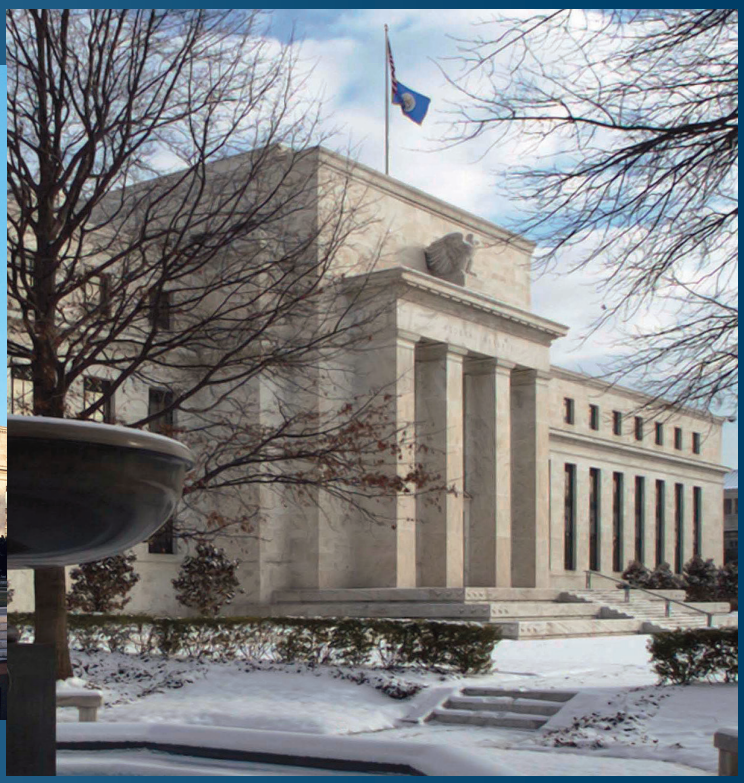
For use at 11:00 a.m. EST
February 7, 2020

# Monetary Policy Report

February 7, 2020



Board of Governors of the Federal Reserve System

# Letter of Transmittal

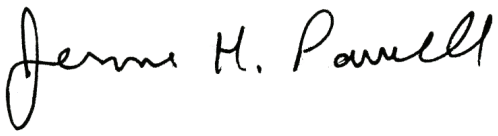
Board of Governors of the
Federal Reserve System

Washington, D.C., February 7, 2020

The President of the Senate
The Speaker of the House of Representatives

The Board of Governors is pleased to submit its *Monetary Policy Report* pursuant to section 2B of the Federal Reserve Act.

Sincerely,



Jerome H. Powell, Chairman

# Statement on Longer-Run Goals and Monetary Policy Strategy

*Adopted effective January 24, 2012; as amended effective January 29, 2019*

The Federal Open Market Committee (FOMC) is firmly committed to fulfilling its statutory mandate from the Congress of promoting maximum employment, stable prices, and moderate long-term interest rates. The Committee seeks to explain its monetary policy decisions to the public as clearly as possible. Such clarity facilitates well-informed decisionmaking by households and businesses, reduces economic and financial uncertainty, increases the effectiveness of monetary policy, and enhances transparency and accountability, which are essential in a democratic society.

Inflation, employment, and long-term interest rates fluctuate over time in response to economic and financial disturbances. Moreover, monetary policy actions tend to influence economic activity and prices with a lag. Therefore, the Committee's policy decisions reflect its longer-run goals, its medium-term outlook, and its assessments of the balance of risks, including risks to the financial system that could impede the attainment of the Committee's goals.

The inflation rate over the longer run is primarily determined by monetary policy, and hence the Committee has the ability to specify a longer-run goal for inflation. The Committee reaffirms its judgment that inflation at the rate of 2 percent, as measured by the annual change in the price index for personal consumption expenditures, is most consistent over the longer run with the Federal Reserve's statutory mandate. The Committee would be concerned if inflation were running persistently above or below this objective. Communicating this symmetric inflation goal clearly to the public helps keep longer-term inflation expectations firmly anchored, thereby fostering price stability and moderate long-term interest rates and enhancing the Committee's ability to promote maximum employment in the face of significant economic disturbances. The maximum level of employment is largely determined by nonmonetary factors that affect the structure and dynamics of the labor market. These factors may change over time and may not be directly measurable. Consequently, it would not be appropriate to specify a fixed goal for employment; rather, the Committee's policy decisions must be informed by assessments of the maximum level of employment, recognizing that such assessments are necessarily uncertain and subject to revision. The Committee considers a wide range of indicators in making these assessments. Information about Committee participants' estimates of the longer-run normal rates of output growth and unemployment is published four times per year in the FOMC's Summary of Economic Projections. For example, in the most recent projections, the median of FOMC participants' estimates of the longer-run normal rate of unemployment was 4.4 percent.

In setting monetary policy, the Committee seeks to mitigate deviations of inflation from its longer-run goal and deviations of employment from the Committee's assessments of its maximum level. These objectives are generally complementary. However, under circumstances in which the Committee judges that the objectives are not complementary, it follows a balanced approach in promoting them, taking into account the magnitude of the deviations and the potentially different time horizons over which employment and inflation are projected to return to levels judged consistent with its mandate.

The Committee intends to reaffirm these principles and to make adjustments as appropriate at its annual organizational meeting each January.

# Contents



## List of Boxes



**Note: This report reflects information that was publicly available as of noon EST on February 5, 2020.** Unless otherwise stated, the time series in the figures extend through, for daily data, February 4, 2020; for monthly data, December 2019; and, for quarterly data, 2019:Q4. In bar charts, except as noted, the change for a given period is measured to its final quarter from the final quarter of the preceding period.

# Summary

The U.S. economy continued to grow moderately last year and the labor market strengthened further. With these gains, the current expansion entered its 11th year, becoming the longest on record. However, inflation was below the Federal Open Market Committee's (FOMC) longer-run objective of 2 percent. In light of the implications of global developments for the economic outlook as well as muted inflation pressures, the FOMC lowered the target range for the federal funds rate at its July, September, and October meetings, bringing it to the current range of 1½ to 1¾ percent. In the Committee's subsequent meetings, it judged that the prevailing stance of monetary policy was appropriate to support sustained expansion of economic activity, strong labor market conditions, and inflation returning to the Committee's symmetric 2 percent objective.

## *Economic and Financial Developments*

**The labor market.** The labor market continued to strengthen last year. Payroll employment growth remained solid in the second half of 2019, and while the pace of job gains during the year as a whole was somewhat slower than in 2018, it was faster than what is needed to provide jobs for new entrants to the labor force. The unemployment rate moved down from 3.9 percent at the end of 2018 to 3.5 percent in December, and the labor force participation rate increased. Meanwhile, wage gains remained moderate although above the pace of gains seen earlier in the expansion.

**Inflation.** After having been close to the FOMC's objective of 2 percent in 2018, consumer price inflation, as measured by the price index for personal consumption expenditures, moved back below 2 percent last year, where it has been during most of the current expansion. The 12-month change was 1.6 percent in December 2019, as was the 12-month measure that excludes consumer food and energy prices (so-called core inflation), which historically has been a better indicator of where inflation will be in the future than the overall figure. The downshift relative to 2018 partly results from particularly low readings in the monthly price data in the early part of last year that appear to reflect transitory influences. Survey-based measures of longer-run inflation expectations have been broadly stable since the middle of last year, and market-based measures of inflation compensation are little changed on net.

**Economic growth.** Real gross domestic product (GDP) is reported to have increased at a moderate rate in the second half of 2019, although growth was somewhat slower than in the first half of the year and in 2018. Consumer spending rose at a moderate pace, on average, and residential investment turned up after having declined in 2018 and the first half of 2019. In contrast, business fixed investment declined in the second half of last year, reflecting a number of factors that likely include trade policy uncertainty and weak global growth. Downside risks to the U.S. outlook seem to have receded in the latter part of the year, as the conflicts over trade policy diminished somewhat, economic growth abroad showed signs of stabilizing, and financial conditions eased. More recently, possible spillovers from the effects of the coronavirus in China have presented a new risk to the outlook.

**Financial conditions.** Domestic financial conditions for businesses and households remained supportive of spending and economic activity. After showing some volatility over the summer, nominal Treasury yields declined and equity prices increased notably, on balance, supported by accommodative monetary policy actions and easing of investors' concerns regarding trade

policy prospects and the global economic outlook. Spreads of yields on corporate bonds over those on comparable-maturity Treasury securities continued to narrow, and mortgage rates remained low. Moreover, loans remained widely available for most businesses and households, and credit provided by commercial banks continued to expand at a moderate pace.

**Financial stability.** The U.S. financial system is substantially more resilient than it was before the financial crisis. Leverage in the financial sector appears low relative to historical norms. Total household debt has grown at a slower pace than economic activity over the past decade, in part reflecting that mortgage credit has remained tight for borrowers with low credit scores, undocumented income, or high debt-to-income ratios. In contrast, the levels of business debt continue to be elevated compared with the levels of either business assets or GDP, with the riskiest firms accounting for most of the increase in debt in recent years. While overall liquidity and maturity mismatches and funding risks in the financial system remain low, the volatility in repurchase agreement (repo) markets in mid-September 2019 highlighted the possibility for frictions in repo markets to spill over to other markets. Finally, asset valuations are elevated and have risen since July 2019, as investor risk appetite appears to have increased. (See the box "Developments Related to Financial Stability" in Part 1.)

**International developments.** After weakening in 2018, foreign economic growth slowed further in 2019, held down by a slump in global manufacturing, elevated trade tensions, and political and social unrest in several countries. Growth in Asian economies slowed markedly, especially in Hong Kong and India, and many Latin American economies continued to underperform. The pace of economic activity weakened in several advanced foreign economies as well. However, recent indicators provide tentative signs of stabilization. The global slowdown in manufacturing and trade appears to be nearing an end, and consumer spending and services activity around the world continue to hold up. Moreover, in some economically important regions, such as China and the euro area, data through early this year suggested that growth was steadying. The recent emergence of the coronavirus, however, could lead to disruptions in China that spill over to the rest of the global economy. Amid weak economic activity and dormant inflation pressures, foreign central banks generally adopted a more accommodative policy stance.

Financial conditions abroad eased in the second half of last year, supported by accommodative actions by central banks and, later in the period, positive political developments, including progress on the U.S.–China trade negotiations and diminished risks of a disorderly Brexit. On balance, since July global equity prices moved higher, sovereign bond spreads in the European periphery narrowed, and measures of sovereign spreads in emerging market economies decreased somewhat. In many advanced foreign economies, long-term interest rates remained well below the levels seen at the end of 2018.

## *Monetary Policy*

**Interest rate policy.** In light of the implications of global developments for the economic outlook as well as muted inflation pressures, the FOMC lowered the target range for the federal funds rate over the second half of 2019. Specifically, at its July, September, and October meetings, the FOMC lowered the target range a cumulative 75 basis points, bringing it to the current range of 1½ to 1¾ percent. In its subsequent meetings, the Committee judged that the prevailing stance of monetary policy was appropriate to support sustained expansion of economic activity, strong labor market conditions, and inflation returning to the Committee's symmetric 2 percent objective. The Committee noted that it will continue to monitor the implications of incoming

information for the economic outlook as it assesses the appropriate path of the target range for the federal funds rate.

**Balance sheet policy.** At its July meeting, the FOMC decided to conclude the reduction of its aggregate securities holdings in the System Open Market Account, or SOMA, in August. Ending the runoff earlier than initially planned was seen as having only very small effects on the balance sheet, with negligible implications for the economic outlook; it was also seen as helpful in simplifying communications regarding the use of the Committee's policy tools at a time when the Committee was lowering the target range for the federal funds rate. As discussed further in the next paragraph, since October 2019, the size of the balance sheet has been expanding to provide an ample level of reserves to ensure that the federal funds rate trades within the FOMC's target range.

**Monetary policy implementation.** Domestic short-term funding markets were volatile in mid-September—amid large flows related to corporate tax payments and settlement of Treasury securities—and experienced a significant tightening of conditions. Since then, the Federal Reserve has been conducting open market operations—repo operations and Treasury bill purchases—in order to maintain ample reserve balances over time. While the balance sheet has expanded in light of the open market operations to maintain ample reserves, these operations are purely technical measures to support the effective implementation of the FOMC's monetary policy, are not intended to change the stance of monetary policy, and reflect the Committee's intention to implement monetary policy in a regime with an ample supply of reserves. The Committee will continue to monitor money market developments as it assesses the level of reserves most consistent with efficient and effective policy implementation and stands ready to adjust the details of its technical operations as necessary to foster efficient and effective implementation of monetary policy. (See the box "Money Market Developments and Monetary Policy Implementation" in Part 2.)

## *Special Topics*

**Manufacturing and U.S. business cycles.** After increasing solidly in 2017 and 2018, manufacturing output turned down last year. This decline raised fears among some observers that the weakness could spread and potentially lead to an economy-wide recession. In general, a decline in manufacturing similar to that in 2019 would not be large enough to initiate a major downturn for the economy. Furthermore, after accounting for changing trends in growth of manufacturing output, mild slowdowns have often occurred during expansionary phases of business cycles. In contrast, a more pronounced contraction in manufacturing has historically been associated with an economy-wide recession. (See the box "Manufacturing and U.S. Business Cycles" in Part 1.)

**Monetary policy rules.** Prescriptions for the policy interest rate from monetary policy rules often depend on judgments and assumptions about economic variables that are inherently uncertain and may change over time. Notably, many policy rules depend on estimates of resource slack and of the longer-run neutral real interest rate, both of which are not directly observable and are estimated with a high degree of uncertainty. As a result, the amount of policy accommodation that these rules prescribe—and whether that amount is appropriate in light of underlying economic conditions—is also uncertain. Such a situation cautions against mechanically following the prescriptions of any specific rule. (See the box "Monetary Policy Rules and Uncertainty in Monetary Policy Settings" in Part 2.)

**Framework review and *Fed Listens* events.** In 2019, the Federal Reserve System began a broad review of the monetary policy strategy,

tools, and communication practices it uses to pursue its statutory dual-mandate goals of maximum employment and price stability. The Federal Reserve sees this review as particularly important at this time because the U.S. economy appears to have changed in ways that matter for monetary policy. For example, the neutral level of the policy interest rate appears to have fallen in the United States and abroad, increasing the risk that the effective lower bound on interest rates will constrain central banks from reducing their policy interest rates enough to effectively support economic activity during downturns. The review is considering what monetary policy strategy will best enable the Federal Reserve to meet its dual mandate in the future, whether the existing monetary policy tools are sufficient to achieve and maintain the dual mandate, and how communication about monetary policy can be improved.

A key component of the review has been a series of public *Fed Listens* events engaging with a broad range of stakeholders in the U.S. economy about how the Federal Reserve can best meet its statutory goals. During 14 *Fed Listens* events in 2019, policymakers heard from individuals and groups around the country on issues related to the labor market, inflation, interest rates, and the transmission of monetary policy. (See the box "Federal Reserve Review of Monetary Policy Strategy, Tools, and Communication Practices" in Part 2.)

# Part 1
# Recent Economic and Financial Developments

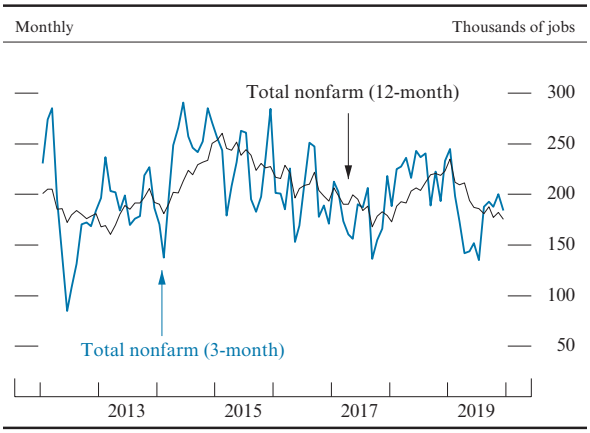
## *Domestic Developments*

### The labor market strengthened further last year but at a slower pace than in 2018 . . .

Payroll employment gains were solid in the second half of 2019 and averaged 176,000 per month during the year as a whole. This pace is somewhat slower than the average monthly gains in 2018, even accounting for the anticipated effects of the Bureau of Labor Statistics' upcoming benchmark revision to payroll employment (figure 1).[1] However, the pace of job gains appears to have remained faster than what is needed to provide jobs for net new entrants to the labor force as the population grows.[2]

Reflecting the employment gains over this period, the unemployment rate declined further in 2019 and stood at 3.5 percent in December, 0.4 percentage point below its year-earlier level and at its lowest level since 1969 (figure 2). In addition, the unemployment rate is 0.6 percentage point below the median of Federal Open Market Committee (FOMC) participants' estimates of its longer-run normal level.[3]

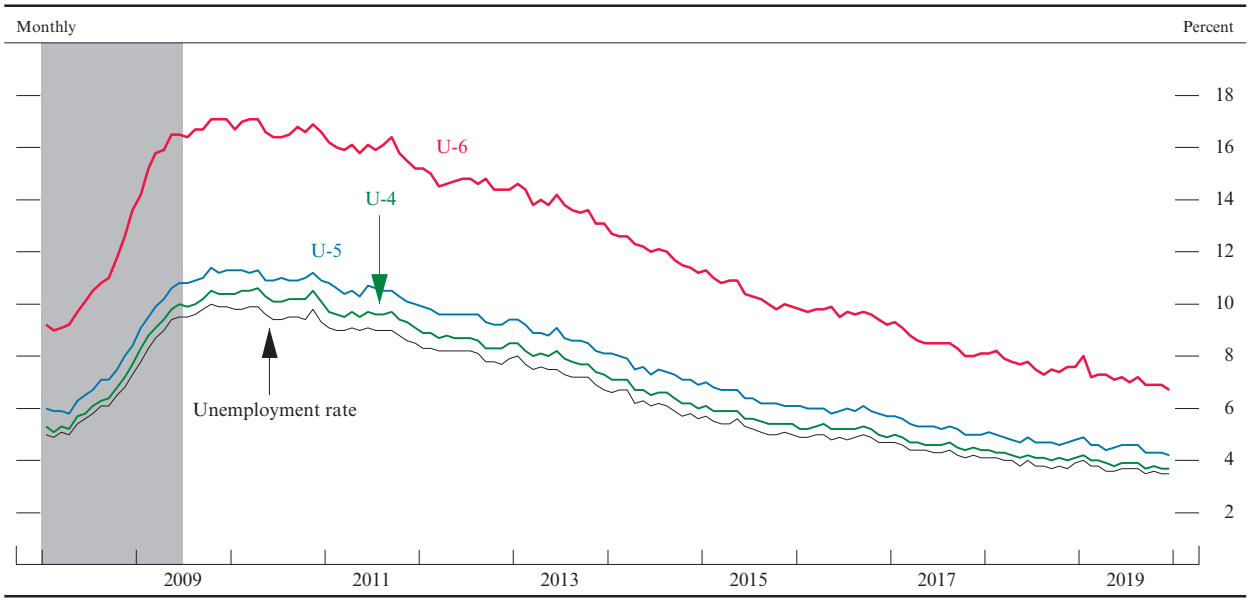
1. Net change in payroll employment




Note: The data are 3-month and 12-month moving averages.
Source: Bureau of Labor Statistics via Haver Analytics.

