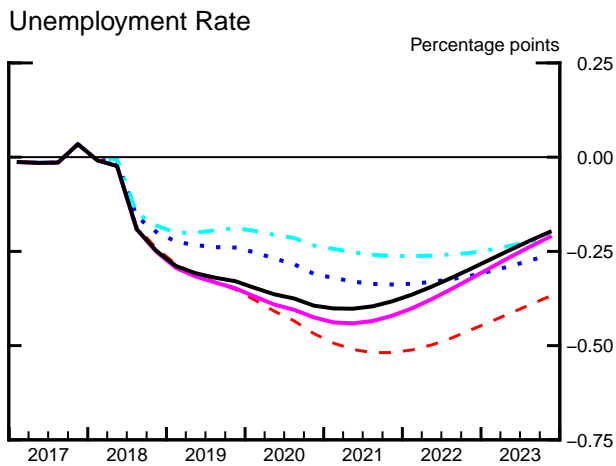
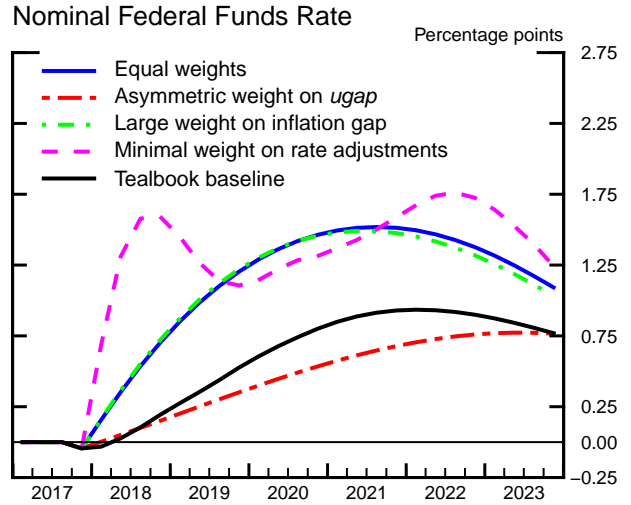
Changes in Prescriptions and Outcomes from the December Tealbook

Monetary Policy Strategies

Simple Rules



Optimal Control



Note: Each set of lines corresponds to the difference between the current prescriptions and economic outcomes under a simple policy rule or optimal control policy (shown in the previous two figures) and the associated prescriptions and economic outcomes shown in the December Tealbook.

point higher than in December. Despite the higher levels of the federal funds rate, the unemployment rate falls by more than in the December Tealbook because of the strength of the economic outlook embedded in the current Tealbook baseline. Because the short-run Phillips curve is quite flat in the FRB/US model, inflation outcomes are similar to those in the December Tealbook.

- With the exception of the policy associated with the asymmetric weight on *ugap*, the optimal control policies prescribe average levels for the federal funds rate over the projection period shown that are between 1 and 1½ percentage points higher than in December. The tighter policy rates under these policies offset most of the additional strength of the economic outlook embedded in the current Tealbook baseline and imply little change in the path for the unemployment rate or inflation from December. The optimal control policy associated with an asymmetric weight on *ugap* does not penalize deviations of the unemployment rate from its natural rate and, as a result, responds only modestly to the additional strength embedded in the staff outlook. The unemployment rate under this policy falls further, by about 0.4 percentage point, on average, over the projection period shown, and the path for inflation is little changed from the December Tealbook.

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

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 |
|---|------|------|------|------|------|------|------|
| | H2 | | | | | | |
| <i>Nominal federal funds rate¹</i> | | | | | | | |
| Taylor (1993) | 1.2 | 3.8 | 4.4 | 4.6 | 4.5 | 4.3 | 4.0 |
| Taylor (1999) | 1.2 | 4.6 | 5.2 | 5.4 | 5.3 | 4.9 | 4.4 |
| First-difference | 1.2 | 3.3 | 4.6 | 5.1 | 4.8 | 4.2 | 3.8 |
| Nominal income targeting | 1.2 | 1.8 | 2.9 | 3.8 | 4.3 | 4.4 | 4.1 |
| Extended Tealbook baseline | 1.2 | 2.7 | 4.0 | 4.8 | 5.1 | 5.0 | 4.6 |
| <i>Real GDP</i> | | | | | | | |
| Taylor (1993) | 3.3 | 2.9 | 2.6 | 2.3 | 1.7 | 1.1 | 1.1 |
| Taylor (1999) | 3.3 | 2.5 | 2.3 | 2.1 | 1.7 | 1.2 | 1.1 |
| First-difference | 3.3 | 2.9 | 2.5 | 2.2 | 1.7 | 1.2 | 1.2 |
| Nominal income targeting | 3.3 | 3.3 | 2.9 | 2.2 | 1.4 | .8 | .9 |
| Extended Tealbook baseline | 3.3 | 2.9 | 2.4 | 2.0 | 1.4 | 1.0 | 1.0 |
| <i>Unemployment rate¹</i> | | | | | | | |
| Taylor (1993) | 4.1 | 3.5 | 3.1 | 3.0 | 3.0 | 3.3 | 3.6 |
| Taylor (1999) | 4.1 | 3.6 | 3.5 | 3.4 | 3.4 | 3.6 | 3.9 |
| First-difference | 4.1 | 3.4 | 3.2 | 3.0 | 3.1 | 3.3 | 3.6 |
| Nominal income targeting | 4.1 | 3.2 | 2.8 | 2.6 | 2.8 | 3.3 | 3.7 |
| Extended Tealbook baseline | 4.1 | 3.4 | 3.2 | 3.2 | 3.4 | 3.7 | 4.0 |
| <i>Total PCE prices</i> | | | | | | | |
| Taylor (1993) | 2.1 | 2.0 | 2.1 | 2.2 | 2.3 | 2.4 | 2.4 |
| Taylor (1999) | 2.1 | 1.9 | 2.0 | 2.0 | 2.1 | 2.2 | 2.2 |
| First-difference | 2.1 | 2.0 | 2.1 | 2.1 | 2.2 | 2.3 | 2.3 |
| Nominal income targeting | 2.1 | 2.0 | 2.1 | 2.1 | 2.2 | 2.3 | 2.3 |
| Extended Tealbook baseline | 2.1 | 1.9 | 1.9 | 2.0 | 2.1 | 2.2 | 2.2 |
| <i>Core PCE prices</i> | | | | | | | |
| Taylor (1993) | 1.6 | 2.1 | 2.3 | 2.3 | 2.4 | 2.4 | 2.4 |
| Taylor (1999) | 1.6 | 1.9 | 2.1 | 2.1 | 2.2 | 2.3 | 2.3 |
| First-difference | 1.6 | 2.0 | 2.2 | 2.2 | 2.3 | 2.4 | 2.4 |
| Nominal income targeting | 1.6 | 2.0 | 2.2 | 2.2 | 2.3 | 2.3 | 2.3 |
| Extended Tealbook baseline | 1.6 | 1.9 | 2.1 | 2.1 | 2.1 | 2.2 | 2.2 |

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 | 2018 | | | | 2019 | | | |
|---|------|-----|-----|-----|------|-----|-----|-----|
| | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 |
| <i>Nominal federal funds rate¹</i> | | | | | | | | |
| Taylor (1993) | 2.7 | 3.2 | 3.6 | 3.8 | 3.9 | 4.1 | 4.2 | 4.4 |
| Taylor (1999) | 3.5 | 4.1 | 4.4 | 4.6 | 4.7 | 4.8 | 5.0 | 5.2 |
| First-difference | 1.8 | 2.4 | 2.9 | 3.3 | 3.7 | 4.1 | 4.3 | 4.6 |
| Nominal income targeting | 1.2 | 1.4 | 1.5 | 1.8 | 2.0 | 2.3 | 2.6 | 2.9 |
| Extended Tealbook baseline | 1.5 | 1.9 | 2.3 | 2.7 | 3.0 | 3.4 | 3.7 | 4.0 |
| <i>Real GDP</i> | | | | | | | | |
| Taylor (1993) | 3.1 | 3.1 | 3.1 | 2.9 | 2.9 | 2.8 | 2.7 | 2.6 |
| Taylor (1999) | 3.1 | 3.0 | 2.8 | 2.5 | 2.5 | 2.4 | 2.3 | 2.3 |
| First-difference | 3.1 | 3.1 | 3.1 | 2.9 | 3.0 | 2.8 | 2.7 | 2.5 |
| Nominal income targeting | 3.1 | 3.3 | 3.4 | 3.3 | 3.5 | 3.3 | 3.1 | 2.9 |
| Extended Tealbook baseline | 3.1 | 3.1 | 3.1 | 2.9 | 2.9 | 2.8 | 2.6 | 2.4 |
| <i>Unemployment rate¹</i> | | | | | | | | |
| Taylor (1993) | 3.9 | 3.9 | 3.6 | 3.5 | 3.4 | 3.3 | 3.2 | 3.1 |
| Taylor (1999) | 3.9 | 3.9 | 3.7 | 3.6 | 3.6 | 3.5 | 3.5 | 3.5 |
| First-difference | 3.9 | 3.8 | 3.6 | 3.4 | 3.3 | 3.3 | 3.2 | 3.2 |
| Nominal income targeting | 3.9 | 3.8 | 3.4 | 3.2 | 3.1 | 2.9 | 2.8 | 2.8 |
| Extended Tealbook baseline | 3.9 | 3.8 | 3.6 | 3.4 | 3.3 | 3.2 | 3.2 | 3.2 |
| <i>Total PCE prices</i> | | | | | | | | |
| Taylor (1993) | 1.7 | 2.1 | 2.2 | 2.0 | 1.9 | 2.0 | 2.1 | 2.1 |
| Taylor (1999) | 1.7 | 2.1 | 2.2 | 1.9 | 1.8 | 1.8 | 1.9 | 2.0 |
| First-difference | 1.7 | 2.1 | 2.2 | 2.0 | 1.9 | 1.9 | 2.0 | 2.1 |
| Nominal income targeting | 1.7 | 2.1 | 2.2 | 2.0 | 1.9 | 1.9 | 2.0 | 2.1 |
| Extended Tealbook baseline | 1.7 | 2.1 | 2.1 | 1.9 | 1.7 | 1.8 | 1.9 | 1.9 |
| <i>Core PCE prices</i> | | | | | | | | |
| Taylor (1993) | 1.6 | 1.9 | 2.0 | 2.1 | 2.1 | 2.1 | 2.2 | 2.3 |
| Taylor (1999) | 1.5 | 1.8 | 2.0 | 1.9 | 1.9 | 2.0 | 2.0 | 2.1 |
| First-difference | 1.5 | 1.9 | 2.0 | 2.0 | 2.0 | 2.0 | 2.1 | 2.2 |
| Nominal income targeting | 1.6 | 1.9 | 2.0 | 2.0 | 2.0 | 2.1 | 2.1 | 2.2 |
| Extended Tealbook baseline | 1.5 | 1.8 | 1.9 | 1.9 | 1.9 | 1.9 | 2.0 | 2.1 |

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 |
|---|------|------|------|------|------|------|------|
| | H2 | | | | | | |
| <i>Nominal federal funds rate¹</i> | | | | | | | |
| Equal weights | 1.2 | 4.9 | 7.1 | 7.9 | 7.8 | 7.0 | 5.8 |
| Asymmetric weight on <i>ugap</i> | 1.2 | 1.8 | 2.5 | 3.2 | 3.8 | 4.3 | 4.5 |
| Large weight on inflation gap | 1.2 | 4.9 | 7.0 | 7.7 | 7.5 | 6.6 | 5.5 |
| Minimal weight on rate adjustments | 1.2 | 10.6 | 7.9 | 7.2 | 7.7 | 8.2 | 6.5 |
| Extended Tealbook baseline | 1.2 | 2.7 | 4.0 | 4.8 | 5.1 | 5.0 | 4.6 |
| <i>Real GDP</i> | | | | | | | |
| Equal weights | 3.3 | 2.0 | 1.3 | 1.5 | 1.5 | 1.5 | 1.3 |
| Asymmetric weight on <i>ugap</i> | 3.3 | 3.3 | 2.9 | 2.2 | 1.3 | .6 | .7 |
| Large weight on inflation gap | 3.3 | 2.1 | 1.4 | 1.6 | 1.6 | 1.5 | 1.3 |
| Minimal weight on rate adjustments | 3.3 | 1.0 | 1.3 | 2.1 | 1.9 | 1.5 | 1.2 |
| Extended Tealbook baseline | 3.3 | 2.9 | 2.4 | 2.0 | 1.4 | 1.0 | 1.0 |
| <i>Unemployment rate¹</i> | | | | | | | |
| Equal weights | 4.1 | 3.8 | 4.2 | 4.5 | 4.7 | 4.6 | 4.6 |
| Asymmetric weight on <i>ugap</i> | 4.1 | 3.2 | 2.8 | 2.6 | 2.8 | 3.4 | 4.0 |
| Large weight on inflation gap | 4.1 | 3.8 | 4.1 | 4.3 | 4.5 | 4.5 | 4.5 |
| Minimal weight on rate adjustments | 4.1 | 4.5 | 4.7 | 4.6 | 4.6 | 4.6 | 4.6 |
| Extended Tealbook baseline | 4.1 | 3.4 | 3.2 | 3.2 | 3.4 | 3.7 | 4.0 |
| <i>Total PCE prices</i> | | | | | | | |
| Equal weights | 2.1 | 1.7 | 1.7 | 1.7 | 1.8 | 1.9 | 2.0 |
| Asymmetric weight on <i>ugap</i> | 2.1 | 1.9 | 2.0 | 2.0 | 2.1 | 2.1 | 2.2 |
| Large weight on inflation gap | 2.1 | 1.7 | 1.7 | 1.8 | 1.9 | 2.0 | 2.0 |
| Minimal weight on rate adjustments | 2.1 | 1.7 | 1.6 | 1.7 | 1.8 | 1.9 | 2.0 |
| Extended Tealbook baseline | 2.1 | 1.9 | 1.9 | 2.0 | 2.1 | 2.2 | 2.2 |
| <i>Core PCE prices</i> | | | | | | | |
| Equal weights | 1.6 | 1.7 | 1.8 | 1.8 | 1.9 | 2.0 | 2.0 |
| Asymmetric weight on <i>ugap</i> | 1.6 | 2.0 | 2.1 | 2.1 | 2.1 | 2.2 | 2.2 |
| Large weight on inflation gap | 1.6 | 1.8 | 1.8 | 1.8 | 1.9 | 2.0 | 2.0 |
| Minimal weight on rate adjustments | 1.6 | 1.7 | 1.8 | 1.8 | 1.9 | 2.0 | 2.0 |
| Extended Tealbook baseline | 1.6 | 1.9 | 2.1 | 2.1 | 2.1 | 2.2 | 2.2 |

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 | 2018 | | | | 2019 | | | |
|---|------|------|------|------|------|-----|-----|-----|
| | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 |
| <i>Nominal federal funds rate¹</i> | | | | | | | | |
| Equal weights | 2.2 | 3.2 | 4.1 | 4.9 | 5.6 | 6.2 | 6.7 | 7.1 |
| Asymmetric weight on <i>ugap</i> | 1.4 | 1.5 | 1.7 | 1.8 | 2.0 | 2.2 | 2.4 | 2.5 |
| Large weight on inflation gap | 2.2 | 3.2 | 4.1 | 4.9 | 5.6 | 6.1 | 6.6 | 7.0 |
| Minimal weight on rate adjustments | 7.2 | 10.1 | 10.9 | 10.6 | 9.9 | 9.1 | 8.4 | 7.9 |
| Extended Tealbook baseline | 1.5 | 1.9 | 2.3 | 2.7 | 3.0 | 3.4 | 3.7 | 4.0 |
| <i>Real GDP</i> | | | | | | | | |
| Equal weights | 3.1 | 2.8 | 2.5 | 2.0 | 1.6 | 1.5 | 1.3 | 1.3 |
| Asymmetric weight on <i>ugap</i> | 3.1 | 3.2 | 3.3 | 3.3 | 3.4 | 3.3 | 3.1 | 2.9 |
| Large weight on inflation gap | 3.1 | 2.9 | 2.6 | 2.1 | 1.8 | 1.6 | 1.5 | 1.4 |
| Minimal weight on rate adjustments | 3.1 | 2.5 | 1.8 | 1.0 | .5 | .6 | .9 | 1.3 |
| Extended Tealbook baseline | 3.1 | 3.1 | 3.1 | 2.9 | 2.9 | 2.8 | 2.6 | 2.4 |
| <i>Unemployment rate¹</i> | | | | | | | | |
| Equal weights | 3.9 | 3.9 | 3.8 | 3.8 | 3.9 | 4.0 | 4.1 | 4.2 |
| Asymmetric weight on <i>ugap</i> | 3.9 | 3.8 | 3.5 | 3.2 | 3.1 | 2.9 | 2.8 | 2.8 |
| Large weight on inflation gap | 3.9 | 3.9 | 3.8 | 3.8 | 3.9 | 3.9 | 4.0 | 4.1 |
| Minimal weight on rate adjustments | 3.9 | 4.2 | 4.3 | 4.5 | 4.6 | 4.7 | 4.7 | 4.7 |
| Extended Tealbook baseline | 3.9 | 3.8 | 3.6 | 3.4 | 3.3 | 3.2 | 3.2 | 3.2 |
| <i>Total PCE prices</i> | | | | | | | | |
| Equal weights | 1.7 | 2.0 | 2.0 | 1.7 | 1.5 | 1.5 | 1.6 | 1.7 |
| Asymmetric weight on <i>ugap</i> | 1.7 | 2.1 | 2.2 | 1.9 | 1.8 | 1.8 | 1.9 | 2.0 |
| Large weight on inflation gap | 1.7 | 2.0 | 2.0 | 1.7 | 1.5 | 1.6 | 1.6 | 1.7 |
| Minimal weight on rate adjustments | 1.7 | 2.0 | 2.0 | 1.7 | 1.5 | 1.5 | 1.6 | 1.6 |
| Extended Tealbook baseline | 1.7 | 2.1 | 2.1 | 1.9 | 1.7 | 1.8 | 1.9 | 1.9 |
| <i>Core PCE prices</i> | | | | | | | | |
| Equal weights | 1.5 | 1.7 | 1.8 | 1.7 | 1.7 | 1.6 | 1.7 | 1.8 |
| Asymmetric weight on <i>ugap</i> | 1.5 | 1.8 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.1 |
| Large weight on inflation gap | 1.5 | 1.8 | 1.8 | 1.8 | 1.7 | 1.7 | 1.7 | 1.8 |
| Minimal weight on rate adjustments | 1.5 | 1.7 | 1.8 | 1.7 | 1.7 | 1.6 | 1.7 | 1.8 |
| Extended Tealbook baseline | 1.5 | 1.8 | 1.9 | 1.9 | 1.9 | 1.9 | 2.0 | 2.1 |