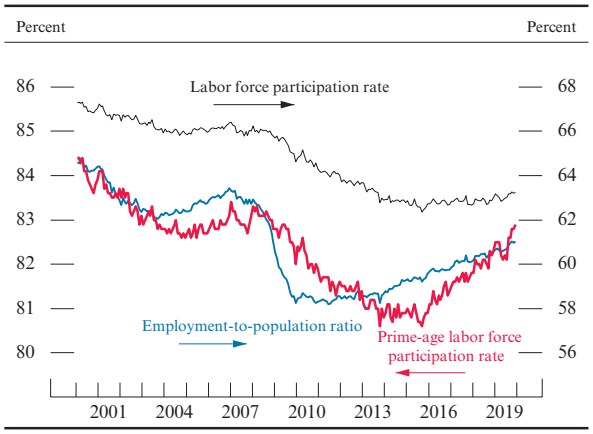
1. The annual benchmark revision to payroll employment will be published on February 7, after this report has gone to print. According to the Bureau of Labor Statistics' preliminary estimates, increases in payrolls will be revised downward roughly 40,000 per month from April 2018 through March 2019. Payroll figures after March 2019 are subject to revision as well.
2. To keep up with population growth, roughly 115,000 to 145,000 payroll jobs per month need to be created, on average, to maintain a constant unemployment rate with an unchanged labor force participation rate. There is considerable uncertainty around these estimates, as the difference between monthly payroll gains and employment changes from the Current Population Survey (the source of the unemployment and participation rates) can be quite volatile over short periods.
3. See the most recent economic projections that were released after the December FOMC meeting in Part 3 of this report.

2. Measures of labor underutilization




NOTE: Unemployment rate measures total unemployed as a percentage of the labor force. U-4 measures total unemployed plus discouraged workers, as a percentage of the labor force plus discouraged workers. Discouraged workers are a subset of marginally attached workers who are not currently looking for work because they believe no jobs are available for them. U-5 measures total unemployed plus all marginally attached to the labor force, as a percentage of the labor force plus persons marginally attached to the labor force. Marginally attached workers are not in the labor force, want and are available for work, and have looked for a job in the past 12 months. U-6 measures total unemployed plus all marginally attached workers plus total employed part time for economic reasons, as a percentage of the labor force plus all marginally attached workers. The shaded bar indicates a period of business recession as defined by the National Bureau of Economic Research.
SOURCE: Bureau of Labor Statistics via Haver Analytics.

3. Labor force participation rates and employment-to-population ratio




NOTE: The data are monthly. The prime-age labor force participation rate is a percentage of the population aged 25 to 54. The labor force participation rate and the employment-to-population ratio are percentages of the population aged 16 and over.
SOURCE: Bureau of Labor Statistics via Haver Analytics.

Strengthening labor market conditions are also evident in rising labor force participation rates (LFPRs)—that is, the shares of the population either working or actively seeking work. The LFPR for individuals aged 16 and over was 63.2 percent in December, above its level a year ago despite the downward pressure of about ¼ percentage point per year associated with the aging of the population. The LFPR for prime-age individuals (between 25 and 54 years old), which is much less sensitive to the effects of population aging, has been rising over the past few years and continued to increase in 2019 (figure 3). The employment-to-population ratio for individuals aged 16 and over—that is, the share of people who are working—was 61.0 percent in December and has been increasing since 2011.

Other indicators are also consistent with strong labor market conditions, albeit with some slowing in the pace of improvement since 2018. As reported in the Job Openings and Labor Turnover Survey (JOLTS), job openings have remained plentiful, although the private-sector

job openings rate has come down over the past year. Similarly, the quits rate in the JOLTS has remained near the top of its historical range, an indication that workers are being bid away from their current jobs or have become more confident that they can successfully switch jobs if they so wish. These data accord well with surveys of consumers that indicate households perceive jobs as plentiful. The JOLTS layoff rate and the number of people filing initial claims for unemployment insurance benefits—historically, a good early indicator of economic downturns—have both remained quite low.

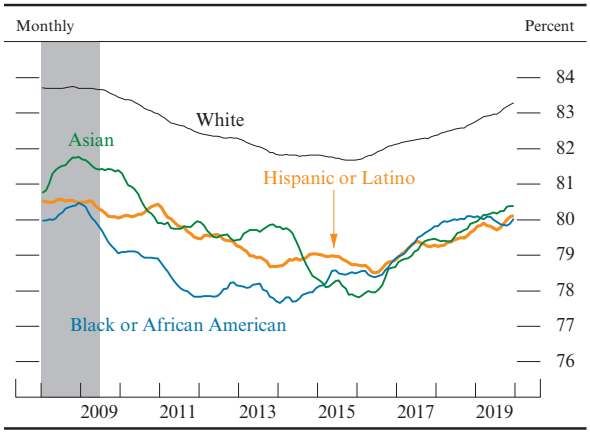
## . . . and unemployment rates have fallen, on net, for all major demographic groups over the past several years

Differences in unemployment rates across ethnic and racial groups have narrowed in recent years, on net, as they typically do during economic expansions, after having widened during the 2007–09 recession (figure 4). The decline in the unemployment rate for African Americans has been particularly sizable, and its average rate in the second half of October 2019 was the lowest recorded since the data began in 1972. Although the unemployment rates for African Americans

4. Unemployment rate by race and ethnicity

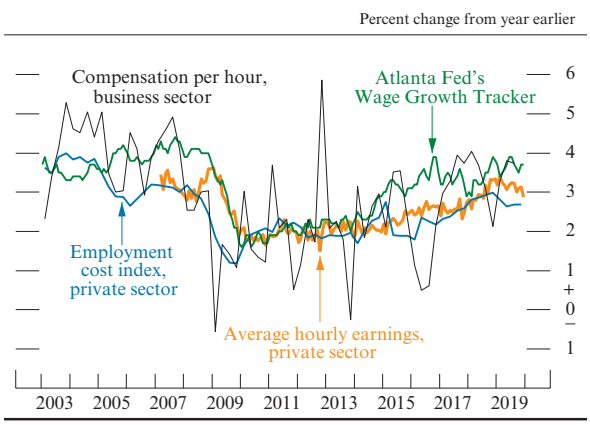

NOTE: Unemployment rate measures total unemployed as a percentage of the labor force. Persons whose ethnicity is identified as Hispanic or Latino may be of any race. The shaded bar indicates a period of business recession as defined by the National Bureau of Economic Research.
SOURCE: Bureau of Labor Statistics via Haver Analytics.

5. Prime-age labor force participation rate by race and ethnicity




NOTE: The prime-age labor force participation rate is a percentage of the population aged 25 to 54. Persons whose ethnicity is identified as Hispanic or Latino may be of any race. The data are 12-month moving averages. The shaded bar indicates a period of business recession as defined by the National Bureau of Economic Research.
SOURCE: Bureau of Labor Statistics via Haver Analytics.

6. Measures of change in hourly compensation




NOTE: Business-sector compensation is on a 4-quarter percent change basis and extends through 2019:Q3. For the private-sector employment cost index, change is over the 12 months ending in the last month of each quarter; for private-sector average hourly earnings, the data are 12-month percent changes and begin in March 2007; for the Atlanta Fed's Wage Growth Tracker, the data are shown as a 3-month moving average of the 12-month percent change.
SOURCE: Bureau of Labor Statistics; Federal Reserve Bank of Atlanta, Wage Growth Tracker; all via Haver Analytics.

and for Hispanics remain substantially above those for whites and for Asians, those differentials in the second half of 2019 were at their narrowest levels on record. The rise in LFPRs for prime-age individuals over the past few years has also been apparent in each of these racial and ethnic groups (figure 5).

## Increases in labor compensation have remained moderate by historical standards . . .

Despite strong labor market conditions, the available indicators generally suggest that increases in hourly labor compensation have remained moderate, averaging about 3 percent over the past two years. These indicators include the employment cost index, a measure of both wages and the cost to employers of providing benefits; compensation per hour in the business sector, a broad-based but volatile measure of wages, salaries, and benefits; and average hourly earnings from the payroll survey, a monthly index that is timely but does not account for benefits (figure 6). The median 12-month wage growth of individuals reporting to the Current Population Survey calculated by the Federal Reserve Bank of Atlanta, which tends to be higher than broader-based measures of wage growth, remains near the upper portion of its range over the past couple of years.[4] Interestingly, wage growth over the past few years has been strongest for workers in relatively low-paying jobs, suggesting that the strong labor market is having a more pronounced benefit for these workers.

## . . . and likely have been restrained by slow growth in labor productivity over much of the expansion

These moderate rates of hourly compensation gains likely reflect the offsetting influences of a strengthening labor market and productivity growth that has been weak through much of the expansion. From 2008 to 2018, labor

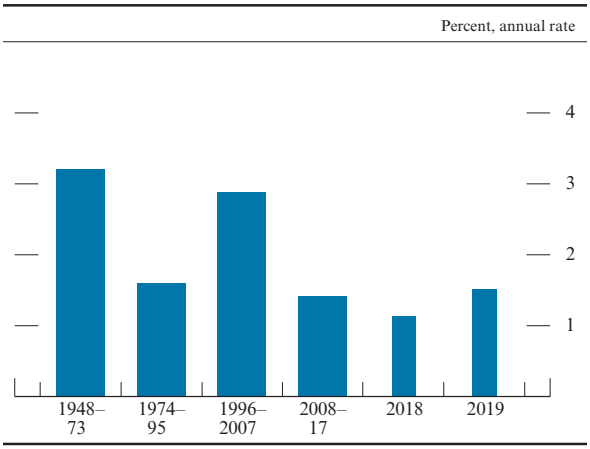
4. The Atlanta Fed's measure differs from others in that it measures the wage growth only of workers who were employed both in the current survey month and 12 months earlier.

productivity increased a little more than 1 percent per year, on average, well below the average pace from 1996 to 2007 of nearly 3 percent and also below the average gain in the 1974–95 period (figure 7). Although considerable debate remains about the reasons for the slowdown in productivity growth over this period, the weakness may be partly attributable to the sharp pullback in capital investment, including on research and development, during the most recent recession and the relatively slow recovery that followed. More recently, labor productivity is estimated to have increased 1.5 percent over the four quarters ending in 2019:Q3—a small improvement from the preceding year, especially given the volatility of the productivity data, but still moderate relative to earlier periods. While it is uncertain whether productivity growth will continue to improve, a sustained pickup in productivity growth, as well as additional labor market strengthening, would support stronger gains in labor compensation.

## Inflation was below 2 percent last year

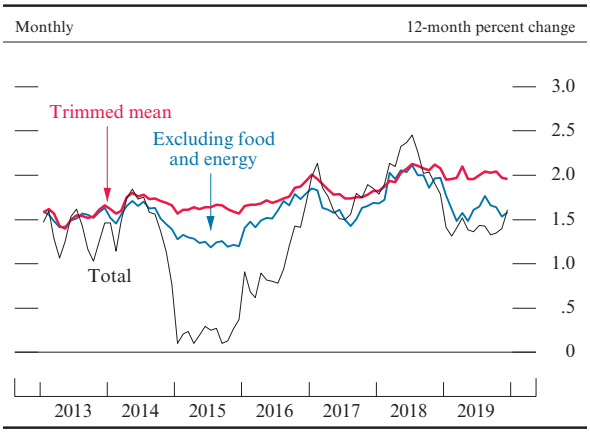
After having been close to the FOMC's objective of 2 percent in 2018, inflation moved back below 2 percent last year, where it has been for most of the time since the end of the most recent recession. The 12-month change in the price index for personal consumption expenditures (PCE) was 1.6 percent in December 2019, as was the 12-month measure of inflation that excludes food and energy items (so-called core inflation), which historically has been a better indicator of where inflation will be in the future than the overall index (figure 8). Both measures are down from the rates recorded a year ago; the slowing partly results from particularly low readings in the monthly price data in the first quarter of 2019, which appear to reflect idiosyncratic price declines in a number of specific categories such as apparel, used cars, banking services, and portfolio management services. Indeed, core inflation picked up after the first quarter and was at an average annual rate of 1.9 percent over the remainder of the year.

7. Change in business-sector output per hour




NOTE: Changes are measured from Q4 of the year immediately preceding the period through Q4 of the final year of the period except 2019 changes, which are calculated from 2018:Q3 to 2019:Q3.
SOURCE: Bureau of Labor Statistics via Haver Analytics.

8. Change in the price index for personal consumption expenditures



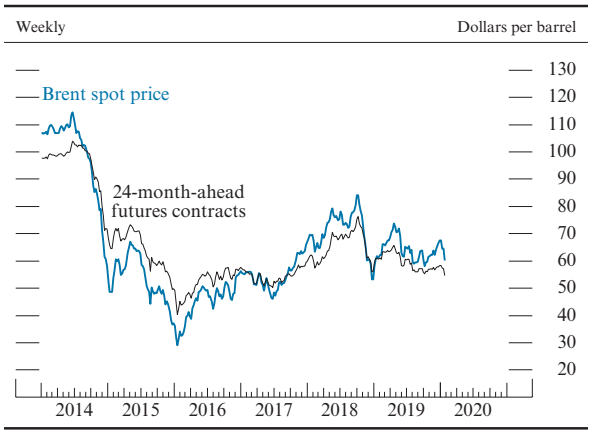

SOURCE: For trimmed mean, Federal Reserve Bank of Dallas; for all else, Bureau of Economic Analysis; all via Haver Analytics.

The trimmed mean PCE price index, calculated by the Federal Reserve Bank of Dallas, also suggests a transitory element to inflation readings early last year. The trimmed mean provides an alternative way to purge inflation of transitory influences, and it is less sensitive than the core index to idiosyncratic price movements such as those noted earlier.[5] The 12-month change in this measure was about the same in December 2019 as it was in 2018.

## Oil prices fluctuated in 2019

After falling from more than $80 per barrel to less than $60 per barrel in late 2018, the Brent spot price of crude oil fluctuated between $60 and $70 for most of 2019. Prices generally moved up in the second half of last year, supported by expectations of supply cuts in OPEC member countries and, later on, diminished concerns about the global outlook (figure 9). Prices also spiked briefly in early January over tensions with Iran. In recent weeks, however, oil prices moved lower amid heightened fears that the coronavirus outbreak that started in China might weigh on economic growth and the demand for oil. Despite these fluctuations in oil prices, retail gasoline prices generally edged lower since mid-2019. For 2019 as a whole, consumer energy prices rose modestly more than the core index. Meanwhile, food prices posted only a small increase in 2019, held down by soft prices for farm commodities, and contributed very little to overall consumer price inflation.

9. Spot and futures prices for crude oil




NOTE: The data are weekly averages of daily data. The weekly data begin on Thursdays and extend through January 29, 2020.
SOURCE: ICE Brent Futures via Bloomberg.

## Reported prices of imports other than energy fell

Nonfuel import prices, before accounting for the effects of tariffs on the price of imported goods, have continued to decline from their mid-2018 peak, responding to lower foreign inflation and declines in non-oil commodity

5. The trimmed mean index excludes prices that showed particularly large increases or decreases in a given month. Note that, since 1995, 12-month changes in the trimmed mean index have averaged about 0.3 percentage point above core PCE inflation and 0.2 percentage point above total PCE inflation.

prices (figure 10).[6] After declining in the first half of 2019, prices of industrial metals appear to have bottomed out in recent months, consistent with increased optimism about global demand following positive trade developments.

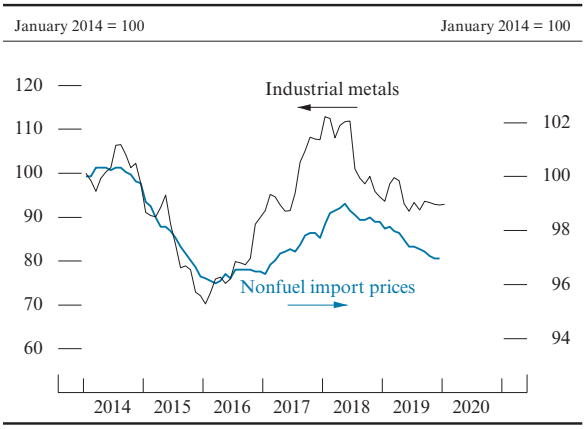
## Survey-based measures of inflation expectations have been broadly stable . . .

Expectations of inflation likely influence actual inflation by affecting wage- and price-setting decisions. Survey-based measures of inflation expectations at medium- and longer-term horizons have remained broadly stable over the past year. In the Survey of Professional Forecasters, conducted by the Federal Reserve Bank of Philadelphia, the median expectation for the annual rate of increase in the PCE price index over the next 10 years has been very close to 2 percent for the past several years (figure 11). In the University of Michigan Surveys of Consumers, the median value for inflation expectations over the next 5 to 10 years has fluctuated within a narrow range around 2½ percent since the end of 2016, though this level is between ¼ and ½ percentage point lower than had prevailed through 2014. In the Survey of Consumer Expectations, conducted by the Federal Reserve Bank of New York, the median of respondents' expected inflation rate three years hence moved lower, on net, in the second half of last year and averaged 2.5 percent, ¼ percentage point below its average over the preceding three years.

## . . . and market-based measures of inflation compensation have also been little changed

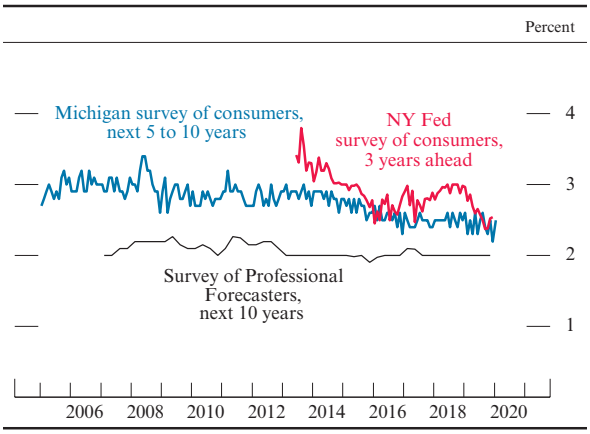
Inflation expectations can also be gauged by market-based measures of inflation compensation. However, the inference is not straightforward, because market-based measures can be importantly affected

10. Nonfuel import prices and industrial metals indexes




NOTE: The data for nonfuel import prices are monthly. The data for industrial metals are a monthly average of daily data and extend through January 31, 2020.
SOURCE: For nonfuel import prices, Bureau of Labor Statistics; for industrial metals, S&P GSCI Industrial Metals Spot Index via Haver Analytics.

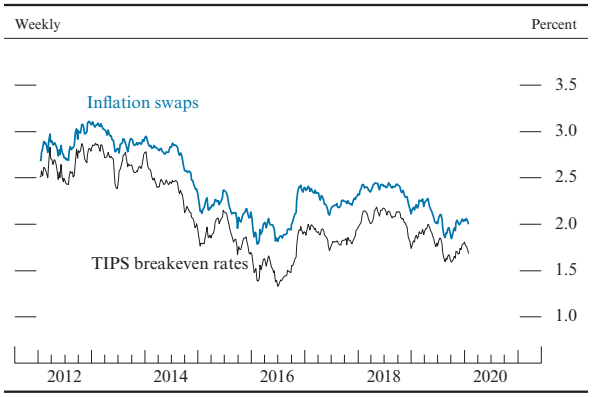
11. Surveys of inflation expectations




NOTE: The series are medians of the survey responses. The Michigan survey data are monthly and extend through January 2020. The Survey of Professional Forecasters data for inflation expectations for personal consumption expenditures are quarterly and begin in 2007:Q1. The NY Fed survey data are monthly and begin in June 2013.
SOURCE: University of Michigan Surveys of Consumers; Federal Reserve Bank of New York, Survey of Consumer Expectations; Federal Reserve Bank of Philadelphia, Survey of Professional Forecasters.