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 | $R_t = r^{LR} + \pi_t + 0.5(\pi_t - \pi^{LR}) + 0.5 ygap_t$ |
| 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 | |
|---------------------------------|-------------|----------|----------|----------|-----------------|----------|----------------------|----------|--------------------------------|----------|
| | 12/01/17 | 01/18/18 | 12/01/17 | 01/18/18 | 12/01/17 | 01/18/18 | 12/01/17 | 01/18/18 | 12/01/17 | 01/18/18 |
| <i>Quarterly</i> | | | | | | | | | | |
| 2017:Q1 | 3.3 | 3.3 | 1.2 | 1.2 | 2.2 | 2.2 | 1.8 | 1.8 | 4.7 | 4.6 |
| 2017:Q2 | 4.1 | 4.1 | 3.1 | 3.1 | .3 | .3 | .9 | .9 | 4.4 | 4.3 |
| 2017:Q3 | 5.5 | 5.3 | 3.3 | 3.2 | 1.5 | 1.5 | 1.4 | 1.3 | 4.3 | 4.3 |
| 2017:Q4 | 4.8 | 6.0 | 2.2 | 3.5 | 2.8 | 2.7 | 1.9 | 1.8 | 4.1 | 4.1 |
| 2018:Q1 | 4.5 | 4.8 | 2.7 | 2.7 | 1.7 | 2.4 | 1.9 | 2.1 | 4.0 | 3.9 |
| 2018:Q2 | 4.3 | 4.9 | 2.4 | 3.2 | 1.7 | 1.8 | 2.0 | 2.0 | 3.8 | 3.8 |
| 2018:Q3 | 4.2 | 5.0 | 2.3 | 3.0 | 1.7 | 1.7 | 1.8 | 1.8 | 3.7 | 3.6 |
| 2018:Q4 | 4.0 | 4.7 | 2.2 | 2.8 | 1.6 | 1.6 | 1.7 | 1.7 | 3.6 | 3.4 |
| 2019:Q1 | 4.4 | 5.0 | 2.2 | 2.7 | 1.9 | 1.9 | 2.0 | 2.0 | 3.6 | 3.3 |
| 2019:Q2 | 4.2 | 4.7 | 2.2 | 2.6 | 1.9 | 1.9 | 2.0 | 2.1 | 3.5 | 3.2 |
| 2019:Q3 | 3.9 | 4.4 | 1.8 | 2.3 | 1.9 | 2.0 | 2.0 | 2.1 | 3.5 | 3.2 |
| 2019:Q4 | 3.7 | 4.2 | 1.6 | 2.2 | 1.9 | 2.0 | 2.0 | 2.1 | 3.5 | 3.2 |
| <i>Two-quarter²</i> | | | | | | | | | | |
| 2017:Q2 | 3.7 | 3.7 | 2.1 | 2.1 | 1.2 | 1.2 | 1.4 | 1.4 | -3 | -4 |
| 2017:Q4 | 5.1 | 5.7 | 2.7 | 3.3 | 2.2 | 2.1 | 1.6 | 1.6 | -3 | -2 |
| 2018:Q2 | 4.4 | 4.8 | 2.5 | 3.0 | 1.7 | 2.1 | 1.9 | 2.1 | -3 | -3 |
| 2018:Q4 | 4.1 | 4.9 | 2.2 | 2.9 | 1.7 | 1.6 | 1.8 | 1.8 | -2 | -4 |
| 2019:Q2 | 4.3 | 4.8 | 2.2 | 2.6 | 1.9 | 1.9 | 2.0 | 2.0 | -1 | -2 |
| 2019:Q4 | 3.8 | 4.3 | 1.7 | 2.2 | 1.9 | 2.0 | 2.0 | 2.1 | .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 | 4.4 | 4.7 | 2.4 | 2.7 | 1.7 | 1.7 | 1.5 | 1.5 | -6 | -6 |
| 2018:Q4 | 4.2 | 4.9 | 2.4 | 2.9 | 1.7 | 1.9 | 1.8 | 1.9 | -5 | -7 |
| 2019:Q4 | 4.1 | 4.6 | 2.0 | 2.4 | 1.9 | 1.9 | 2.0 | 2.1 | -1 | -2 |
| 2020:Q4 | 3.8 | 4.1 | 1.7 | 2.0 | 2.0 | 2.0 | 2.0 | 2.1 | .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 | 4.1 | 4.2 | 2.2 | 2.3 | 1.7 | 1.7 | 1.5 | 1.5 | 4.4 | 4.4 |
| 2018 | 4.5 | 5.1 | 2.5 | 3.1 | 1.8 | 2.0 | 1.8 | 1.8 | 3.8 | 3.7 |
| 2019 | 4.2 | 4.8 | 2.1 | 2.7 | 1.8 | 1.8 | 1.9 | 2.0 | 3.5 | 3.2 |
| 2020 | 3.9 | 4.3 | 1.7 | 2.1 | 2.0 | 2.0 | 2.0 | 2.1 | 3.5 | 3.2 |

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.

Greensheets

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 | 3.2 | 3.5 | | 2.7 | 3.2 | 3.0 | 2.8 | 2.7 | 2.6 | 2.3 | 2.2 | 2.7 | 2.9 | 2.4 | 2.0 |
| <i>Previous Tealbook</i> | 3.1 | 3.3 | 2.2 | | 2.7 | 2.4 | 2.3 | 2.2 | 2.2 | 2.2 | 1.8 | 1.6 | 2.4 | 2.4 | 2.0 | 1.7 |
| Final sales | 3.0 | 2.4 | 4.0 | | 2.2 | 3.1 | 3.2 | 3.2 | 2.8 | 2.4 | 2.2 | 2.2 | 3.0 | 2.9 | 2.4 | 2.0 |
| <i>Previous Tealbook</i> | 3.0 | 2.5 | 2.6 | | 2.3 | 2.5 | 2.4 | 2.7 | 2.1 | 1.9 | 1.8 | 1.9 | 2.7 | 2.5 | 1.9 | 1.7 |
| Priv. dom. final purch. | 3.3 | 2.2 | 4.9 | | 2.7 | 3.5 | 3.6 | 3.4 | 3.0 | 2.8 | 2.6 | 2.5 | 3.4 | 3.3 | 2.7 | 2.5 |
| <i>Previous Tealbook</i> | 3.3 | 2.4 | 2.9 | | 2.8 | 3.0 | 2.8 | 2.5 | 2.4 | 2.3 | 2.1 | 2.1 | 2.9 | 2.8 | 2.2 | 2.0 |
| Personal cons. expend. | 3.3 | 2.2 | 3.8 | | 2.6 | 2.9 | 3.0 | 3.0 | 2.9 | 2.8 | 2.7 | 2.6 | 2.8 | 2.9 | 2.8 | 2.5 |
| <i>Previous Tealbook</i> | 3.3 | 2.3 | 2.5 | | 2.7 | 2.6 | 2.5 | 2.4 | 2.3 | 2.3 | 2.2 | 2.2 | 2.5 | 2.6 | 2.3 | 2.1 |
| Durables | 7.6 | 8.6 | 12.2 | | 1.5 | 4.6 | 4.7 | 4.3 | 2.4 | 2.3 | 2.2 | 2.1 | 7.0 | 3.8 | 2.3 | 2.0 |
| Nondurables | 4.2 | 2.3 | 6.3 | | 3.4 | 3.5 | 3.2 | 3.2 | 3.0 | 2.9 | 2.8 | 2.7 | 3.5 | 3.4 | 2.9 | 2.6 |
| Services | 2.3 | 1.1 | 1.8 | | 2.5 | 2.5 | 2.7 | 2.7 | 3.0 | 2.9 | 2.8 | 2.7 | 1.9 | 2.6 | 2.8 | 2.6 |
| Residential investment | -7.3 | -4.7 | 11.3 | | -1.0 | 5.2 | 7.9 | 4.9 | 2.2 | .1 | -1 | -7 | 2.2 | 4.2 | .4 | 4.1 |
| <i>Previous Tealbook</i> | -7.3 | -5.1 | 3.2 | | 1.0 | 5.3 | 6.1 | 3.2 | 2.4 | 1.7 | 2.1 | 1.8 | .2 | 3.9 | 2.0 | 3.4 |
| Nonres. priv. fixed invest. | 6.7 | 4.7 | 8.9 | | 4.6 | 6.3 | 5.4 | 4.7 | 3.9 | 3.6 | 3.1 | 2.6 | 6.8 | 5.2 | 3.3 | 1.7 |
| <i>Previous Tealbook</i> | 6.7 | 5.1 | 5.2 | | 4.0 | 4.3 | 3.5 | 2.9 | 2.7 | 2.5 | 1.8 | 1.4 | 6.0 | 3.7 | 2.1 | 1.1 |
| Equipment & intangibles | 6.6 | 8.4 | 10.8 | | 5.3 | 6.5 | 5.6 | 5.4 | 4.3 | 4.2 | 3.5 | 3.0 | 7.7 | 5.7 | 3.8 | 2.1 |
| <i>Previous Tealbook</i> | 6.6 | 8.9 | 8.4 | | 4.8 | 4.1 | 3.8 | 3.4 | 3.1 | 2.9 | 2.2 | 1.8 | 7.2 | 4.0 | 2.5 | 1.6 |
| Nonres. structures | 7.0 | -7.0 | 2.6 | | 2.1 | 5.6 | 4.7 | 2.5 | 2.5 | 1.5 | 1.6 | 1.4 | 4.0 | 3.7 | 1.8 | .5 |
| <i>Previous Tealbook</i> | 7.0 | -6.8 | -5.2 | | 1.3 | 4.7 | 2.6 | 1.4 | 1.4 | 1.0 | .4 | .0 | 2.1 | 2.5 | .7 | -6 |
| Net exports ² | -614 | -598 | -627 | | -632 | -631 | -628 | -623 | -618 | -625 | -633 | -641 | -615 | -628 | -629 | -678 |
| <i>Previous Tealbook</i> ² | -614 | -594 | -594 | | -604 | -608 | -610 | -597 | -595 | -607 | -614 | -619 | -606 | -605 | -609 | -643 |
| Exports | 3.5 | 2.1 | 5.2 | | 4.3 | 5.4 | 7.0 | 5.5 | 5.6 | 5.0 | 4.9 | 4.0 | 4.5 | 5.6 | 4.9 | 3.3 |
| Imports | 1.5 | -7 | 8.5 | | 4.0 | 4.1 | 5.0 | 3.7 | 3.6 | 5.0 | 4.9 | 4.2 | 3.3 | 4.2 | 4.4 | 4.5 |
| Gov't. cons. & invest. | -2 | 7 | 2.4 | | -1 | 4 | 0 | 1.0 | .2 | .9 | .5 | 1.0 | .6 | .3 | .7 | .8 |
| <i>Previous Tealbook</i> | -2 | 4 | .7 | | .3 | .3 | -3 | 1.7 | .3 | 1.2 | .4 | 1.0 | .1 | .5 | .7 | .7 |
| Federal | 1.9 | 1.3 | 2.5 | | -2.2 | -9 | -1.2 | 1.2 | -1.0 | .8 | .5 | 1.1 | .8 | -8 | .3 | .7 |
| Defense | 4.7 | 2.4 | 5.4 | | -2.5 | -5 | -6 | 2.6 | -8 | 2.0 | 1.4 | 2.0 | 2.3 | -3 | 1.1 | 1.0 |
| Nondefense | -1.9 | -2 | -1.6 | | -1.6 | -1.6 | -2.0 | -8 | -1.2 | -1.0 | -1.0 | -3 | -1.2 | -1.5 | -8 | -1 |
| State & local | -1.5 | .2 | 2.4 | | 1.2 | 1.2 | .7 | .9 | .9 | 1.0 | .6 | .9 | .4 | 1.0 | .8 | .9 |
| Change in priv. inventories ² | 5 | 39 | 18 | | 40 | 42 | 35 | 22 | 19 | 25 | 30 | 30 | 16 | 35 | 26 | 37 |
| <i>Previous Tealbook</i> ² | 5 | 37 | 17 | | 34 | 29 | 25 | 2 | 5 | 14 | 16 | 6 | 15 | 22 | 10 | 12 |