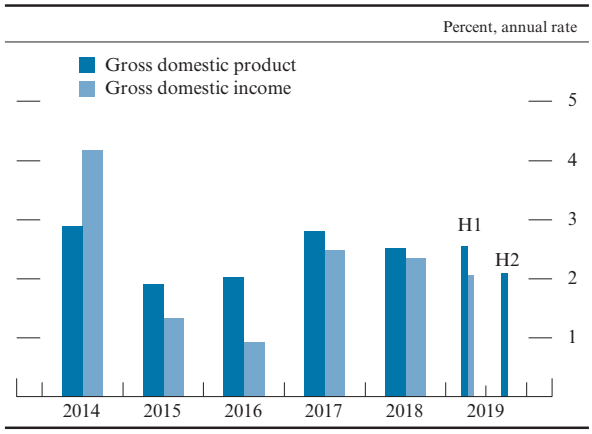
6. Published import price indexes exclude tariffs. However, tariffs add to the prices that purchasers of imports actually pay, and tariff-inclusive import prices have likely increased, rather than declined, since mid-2018.

12. 5-to-10-year-forward inflation compensation




NOTE: The data are weekly averages of daily data and extend through January 31, 2020. TIPS is Treasury Inflation-Protected Securities.
SOURCE: Federal Reserve Bank of New York; Barclays; Federal Reserve Board staff estimates.

13. Change in real gross domestic product and gross domestic income




NOTE: Gross domestic income is not yet available for 2019:H2.
SOURCE: Bureau of Economic Analysis via Haver Analytics.

by changes in premiums that provide compensation for bearing inflation and liquidity risks. Measures of longer-term inflation compensation—derived either from differences between yields on nominal Treasury securities and those on comparable-maturity Treasury Inflation-Protected Securities (TIPS) or from inflation swaps—have been little changed, on net, since the middle of 2019, with both measures below their respective ranges that persisted for most of the 10 years before the start of notable declines in mid-2014 (figure 12).[7] The TIPS-based measure of 5-to-10-year-forward inflation compensation and the analogous measure from inflation swaps are now about 1¾ percent and 2 percent, respectively.[8]

## Growth of gross domestic product was moderate in the second half of 2019 . . .

Real gross domestic product (GDP) is reported to have increased at a moderate average annual rate of 2.1 percent in the second half of 2019, although growth was somewhat slower than in the first half of the year and in 2018 (figure 13). Consumer spending rose at a moderate pace, on average, and residential investment turned up after having declined since the end of 2017. In contrast, business fixed investment declined in the second half of last year, reflecting a number of factors that likely include uncertainty regarding trade tensions and the weak global growth outlook. Those factors also continued to weigh on manufacturing output, which declined

7. Inflation compensation implied by the TIPS breakeven inflation rate is based on the difference, at comparable maturities, between yields on nominal Treasury securities and yields on TIPS, which are indexed to the total consumer price index (CPI). Inflation swaps are contracts in which one party makes payments of certain fixed nominal amounts in exchange for cash flows that are indexed to cumulative CPI inflation over some horizon. Inflation compensation derived from inflation swaps typically exceeds TIPS-based compensation, but week-to-week movements in the two measures are highly correlated.

8. As these measures are based on CPI inflation, one should probably subtract about ¼ percentage point—the average differential with PCE inflation over the past two decades—to infer inflation compensation on a PCE basis.

over the first half of 2019 and has moved roughly sideways since then. (See the box "Manufacturing and U.S. Business Cycles.") Despite those headwinds, the economic expansion continues to be supported by steady job gains, increases in household wealth, expansionary fiscal policy, and supportive domestic financial conditions that include moderate borrowing costs and easy access to credit for many households and businesses.

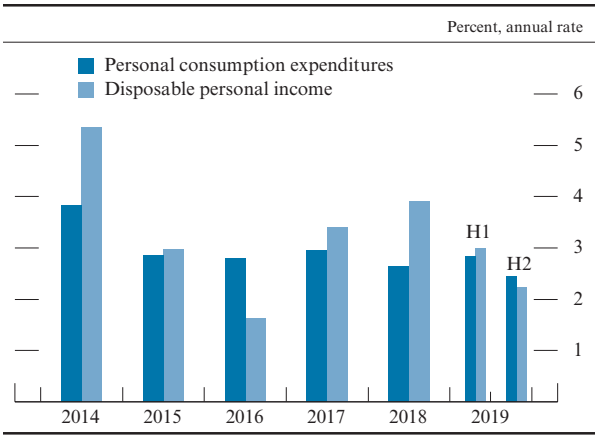
### . . . and downside risks to the outlook receded somewhat

Downside risks to the economic outlook seem to have receded somewhat in the latter part of 2019. Labor market conditions and economic growth in the United States have been resilient to the global headwinds in 2019, and conflicts over trade policy diminished somewhat toward the end of the year. Economic growth abroad also shows signs of stabilizing, though the coronavirus outbreak presents a more recent risk. Reflecting these factors as well as more accommodative monetary policy stances in the United States and some foreign economies, financial conditions eased somewhat over the second half of the year. Statistical models designed to gauge the probability of recession using various indicators, including the Treasury yield curve, suggest that the likelihood of a recession occurring over the next year has fallen noticeably in recent months. Similarly, as shown in Part 3, when Federal Reserve policymakers most recently presented their economic projections, in December, fewer participants judged the risks to the outlook to be tilted to the downside compared with their projections from last June.

## Ongoing improvements in the labor market continue to support household income and consumer spending

Consumer spending rose at a moderate pace, on average, in the third and fourth quarters of 2019 and posted another solid gain for the year as a whole (figure 14). The growth in real PCE in recent years reflects the continued

14. Change in real personal consumption expenditures and disposable personal income




Source: Bureau of Economic Analysis via Haver Analytics.

# Manufacturing and U.S. Business Cycles

Historically, the manufacturing sector in the United States has been a source of economic strength and of good jobs for workers at all levels of education. It is also a highly cyclical sector that has tended to retrench dramatically during economy-wide contractions and to rebound sharply during expansions.

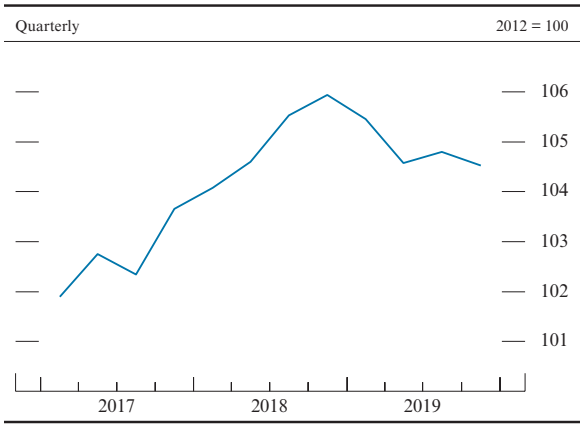
Concerns by some observers about a possible economy-wide recession were prompted by declines in the industrial production index for manufacturing (IP) in the first two quarters of 2019, particularly when viewed in conjunction with the stagnant manufacturing growth that was occurring in many foreign economies. Manufacturing output in the United States remained weak through the end of the year (figure A). And, for 2019 as a whole, production decreased 1.3 percent, with fairly broad-based declines across both durable and nondurable goods industries. The slump in manufacturing last year is attributable to several factors, including trade developments, weak global growth, softer business investment, lower oil prices engendering a cutback in demand by drillers, and the slower production of Boeing's 737 Max aircraft due to safety issues.[1]

When considering the implications of these declines in manufacturing production for the broader economy, it is important to recognize that this weakness has likely spilled over to other sectors. Manufacturing production requires inputs from other industries, and goods that are produced need to be transported and sold. For example, a reduction in auto assemblies affects automakers' demand both for intermediate inputs like steel and for business services like accounting. In turn, the steelmakers need less iron ore, and the accountants need less tech support. The input-output tables for the U.S. economy imply that every dollar of factory output requires 56 cents of input from other domestic sectors.[2] Manufacturing currently accounts for 12 percent of gross domestic product (GDP), so its 2019 decline of 1.3 percent would have directly subtracted about 0.15 percent from GDP; including inputs purchased from upstream sectors, the drag is a bit more than 0.2 percent. After adding in the downstream activities needed to bring products to market (such as transportation, wholesaling, and retailing), last year's decline in manufacturing likely reduced GDP by less than 0.5 percent—not enough to tip an otherwise-expanding economy into recession.

That modest effect partly reflects the decline in manufacturing's share of the U.S. economy since the middle of the 20th century. Manufacturing employment has dropped from about 30 percent of total employment

*(continued)*

A. Industrial production index for manufacturing

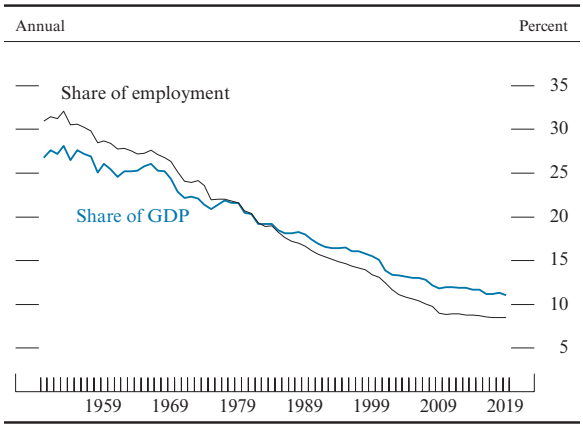



SOURCE: Federal Reserve Board, Statistical Release G.17, "Industrial Production and Capacity Utilization."

1. See, for example, Aaron Flaaen and Justin Pierce (2019), "Disentangling the Effects of the 2018–2019 Tariffs on a Globally Connected U.S. Manufacturing Sector," Finance and Economics Discussion Series 2019-086 (Washington: Board of Governors of the Federal Reserve System, December), https://dx.doi.org/10.17016/FEDS.2019.086. Also see Dario Caldara, Matteo Iacoviello, Patrick Molligo, Andrea Prestipino, and Andrea Raffo (2019), "The Economic Effects of Trade Policy Uncertainty," International Finance Discussion Papers 1256 (Washington: Board of Governors of the Federal Reserve System, September), https://dx.doi.org/10.17016/IFDP.2019.1256. Boeing slowed production of the 737 Max in the spring of 2019 and subsequently announced a temporary suspension of production beginning in early 2020.

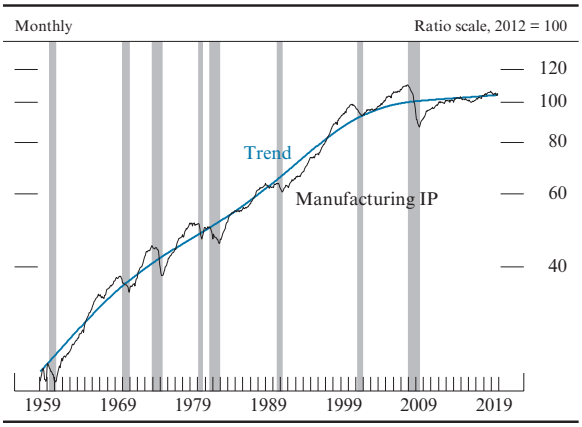
2. The input-output tables are published by the Bureau of Economic Analysis. Our estimates are from the 2018 sectoral "Domestic Requirements" table, which shows both the intermediate products used directly by manufacturers and the intermediate products used further upstream by their suppliers. The tables do not, however, account for broader general equilibrium effects such as, for example, the lower spending by workers who may have been laid off when there were cutbacks in auto production.

B. Manufacturing share of GDP and employment




SOURCE: Staff estimates of data from the Bureau of Economic Analysis (for gross domestic product) and from the Bureau of Labor Statistics (for employment).

C. Manufacturing IP and its trend



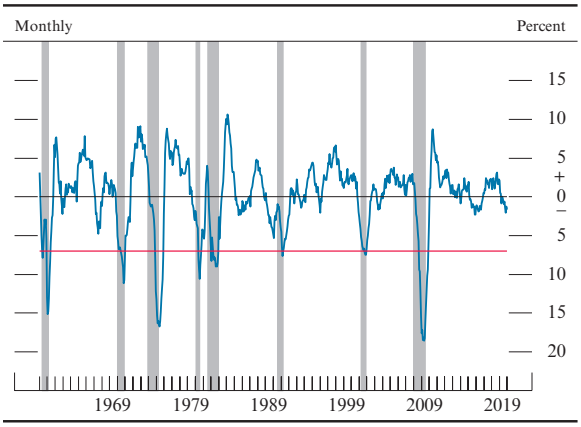

NOTE: The shaded bars indicate periods of business recession as defined by the National Bureau of Economic Research.
SOURCE: Federal Reserve Board, Statistical Release G.17, "Industrial Production and Capacity Utilization"; Federal Reserve Board staff estimates of the trend.

to less than 9 percent today, and the value added from manufacturing has fallen from more than 25 percent of GDP to a bit under 12 percent (figure B). However, although the manufacturing sector has shrunk, factory output may still be a good barometer of aggregate demand and of the economy's health.

Growth in the U.S. manufacturing sector has slowed considerably over time. Measured from business cycle peak to business cycle peak, output grew about 3.5 percent per year between 1920 and 1960, as well as from 1960 through 2001. As seen in figure C, factory production has moved up only about 0.5 percent per year since 2001, and only 2 of those 19 calendar years recorded gains of more than 3.5 percent.

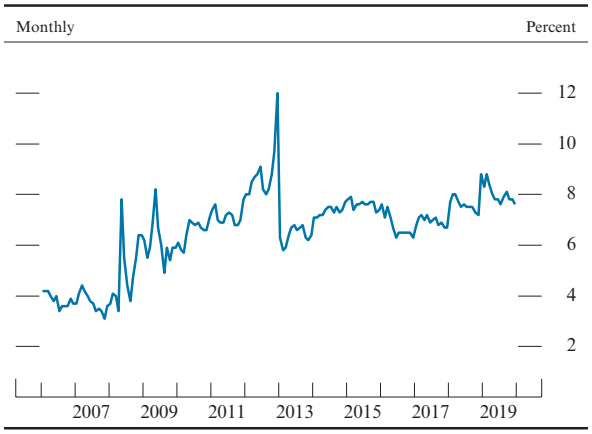
To interpret the recent weakness in manufacturing in this light, figure D shows 12-month changes in "detrended" IP, where values below zero indicate year-over-year changes in IP that are slower than its trend at the time. Notably, most expansions include periods of modest below-trend growth. In 2019, growth averaged about 2 percentage points below trend, a slowdown fairly similar to that in the 2015–16 period. Other episodes of modest below-trend growth appear in the expansions of the early 2000s, the 1990s, the mid-1980s, and the 1960s. In contrast, as shown by the red line in figure D, every recession since 1960—but no expansion—includes at least some months when the 12-month change in IP was at least 7 percentage points below trend. The available data, however, suggest that the recent experience in the United States falls well short of that threshold.

D. 12-month change in detrended manufacturing IP



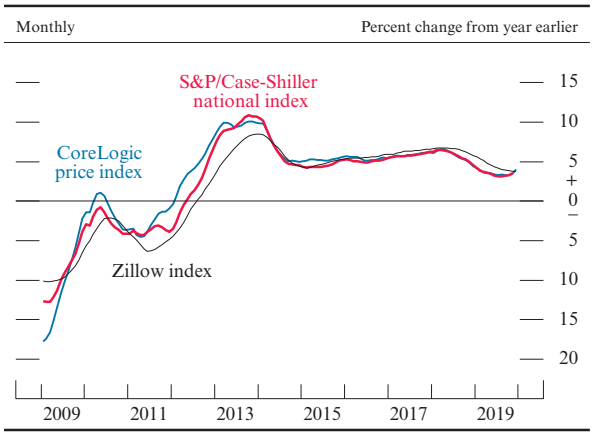

NOTE: The red line is drawn at -7. The shaded bars indicate periods of business recession as defined by the National Bureau of Economic Research.
SOURCE: Federal Reserve Board, Statistical Release G.17, "Industrial Production and Capacity Utilization."

15. Personal saving rate




SOURCE: Bureau of Economic Analysis via Haver Analytics.

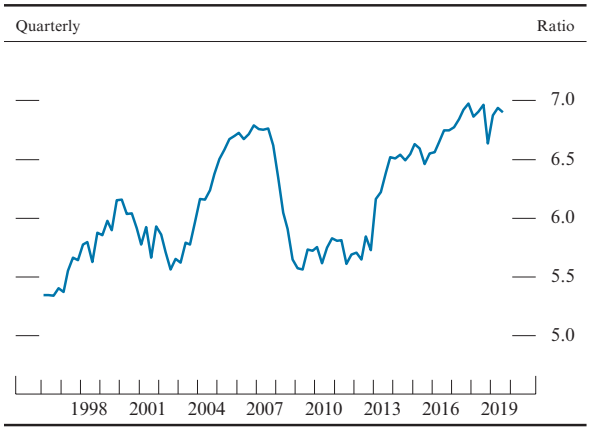
16. Prices of existing single-family houses




NOTE: The data for the S&P/Case-Shiller index extend through November 2019.

SOURCE: CoreLogic Home Price Index; Zillow; S&P/Case-Shiller U.S. National Home Price Index. The S&P/Case-Shiller index is a product of S&P Dow Jones Indices LLC and/or its affiliates. (For Dow Jones Indices licensing information, see the note on the Contents page.)

17. Wealth-to-income ratio




NOTE: The data extend through 2019:Q3. The series is the ratio of household net worth to disposable personal income.

SOURCE: For net worth, Federal Reserve Board, Statistical Release Z.1, "Financial Accounts of the United States"; for income, Bureau of Economic Analysis via Haver Analytics.

improvements in the labor market, which have supported further increases in household income. Real disposable personal income, a measure of households' after-tax purchasing power, increased 2.6 percent in 2019, a solid gain albeit below the robust increase in 2018 that was bolstered by a reduction in personal income taxes. The personal saving rate, at 7.7 percent in the fourth quarter, was little changed from the previous year (figure 15).

## Spending was also supported by high household wealth . . .

The relatively high level of aggregate household net worth also supported consumer spending last year. House prices, which are of particular importance for the value of assets held by a large portion of households, continued to increase in 2019, although at a more moderate pace than in recent years (figure 16). In addition, U.S. equity prices, which fell sharply at the end of 2018, have rebounded since then. Equity wealth is more concentrated among high-wealth households with high propensities to save than is housing wealth, however, and may therefore provide less support for consumption. The ratio of aggregate household net worth to household income held steady through the third quarter of last year at 6.9, near its all-time high (figure 17).

## . . . and consumer sentiment remains strong

Consumers have remained upbeat during the past year. The Michigan index of consumer sentiment, which declined last summer as trade tensions spiked, recovered in recent months and currently stands at a high level by historical standards. The sentiment measure from the Conference Board, which has been more stable, also suggests consumers are fairly upbeat (figure 18).

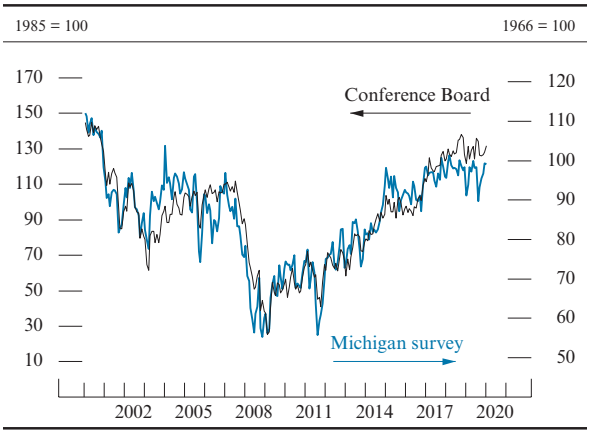
## Borrowing conditions for households remain generally favorable, and borrowing costs have moved down since the middle of 2019 . . .

Financing conditions for consumers remain supportive of growth in household spending. Interest rates on credit cards and auto loans declined, on net, during the second half of 2019, and consumer credit continued to expand at a moderate pace (figure 19). Standards and delinquency rates for these loans have been generally stable. For student loans, credit remains widely available, with over 90 percent of such credit being extended by the federal government. After peaking in 2013, delinquencies on such loans have been gradually declining, reflecting in part the continued improvements in the labor market. In the mortgage market, credit has continued to be readily available for households with solid credit profiles but remains noticeably tighter than before the most recent recession for borrowers with low credit scores.