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 | 2.7 | 2.9 | 2.4 | 2.0 |
| <i>Previous Tealbook</i> | 1.7 | 1.3 | 2.7 | 2.7 | 2.0 | 1.8 | 2.4 | 2.4 | 2.0 | 1.7 |
| Final sales | 1.5 | 1.7 | 2.0 | 2.9 | 2.0 | 1.9 | 3.0 | 2.9 | 2.4 | 2.0 |
| <i>Previous Tealbook</i> | 1.5 | 1.7 | 2.0 | 2.9 | 2.0 | 1.9 | 2.7 | 2.5 | 1.9 | 1.7 |
| Priv. dom. final purch. | 2.6 | 2.3 | 2.6 | 4.1 | 2.9 | 2.5 | 3.4 | 3.3 | 2.7 | 2.5 |
| <i>Previous Tealbook</i> | 2.6 | 2.3 | 2.6 | 4.1 | 2.9 | 2.5 | 2.9 | 2.8 | 2.2 | 2.0 |
| Personal cons. expend. | 1.5 | 1.3 | 2.0 | 3.6 | 3.0 | 2.8 | 2.8 | 2.9 | 2.8 | 2.5 |
| <i>Previous Tealbook</i> | 1.5 | 1.3 | 2.0 | 3.6 | 3.0 | 2.8 | 2.5 | 2.6 | 2.3 | 2.1 |
| Durables | 4.8 | 7.2 | 5.2 | 8.7 | 6.4 | 7.0 | 7.0 | 3.8 | 2.3 | 2.0 |
| Nondurables | .4 | .8 | 2.6 | 2.8 | 2.8 | 2.5 | 3.5 | 3.4 | 2.9 | 2.6 |
| Services | 1.4 | .6 | 1.3 | 3.0 | 2.6 | 2.3 | 1.9 | 2.6 | 2.8 | 2.6 |
| Residential investment | 6.0 | 15.7 | 6.8 | 6.3 | 10.3 | 2.5 | 2.2 | 4.2 | .4 | 4.1 |
| <i>Previous Tealbook</i> | 6.0 | 15.7 | 6.8 | 6.3 | 10.3 | 2.5 | .2 | 3.9 | 2.0 | 3.4 |
| Nonres. priv. fixed invest. | 9.0 | 5.2 | 4.8 | 6.1 | .3 | .7 | 6.8 | 5.2 | 3.3 | 1.7 |
| <i>Previous Tealbook</i> | 9.0 | 5.2 | 4.8 | 6.1 | .3 | .7 | 6.0 | 3.7 | 2.1 | 1.1 |
| Equipment & intangibles | 9.2 | 5.5 | 4.5 | 5.3 | 3.3 | -1 | 7.7 | 5.7 | 3.8 | 2.1 |
| <i>Previous Tealbook</i> | 9.2 | 5.5 | 4.5 | 5.3 | 3.3 | -1 | 7.2 | 4.0 | 2.5 | 1.6 |
| Nonres. structures | 8.0 | 4.1 | 5.8 | 8.8 | -9.1 | 3.5 | 4.0 | 3.7 | 1.8 | .5 |
| <i>Previous Tealbook</i> | 8.0 | 4.1 | 5.8 | 8.8 | -9.1 | 3.5 | 2.1 | 2.5 | .7 | -6 |
| Net exports ¹ | -459 | -447 | -405 | -428 | -545 | -586 | -615 | -628 | -629 | -678 |
| <i>Previous Tealbook¹</i> | -459 | -447 | -405 | -428 | -545 | -586 | -606 | -605 | -609 | -643 |
| Exports | 4.2 | 2.2 | 5.9 | 3.0 | -1.8 | .6 | 4.5 | 5.6 | 4.9 | 3.3 |
| Imports | 3.5 | .3 | 2.5 | 6.2 | 2.9 | 2.7 | 3.3 | 4.2 | 4.4 | 4.5 |
| Gov't. cons. & invest. | -3.0 | -2.2 | -2.8 | .5 | 1.6 | .4 | .6 | .3 | .7 | .8 |
| <i>Previous Tealbook</i> | -3.0 | -2.2 | -2.8 | .5 | 1.6 | .4 | .1 | .5 | .7 | .7 |
| Federal | -4.0 | -2.1 | -6.7 | -1.2 | 1.2 | -3 | .8 | -8 | .3 | .7 |
| Defense | -4.1 | -3.9 | -7.1 | -4.0 | .0 | -1.4 | 2.3 | -3 | 1.1 | 1.0 |
| Nondefense | -3.9 | 1.0 | -6.0 | 3.5 | 2.9 | 1.2 | -1.2 | -1.5 | -8 | .1 |
| State & local | -2.3 | -2.3 | -1 | 1.5 | 1.9 | .8 | .4 | 1.0 | .8 | .9 |
| Change in priv. inventories ¹ | 38 | 55 | 79 | 68 | 101 | 33 | 16 | 35 | 26 | 37 |
| <i>Previous Tealbook¹</i> | 38 | 55 | 79 | 68 | 101 | 33 | 15 | 22 | 10 | 12 |

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 | 3.2 3.3 | 3.5 2.2 | | 2.7 2.7 | 3.2 2.4 | 3.0 2.3 | 2.8 2.2 | | 2.7 2.2 | 2.6 2.2 | 2.3 1.8 | 2.2 1.6 | 2.7 2.4 | 2.9 2.4 | 2.4 2.0 | 2.0 1.7 |
| Final sales <i>Previous Tealbook</i> | 2.9 | 2.4 | 4.0 | | 2.2 | 3.1 | 3.2 | 3.2 | | 2.8 | 2.4 | 2.2 | 2.2 | 3.0 | 2.9 | 2.4 | 2.0 |
| Priv. dom. final purch. <i>Previous Tealbook</i> | 2.9 | 2.5 | 2.6 | | 2.3 | 2.5 | 2.4 | 2.7 | | 2.1 | 1.9 | 1.8 | 1.9 | 2.7 | 2.5 | 1.9 | 1.7 |
| | 2.8 | 1.9 | 4.1 | | 2.3 | 3.0 | 3.1 | 2.9 | | 2.6 | 2.4 | 2.3 | 2.1 | 2.9 | 2.8 | 2.3 | 2.1 |
| | 2.8 | 2.1 | 2.5 | | 2.4 | 2.5 | 2.4 | 2.2 | | 2.0 | 2.0 | 1.8 | 1.8 | 2.5 | 2.4 | 1.9 | 1.7 |
| Personal cons. expend. <i>Previous Tealbook</i> | 2.2 | 1.5 | 2.6 | | 1.8 | 2.0 | 2.1 | 2.1 | | 2.0 | 1.9 | 1.9 | 1.8 | 1.9 | 2.0 | 1.9 | 1.7 |
| | 2.2 | 1.6 | 1.7 | | 1.9 | 1.8 | 1.7 | 1.7 | | 1.6 | 1.6 | 1.5 | 1.5 | 1.7 | 1.8 | 1.6 | 1.4 |
| Durables | .6 | .6 | .9 | | .1 | .3 | .4 | .3 | | .2 | .2 | .2 | .2 | .5 | .3 | .2 | .1 |
| Nondurables | .6 | .3 | .9 | | .5 | .5 | .5 | .5 | | .4 | .4 | .4 | .4 | .5 | .5 | .4 | .4 |
| Services | 1.1 | .5 | .9 | | 1.2 | 1.2 | 1.3 | 1.3 | | 1.4 | 1.3 | 1.3 | 1.3 | .9 | 1.2 | 1.3 | 1.2 |
| Residential investment <i>Previous Tealbook</i> | -.3 | -.2 | .4 | | .0 | .2 | .3 | .2 | | .1 | .0 | .0 | .0 | .1 | .2 | .0 | .2 |
| | -.3 | -.2 | .1 | | .0 | .2 | .2 | .1 | | .1 | .1 | .1 | .1 | .0 | .1 | .1 | .1 |
| Nonres. priv. fixed invest. <i>Previous Tealbook</i> | .8 | .6 | 1.1 | | .6 | .8 | .7 | .6 | | .5 | .5 | .4 | .3 | .8 | .7 | .4 | .2 |
| Equipment & intangibles <i>Previous Tealbook</i> | .8 | .6 | .6 | | .5 | .5 | .4 | .4 | | .3 | .3 | .2 | .2 | .7 | .5 | .3 | .1 |
| | .6 | .8 | 1.0 | | .5 | .6 | .6 | .5 | | .4 | .4 | .3 | .3 | .7 | .6 | .4 | .2 |
| | .6 | .8 | .8 | | .5 | .4 | .4 | .3 | | .3 | .3 | .2 | .2 | .7 | .4 | .2 | .2 |
| Nonres. structures <i>Previous Tealbook</i> | .2 | -.2 | .1 | | .1 | .2 | .1 | .1 | | .1 | .0 | .0 | .0 | .1 | .1 | .1 | .0 |
| | .2 | -.2 | -.2 | | .0 | .1 | .1 | .0 | | .0 | .0 | .0 | .0 | .1 | .1 | .0 | .0 |
| Net exports <i>Previous Tealbook</i> | .2 | .4 | -.6 | | -.1 | .0 | .1 | .1 | | .1 | -.1 | -.1 | -.1 | .0 | .0 | -.1 | -.3 |
| Exports | .2 | .4 | .0 | | -.2 | -.1 | .0 | .3 | | .1 | -.2 | -.1 | -.1 | .2 | .0 | -.1 | -.2 |
| Imports | .4 | .3 | .6 | | .5 | .7 | .8 | .7 | | .7 | .6 | .6 | .5 | .5 | .7 | .6 | .4 |
| | -.2 | .1 | -.2 | | -.6 | -.6 | -.8 | -.6 | | -.5 | -.7 | -.7 | -.6 | -.5 | -.6 | -.7 | -.7 |
| Gov't. cons. & invest. <i>Previous Tealbook</i> | .0 | .1 | .4 | | .0 | .1 | .0 | .2 | | .0 | .2 | .1 | .2 | .1 | .1 | .1 | .1 |
| | .0 | .1 | .1 | | .1 | .1 | .0 | .3 | | .1 | .2 | .1 | .2 | .0 | .1 | .1 | .1 |
| Federal | .1 | .1 | .2 | | -.1 | -.1 | -.1 | .0 | | -.1 | .0 | .0 | .1 | .1 | -.1 | .0 | .0 |
| Defense | .2 | .1 | .2 | | -.1 | .0 | .0 | .1 | | .0 | .1 | .1 | .1 | .1 | .0 | .0 | .0 |
| Nondefense | -.1 | .0 | .0 | | .0 | .0 | -.1 | .0 | | .0 | .0 | .0 | .0 | .0 | .0 | .0 | .0 |
| State & local | -.2 | .0 | .3 | | .1 | .1 | .1 | .1 | | .1 | .1 | .1 | .1 | .0 | .1 | .1 | .1 |
| Change in priv. inventories <i>Previous Tealbook</i> | .1 | .8 | -.4 | | .5 | .1 | -.2 | -.3 | | -.1 | .1 | .1 | .0 | -.3 | .0 | .0 | .0 |
| | .1 | .8 | -.5 | | .4 | -.1 | -.1 | -.5 | | .1 | .2 | .0 | -.2 | -.3 | -.1 | .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 | 2.4 | 2.0 | 1.7 | 1.9 | 1.8 | 2.2 | 2.1 | 2.1 | 2.1 | 2.0 | 1.9 | 1.9 | 2.1 | 2.1 |
| PCE chain-wt. price index <i>Previous Tealbook</i> | .3 | 1.5 | 2.7 | 2.4 | 1.8 | 1.7 | 1.6 | 1.9 | 1.9 | 1.9 | 2.0 | 2.0 | 1.7 | 1.9 | 1.9 | 2.0 |
| Energy <i>Previous Tealbook</i> | -16.0 | 8.4 | 30.6 | 12.4 | -4.1 | -2.4 | -1.9 | -1.6 | -1.2 | -1.0 | -1.0 | -8 | 8.2 | .8 | -1.1 | -4 |
| Food <i>Previous Tealbook</i> | -16.0 | 8.3 | 31.2 | -2.6 | -4.2 | -2.1 | -1.2 | -7 | -5 | -2 | -2 | -2 | 8.3 | -2.5 | -4 | .3 |
| Ex. food & energy <i>Previous Tealbook</i> | 2.0 | .2 | -.1 | .9 | 1.9 | 2.1 | 2.3 | 2.3 | 2.3 | 2.3 | 2.3 | 2.3 | .6 | 1.8 | 2.3 | 2.2 |
| Ex. food & energy, market based <i>Previous Tealbook</i> | 2.0 | .2 | .9 | 2.0 | 2.1 | 2.1 | 2.3 | 2.3 | 2.3 | 2.3 | 2.3 | 2.3 | .9 | 2.1 | 2.3 | 2.2 |
| CPI <i>Previous Tealbook</i> | .9 | 1.3 | 1.8 | 2.1 | 2.0 | 1.8 | 1.7 | 2.0 | 2.1 | 2.1 | 2.1 | 2.1 | 1.5 | 1.9 | 2.1 | 2.1 |
| ECL, hourly compensation ² <i>Previous Tealbook</i> ² | .9 | 1.4 | 1.9 | 1.9 | 2.0 | 1.8 | 1.7 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 1.5 | 1.8 | 2.0 | 2.0 |
| Business sector Output per hour <i>Previous Tealbook</i> | .3 | 1.0 | 1.6 | 1.8 | 1.9 | 1.6 | 1.5 | 1.8 | 1.9 | 1.9 | 1.9 | 1.9 | 1.2 | 1.7 | 1.9 | 1.9 |
| Compensation 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 | 1.8 | 1.2 | 1.7 | 1.8 | 1.9 |
| Unit labor costs <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 | 1.8 | 1.2 | 1.7 | 1.8 | 1.9 |
| Core goods imports chain-wt. price index ³ <i>Previous Tealbook</i> ³ | -3 | 2.0 | 3.7 | 3.1 | 2.0 | 2.0 | 2.0 | 2.2 | 2.2 | 2.3 | 2.3 | 2.3 | 2.1 | 2.3 | 2.2 | 2.3 |
| | -3 | 2.0 | 3.7 | 1.9 | 1.9 | 2.0 | 2.0 | 2.2 | 2.3 | 2.3 | 2.3 | 2.3 | 2.1 | 2.0 | 2.3 | 2.4 |
| | .6 | 1.7 | 2.3 | 2.6 | 2.5 | 2.3 | 2.2 | 2.4 | 2.5 | 2.5 | 2.5 | 2.5 | 1.7 | 2.4 | 2.5 | 2.5 |
| | .6 | 1.7 | 2.2 | 2.2 | 2.3 | 2.3 | 2.2 | 2.4 | 2.4 | 2.4 | 2.4 | 2.5 | 1.7 | 2.4 | 2.4 | 2.5 |
| | 2.2 | 3.1 | 2.5 | 2.6 | 2.5 | 2.5 | 2.5 | 2.6 | 2.6 | 2.7 | 2.7 | 2.7 | 2.8 | 2.5 | 2.7 | 2.7 |
| | 2.2 | 3.1 | 2.5 | 2.6 | 2.4 | 2.4 | 2.4 | 2.5 | 2.5 | 2.6 | 2.6 | 2.6 | 2.8 | 2.5 | 2.5 | 2.6 |
| Business sector Output per hour <i>Previous Tealbook</i> | 1.4 | 3.3 | .2 | .5 | .9 | 1.6 | 1.3 | 1.0 | .9 | .8 | .5 | .9 | 1.0 | 1.1 | .8 | .9 |
| Compensation 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 | .8 | 1.0 | .9 | .9 |
| Unit labor costs <i>Previous Tealbook</i> | .3 | 3.3 | 1.5 | 3.0 | 4.0 | 4.0 | 4.0 | 3.9 | 3.9 | 3.9 | 3.9 | 3.9 | 2.4 | 3.8 | 3.9 | 3.9 |
| Core goods imports chain-wt. price index ³ <i>Previous Tealbook</i> ³ | .2 | 3.5 | 1.3 | 3.6 | 3.5 | 3.5 | 3.5 | 3.6 | 3.6 | 3.6 | 3.6 | 3.6 | 2.3 | 3.5 | 3.6 | 3.6 |
| | -1.0 | .1 | 1.3 | 2.5 | 3.1 | 2.4 | 2.7 | 2.9 | 3.0 | 3.2 | 3.4 | 3.4 | 1.3 | 2.7 | 3.1 | 3.0 |
| | -1.2 | -.2 | 2.4 | 2.3 | 2.4 | 2.6 | 2.6 | 2.5 | 2.6 | 2.8 | 2.9 | 2.9 | 1.5 | 2.5 | 2.7 | 2.7 |
| | 2.5 | 1.1 | 1.7 | 2.4 | 3.0 | 1.1 | .8 | .7 | .6 | .6 | .6 | .6 | 1.3 | 1.8 | .6 | .6 |
| | 2.5 | 1.2 | 2.6 | .8 | 1.2 | .8 | .8 | .8 | .7 | .7 | .7 | .7 | 1.6 | .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 1.9 | 1.9 1.8 | 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 1.7 | 1.9 1.7 | 1.9 1.9 | 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 | 8.2 8.3 | .8 -2.5 | -1.1 -4 | -4 .3 |
| 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 | .6 .9 | 1.8 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 1.5 | 1.9 1.8 | 2.1 2.0 | 2.1 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 | 1.7 1.6 | 1.9 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 2.1 | 2.3 2.0 | 2.2 2.3 | 2.3 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 | 2.4 2.2 | 2.5 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 2.8 | 2.5 2.5 | 2.7 2.5 | 2.7 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 | 1.0 .8 | 1.1 1.0 | .8 .9 | .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 | 2.4 2.3 | 3.8 3.5 | 3.9 3.6 | 3.9 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 | 1.3 1.5 | 2.7 2.5 | 3.1 2.7 | 3.0 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 | 1.3 1.6 | 1.8 .9 | .6 .7 | .6 .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 | 128 | 204 | 183 | 188 | 203 | 203 | 189 | 189 | 169 | 169 | | | | |
| Nonfarm payroll employment ² | 4.3 | 4.3 | 4.1 | 3.9 | 3.8 | 3.6 | 3.4 | 3.3 | 3.2 | 3.2 | 3.2 | 4.1 | 3.4 | 3.2 | 3.2 | |
| Unemployment rate ³ | 4.4 | 4.3 | 4.1 | 4.0 | 3.8 | 3.7 | 3.6 | 3.6 | 3.5 | 3.5 | 3.5 | 4.1 | 3.6 | 3.5 | 3.5 | |
| <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 | 4.7 | 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 | |
| <i>Previous Tealbook³</i> | 60.1 | 60.2 | 60.1 | 60.2 | 60.3 | 60.5 | 60.6 | 60.6 | 60.7 | 60.7 | 60.7 | 60.1 | 60.6 | 60.7 | 60.7 | |
| Employment-to-Population Ratio ³ | 59.8 | 59.7 | 59.7 | 59.6 | 59.6 | 59.5 | 59.5 | 59.5 | 59.4 | 59.4 | 59.4 | 59.7 | 59.5 | 59.4 | 59.2 | |
| Employment-to-Population Trend ³ | .8 | 1.2 | 1.5 | 1.7 | 2.1 | 2.4 | 2.7 | 2.9 | 3.1 | 3.2 | 3.3 | 1.5 | 2.7 | 3.3 | 3.3 | |
| Output gap ⁴ | .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 | |
| <i>Previous Tealbook⁴</i> | 5.6 | -1.3 | 8.2 | 5.0 | 3.4 | 2.6 | .9 | 1.8 | 1.6 | 1.1 | 1.1 | 3.5 | 3.0 | 1.4 | 1.1 | |
| Industrial production ⁵ | 5.6 | -3 | 5.5 | 3.5 | 2.4 | 1.1 | 1.1 | 1.2 | .9 | .6 | .4 | 3.1 | 2.0 | .8 | .5 | |
| <i>Previous Tealbook⁵</i> | 2.6 | -2.0 | 7.0 | 3.1 | 3.6 | 2.7 | .7 | 1.4 | 1.6 | 1.4 | .8 | 2.4 | 2.5 | 1.3 | .9 | |
| Manufacturing industr. prod. ⁵ | 2.6 | -1.2 | 6.3 | 2.1 | 2.0 | 1.3 | .9 | .9 | .8 | .6 | .2 | 2.5 | 1.6 | .6 | .2 | |
| <i>Previous Tealbook⁵</i> | 75.7 | 75.2 | 76.4 | 76.8 | 77.4 | 77.8 | 77.8 | 77.9 | 78.1 | 78.2 | 78.2 | 76.4 | 77.8 | 78.2 | 78.3 | |
| Capacity utilization rate - mfg. ³ | 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 | |
| <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 | 17.7 | 17.3 | 17.4 | 17.4 | 17.1 | 17.1 | 17.1 | 17.0 | 16.9 | 17.1 | 17.3 | 17.0 | 16.7 | |
| Light motor vehicle sales ⁶ | 4.1 | 5.3 | 6.0 | 4.8 | 4.9 | 5.0 | 4.7 | 5.0 | 4.7 | 4.4 | 4.2 | 4.7 | 4.9 | 4.6 | 4.1 | |
| <i>Income and saving</i> | 2.7 | .5 | 2.0 | 5.6 | 2.8 | 2.0 | 2.7 | 4.8 | 2.5 | 2.0 | 2.3 | 2.0 | 3.3 | 2.9 | 2.1 | |
| Nominal GDP 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 | |
| Real disposable pers. income ⁵ | 3.7 | 3.3 | 2.9 | 3.6 | 3.6 | 3.4 | 3.3 | 3.7 | 3.7 | 3.5 | 3.4 | 2.9 | 3.3 | 3.4 | 3.1 | |
| <i>Previous Tealbook⁵</i> | 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 | |
| Personal saving rate ³ | 2.8 | 18.1 | 17.7 | 5.3 | 2.3 | 12.6 | 7.7 | 2.5 | 3.5 | 3.8 | 2.8 | 7.0 | 6.9 | 3.1 | 2.8 | |
| <i>Previous Tealbook³</i> | 10.9 | 11.2 | 11.5 | 11.5 | 11.5 | 11.7 | 11.8 | 11.8 | 11.7 | 11.7 | 11.7 | 11.5 | 11.8 | 11.7 | 11.6 | |
| Corporate profits ⁷ | 17.2 | 17.6 | 17.3 | 17.0 | 17.0 | 17.2 | 17.4 | 17.3 | 17.3 | 17.2 | 17.1 | 17.3 | 17.4 | 17.1 | 16.8 | |
| Profit share of GNP ³ | 2.0 | 2.5 | 2.4 | 2.1 | 2.1 | 2.4 | 2.5 | 2.4 | 2.3 | 2.2 | 2.1 | 2.4 | 2.5 | 2.1 | 1.7 | |
| Gross national saving rate ³ | | | | | | | | | | | | | | | | |
| Net national saving rate ³ | | | | | | | | | | | | | | | | |