## . . . and activity in the housing sector has picked up, likely reflecting lower interest rates

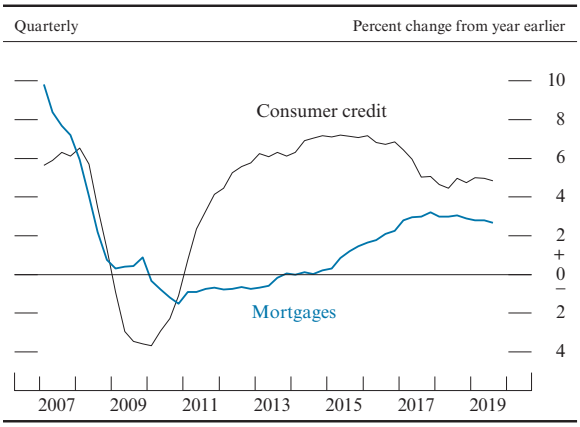
Residential investment picked up in the second half of 2019 after declining for six straight quarters. Housing starts for single-family and multifamily housing units increased sharply in the second half of last year and posted appreciable gains for the year as a whole, with starts and permits for new construction rising to the highest levels in more than 10 years (figure 20). Sales of new and existing homes also increased during 2019 (figure 21). This improvement appears to have importantly reflected the reduction in mortgage interest rates; after increasing appreciably from mid-2017 through 2018, rates declined markedly last year, fully reversing those earlier increases (figure 22). Despite the lower mortgage rates, households' perceptions of homebuying conditions have remained low, likely reflecting ongoing increases in housing prices.

18. Indexes of consumer sentiment



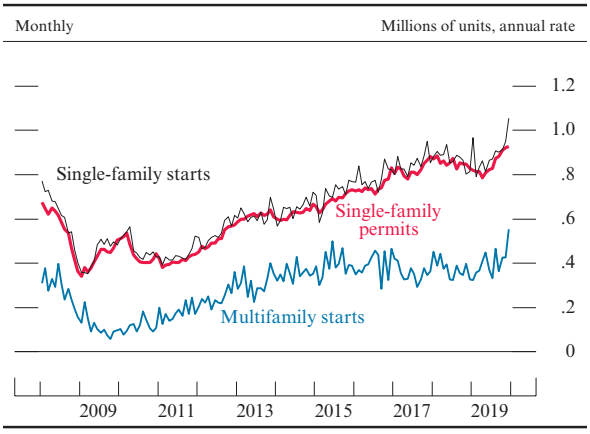

NOTE: The data are monthly and extend through January 2020.
SOURCE: University of Michigan Surveys of Consumers; Conference Board.

19. Changes in household debt



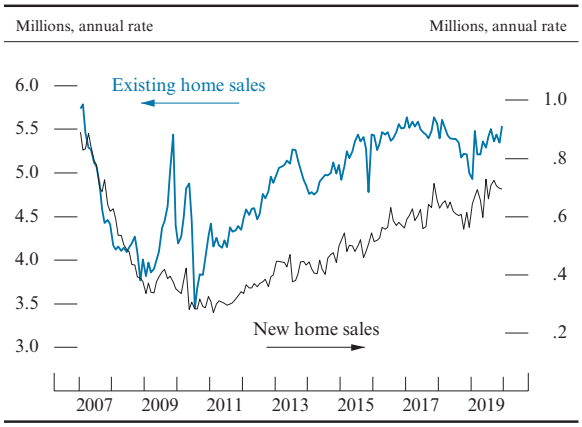

NOTE: The data extend through 2019:Q3.
SOURCE: Federal Reserve Board, Statistical Release Z.1, "Financial Accounts of the United States."

20. Private housing starts and permits



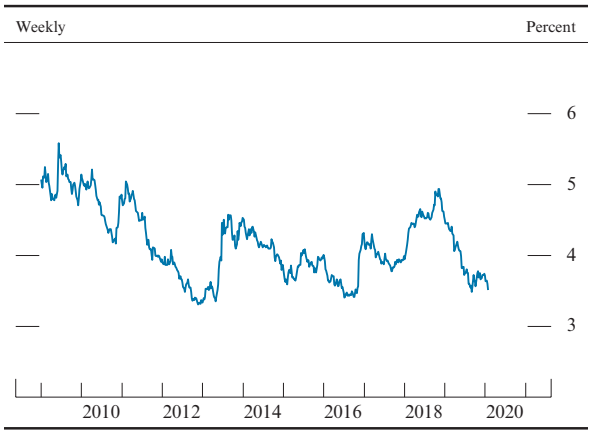

SOURCE: U.S. Census Bureau via Haver Analytics.

21. New and existing home sales



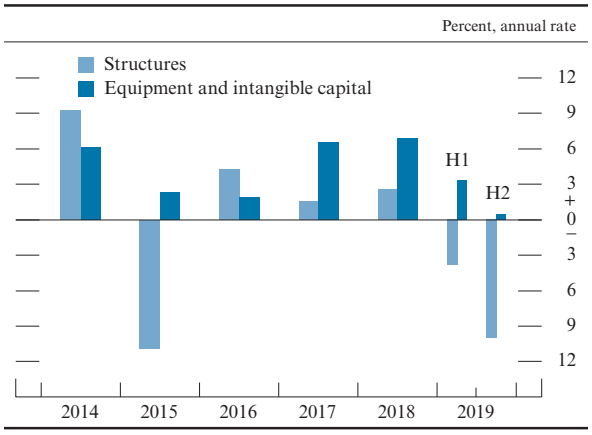

NOTE: Data are monthly. New home sales includes only single-family sales. Existing home sales includes single-family, condo, townhome, and co-op sales.
SOURCE: For new home sales, U.S. Census Bureau; for existing home sales, National Association of Realtors; all via Haver Analytics.

22. Mortgage rates




NOTE: Data are weekly through January 30, 2020.
SOURCE: Freddie Mac Primary Mortgage Market Survey.

23. Change in real business fixed investment




NOTE: Business fixed investment is known as "private nonresidential fixed investment" in the National Income and Product Accounts.
SOURCE: Bureau of Economic Analysis via Haver Analytics.

## In contrast, business fixed investment weakened in the second half of 2019 . . .

After increasing more than 5 percent per year in 2017 and 2018, business fixed investment—spending by businesses on structures, equipment, and intangibles such as research and development—stalled in 2019, as a moderate gain in the first quarter was offset by small declines over the rest of the year. The softness in business investment last year was evident in each of the three main components, and a portion of the weakening appears to reflect concerns over trade policy and slower foreign growth; other factors included the suspension of deliveries of the Boeing 737 Max aircraft and the continued decline in drilling and mining structures investment amid oil prices that fell back from the levels reached in 2018. Forward-looking indicators of business spending—such as orders of capital goods, surveys of business conditions and sentiment, and profit expectations from industry analysts—all appear to have stabilized in recent months but suggest that investment is likely to remain subdued (figure 23).

## . . . despite corporate financing conditions that remained accommodative overall

Financing conditions for nonfinancial firms have remained accommodative amid lower interest rates. Flows of credit to large nonfinancial firms remained solid overall in the third quarter of 2019 (figure 24). The gross issuance of corporate bonds, although lower than in the first half of last year, was robust across credit categories. Yields on both investment- and speculative-grade corporate bonds continued to decrease and are near historical lows. Spreads on corporate bond yields over comparable-maturity Treasury securities have continued to narrow, on net, since the middle of last year and are at the lower end of their historical distributions. Respondents to the January Senior Loan Officer Opinion Survey on Bank Lending Practices, or SLOOS, reported that banks eased several terms on commercial and industrial (C&I) loans but that demand for C&I loans has continued to weaken, consistent

with the slowdown in business investment. C&I loan growth at banks has slowed since the first half of last year, while commercial real estate loan growth has continued to be strong. Meanwhile, financing conditions for small businesses have remained generally accommodative, but credit growth has been subdued.

## Net exports added to GDP growth in 2019, as exports grew little but imports declined

Real exports grew only a touch in 2019, as tariffs on U.S. exports increased and foreign growth weakened (figure 25). Real imports declined last year, in part reflecting higher tariffs on imported goods and weakness in investment and manufacturing. As a result, real net exports—after having subtracted from U.S. real GDP growth in 2018—provided a modest boost to GDP growth in 2019. Relative to 2018, the nominal trade deficit is slightly less negative, and the current account deficit is little changed as a percent of GDP (figure 26).

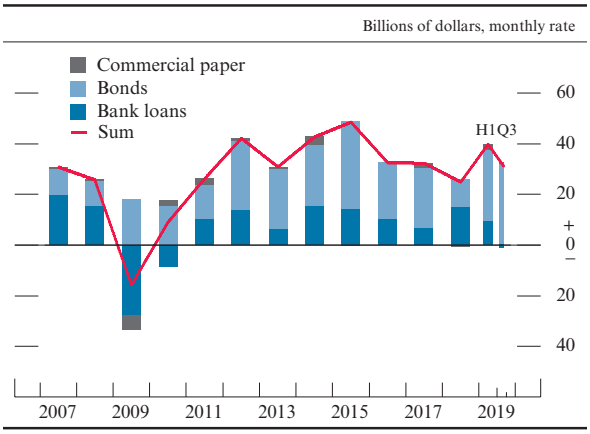
## Federal fiscal policy actions continued to boost economic growth in 2019 while raising the federal unified budget deficit . . .

The effects of fiscal policy actions enacted at the federal level in earlier years continued to boost GDP growth in 2019; the Tax Cuts and Jobs Act of 2017 lowered personal and business income taxes, and rising appropriations consistent with the Bipartisan Budget Act of 2018 boosted federal purchases.[9] In 2019, federal purchases rose 4.3 percent, well above the 2.7 percent increase of 2018 (figure 27).

The federal unified budget deficit widened further in fiscal year 2019 to 4½ percent of

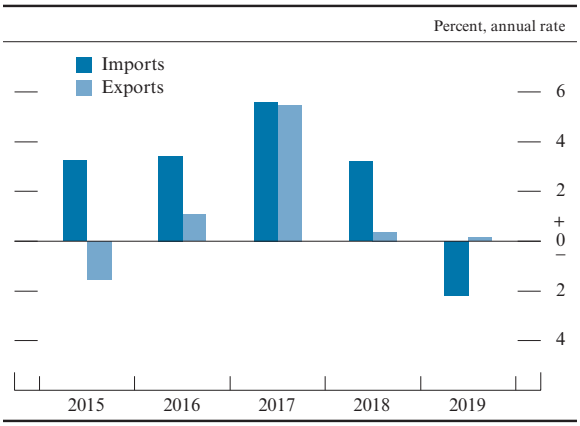
9. The Congressional Budget Office (CBO) estimated that the Tax Cuts and Jobs Act would reduce annual tax revenue by around 1 percent of GDP, on average, from fiscal years 2018 through 2021. This revenue projection includes the CBO's estimated macroeconomic effects of the legislation, which add almost ¼ percentage point to GDP growth, on average, over the same period.

24. Selected components of net debt financing for nonfinancial businesses



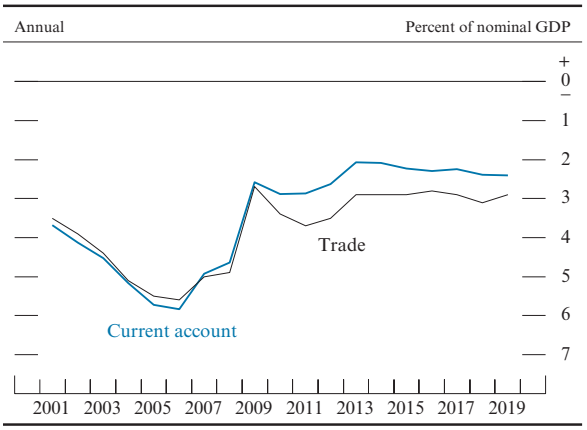

Source: Federal Reserve Board, Statistical Release Z.1, "Financial Accounts of the United States."

25. Change in real imports and exports of goods and services



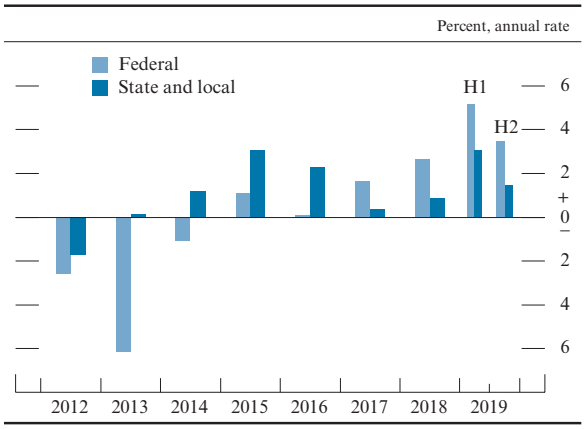

Source: Bureau of Economic Analysis via Haver Analytics.

26. U.S. trade and current account balances



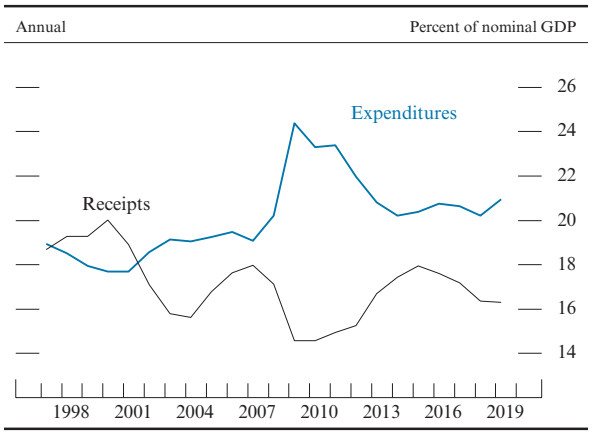

Note: GDP is gross domestic product. Current account data for 2019 are the average of the first three quarters of the year.
Source: Bureau of Economic Analysis via Haver Analytics.

27. Change in real government expenditures on consumption and investment



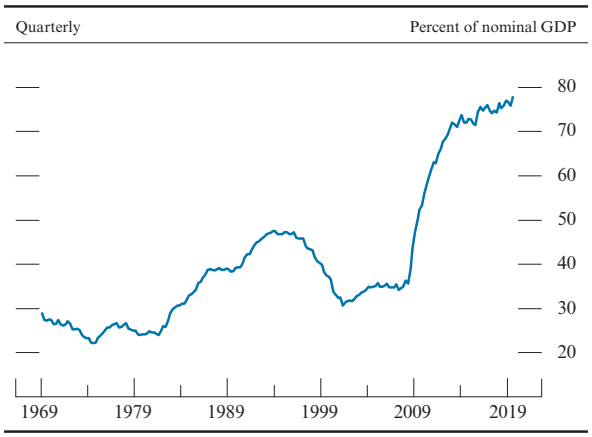

SOURCE: Bureau of Economic Analysis via Haver Analytics.

28. Federal receipts and expenditures




NOTE: The receipts and expenditures data are on a unified-budget basis and are for fiscal years (October through September); gross domestic product (GDP) data are for the four quarters ending in Q3.
SOURCE: Office of Management and Budget via Haver Analytics.

29. Federal government debt held by the public




NOTE: Federal debt extends through 2019:Q3. The data for gross domestic product (GDP) are at an annual rate. Federal debt held by the public equals federal debt less Treasury securities held in federal employee defined benefit retirement accounts, evaluated at the end of the quarter.
SOURCE: For GDP, Bureau of Economic Analysis via Haver Analytics; for federal debt, Federal Reserve Board, Statistical Release Z.1, "Financial Accounts of the United States."

nominal GDP from 3¾ percent of GDP in 2018, as expenditures moved up as a share of the economy while receipts moved sideways (figure 28). Expenditures, at 21 percent of GDP, are above the level that prevailed in the decade before the start of the 2007–09 recession, while receipts have continued to run below their average levels. The ratio of federal debt held by the public to nominal GDP rose to 79 percent in fiscal 2019 and was quite elevated relative to historical norms (figure 29). The Congressional Budget Office projects that this ratio will rise further over the next several years, reflecting large and rising deficits under current fiscal policy.

## . . . and the fiscal position of most state and local governments is stable

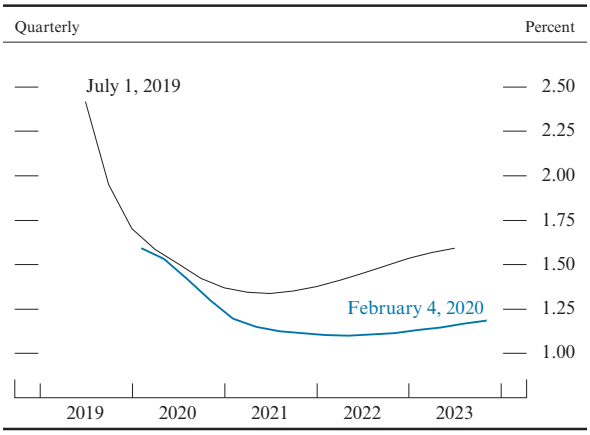
The fiscal position of most state and local governments remains stable, although there is a range of experiences across these governments. Revenues for these governments have continued to grow in recent quarters, as the economic expansion pushes up income and sales tax collections for state governments, and past house price gains continue to push up property tax collections for local governments. Boosted by a rebound in construction spending following two years of weak growth, real purchases by state and local governments rose moderately last year but still remained quite restrained, partly reflecting budget pressures associated with pension and retiree health-care obligations. State and local government payrolls increased moderately in 2019 but have only roughly regained the peak observed before the current expansion, and real outlays for construction are more than 10 percent below their pre-recession peak. The debt of these governments as a share of the economy has continued to edge lower and currently equals around 14 percent of GDP, well below the previous peak of 21 percent following the most recent recession.

## *Financial Developments*

### The expected path of the federal funds rate over the next several years shifted down

Market-based measures of the expected path of the federal funds rate over the next several years have moved down, on net, since the middle of last year and show about a 30 basis point decrease in the federal funds rate over 2020 and a relatively flat path thereafter (figure 30). Survey-based measures of the expected path of the policy rate also shifted down from the levels observed in the middle of 2019 but indicate no change to the target range for the federal funds rate over 2020 from its level at the end of 2019. According to the results of the most recent Survey of Primary Dealers and Survey of Market Participants, both conducted by the Federal Reserve Bank of New York in December, the median of respondents' modal projections implies a flat trajectory for the target range of the federal funds rate for the next few years.[10] Additionally, market-based measures of uncertainty about the policy rate approximately one to two years ahead declined, on balance, from their levels at the end of last June and are close to their average level in recent years.

30. Market-implied federal funds rate path




NOTE: The federal funds rate path is implied by quotes on overnight index swaps—a derivative contract tied to the effective federal funds rate. The implied path as of July 1, 2019, is compared with that as of February 4, 2020. The path is estimated with a spline approach, assuming a term premium of 0 basis points. The July 1, 2019, path extends through July 2023 and the February 4, 2020, path through December 2023.
SOURCE: Bloomberg; Federal Reserve Board staff estimates.