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 | 171 | 194 | 179 | 149 |
| Unemployment rate ² | 8.7 | 7.8 | 7.0 | 5.7 | 5.0 | 4.7 | 4.1 | 3.4 | 3.2 | 3.2 |
| <i>Previous Tealbook²</i> | 8.7 | 7.8 | 7.0 | 5.7 | 5.0 | 4.7 | 4.1 | 3.6 | 3.5 | 3.5 |
| 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 | 4.7 | 4.7 | 4.7 | 4.7 |
| Employment-to-Population Ratio ² | 58.5 | 58.7 | 58.5 | 59.3 | 59.4 | 59.8 | 60.1 | 60.6 | 60.7 | 60.7 |
| Employment-to-Population Trend ² | 60.7 | 60.3 | 60.2 | 60.1 | 59.9 | 59.8 | 59.7 | 59.5 | 59.4 | 59.2 |
| Output gap ³ | -3.7 | -3.7 | -2.5 | -9 | -1 | .3 | 1.5 | 2.7 | 3.3 | 3.3 |
| <i>Previous Tealbook³</i> | -3.7 | -3.7 | -2.5 | -9 | -1 | .3 | 1.3 | 2.1 | 2.3 | 2.1 |
| Industrial production ⁴ | 2.8 | 2.3 | 2.2 | 3.4 | -2.7 | -1 | 3.5 | 3.0 | 1.4 | 1.1 |
| <i>Previous Tealbook⁴</i> | 2.8 | 2.3 | 2.2 | 3.4 | -2.7 | -1 | 3.1 | 2.0 | .8 | .5 |
| Manufacturing industr. prod. ⁴ | 2.5 | 1.7 | .9 | 1.5 | -6 | .3 | 2.4 | 2.5 | 1.3 | .9 |
| <i>Previous Tealbook⁴</i> | 2.5 | 1.7 | .9 | 1.5 | -6 | .3 | 2.5 | 1.6 | .6 | .2 |
| Capacity utilization rate - mfg. ² | 74.4 | 74.6 | 74.7 | 75.9 | 75.4 | 75.1 | 76.4 | 77.8 | 78.2 | 78.3 |
| <i>Previous Tealbook²</i> | 74.4 | 74.6 | 74.7 | 75.9 | 75.4 | 75.1 | 76.4 | 77.1 | 77.3 | 77.3 |
| 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 | 17.3 | 17.0 | 16.7 |
| <i>Income and saving</i> | | | | | | | | | | |
| Nominal GDP ⁴ | 3.6 | 3.2 | 4.3 | 4.3 | 3.1 | 3.4 | 4.7 | 4.9 | 4.6 | 4.1 |
| Real disposable pers. income ⁴ | 1.7 | 5.1 | -2.8 | 4.9 | 3.2 | .2 | 2.0 | 3.3 | 2.9 | 2.1 |
| <i>Previous Tealbook⁴</i> | 1.7 | 5.1 | -2.8 | 4.9 | 3.2 | .2 | 1.8 | 2.5 | 2.3 | 1.8 |
| Personal saving rate ² | 5.8 | 9.2 | 4.7 | 5.9 | 6.1 | 3.6 | 2.9 | 3.3 | 3.4 | 3.1 |
| <i>Previous Tealbook²</i> | 5.8 | 9.2 | 4.7 | 5.9 | 6.1 | 3.6 | 3.0 | 2.9 | 3.0 | 2.7 |
| Corporate profits ⁶ | 6.8 | .6 | 4.7 | 7.4 | -11.1 | 8.7 | 7.0 | 6.9 | 3.1 | 2.8 |
| Profit share of GNP ² | 12.3 | 12.0 | 12.0 | 12.4 | 10.7 | 11.3 | 11.5 | 11.8 | 11.7 | 11.6 |
| Gross national saving rate ² | 16.1 | 18.0 | 18.2 | 19.5 | 19.0 | 17.2 | 17.3 | 17.4 | 17.1 | 16.8 |
| Net national saving rate ² | .8 | 2.9 | 3.1 | 4.7 | 4.1 | 2.1 | 2.4 | 2.5 | 2.1 | 1.7 |