### U.S. nominal Treasury yields decreased on net

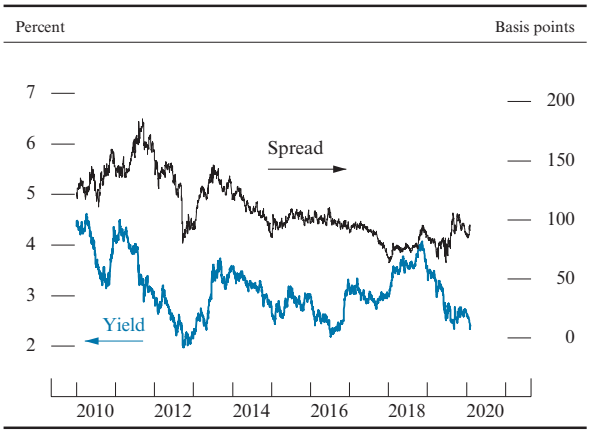
After moving significantly lower over the first half of 2019, nominal Treasury yields also fell sharply in August, largely in response to investors' concerns regarding trade tensions between the United States and China and the global economic outlook (figure 31). Later in the year, as these concerns abated, Treasury yields rose, the yield curve steepened, and uncertainty about near-term Treasury yields—measured by option-implied volatility on short- and longer-dated swap rates—declined.

31. Yields on nominal Treasury securities


SOURCE: Department of the Treasury via Haver Analytics.

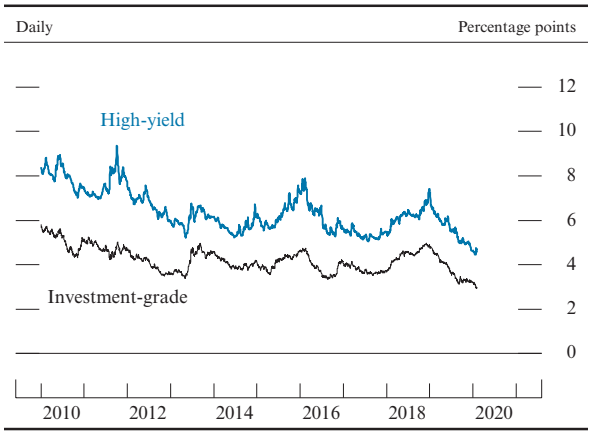
10. The results of the Survey of Primary Dealers and the Survey of Market Participants are available on the Federal Reserve Bank of New York's website at https://www.newyorkfed.org/markets/primarydealer_survey_questions.html and https://www.newyorkfed.org/markets/survey_market_participants, respectively.

32. Yield and spread on agency mortgage-backed securities



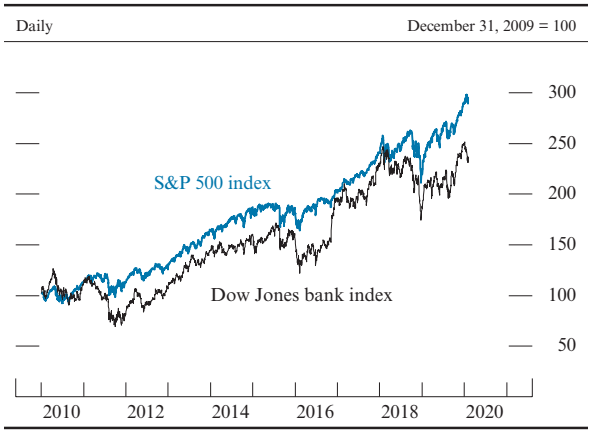

NOTE: The data are daily. Yield shown is for the Fannie Mae 30-year current coupon, the coupon rate at which new mortgage-backed securities would be priced at par, or face, value. Spread shown is to the average of the 5- and 10-year nominal Treasury yields.
SOURCE: Department of the Treasury; Barclays Live.

33. Corporate bond yields, by securities rating




NOTE: Investment-grade is the 10-year triple-B, which reflects the effective yield of the ICE BofAML 7-to-10-year triple-B U.S. Corporate Index (C4A4). High-yield is the 10-year high-yield and reflects the effective yield of the ICE BofAML 7-to-10-year U.S. Cash Pay High Yield Index (J4A0).
SOURCE: ICE Data Indices, LLC, used with permission.

34. Equity prices




SOURCE: S&P's Dow Jones Indices via Bloomberg. (For Dow Jones Indices licensing information, see the note on the Contents page.)

However, in the second half of January, investors' concerns about the implications of the coronavirus outbreak for the economic outlook weighed on Treasury yields and led to a flattening of the yield curve as well as some increase in uncertainty about near-term Treasury yields. Since the middle of last year, Treasury yields ended lower on net.

Consistent with changes in the yields on nominal Treasury securities, yields on 30-year agency mortgage-backed securities (MBS)—an important determinant of mortgage interest rates—decreased, on balance, since the middle of last year and remained low by historical standards (figure 32). Meanwhile, yields on both investment- and speculative-grade corporate bonds continued to decline and also stayed low by historical standards (figure 33). Spreads on corporate bond yields over comparable-maturity Treasury yields narrowed moderately, on net, over the second half of 2019 and remained in the lower end of their historical distribution.

## Broad equity price indexes increased notably

Equity prices fluctuated in August and September along with investors' concerns about trade developments and the economic outlook. Later in 2019 and into 2020, as these concerns abated, equity prices rose substantially and were reportedly boosted by greater certainty among investors that monetary policy would remain accommodative in the near term (figure 34). Gains were spread across most major economic sectors, with the exception of the energy sector, for which stock prices declined markedly. Measures of implied and realized stock price volatility for the S&P 500 index—the VIX and the 20-day realized volatility—increased in August to fairly elevated levels but declined later in the year (figure 35). (For a discussion of financial stability issues, see the box "Developments Related to Financial Stability.")

## Markets for Treasury securities, mortgage-backed securities, and municipal bonds have functioned well

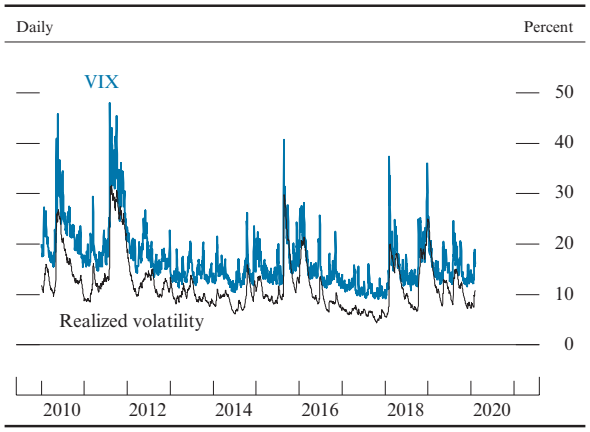
While available indicators of Treasury market functioning have generally remained stable since the first half of 2019—including bid-ask spreads, bid sizes, and estimates of transaction costs—some, such as measures of market depth, have decreased. However, the decline in measures of market depth has reportedly not led to any concerns about Treasury market liquidity. Liquidity conditions in the agency MBS market were also generally stable. Credit conditions in municipal bond markets remained stable as well, with yield spreads on 20-year general obligation municipal bonds over comparable-maturity Treasury securities declining notably and standing near historically low levels.

## Money market rates moved down in line with decreases in the FOMC's target range, except for some notable volatility in mid-September

Decreases in the FOMC's target range for the federal funds rate in July, September, and October transmitted effectively through money markets, with yields on a broad set of money market instruments moving lower in response to the FOMC's policy actions.

The effective federal funds rate moved nearly in parity with the interest rate paid on reserves and was closely tracked by the overnight Eurodollar rate. Other short-term interest rates, including those on commercial paper and negotiable certificates of deposit, also moved down in line with decreases in the policy rate. Domestic short-term funding markets were volatile in mid-September—amid large flows related to corporate tax payments and settlement of Treasury securities—and experienced significant tightening of conditions. The effective federal funds rate rose above the target range on September 17 but then moved back within the target range following the Federal Reserve's open market operations, which eased pressures in money markets (see the box "Money Market Developments and Monetary Policy Implementation" in Part 2).

35. S&P 500 volatility




NOTE: The VIX is a measure of implied volatility that represents the expected annualized change in the S&P 500 index over the following 30 days. For realized volatility, five-minute S&P 500 returns are used in an exponentially weighted moving average with 75 percent of weight distributed over the past 20 days.

SOURCE: Cboe Volatility Index® (VIX®) accessed via Bloomberg; Federal Reserve Board staff estimates.

# Developments Related to Financial Stability

The framework used by the Federal Reserve Board for assessing the resilience of the U.S. financial system focuses on financial vulnerabilities in four broad areas: asset valuations, household and business debt, leverage in the financial sector, and funding risks.[1]

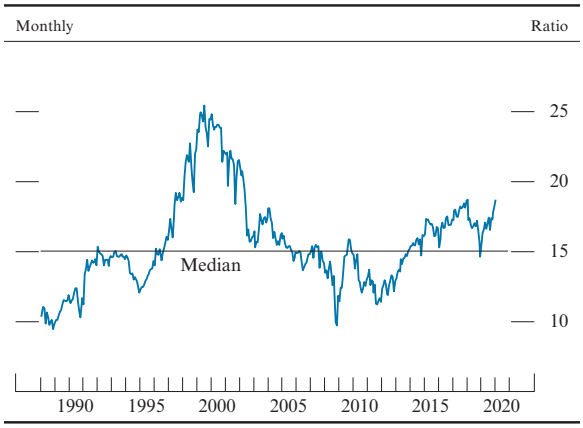
Asset prices have risen partly because of declines in interest rates, but valuation pressures are elevated. Equity prices increased nearly 30 percent over 2019, and the forward price-to-earnings ratio has reached the recent peak seen in 2018 (figure A). In corporate debt markets, the spreads of interest rates on newly issued leveraged loans over LIBOR (London interbank offered rate) have decreased since July 2019 across the credit-quality spectrum, with spreads for the relatively higher-rated issuers reaching their post-crisis lows. Spreads on investment- and speculative-grade bonds over comparable-maturity Treasury yields narrowed since July 2019 and stand notably below their respective medians (figure B). In commercial real estate markets, prices continued to grow at a robust pace in recent quarters, with capitalization rates at historically low levels. Although house price growth slowed noticeably in 2019, house prices still appear to lie modestly above the level predicted by their historical relationship with rents.

Vulnerabilities associated with total private-sector debt continue to be at a moderate level relative to their historical norms. Total household debt has grown at a slower pace than economic activity over the past decade, in part reflecting that mortgage credit has remained tight for borrowers with low credit scores, undocumented income, or high debt-to-income ratios. In contrast, business debt levels continue to be elevated compared with either business assets or gross domestic product, with the riskiest firms accounting for most of the increase in debt in recent years (figure C). Although the net issuance of riskier forms of business debt—high-yield bonds and institutional leveraged loans—has slowed since July 2019, it is still solid by historical standards (figure D).

In addition, about half of investment-grade debt outstanding is currently rated in the lowest category of the investment-grade range (triple-B), a share that is near an all-time high. The concentration of investment-grade debt at the lower end of the investment-grade spectrum creates the risk that adverse developments, such as a deterioration in economic activity, could lead to a sizable volume of bond downgrades to speculative-grade ratings. Such conditions could trigger investors to sell the downgraded bonds rapidly, increasing market illiquidity and causing outsized downward price pressures.

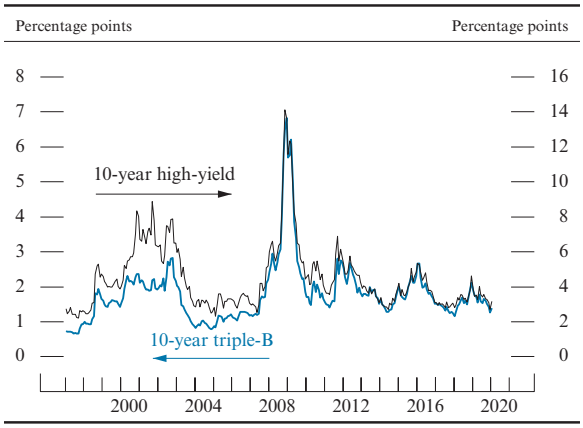
1. The *Financial Stability Report* published on November 15, 2019, presents the most recent, detailed assessment of these vulnerabilities.

A. Forward price-to-earnings ratio of S&P 500 firms




NOTE: The data extend through January 2020. The series represents the aggregate forward price-to-earnings ratio of S&P 500 firms based on expected earnings for 12 months ahead.
SOURCE: Federal Reserve Board staff calculations using Refinitiv (formerly Thomson Reuters), IBES Estimates.

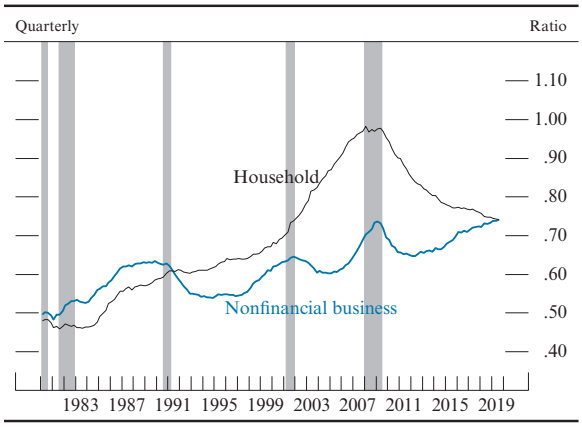
B. Corporate bond spreads to similar-maturity Treasury securities




NOTE: The data are monthly and extend through January 2020. The 10-year triple-B reflects the effective yield of the ICE BofAML 7-to-10-year triple-B U.S. Corporate Index (C4A4), and the 10-year high-yield reflects the effective yield of the ICE BofAML 7-to-10-year U.S. Cash Pay High Yield Index (J4A0). Treasury yields from smoothed yield curve estimated from off-the-run securities.
SOURCE: ICE Data Indices, LLC, used with permission; Department of the Treasury.

*(continued)*

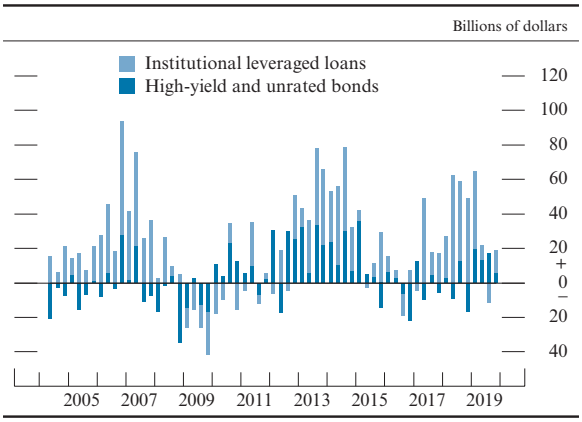
C. Nonfinancial business- and household-sector credit-to-GDP ratios




NOTE: The data extend through 2019:Q3. The shaded bars indicate periods of business recession as defined by the National Bureau of Economic Research. GDP is gross domestic product.

SOURCE: Federal Reserve Board staff calculations based on Bureau of Economic Analysis, national income and product accounts, and Federal Reserve Board, Statistical Release Z.1, "Financial Accounts of the United States."

D. Net issuance of risky debt




NOTE: Institutional leveraged loans generally exclude loan commitments held by banks.

SOURCE: Mergent, Fixed Investment Securities Database; S&P Global, Leveraged Commentary & Data.

Leverage in the financial sector appears low relative to historical norms. The banking sector is much more highly capitalized, in part due to the regulatory reforms enacted after the financial crisis. In addition, the results of the most recent stress test, released in June 2019, indicated that these banks are well positioned to continue lending to households and businesses even in the event of a severe global recession.[2] However, several large banks have announced plans to distribute capital to their shareholders in excess of expected earnings, implying that capital at those banks will decrease. Outside the banking sector, broker-dealers as well as property-and-casualty insurance companies continue to operate with historically low levels of leverage. Leverage at life insurance companies has risen but continues to be close to its average level over the past two decades, and leverage at hedge funds remains near the top of its range since 2014. Furthermore, the outlook for profitability of a range of financial institutions has weakened following declines in interest rates. Weaker profitability could affect their ability to absorb losses or build capital through retained earnings.

Funding risk in the banking sector remains low. Banks rely only modestly on short-term wholesale funding and maintain large amounts of high-quality liquid assets in compliance with liquidity regulations introduced after the financial crisis and the improved understanding by banks of their liquidity risks. In addition, money market mutual funds remain less prone to runs than they were before the implementation of the money market reforms, as the composition of assets under management remains heavily tilted toward the safer and more liquid government funds. Nonetheless, the volatility in repurchase agreement (repo) markets in mid-September 2019 highlighted the possibility for frictions in repo markets to spill over to other markets.[3]

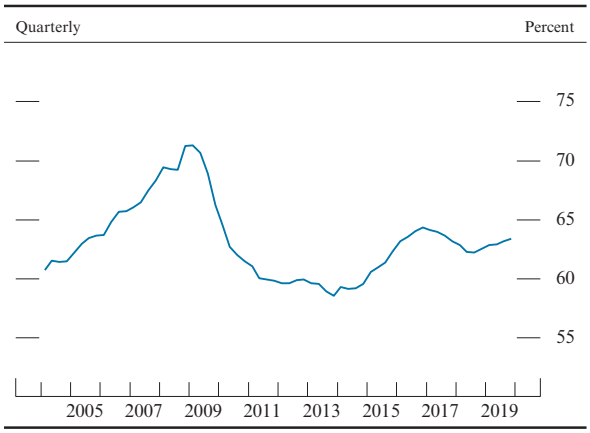
Foreign financial, economic, and political developments could pose a number of near-term risks to the U.S. financial system. In China, fragilities in the corporate and financial sector leave it vulnerable to adverse developments. Because of the size of the Chinese economy, significant distress in China could spill over to U.S. and global markets through a retrenchment of risk appetite, U.S. dollar appreciation, and declines in trade and commodity prices.

In Europe, the risk of a "no-deal Brexit" passed at the end of January, but the United Kingdom and the European Union are still committed to conclude negotiations over their future relationship—including new trade arrangements—by the end of 2020. Failure to do so could trigger market and economic disruptions in Europe that may weaken systemically important financial institutions and spill over to global markets, leading to a tightening of U.S. financial conditions.

2. See Board of Governors of the Federal Reserve System (2019), *Dodd-Frank Act Stress Test 2019: Supervisory Stress Test Results* (Washington: Board of Governors, June), https://www.federalreserve.gov/publications/files/2019-dfast-results-20190621.pdf.

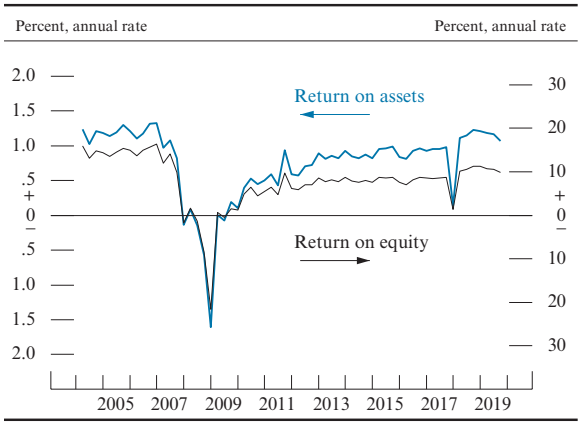
3. See the box "Money Market Developments and Monetary Policy Implementation" in Part 2.

36. Ratio of total commercial bank credit to nominal gross domestic product



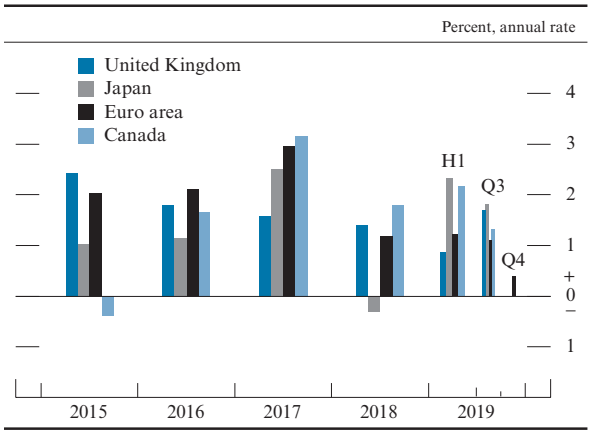

SOURCE: Federal Reserve Board, Statistical Release H.8, "Assets and Liabilities of Commercial Banks in the United States"; Bureau of Economic Analysis via Haver Analytics.