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 | |
|---|-------|-------|-------|-------|-------|--------|------|------|-------|-------|--|
| | | | | | | | Q3 | Q4 | Q1 | Q2 | |
| Unified federal budget¹ | | | | | | | | | | | |
| Receipts | 3,250 | 3,268 | 3,315 | 3,259 | 3,472 | 3,716 | 807 | 770 | 662 | 1,033 | |
| Outlays | 3,688 | 3,853 | 3,981 | 4,112 | 4,428 | 4,719 | 950 | 994 | 1,119 | 1,031 | |
| Surplus/deficit | -438 | -585 | -666 | -853 | -956 | -1,002 | -143 | -225 | -458 | 1 | |
| <i>Percent of GDP</i> | | | | | | | | | | | |
| Surplus/deficit | -2.4 | -3.2 | -3.5 | -4.2 | -4.5 | -4.5 | -2.9 | -4.5 | -9.1 | .0 | |
| <i>Previous Tealbook</i> | -2.4 | -3.2 | -3.5 | -3.6 | -3.9 | -4.0 | -2.9 | -4.5 | -9.1 | .0 | |
| Primary surplus/deficit | -1.2 | -1.9 | -2.0 | -2.6 | -2.6 | -2.1 | -2.0 | -2.8 | -7.4 | 1.9 | |
| Net interest | 1.2 | 1.3 | 1.4 | 1.6 | 2.0 | 2.4 | .9 | 1.7 | 1.7 | 1.9 | |
| Cyclically adjusted surplus/deficit | -1.9 | -2.8 | -3.3 | -4.7 | -5.6 | -5.9 | -3.0 | -4.8 | -9.5 | -5 | |
| Federal debt held by public | 72.9 | 76.7 | 76.5 | 77.6 | 79.4 | 81.2 | 75.2 | 74.8 | 76.7 | 75.9 | |
| Government in the NIPA² | | | | | | | | | | | |
| Purchases | 1.6 | .4 | .6 | .3 | .7 | .8 | .7 | 2.4 | -1 | .4 | |
| Consumption | 1.9 | .6 | .2 | .0 | .3 | .5 | 1.6 | .6 | -.4 | -1 | |
| Investment | .4 | -.5 | 2.3 | 1.8 | 2.0 | 2.0 | -1.5 | 10.5 | 1.4 | 2.2 | |
| State and local construction | .0 | -2.3 | -2.6 | 1.5 | 1.0 | 1.0 | -4.2 | 17.0 | 2.0 | 2.0 | |
| Real disposable personal income | 3.2 | .2 | 2.0 | 3.3 | 2.9 | 2.1 | .5 | 2.0 | 5.6 | 2.8 | |
| Contribution from transfers ³ | .7 | .3 | .4 | .7 | .8 | .7 | .3 | .5 | 1.2 | 1.3 | |
| Contribution from taxes ³ | -1.4 | .2 | -.8 | .1 | -.7 | -1.0 | -1.1 | -.6 | 3.3 | -.9 | |
| Government employment | | | | | | | | | | | |
| Federal | 3 | 4 | -1 | -1 | 0 | 0 | -1 | -2 | -1 | -1 | |
| State and local | 10 | 13 | 5 | 9 | 9 | 9 | 6 | 3 | 9 | 9 | |
| Fiscal indicators² | | | | | | | | | | | |
| Fiscal effect (FE) ⁴ | .2 | .3 | .1 | .4 | .6 | .5 | -.1 | .2 | .5 | .5 | |
| Discretionary policy actions (FI) | .4 | .2 | .1 | .5 | .5 | .4 | .2 | .5 | .3 | .4 | |
| <i>Previous Tealbook</i> | .4 | .2 | .1 | .3 | .3 | .2 | .1 | .2 | .4 | .2 | |
| Federal purchases | .1 | .0 | .1 | -.1 | .0 | .0 | .1 | .2 | -.1 | -.1 | |
| State and local purchases | .2 | .1 | .0 | .1 | .1 | .1 | .0 | .3 | .1 | .1 | |
| Taxes and transfers | .1 | .1 | .1 | .4 | .4 | .2 | .1 | .1 | .4 | .4 | |
| Cyclical | -.2 | .0 | -.2 | -.3 | -.1 | .0 | -.3 | -.3 | -.2 | -.2 | |
| Other | .0 | .1 | .1 | .3 | .3 | .2 | .0 | .0 | .3 | .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 | | | | Projected | | | | |
|------------------------------------|------|-----|------|-----|------|-----|-----|-----|-----------|-----|-----|------|--|
| | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | |
| Real GDP¹ | | | | | | | | | | | | | |
| Total foreign | 3.0 | 3.1 | 2.4 | 3.0 | 3.1 | 3.0 | 2.9 | 2.9 | 2.8 | 2.8 | 2.9 | 2.5 | |
| <i>Previous Tealbook</i> | 2.9 | 3.1 | 2.2 | 3.1 | 2.8 | 2.7 | 2.7 | 2.6 | 2.7 | 2.6 | 2.8 | 2.4 | |
| Advanced foreign economies | 2.7 | 3.4 | 2.2 | 2.2 | 2.2 | 2.1 | 2.0 | 2.0 | 1.8 | 1.8 | 2.0 | 1.3 | |
| Canada | 3.7 | 4.3 | 1.7 | 2.0 | 2.4 | 2.3 | 2.3 | 2.2 | 2.0 | 2.0 | 2.0 | 2.0 | |
| Japan | 1.5 | 2.9 | 2.5 | 2.0 | 1.4 | 1.2 | 1.0 | .9 | .9 | .9 | 3.3 | -3.7 | |
| United Kingdom | 1.2 | 1.2 | 1.6 | 1.8 | 1.7 | 1.7 | 1.6 | 1.5 | 1.5 | 1.6 | 1.6 | 1.6 | |
| Euro area | 2.5 | 2.9 | 2.9 | 2.6 | 2.4 | 2.1 | 2.1 | 2.1 | 1.9 | 1.8 | 1.7 | 1.7 | |
| Germany | 3.6 | 2.6 | 3.3 | 2.5 | 2.2 | 1.9 | 1.8 | 1.7 | 1.6 | 1.5 | 1.4 | 1.4 | |
| Emerging market economies | 3.3 | 2.9 | 2.6 | 3.8 | 4.0 | 3.9 | 3.8 | 3.8 | 3.8 | 3.8 | 3.8 | 3.8 | |
| Asia | 5.4 | 5.1 | 5.6 | 5.3 | 5.2 | 5.0 | 5.0 | 4.9 | 4.8 | 4.7 | 4.7 | 4.7 | |
| Korea | 4.3 | 2.4 | 6.3 | 3.7 | 3.4 | 3.4 | 3.4 | 3.4 | 3.2 | 3.2 | 3.1 | 3.1 | |
| China | 7.1 | 6.8 | 6.5 | 6.8 | 6.7 | 6.6 | 6.5 | 6.4 | 6.3 | 6.2 | 6.2 | 6.1 | |
| Latin America | 2.1 | 1.3 | -5 | 2.4 | 3.0 | 2.9 | 2.8 | 2.8 | 2.9 | 2.9 | 2.9 | 2.9 | |
| Mexico | 2.2 | 1.1 | -1.2 | 2.7 | 3.2 | 3.0 | 2.8 | 2.8 | 2.9 | 2.9 | 2.9 | 2.9 | |
| Brazil | 5.3 | 2.7 | .6 | 1.5 | 2.5 | 2.5 | 2.5 | 2.5 | 3.0 | 3.0 | 3.0 | 3.0 | |
| Consumer prices² | | | | | | | | | | | | | |
| Total foreign | 2.9 | 2.0 | 2.2 | 3.1 | 2.9 | 2.5 | 2.5 | 2.5 | 2.4 | 2.4 | 2.4 | 2.8 | |
| <i>Previous Tealbook</i> | 2.9 | 2.0 | 2.2 | 2.6 | 2.5 | 2.5 | 2.5 | 2.5 | 2.4 | 2.4 | 2.4 | 2.8 | |
| Advanced foreign economies | 2.2 | .3 | 1.1 | 2.1 | 2.0 | 1.6 | 1.5 | 1.5 | 1.5 | 1.6 | 1.6 | 2.6 | |
| Canada | 2.6 | .1 | 1.2 | 2.5 | 2.3 | 2.3 | 2.3 | 2.1 | 2.0 | 2.0 | 2.0 | 2.0 | |
| Japan | -1 | -3 | .4 | 2.3 | 1.3 | .6 | .6 | .7 | .8 | .9 | 1.0 | 6.3 | |
| United Kingdom | 3.7 | 3.0 | 2.4 | 2.9 | 2.8 | 2.3 | 2.2 | 2.2 | 2.2 | 2.2 | 2.2 | 2.2 | |
| Euro area | 2.8 | .2 | 1.0 | 1.7 | 1.9 | 1.3 | 1.3 | 1.4 | 1.4 | 1.5 | 1.6 | 1.6 | |
| Germany | 2.1 | .4 | 1.6 | 2.4 | 2.4 | 1.8 | 1.7 | 1.8 | 1.9 | 2.0 | 2.1 | 2.2 | |
| Emerging market economies | 3.3 | 3.3 | 3.0 | 3.8 | 3.6 | 3.3 | 3.2 | 3.2 | 3.1 | 3.0 | 3.0 | 3.0 | |
| Asia | .9 | 1.7 | 2.1 | 3.3 | 3.1 | 2.8 | 2.8 | 2.8 | 2.8 | 2.7 | 2.7 | 2.7 | |
| Korea | 2.6 | .7 | 2.2 | .5 | 2.8 | 3.4 | 3.4 | 3.3 | 3.2 | 3.1 | 3.1 | 3.1 | |
| China | -6 | 2.3 | 2.0 | 3.5 | 2.8 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | |
| Latin America | 9.1 | 7.0 | 5.2 | 5.0 | 5.0 | 4.3 | 4.3 | 4.1 | 3.7 | 3.5 | 3.5 | 3.5 | |
| Mexico | 9.9 | 6.9 | 5.1 | 4.5 | 4.4 | 3.7 | 3.7 | 3.5 | 3.3 | 3.2 | 3.2 | 3.2 | |
| Brazil | 3.2 | 2.3 | 2.3 | 3.6 | 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 | 2.7 | 2.9 | 3.0 | 2.8 | 2.8 | |
| <i>Previous Tealbook</i> | 3.2 | 2.2 | 3.0 | 2.8 | 2.0 | 2.6 | 2.8 | 2.7 | 2.6 | 2.7 | |
| Advanced foreign economies | 1.8 | .3 | 2.5 | 2.0 | 1.2 | 1.9 | 2.6 | 2.1 | 1.8 | 1.7 | |
| Canada | 3.1 | .7 | 3.6 | 2.5 | .3 | 2.0 | 2.9 | 2.3 | 2.0 | 1.9 | |
| Japan | .2 | .3 | 2.8 | -.3 | 1.2 | 1.5 | 2.2 | 1.1 | .3 | .9 | |
| United Kingdom | 1.3 | 1.5 | 2.6 | 3.3 | 2.1 | 2.0 | 1.4 | 1.6 | 1.6 | 1.6 | |
| Euro area | .5 | -1.0 | .8 | 1.5 | 2.0 | 1.9 | 2.7 | 2.2 | 1.8 | 1.7 | |
| Germany | 2.4 | .2 | 1.6 | 1.9 | 1.3 | 1.9 | 3.0 | 1.9 | 1.5 | 1.4 | |
| Emerging market economies | 4.6 | 4.2 | 3.5 | 3.6 | 2.9 | 3.4 | 3.2 | 3.9 | 3.8 | 3.8 | |
| Asia | 5.1 | 5.7 | 5.4 | 5.0 | 4.4 | 4.8 | 5.4 | 5.0 | 4.7 | 4.6 | |
| Korea | 2.9 | 2.1 | 3.5 | 2.8 | 3.3 | 2.4 | 4.2 | 3.4 | 3.1 | 3.0 | |
| China | 8.7 | 8.0 | 7.6 | 7.1 | 6.8 | 6.8 | 6.8 | 6.5 | 6.2 | 5.9 | |
| Latin America | 4.0 | 3.1 | 1.7 | 2.5 | 1.6 | 2.1 | 1.3 | 2.9 | 2.9 | 3.0 | |
| Mexico | 3.9 | 3.0 | 1.2 | 3.5 | 2.7 | 3.3 | 1.2 | 2.9 | 2.9 | 3.0 | |
| Brazil | 2.6 | 2.6 | 2.6 | -.1 | -5.5 | -2.4 | 2.5 | 2.5 | 3.0 | 2.6 | |
| Consumer prices² | | | | | | | | | | | |
| Total foreign | 3.4 | 2.3 | 2.4 | 2.0 | 1.4 | 1.9 | 2.5 | 2.6 | 2.5 | 2.4 | |
| <i>Previous Tealbook</i> | 3.4 | 2.3 | 2.4 | 2.0 | 1.4 | 1.9 | 2.4 | 2.5 | 2.5 | 2.4 | |
| Advanced foreign economies | 2.2 | 1.3 | 1.0 | 1.2 | .5 | .9 | 1.4 | 1.7 | 1.8 | 1.7 | |
| Canada | 2.7 | 1.0 | 1.0 | 2.0 | 1.3 | 1.4 | 1.6 | 2.2 | 2.0 | 2.0 | |
| Japan | -.3 | -.2 | 1.4 | 2.6 | .2 | .3 | .6 | .8 | 2.2 | 1.0 | |
| United Kingdom | 4.6 | 2.6 | 2.1 | .9 | .1 | 1.2 | 3.0 | 2.4 | 2.2 | 2.1 | |
| Euro area | 2.9 | 2.3 | .8 | .2 | .2 | .7 | 1.4 | 1.5 | 1.5 | 1.7 | |
| Germany | 2.6 | 1.9 | 1.4 | .4 | .2 | 1.0 | 1.6 | 1.9 | 2.0 | 2.2 | |
| Emerging market economies | 4.3 | 3.1 | 3.4 | 2.7 | 2.1 | 2.7 | 3.3 | 3.3 | 3.0 | 2.9 | |
| Asia | 4.4 | 2.6 | 3.1 | 1.8 | 1.5 | 2.0 | 2.0 | 2.9 | 2.7 | 2.7 | |
| Korea | 3.9 | 1.7 | 1.1 | 1.0 | .9 | 1.5 | 1.5 | 3.3 | 3.2 | 3.0 | |
| China | 4.6 | 2.1 | 2.9 | 1.5 | 1.5 | 2.2 | 1.8 | 2.6 | 2.5 | 2.5 | |
| Latin America | 4.1 | 4.4 | 4.1 | 4.8 | 3.4 | 4.2 | 6.6 | 4.4 | 3.6 | 3.4 | |
| Mexico | 3.5 | 4.1 | 3.6 | 4.2 | 2.3 | 3.2 | 6.6 | 3.8 | 3.2 | 3.2 | |
| Brazil | 6.7 | 5.6 | 5.8 | 6.5 | 10.4 | 7.1 | 2.8 | 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.