37. Profitability of bank holding companies




NOTE: The data are quarterly and are seasonally adjusted. The data extend through 2019:Q3.
SOURCE: Federal Reserve Board, Form FR Y-9C, Consolidated Financial Statements for Bank Holding Companies.

38. Real gross domestic product growth in selected advanced foreign economies




NOTE: The data for the euro area incorporate a preliminary release for 2019:Q4.
SOURCE: For the United Kingdom, Office for National Statistics; for Japan, Cabinet Office, Government of Japan; for the euro area, Eurostat; for Canada, Statistics Canada; all via Haver Analytics.

## Bank credit continued to expand, and bank profitability remained robust

Aggregate credit provided by commercial banks continued to expand through the second half of 2019, as the strength in commercial real estate and residential real estate loan growth, helped by falling interest rates, more than offset the slowdown in C&I and consumer loans. In the second half of last year, the pace of bank credit expansion was about in line with that of nominal GDP, leaving the ratio of total commercial bank credit to current-dollar GDP little changed from its value last June (figure 36). Overall, measures of bank profitability ticked down a bit in the third quarter because of narrower net interest margins but remain near their post-crisis highs (figure 37).

# *International Developments*

## Growth in advanced foreign economies weakened, but it appears to be stabilizing

Real GDP growth in several advanced foreign economies (AFEs) appears to have stepped down in the second half of the year (figure 38). However, incoming data suggest that the slowdown in the AFEs may have bottomed out. Household spending has generally remained resilient, sustained by low unemployment rates and rising wages. Financial conditions have improved further, supported in part by accommodative monetary policy actions. The protracted slump in global manufacturing, which weighed on external demand across the AFEs, is showing tentative signs of nearing an end. In the euro area, where manufacturing activity was particularly weak, recent indicators suggest that growth may be steadying. In Japan, real GDP appears to have contracted sharply at the end of 2019, following a consumption tax hike in October, but its effects are likely to be transitory. In the United Kingdom, Brexit-related uncertainty weighed on economic activity throughout 2019; around the turn of the year, U.K. and European Union authorities took the necessary steps to prevent a disorderly Brexit from occurring on January 31, 2020,

but they still need to negotiate a new trade arrangement.

## Inflationary pressures remained subdued in many advanced foreign economies

Against a backdrop of slower economic growth, consumer prices in many AFEs continued to rise at a subdued pace, especially in the euro area and Japan (figure 39). Canada remains an exception, as inflation there hovered around 2 percent.

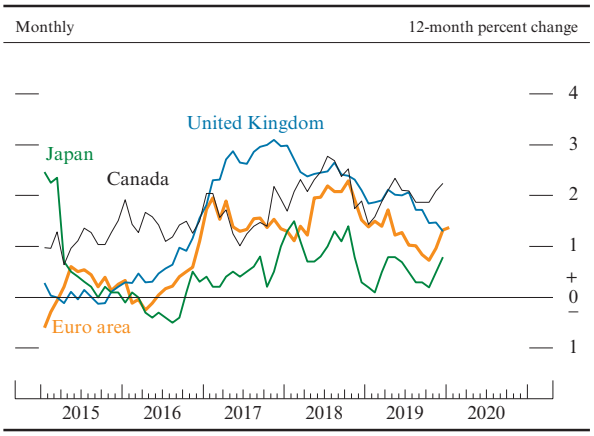
## Central banks in several advanced foreign economies provided accommodation

In response to subdued growth and below-target inflation, the European Central Bank introduced a new stimulus package in September of last year, including a deposit rate cut of 10 basis points to negative 0.5 percent, a restart of its Asset Purchase Programme, and more favorable terms for its targeted longer-term refinancing operations. Similarly, the Reserve Bank of Australia and the Reserve Bank of New Zealand reduced their policy rates in the second half of last year, citing concerns about the global outlook. The Bank of Canada, the Bank of England, and the Bank of Japan kept their policy rates unchanged, although communications by their officials took a more dovish tone, emphasizing increased downside risks to the global economy. In contrast, Sweden's Riksbank and Norway's Norges Bank increased their policy rates, citing favorable macroeconomic conditions and concerns about growing financial imbalances.

## Financial conditions in advanced foreign economies eased further

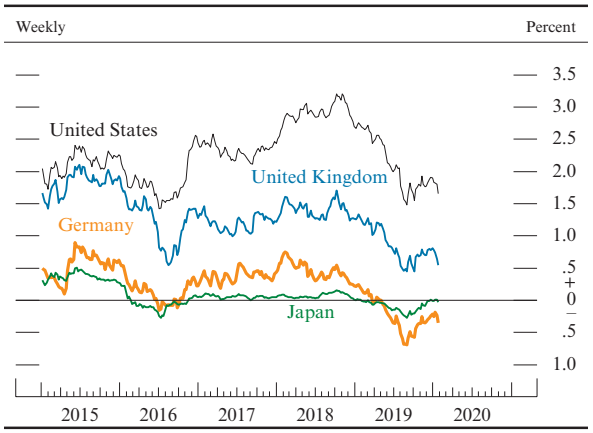
Notwithstanding slowing global growth and bouts of political tensions, financial conditions in the AFEs, on balance, eased further in the second half of 2019, supported by accommodative central bank actions, progress on trade negotiations between the United States and China, and diminished fears of a hard Brexit. Long-term interest rates in many AFEs remained well below the levels seen at the end of 2018 (figure 40). Equity

39. Consumer price inflation in selected advanced foreign economies



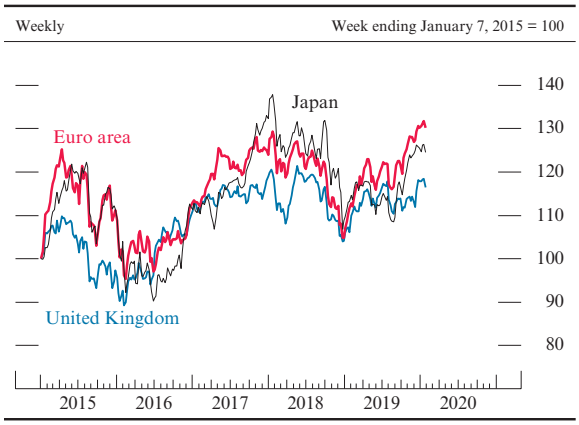

NOTE: The data for the euro area incorporate the flash estimate for January 2020.
SOURCE: For the United Kingdom, Office for National Statistics; for Japan, Ministry of Internal Affairs and Communications; for the euro area, Statistical Office of the European Communities; for Canada, Statistics Canada; all via Haver Analytics.

40. Nominal 10-year government bond yields in selected advanced foreign economies



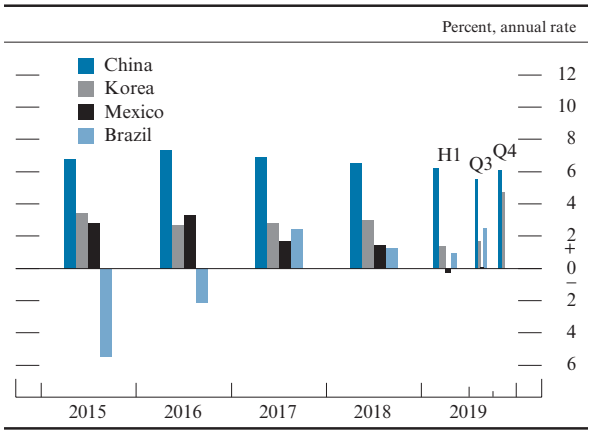

NOTE: The data are weekly averages of daily benchmark yields. The weekly data begin on Thursdays and extend through January 29, 2020.
SOURCE: Bloomberg.

41. Equity indexes for selected advanced foreign economies




NOTE: The data are weekly averages of daily data. The weekly data begin on Thursdays and extend through January 29, 2020.
SOURCE: For euro area, DJ Euro Stoxx Index; for Japan, TOPIX Stock Index; for United Kingdom, FTSE 100 Stock Index; all via Bloomberg.

42. Real gross domestic product growth in selected emerging market economies




NOTE: The data for China are seasonally adjusted by Board staff. The data for Korea, Mexico, and Brazil are seasonally adjusted by their respective government agencies. The 2019:Q4 value for Mexico is 0 percent.
SOURCE: For China, National Bureau of Statistics of China; for Korea, Bank of Korea; for Mexico, Instituto Nacional de Estadística y Geografía; for Brazil, Instituto Brasileiro de Geografia e Estatística; all via Haver Analytics.

prices, as well as prices of other risky assets, increased moderately (figure 41). Sovereign bond spreads over German bund yields for euro-area peripheral countries narrowed slightly. In recent weeks, however, equity and bond markets gave up some of their gains as uncertainty about the economic effects of the coronavirus weighed on investors' sentiment.

## Growth slowed markedly in many emerging market economies, but there are tentative signs of stabilization

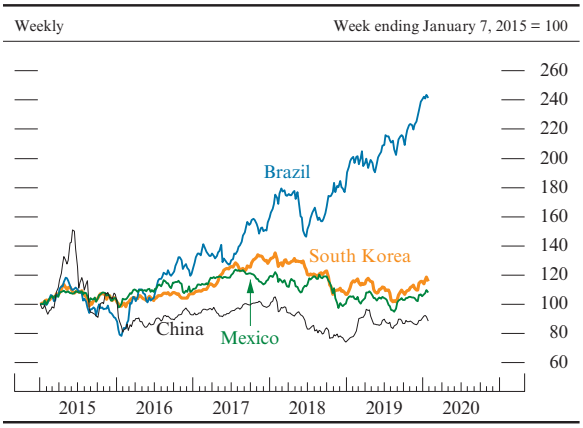
Chinese GDP growth slowed further in the second half of 2019 against the backdrop of increased tariffs on Chinese exports, global weakness in trade and manufacturing, and authorities' deleveraging campaign that continued to exert a drag on the economy (figure 42). However, recent data suggest that China's economic activity picked up at the end of last year, in part supported by some fiscal and monetary policy stimulus and some easing of trade tensions. In emerging Asia excluding China, economic growth was dragged down by a sharp contraction in Hong Kong, where social and political unrest resulted in severe economic disruptions, and by weakness in India, where an ongoing credit crunch continues to weigh on activity. In several other Asian economies, GDP growth held steady but at a lackluster pace amid headwinds from moderating global growth. GDP growth in Korea, Taiwan, and the Philippines rebounded in the last quarter of 2019, consistent with signs of stabilization in the global manufacturing cycle, especially in the high-tech sector. However, the recent emergence of the coronavirus could lead to disruptions in China that spill over to other Asian countries and, more generally, to the rest of the global economy.

Many Latin American economies continued to underperform. Economic stagnation persisted in Mexico, reflecting both domestic factors—including market concerns about economic policies—and external factors, notably, renewed weakness in U.S. manufacturing production. Severe social unrest in several countries—including Chile, Ecuador, and Bolivia—disrupted economic activity. Argentina's financial crisis continued, while Venezuela's economy likely continued to contract. Growth in Brazil, in contrast, edged up as aggregate demand continued to recover, supported by further reductions in policy interest rates.

## Financial conditions in emerging market economies fluctuated but, on net, eased somewhat

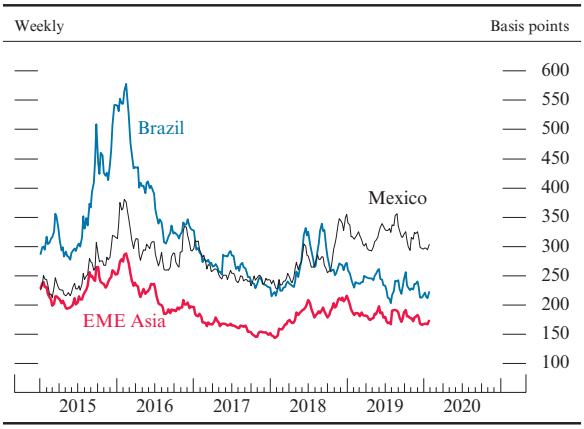
Notwithstanding social and political tensions as well as concerns about the global outlook, financial conditions in the emerging market economies (EMEs) eased somewhat in the second half of 2019. Conditions were supported by the accommodative actions of the FOMC and several foreign central banks and, later in the year, by progress in the negotiations between the United States and its major trading partners as well as improved prospects about global growth. EME equity prices generally increased, especially for Brazil (figure 43). And measures of EME sovereign bond spreads over U.S. Treasury yields generally decreased (figure 44). Political tensions in Hong Kong contributed to an underperformance of Chinese risky assets. After several months of withdrawals, flows to dedicated EME mutual funds resumed in the fourth quarter of 2019, consistent with the improved sentiment toward global prospects

43. Equity indexes for selected emerging market economies



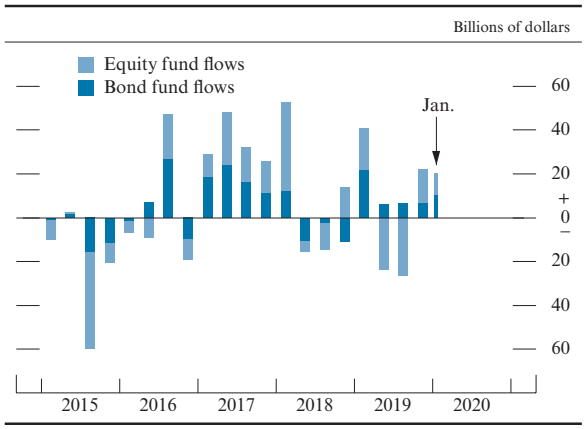

NOTE: The data are weekly averages of daily data. The weekly data begin on Thursdays and extend through January 29, 2020.
SOURCE: For China, Shanghai Composite Index; for Brazil, Bovespa Index; for South Korea, Korean Composite Index; for Mexico, IPC Index; all via Bloomberg.

44. Sovereign spreads in selected emerging market economies



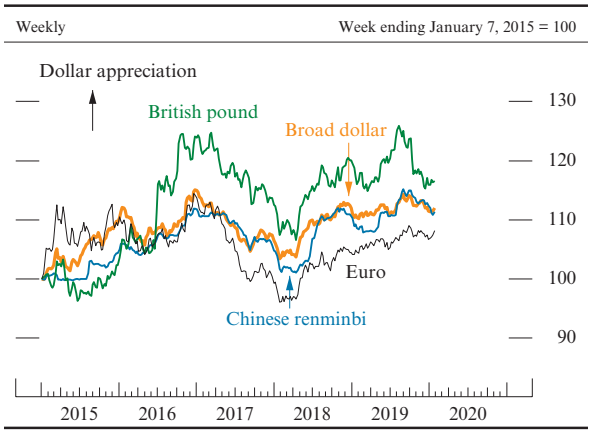

NOTE: The data are weekly averages of daily data. The weekly data begin on Thursdays and extend through January 29, 2020.
SOURCE: J.P. Morgan Emerging Markets Bond Index Global via Bloomberg.

45. Emerging market mutual fund flows




NOTE: The bond and equity fund flows data are quarterly sums of weekly data from January 1, 2015, to December 25, 2019. Weekly data span Thursday through Wednesday, and the quarterly and January 2020 values are sums over weekly data for weeks ending in that quarter or month. The data exclude funds located in China.
SOURCE: EPFR Global.

46. U.S. dollar exchange rate indexes




NOTE: The data, which are in foreign currency units per dollar, are weekly averages of daily data. The weekly data begin on Thursdays and extend through January 29, 2020. As indicated by the leftmost arrow, increases in the data represent U.S. dollar appreciation, and decreases represent U.S. dollar depreciation.
SOURCE: Federal Reserve Board, Statistical Release H.10, "Foreign Exchange Rates."

(figure 45). However, in reaction to the emergence of the coronavirus, in late January equity and bond markets gave up some of their gains.

## The dollar fluctuated but is, on balance, little changed

The foreign exchange value of the U.S. dollar fluctuated but is, on balance, little changed compared with last July (figure 46). While concerns about global growth and trade tensions contributed to the appreciation of the dollar over the summer, monetary policy easing by the Federal Reserve and progress on U.S.–China trade negotiations led to a depreciation of the dollar, especially with respect to the Chinese renminbi. The British pound appreciated notably against the dollar as fears of a disorderly Brexit diminished.

# Part 2
## Monetary Policy

### The Federal Open Market Committee reduced the federal funds rate to support sustained economic expansion and foster a return of inflation to the Committee's 2 percent objective

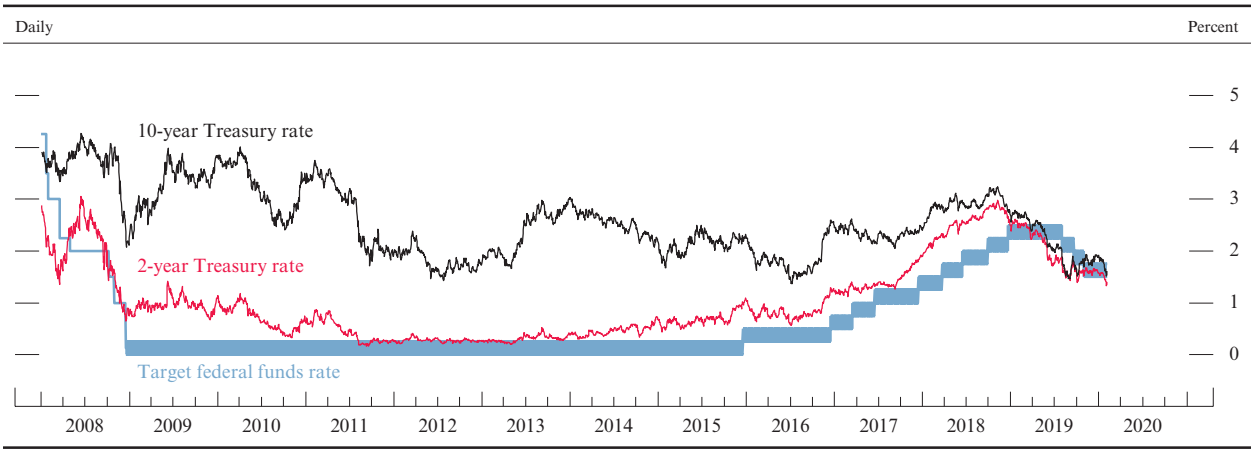
After having gradually increased its target range for the federal funds rate from late 2015 through the end of 2018, the Committee maintained its target range for the federal funds rate at 2¼ to 2½ percent during the first half of 2019. In light of the implications of global developments for the economic outlook as well as muted inflation pressures, the Federal Open Market Committee (FOMC) lowered the target range for the federal funds rate at its July, September, and October meetings by 25 basis points each, bringing it to 1½ to 1¾ percent (figure 47).[11] At its December and January meetings, the Committee judged that the prevailing stance of monetary policy was appropriate to support sustained expansion of economic activity, strong labor market conditions, and inflation returning to its symmetric 2 percent objective.

### Future changes in the federal funds rate will depend on the economic outlook and risks to the outlook as informed by incoming data

The FOMC has continued to emphasize that the actual path of monetary policy will depend on the evolution of the economic outlook and risks to the outlook as informed by incoming data. Specifically, in deciding on the timing and size of future adjustments to the target range for the federal funds rate, the Committee will assess realized and expected economic conditions relative to its objectives of maximum employment and symmetric 2 percent inflation. This assessment will take into account a wide range of information, including measures of labor market conditions, indicators of inflation pressures and inflation

11. See the FOMC statements issued after the July, September, and October meetings, which are available (along with other postmeeting statements) on the Monetary Policy portion of the Board's website at https://www.federalreserve.gov/monetarypolicy.htm.