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 | -497.6 | -402.3 | -466.1 | -541.1 | -513.6 | -533.5 | -567.4 | -617.0 | -614.2 | -638.4 | -662.0 |
| <i>Previous Tealbook</i> | -454.1 | -492.5 | -408.8 | -448.0 | -508.8 | -484.7 | -501.8 | -509.5 | -554.6 | -550.3 | -564.8 | -580.4 |
| Current account as percent of GDP | -2.4 | -2.6 | -2.1 | -2.4 | -2.7 | -2.5 | -2.6 | -2.7 | -2.9 | -2.9 | -3.0 | -3.1 |
| <i>Previous Tealbook</i> | -2.4 | -2.6 | -2.1 | -2.3 | -2.5 | -2.4 | -2.5 | -2.5 | -2.7 | -2.6 | -2.7 | -2.7 |
| Net goods & services | -552.4 | -566.9 | -537.4 | -583.7 | -632.2 | -608.6 | -592.9 | -591.3 | -601.6 | -580.7 | -579.6 | -591.9 |
| Investment income, net | 213.7 | 216.3 | 242.4 | 245.3 | 227.6 | 220.5 | 191.1 | 151.5 | 121.1 | 92.0 | 72.8 | 57.5 |
| Direct, net | 295.7 | 292.8 | 312.8 | 316.6 | 313.6 | 327.9 | 322.0 | 307.1 | 301.1 | 296.2 | 301.5 | 309.9 |
| Portfolio, net | -82.1 | -76.5 | -70.4 | -71.4 | -86.0 | -107.5 | -130.9 | -155.6 | -179.9 | -204.2 | -228.7 | -252.4 |
| Other income and transfers, net | -115.4 | -147.0 | -107.2 | -127.6 | -136.5 | -125.5 | -131.6 | -127.6 | -136.5 | -125.5 | -131.6 | -127.6 |

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 | -455.0 | -538.9 | -632.9 | -742.2 |
| <i>Previous Tealbook</i> | -444.6 | -426.2 | -349.5 | -373.0 | -434.6 | -451.7 | -450.9 | -501.2 | -562.5 | -630.7 |
| Current account as percent of GDP | -2.9 | -2.6 | -2.1 | -2.1 | -2.4 | -2.4 | -2.3 | -2.6 | -3.0 | -3.3 |
| <i>Previous Tealbook</i> | -2.9 | -2.6 | -2.1 | -2.1 | -2.4 | -2.4 | -2.3 | -2.5 | -2.7 | -2.9 |
| Net goods & services | -548.6 | -536.8 | -461.9 | -489.5 | -500.4 | -504.8 | -560.1 | -606.2 | -588.5 | -629.5 |
| Investment income, net | 219.2 | 216.1 | 215.4 | 221.3 | 192.7 | 186.8 | 229.4 | 197.7 | 85.9 | 17.6 |
| Direct, net | 288.7 | 285.5 | 283.3 | 276.7 | 266.5 | 258.8 | 304.5 | 317.7 | 302.2 | 325.1 |
| Portfolio, net | -69.5 | -69.4 | -67.9 | -55.4 | -73.8 | -72.0 | -75.1 | -120.0 | -216.3 | -307.5 |
| Other income and transfers, net | -115.1 | -105.5 | -103.1 | -104.8 | -126.9 | -133.7 | -124.3 | -130.3 | -130.3 | -130.3 |

Billions of dollars

Abbreviations

| | |
|--------|--|
| AFE | advanced foreign economy |
| BLS | Bureau of Labor Statistics |
| BOC | Bank of Canada |
| BOE | Bank of England |
| BOM | Bank of Mexico |
| C&I | commercial and industrial |
| CMBS | commercial mortgage-backed securities |
| CPH | compensation per hour |
| CPI | consumer price index |
| CRE | commercial real estate |
| ECB | European Central Bank |
| ECI | employment cost index |
| E&I | equipment and intangibles |
| ELB | effective lower bound |
| EME | emerging market economy |
| FOMC | Federal Open Market Committee; also, the Committee |
| GDP | gross domestic product |
| LFPR | labor force participation rate |
| MBS | mortgage-backed securities |
| MMF | money market fund |
| NAFTA | North American Free Trade Agreement |
| NIT | nominal income targeting |
| OIS | overnight index swap |
| ON RRP | overnight reverse repurchase agreement |
| PAB | private activity bonds |

| | |
|-------|--|
| PCE | personal consumption expenditures |
| PMI | purchasing managers index |
| REIT | real estate investment trust |
| repo | repurchase agreement |
| SEP | Summary of Economic Projections |
| SLOOS | Senior Loan Officer Opinion Survey on Bank Lending Practices |
| SOMA | System Open Market Account |
| S&P | Standard & Poor's |
| TCJA | Tax Cuts and Jobs Act |
| TIPS | Treasury Inflation-Protected Securities |
| VIX | Chicago Board Options Exchange volatility index |