47. Selected interest rates




Note: The 2-year and 10-year Treasury rates are the constant-maturity yields based on the most actively traded securities.
Source: Department of the Treasury; Federal Reserve Board.

expectations, and readings on financial and international developments.

In addition to evaluating a wide range of economic and financial data and information gathered from business contacts and other informed parties around the country, policymakers routinely consult prescriptions for the policy interest rate from various monetary policy rules, which can provide useful guidance to the FOMC. Although many practical considerations make it undesirable for the FOMC to mechanically follow the prescriptions of any specific rule, the FOMC's framework for conducting systematic monetary policy respects key principles of good monetary policy embodied by these rules, while at the same time, providing flexibility to address many of the limitations of these policy rules (see the box "Monetary Policy Rules and Uncertainty in Monetary Policy Settings").

### The FOMC concluded the reduction of its aggregate securities holdings in the System Open Market Account . . .

At its July meeting, along with its decision to lower the target range for the federal funds rate, the FOMC also announced that it was ending the runoff of securities holdings two months earlier than the initially planned termination at the end of September.[12] Ending the runoff earlier than initially planned was seen as having only very small effects on the balance sheet, with negligible implications for the economic outlook. Moreover, doing so avoided the appearance of inconsistency in continuing to allow the balance sheet to run off while simultaneously lowering the target range for the federal funds rate.

Since then, the Federal Reserve has rolled over at auction all principal payments from its holdings of Treasury securities and has reinvested all principal payments from its holdings of agency debt and agency mortgage-backed securities (MBS) received during each calendar month. The Committee intends to continue to reduce its holdings of agency debt and agency MBS, consistent with the aim of holding primarily Treasury securities in the long run. To allow for a gradual runoff of the MBS portfolio, principal payments from agency debt and agency MBS of up to $20 billion per month have been reinvested in Treasury securities; agency MBS principal payments in excess of $20 billion each month have been reinvested in agency MBS.[13]

### . . . and reaffirmed its intention to implement monetary policy in a regime with an ample supply of reserves

In a monetary policy regime with an ample supply of reserves, control over the level of the federal funds rate and other short-term interest rates is exercised primarily through the setting of the Federal Reserve's administered rates, and active management of the supply of reserves is not required. The Federal Reserve will still conduct periodic open market operations as necessary to accommodate the trend growth in the demand for its nonreserve liabilities, such as currency in circulation, and maintain an ample supply of reserves over time. Separate from such periodic open market operations, beginning in October 2019, the Federal Reserve has implemented a temporary program of open market operations, specifically Treasury bill purchases, aimed at durably raising reserves to levels at or above those prevailing in early September (see the box "Money Market Developments and Monetary Policy Implementation" at the end of Part 2). These actions are purely technical measures to support the effective

12. The Committee had initially indicated in its Balance Sheet Normalization Principles and Plans, issued in March 2019, that it intended to conclude the reduction of its aggregate securities holdings in the System Open Market Account at the end of September 2019. The document is available on the Board's website at https://www.federalreserve.gov/newsevents/pressreleases/monetary20190320c.htm.

13. See the Balance Sheet Normalization Principles and Plans in note 12. Since August, the Federal Reserve has reinvested, on average, about $7 billion per month in agency MBS.

# Monetary Policy Rules and Uncertainty in Monetary Policy Settings

Monetary policy rules are mathematical formulas that relate a policy interest rate, such as the federal funds rate, to a small number of other economic variables—typically including the deviation of inflation from its target value and a measure of resource slack in the economy. The prescriptions for the policy interest rate from these rules can provide helpful guidance for the Federal Open Market Committee (FOMC).[1]

This discussion examines prescriptions from selected policy rules and considers how these prescriptions often depend on judgments and assumptions about economic variables that are inherently uncertain and may change over time. Notably, many policy rules depend on estimates of resource slack and of the longer-run neutral real interest rate, both of which are not directly observable and are estimated with a high degree of uncertainty. As a result, the policy stance that these rules prescribe—and whether that stance is appropriate in light of underlying economic conditions—is also uncertain. Such a situation cautions against mechanically following the prescriptions of any specific rule.

## Policy Rules: Some Key Design Principles and Historical Prescriptions

In many models of the economy, good economic performance can be achieved by following a monetary policy rule that fosters public understanding and that incorporates key principles of good monetary policy.[2] One such principle is that monetary policy should respond in a predictable way to changes in economic conditions. A second principle is that monetary policy should be accommodative when inflation is below policymakers' longer-run inflation objective and employment is below its maximum sustainable level; conversely, monetary policy should be restrictive when the opposite holds. A third principle is that, to stabilize inflation, the policy rate should be adjusted over time by more than one-for-one in response to persistent increases or decreases in inflation.

Economists have analyzed many monetary policy rules, including the well-known Taylor (1993) rule, the "balanced approach" rule, the "adjusted Taylor (1993)" rule, the "price level" rule, and the "first difference" rule (figure A).[3] These policy rules embody the three key principles of good monetary policy and take into account estimates of how far the economy is from the Federal Reserve's dual-mandate goals of maximum employment and price stability. The Taylor (1993), balanced-approach, adjusted Taylor (1993), and price-level rules provide prescriptions for the level of the federal funds rate; all require an estimate of the neutral real interest rate in the longer run ($r_t^{LR}$)—that is, the level of the real federal funds rate that is expected to be consistent, in the longer run, with maximum

*(continued on next page)*

1. FOMC policymakers first discussed prescriptions from monetary policy rules in 1995 and have consulted them routinely since 2004.

2. The effectiveness of monetary policy is enhanced when it is well understood by the public. For a discussion of how the public's understanding of monetary policy matters for the effectiveness of monetary policy, see Janet L. Yellen (2012), "Revolution and Evolution in Central Bank Communications," speech delivered at the Haas School of Business, University of California, Berkeley, November 13, https://www.federalreserve.gov/newsevents/speech/yellen20121113a.htm. For a discussion regarding principles for the conduct of monetary policy, see Board of Governors of the Federal Reserve System (2018), "Monetary Policy Principles and Practice," webpage, https://www.federalreserve.gov/monetarypolicy/monetary-policy-principles-and-practice.htm.

3. The Taylor (1993) rule was suggested in John B. Taylor (1993), "Discretion versus Policy Rules in Practice," *Carnegie-Rochester Conference Series on Public Policy*, vol. 39 (December), pp. 195–214. The balanced-approach rule was analyzed in John B. Taylor (1999), "A Historical Analysis of Monetary Policy Rules," in John B. Taylor, ed., *Monetary Policy Rules* (Chicago: University of Chicago Press), pp. 319–41. The adjusted Taylor (1993) rule was studied in David Reifschneider and John C. Williams (2000), "Three Lessons for Monetary Policy in a Low-Inflation Era," *Journal of Money, Credit and Banking*, vol. 32 (November), pp. 936–66. A price-level rule was discussed in Robert E. Hall (1984), "Monetary Strategy with an Elastic Price Standard," in *Price Stability and Public Policy,* proceedings of a symposium sponsored by the Federal Reserve Bank of Kansas City, held in Jackson Hole, Wyo., August 2–3 (Kansas City: Federal Reserve Bank of Kansas City), pp. 137–59, https://www.kansascityfed.org/publicat/sympos/1984/s84.pdf. The first-difference rule is based on a rule suggested by Athanasios Orphanides (2003), "Historical Monetary Policy Analysis and the Taylor Rule," *Journal of Monetary Economics,* vol. 50 (July), pp. 983–1022. A comprehensive review of policy rules is in John B. Taylor and John C. Williams (2011), "Simple and Robust Rules for Monetary Policy," in Benjamin M. Friedman and Michael Woodford, eds., *Handbook of Monetary Economics,* vol. 3B (Amsterdam: North-Holland), pp. 829–59. The same volume of the *Handbook of Monetary Economics* also discusses approaches other than policy rules for deriving policy rate prescriptions.

## Monetary Policy Rules *(continued)*

A. Monetary policy rules

| | |
|---|---|
| Taylor (1993) rule | $R_t^{T93} = r_t^{LR} + \pi_t + 0.5(\pi_t - \pi^{LR}) + (u_t^{LR} - u_t)$ |
| Balanced-approach rule | $R_t^{BA} = r_t^{LR} + \pi_t + 0.5(\pi_t - \pi^{LR}) + 2(u_t^{LR} - u_t)$ |
| Adjusted Taylor (1993) rule | $R_t^{T93\,adj} = maximum\ \{R_t^{T93} - Z_t, 0\}$ |
| Price-level rule | $R_t^{PL} = maximum\ \{r_t^{LR} + \pi_t + (u_t^{LR} - u_t) + 0.5(PLgap_t), 0\}$ |
| First-difference rule | $R_t^{FD} = R_{t-1} + 0.5(\pi_t - \pi^{LR}) + (u_t^{LR} - u_t) - (u_{t-4}^{LR} - u_{t-4})$ |

NOTE: $R_t^{T93}$, $R_t^{BA}$, $R_t^{T93adj}$, $R_t^{PL}$, and $R_t^{FD}$ represent the values of the nominal federal funds rate prescribed by the Taylor (1993), balanced-approach, adjusted Taylor (1993), price-level, and first-difference rules, respectively.

$R_t$ denotes the realized nominal federal funds rate for quarter $t$, $\pi_t$ is the four-quarter price inflation for quarter $t$, $u_t$ is the unemployment rate in quarter $t$, and $r_t^{LR}$ is the level of the neutral real federal funds rate in the longer run that is expected to be consistent with sustaining maximum employment and inflation at the FOMC's 2 percent longer-run objective, $\pi^{LR}$. In addition, $u_t^{LR}$ is the rate of unemployment expected in the longer run. $Z_t$ is the cumulative sum of past deviations of the federal funds rate from the prescriptions of the Taylor (1993) rule when that rule prescribes setting the federal funds rate below zero. $PLgap_t$ is the percent deviation of the realized level of prices from a price level that rises 2 percent per year from its level in a specified starting period.

The Taylor (1993) rule and other policy rules are generally written in terms of the deviation of real output from its full capacity level. In these equations, the output gap has been replaced with the gap between the rate of unemployment in the longer run and its actual level (using a relationship known as Okun's law) to represent the rules in terms of the FOMC's statutory goals. The rules are implemented as responding to core PCE inflation rather than to headline PCE inflation because current and near-term core inflation rates tend to outperform headline inflation rates as predictors of the medium-term behavior of headline inflation. Box note 3 provides references for the policy rules.

employment and stable inflation.[4] The rules feature the unemployment rate gap, measured as the difference between an estimate of the rate of unemployment that is sustainable in the longer run ($u_t^{LR}$) and the current unemployment rate; the first-difference rule includes the change in the unemployment gap rather than its level.[5] In addition, four of the five rules include the difference between recent inflation and the FOMC's longer-run objective of 2 percent, whereas the price-level rule includes the gap between the level of prices today and the level of prices that would have been realized if inflation had been constant at 2 percent from a specified starting year.[6] The price-level rule thereby takes account of the deviation of inflation from the longer-run objective in earlier periods as well as in the current period, in contrast with the other rules that do not make up past misses of the inflation objective.

The adjusted Taylor (1993) rule recognizes that the federal funds rate cannot be reduced materially below zero and that following the prescriptions of the standard Taylor (1993) rule after a recession during which the federal funds rate has fallen to its effective lower bound may therefore not provide enough policy accommodation. To make up for the

*(continued)*

4. The expression of the first-difference rule shown in figure A does not involve an estimate of the neutral real interest rate in the longer run. However, this rule has its own shortcomings. For example, research suggests that this sort of rule often results in greater volatility in employment and inflation relative to what would be obtained under the Taylor (1993) and balanced-approach rules.

5. The original Taylor (1993) rule represented slack in resource utilization using an output gap (the difference between the current level of real gross domestic product (GDP) and the level that GDP would be if the economy were operating at maximum employment, measured in percent of the latter). The rules in figure A represent slack in resource utilization using the unemployment gap instead, because that gap better captures the FOMC's statutory goal to promote maximum employment. However, movements in these alternative measures of resource utilization are highly correlated. For more information, see the note below figure A.

6. Calculating the prescriptions of the price-level rule requires selecting a starting year for the price level from which to cumulate the 2 percent annual rate of inflation. Figure B uses 1998 as the starting year. Around that time, the underlying trend of inflation and longer-term inflation expectations stabilized at levels consistent with PCE (personal consumption expenditures) price inflation being close to 2 percent.

cumulative shortfall in accommodation, the adjusted Taylor (1993) rule prescribes only a gradual return of the policy rate to the (positive) levels prescribed by the standard Taylor (1993) rule after the economy begins to recover. Similarly, the price-level rule specified in figure A recognizes that the federal funds rate cannot be reduced materially below zero. If inflation runs below the 2 percent objective during periods when the policy rate is constrained by the effective lower bound, this rule will, over time, call for more accommodation to make up for the past inflation shortfall.

Figure B shows historical prescriptions for the federal funds rate from the five rules described earlier. For each period, the figure reports the policy rates prescribed by the rules given prevailing economic conditions and estimates of $u_t^{LR}$ and $r_t^{LR}$ at the time. The prescribed values often vary widely across rules. Because there is no definitive standard for favoring one rule over another, consulting a range of rules is generally preferable to relying on any particular rule.

## Estimates of $r_t^{LR}$ and $u_t^{LR}$: Uncertainty and Revisions

As already noted, the level of the neutral real interest rate and the unemployment rate that is sustainable in the longer run is not directly observable and can be estimated only imprecisely. The neutral real interest rate in the longer run is determined by structural features of the economy, including trend productivity growth, demographics, and risk-taking behavior. The unemployment rate that can be sustained in the longer run is also determined largely by nonmonetary factors, such as demographics, educational attainment, and the structure and dynamics of the labor market. These various determining factors may change over time and may not be directly measurable, hence leading to time-varying and uncertain estimates of $u_t^{LR}$ and $r_t^{LR}$.

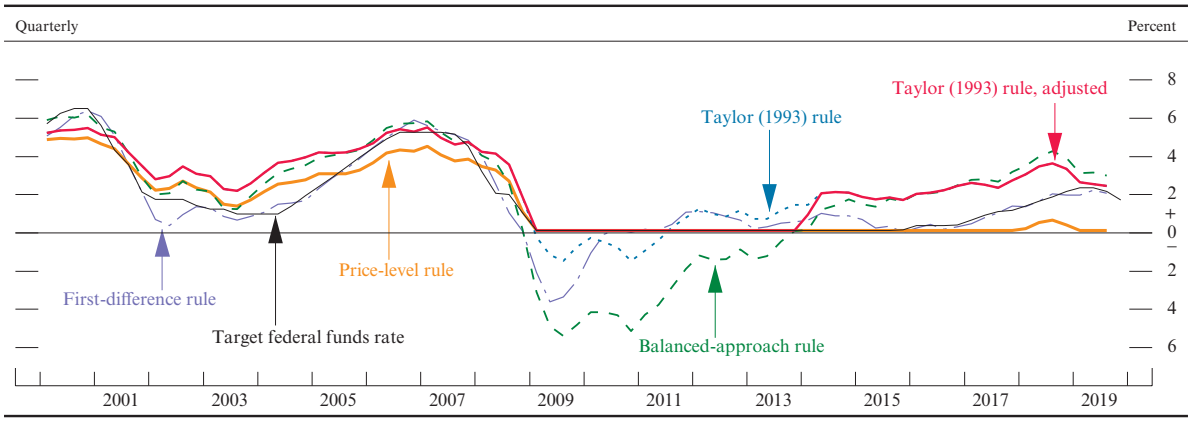
Since 2000, forecasters in the Blue Chip survey have markedly reduced their estimates of the longer-run level of the real short-term interest rate (figure C). FOMC participants have also lowered their estimates of the real federal funds rate in the longer run since the Summary of Economic Projections, or SEP, began reporting this information in 2012. Similarly, in recent years, FOMC participants as well as outside forecasters and analysts generally have lowered their estimates of the longer-run unemployment rate considerably.[7]

Figure D illustrates the imprecision with which the longer-run neutral real interest rate is estimated by reporting values from several time-series models, along with measures of the uncertainty surrounding these values.[8] The models use statistical techniques to capture the variations among inflation, interest rates, real gross domestic product, unemployment, and other data series. The point estimates are dispersed across models, ranging from 0.3 to 2.1 percent. Moreover, the 95 percent uncertainty bands around the estimates illustrate the substantial uncertainty inherent in such estimates.[9]

*(continued on next page)*

7. The SEP median for the longer-run unemployment rate is available since April 2009.
8. The estimates are based on data through 2019:Q3.
9. The range of estimates is computed using published values or values computed using the methodology from the following studies: Jens H.E. Christensen and Glenn D. Rudebusch (2019), "A New Normal for Interest Rates? Evidence from Inflation-Indexed Debt," *Review of Economics and Statistics*, vol. 101 (December), pp. 933–49; Marco Del Negro, Domenico Giannone, Marc P. Giannoni, and Andrea Tambalotti (2017), "Safety, Liquidity, and the Natural Rate of Interest," *Brookings Papers on Economic Activity*,

B. Historical federal funds rate prescriptions from policy rules

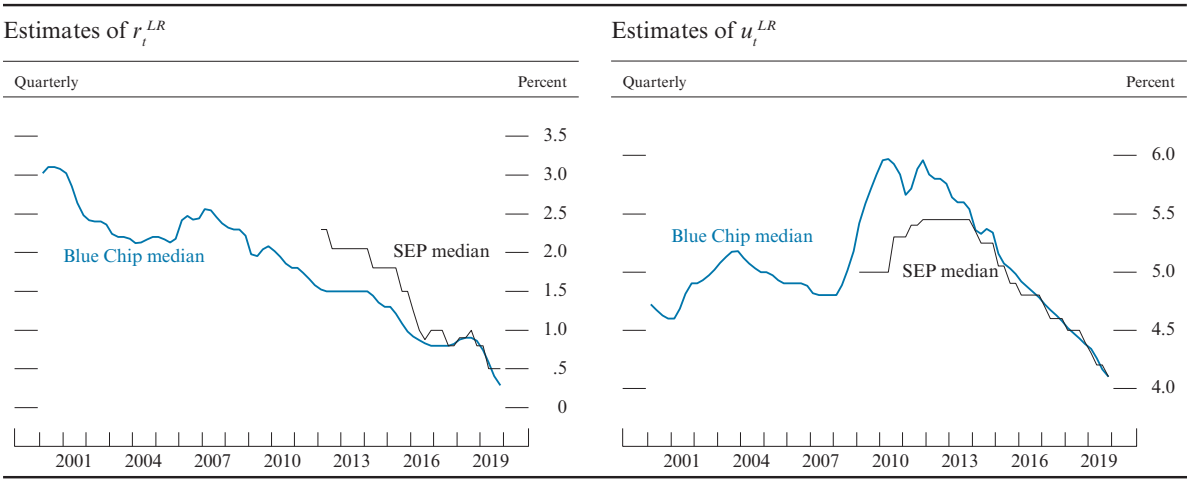



NOTE: The rules use historical values of the federal funds rate, core personal consumption expenditures (PCE) inflation, and the unemployment rate. Quarterly projections of longer-run values for the federal funds rate and the unemployment rate are derived through interpolations of biannual 6-to-10-year-ahead projections from Blue Chip Economic Indicators. The longer-run value for inflation is taken as 2 percent. The target value of the price level is the average level of the price index for PCE excluding food and energy in 1998 extrapolated at 2 percent growth per year. The data extend through 2019:Q3, with the exception of the midpoint of the target range for the federal funds rate data, which go through 2019:Q4.

SOURCE: Federal Reserve Bank of Philadelphia; Wolters Kluwer, Blue Chip Economic Indicators; Federal Reserve Board staff estimates.

## Monetary Policy Rules *(continued)*

C. Real-time estimates of the neutral real interest rate and the unemployment rate in the longer run




NOTE: The Blue Chip median for the longer-run neutral real interest rate, $r_t^{LR}$, equals the 3-month Treasury bill rate projected 6 to 10 years ahead deflated by the corresponding projected annual change in the price index for gross domestic product. The Summary of Economic Projections (SEP) median for the longer-run neutral real interest rate starts in January 2012 and equals the median of Federal Open Market Committee participants' projections of the nominal federal funds rate in the longer run minus the corresponding median projection of personal consumption expenditures inflation. The SEP median for the longer-run unemployment rate, $u_t^{LR}$, is available since April 2009.

SOURCE: Wolters Kluwer, Blue Chip Economic Indicators; Federal Reserve Board.

### Some Implications for Monetary Policy

The longer-run neutral level of the federal funds rate—equal to the sum of the neutral real interest rate in the longer run and the FOMC's 2 percent inflation objective—is one benchmark for evaluating the current stance of monetary policy. Uncertainty about estimates of the longer-run neutral real interest rate leads to uncertainty about how far the current federal funds rate is from its longer-run neutral level. For the Taylor (1993), balanced-approach, adjusted Taylor (1993), and price-level rules, a decrease in the assumed longer-run neutral real interest rate translates

*(continued)*

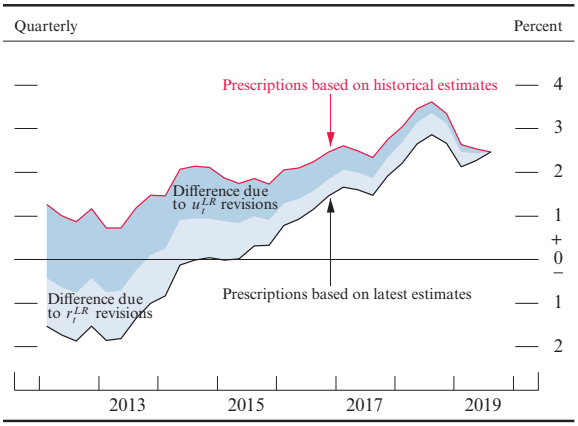
Spring, pp. 235–94, https://www.brookings.edu/wp-content/uploads/2017/08/delnegrotextsp17bpea.pdf; Kathryn Holston, Thomas Laubach, and John C. Williams (2017), "Measuring the Natural Rate of Interest: International Trends and Determinants," *Journal of International Economics*, supp. 1, vol. 108 (May), pp. S59–75; Benjamin K. Johannsen and Elmar Mertens (2016), "The Expected Real Interest Rate in the Long Run: Time Series Evidence with the Effective Lower Bound," FEDS Notes (Washington: Board of Governors of the Federal Reserve System, February 9), https://www.federalreserve.gov/econresdata/notes/feds-notes/2016/the-expected-real-interest-rate-in-the-long-run-time-series-evidence-with-the-effective-lower-bound-20160209.html; Michael T. Kiley (2015), "What Can the Data Tell Us about the Equilibrium Real Interest Rate?" Finance and Economics Discussion Series 2015-77 (Washington: Board of Governors of the Federal Reserve System, August), http://dx.doi.org/10.17016/FEDS.2015.077; Thomas Laubach and John C. Williams (2003), "Measuring the Natural Rate of Interest," *Review of Economics and Statistics*, vol. 85 (November), pp. 1063–70; Kurt F. Lewis and Francisco Vazquez-Grande (2019), "Measuring the Natural Rate of Interest: A Note on Transitory Shocks," *Journal of Applied Econometrics*, vol. 34 (April), pp. 425–36; Thomas A. Lubik and Christian Matthes (2015), "Calculating the Natural Rate of Interest: A Comparison of Two Alternative Approaches," Economic Brief 15-10 (Richmond: Federal Reserve Bank of Richmond, October), https://www.richmondfed.org/-/media/richmondfedorg/publications/research/economic_brief/2015/pdf/eb_15-10.pdf.

D. Point estimates and uncertainty bands for the neutral real rate in the longer run

| Study | Point estimate | 95 percent uncertainty bands |
|---|---|---|
| Christensen and Rudebusch (2019) | .3 | (−.7,1.3) |
| Del Negro and others (2017) | 1.3 | (1, 1.6) |
| Holston and others (2017) | .6 | (−1.1,2.3) |
| Johannsen and Mertens (2016) | .4 | (−.4,1.2) |
| Kiley (2015) | .5 | (.1,1) |
| Laubach and Williams (2003) | .9 | (−1.7, 3.5) |
| Lewis and Vazquez-Grande (2019) | 2.1 | (1.4, 2.8) |
| Lubik and Matthes (2015) | .7 | (−.5,1.7) |

NOTE: The estimates use data through 2019:Q3.
SOURCE: Federal Reserve Board staff calculations, along with references listed in box note 9.

E. Historical federal funds rate prescriptions from Taylor (1993) rule conditional on historical and latest estimates of $r_t^{LR}$ and $u_t^{LR}$




NOTE: The note in figure B provides references to the data and calculations used to derive the historical federal funds rate prescriptions from the Taylor (1993) rule. The data extend through 2019:Q3. For each period, the "prescriptions based on historical estimates" use the interpolated median Blue Chip estimates 6 to 10 years ahead for the neutral real interest rate, $r_t^{LR}$, and the unemployment rate, $u_t^{LR}$, as of that period. "Prescriptions based on latest estimates" use the corresponding estimates as of 2019:Q3 for all periods shown.
SOURCE: Wolters Kluwer, Blue Chip Economic Indicators; Federal Reserve Board staff calculations.

one-for-one into a decline in these rules' prescribed settings for the federal funds rate. Therefore, to the extent that the downward revisions to estimates of $r_t^{LR}$ reflect learning that the longer-run neutral rate was lower than had been assessed previously, the historical prescriptions of these rules would be less accommodative than previously thought. Uncertainty about estimates of the longer-run normal unemployment rate also imparts uncertainty to these rules' prescriptions. For example, given current economic conditions, the assumption of a lower sustainable rate of unemployment in the longer run translates one-for-one into reduced unemployment gaps in the rules and, in turn, leads to lower prescribed values of the policy rate.

Figure E compares the prescriptions of the Taylor (1993) rule based on the historical median estimates of $u_t^{LR}$ and $r_t^{LR}$ from the Blue Chip survey (shown in figure C) and the prescriptions generated based on the latest median estimates of these variables. The federal funds rate prescriptions based on the latest estimates (black line) are lower than the prescriptions based on the historical estimates (red line). For example, using the latest median estimates, the rule's prescribed federal funds rates for 2012 are about 3 percentage points lower than the values prescribed based on the historical estimates. Figure E also shows that revisions to the estimates of $u_t^{LR}$ and $r_t^{LR}$ contribute roughly equally to the difference in the policy rate prescriptions of the Taylor (1993) rule based on the historical and the latest estimates of $u_t^{LR}$ and $r_t^{LR}$.[10]

To conclude, this discussion illustrates that policy rules crucially entail an important element of judgment. Moreover, the inherent uncertainty about some of the variables included in these rules leads to significant uncertainty regarding their policy settings, which cautions against strict adherence to any particular rule.

10. The extent to which these downward revisions to estimates of $r_t^{LR}$ *and* $u_t^{LR}$ lead to downward revisions in historical policy rate prescriptions varies across policy rules. For example, the historical prescriptions of the balanced-approach rule, which responds more strongly to the unemployment gap than the Taylor (1993) rule, would decrease more than shown in figure E when conditioned on the latest estimates of $r_t^{LR}$ *and* $u_t^{LR}$. By contrast, the historical prescriptions of the first-difference rule are essentially unaffected by the downward revisions to $r_t^{LR}$ *and* $u_t^{LR}$.

implementation of the FOMC's monetary policy and are not intended to change the stance of monetary policy. These Treasury bill purchases are distinct from the large-scale asset purchase programs that the Federal Reserve deployed after the financial crisis. In those programs, the Federal Reserve purchased longer-term securities to put downward pressure on longer-term interest rates and ease broader financial conditions.

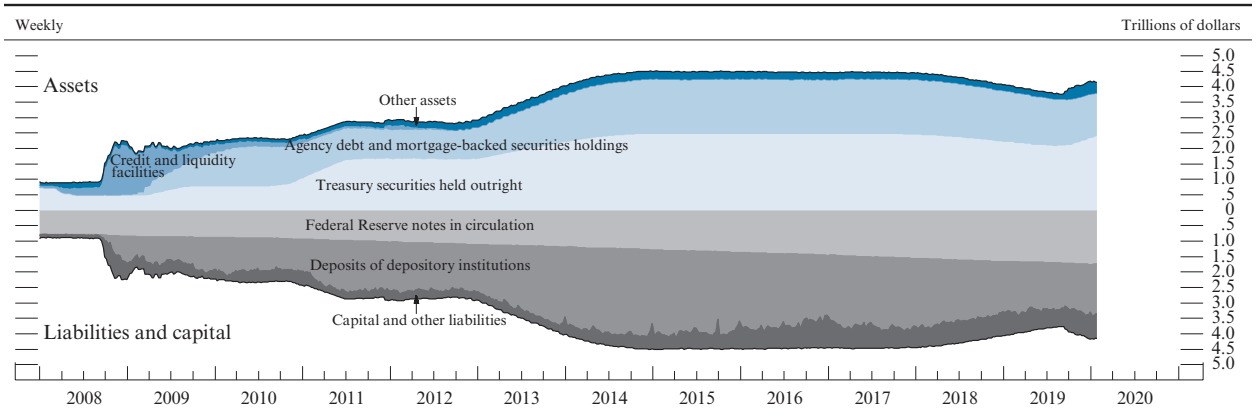
The Federal Reserve's total assets have increased from about $3.8 trillion last July to about $4.1 trillion at present, with holdings of Treasury securities at approximately $2.4 trillion and holdings of agency debt and agency MBS at approximately $1.4 trillion (figure 48). The increase in the size of the balance sheet partly reflects an increase in the level of nonreserve liabilities—such as currency in circulation and the TGA—and a rise in the level of reserve balances, which have increased from approximately $1.5 trillion last July to approximately $1.6 trillion at present.

Meanwhile, interest income on the Federal Reserve's securities holdings has continued to result in substantial remittances to the U.S. Treasury. Preliminary data indicate that the Federal Reserve remitted about $55 billion in 2019.

## The effective federal funds rate moved down in line with the FOMC's target range for the federal funds rate

The Federal Reserve reduced the effective federal funds rate following the FOMC's decisions in July, September, and October to lower the target range for the federal funds rate by reducing the interest rate paid on required and excess reserve balances and the interest rate offered on overnight reverse repurchase agreements (ON RRPs). Specifically, the Federal Reserve lowered the interest rate paid on required and excess reserve balances to 2.10 percent in July, 1.80 percent in September, and 1.55 percent in October. In addition, the Federal Reserve lowered the ON RRP offering rate to 2 percent in July, 1.70 percent in September, and 1.45 percent in October. The Federal Reserve also approved a ¼ percentage point decrease in the discount rate (the primary credit rate) in July, September, and October. Yields on a broad set of money market instruments also moved lower, roughly in line with the effective federal funds rate, in response to the FOMC's policy decisions in July, September, and October.

48. Federal Reserve assets and liabilities




NOTE: "Credit and liquidity facilities" consists of primary, secondary, and seasonal credit; term auction credit; central bank liquidity swaps; support for Maiden Lane, Bear Stearns, and AIG; and other credit facilities, including the Primary Dealer Credit Facility, the Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility, the Commercial Paper Funding Facility, and the Term Asset-Backed Securities Loan Facility. "Other assets" includes repurchase agreements as well as unamortized premiums and discounts on securities held outright. "Capital and other liabilities" includes reverse repurchase agreements, the U.S. Treasury General Account, and the U.S. Treasury Supplementary Financing Account. The data extend through January 29, 2020.
SOURCE: Federal Reserve Board, Statistical Release H.4.1, "Factors Affecting Reserve Balances."

## The Federal Reserve continued the review of its strategic framework for monetary policy

In the second half of 2019, the Federal Reserve continued the review of its monetary policy strategy, tools, and communication practices. The goal of this assessment is to identify possible ways to improve the Committee's current policy framework in order to ensure that the Federal Reserve is best positioned going forward to achieve its statutory mandate of maximum employment and price stability. (The box "Federal Reserve Review of Monetary Policy Strategy, Tools, and Communication Practices" discusses the review and the public outreach that has accompanied it.)

# Federal Reserve Review of Monetary Policy Strategy, Tools, and Communication Practices

## Overview

In 2019, the Federal Reserve began a broad review of the monetary policy strategy, tools, and communication practices it uses to pursue its statutory dual-mandate goals of maximum employment and price stability. The Federal Reserve is undertaking the review because the U.S. economy appears to have changed in ways that matter for monetary policy. For example, the neutral level of the policy interest rate appears to have fallen in the United States and abroad, increasing the risk that the effective lower bound on interest rates will constrain central banks from reducing their policy interest rates enough to effectively support economic activity during downturns. The review is considering what monetary policy strategy will best enable the Federal Reserve to meet its dual mandate in the future, whether the existing monetary policy tools are sufficient to achieve and maintain the dual mandate, and how its communication about monetary policy can be improved.

## *Fed Listens* Initiative

A key component of the review has been a series of public *Fed Listens* events aimed at consulting with a broad range of stakeholders in the U.S. economy. The goal of *Fed Listens* was for policymakers to engage directly with a range of individuals and groups on issues pertaining to the dual-mandate objectives of maximum employment and stable prices.

From February to October 2019, the Federal Reserve hosted 14 public *Fed Listens* events—one at the Board of Governors, one at each of the 12 Reserve Banks, and a System research conference at the Federal Reserve Bank of Chicago. The events featured a broad range of participants drawn from the System's existing advisory councils and community networks and from outreach conducted specifically for the *Fed Listens* initiative. The participants represented small businesses, labor unions, state and local governments, schools and community colleges, workforce development organizations, housing groups, community development financial institutions (CDFIs), retirees, and academia.

Most of the events were conducted in a town hall format with one or more panel sessions. A few incorporated site visits to schools and businesses to learn about local initiatives in underserved communities to increase education, combine high school completion with work experience, or offer after-hours vocational training to enhance skill levels.

At the events, participants were asked how they viewed the relative importance of maximum employment and price stability and how monetary policy actions affected them and the people they represent. Participants commented on labor market conditions and whether they saw those conditions as consistent with the dual-mandate objective of maximum employment; they also offered perspectives on inflation, lending conditions, and how people in their organizations or communities responded to interest rate changes. In addition, participants often compared economic conditions today with conditions a few years or a decade ago and assessed the Federal Reserve's public communications. In keeping with the transparency of the review, all of the events were livestreamed, with written summaries of the events posted on System websites afterward.[1]

*(continued)*

1. Information on the *Fed Listens* events is available on the Board's website at https://www.federalreserve.gov/monetarypolicy/review-of-monetary-policy-strategy-tools-and-communications-fed-listens-events.htm.

## Takeaways from *Fed Listens*

While the *Fed Listens* events covered a broad range of topics, participants consistently highlighted a few points. Representatives of disadvantaged communities generally saw the strong labor market as providing significant benefits to their constituents—primarily by providing job opportunities for people who had had difficulty finding jobs in the past. These representatives also expressed concern about how newly hired workers would fare in the next downturn and whether the job experience they will have acquired by then would allow them to retain their jobs during the downturn or obtain jobs easily after the economy recovers.

Small business owners and representatives from business organizations said finding qualified workers to fill available positions was a challenge in the current labor market conditions. As a result, businesses are partnering with workforce development agencies or community colleges to devise training programs or specialized curriculums to prepare would-be workers. In addition, firms have been more willing to hire people who would not have been considered in less favorable labor market conditions. However, businesses generally are not increasing wages to attract and retain workers. Instead, they are offering new training or education programs and adding or augmenting health-care and other benefits.

While businesses and CDFIs generally found low interest rates to be beneficial, representatives of underserved populations and retirees conveyed different views. Many people in lower-income communities generally have little or no access to conventional credit. Consequently, they often do not benefit when interest rates on conventional credit fall as a result of the Fed's actions. In addition, we heard that retirees with savings have seen interest income on their savings decline.

Participants acknowledged that inflation is low, and representatives of small businesses or business associations emphasized the importance of stable and predictable inflation for planning and decisionmaking. Participants representing retirees said rising costs of health care and prescription drugs pose challenges for people on fixed incomes, while representatives of low- and middle-income communities said the people they represent still struggle to afford basic necessities such as housing, utilities, and food. Participants generally did not regard the fact that aggregate inflation is running modestly below the Federal Reserve's 2 percent objective as a problem. That perception highlights a challenge for the Federal Reserve as it publicly communicates about the rationale for the review and the importance of anchoring inflation expectations at 2 percent for keeping policy interest rates sufficiently above the effective lower bound.

## Policymaker Discussions

Since the summer of 2019, Federal Reserve policymakers have been discussing issues associated with the monetary policy strategy review at meetings of the Federal Open Market Committee (FOMC). At its July, September, and October meetings, the FOMC reviewed the performance of its current approach to monetary policy, discussed possible alternative policy strategies, and reviewed policy tools. Key points of these discussions have been summarized in publicly released meeting minutes. In December, the FOMC considered the views offered at the *Fed Listens* events together with staff analysis on the distributional effects of monetary policy. The FOMC's discussions are continuing into 2020. Policymakers expect to complete the review around the middle of this year. At that time, policymakers will report their findings to the public.

# Money Market Developments and Monetary Policy Implementation

Consistent with its decision at the January 2019 meeting, the Federal Open Market Committee (FOMC) reaffirmed, in its Statement Regarding Monetary Policy Implementation on October 11, 2019, the intention to implement monetary policy in a regime with an ample supply of reserves.[1] In such a system, active management of reserves through frequent open market operations is not required, and control over the level of the federal funds rate and other short-term interest rates is exercised primarily through the setting of the Federal Reserve's administered rates.

In recent years, depository institutions' reserve balances held at the Federal Reserve have declined as a result of the normalization of the Federal Reserve's balance sheet as well as growth in nonreserve liabilities. Reserves dropped from a peak of about $2.8 trillion in 2014 to about $2.2 trillion in late September 2017, largely reflecting the expansion of nonreserve liabilities. Subsequently, reserves declined further, reflecting the FOMC's decision to allow a gradual runoff of maturing securities, and, by the time the FOMC decided to conclude the reduction of its aggregate securities holdings in August 2019, reserves had fallen to about $1.5 trillion. Despite the cessation of balance sheet runoff in August 2019, reserves subsequently continued to decline because of increases in currency and other nonreserve liabilities and reached a multiyear low of about $1.4 trillion in September 2019.

Against a backdrop of declining reserves and high levels of Treasury securities outstanding, in mid-September 2019, imbalances in the supply of and demand for short-term funding led to pressures in the repurchase agreement (repo) market—a money market segment in which banks, securities dealers, money market funds (MMFs), and other financial market participants lend to and borrow from each other for short periods against high-quality collateral. On the demand side, dealers' and other investors' needs for financing securities had increased following the settlement of Treasury auctions at mid-month. On the supply side, some institutional investors, such as government-only MMFs and banks, may have been reluctant to increase lending because they faced uncertainty regarding cash outflows as their clients were making corporate tax payments due in mid-September. As a result, repo rates rose sharply in mid-September (figure A). Pressures in the repo market spilled over to other short-term funding markets, including the federal funds market. The federal funds rate firmed, moving out of its target range for one day (as shown in figure A). In response to elevated rates, the Federal Reserve began conducting repo operations to help stabilize money markets and provide reserves to keep the federal funds rate within its target range (figure B). These operations have been effective in meeting these goals.

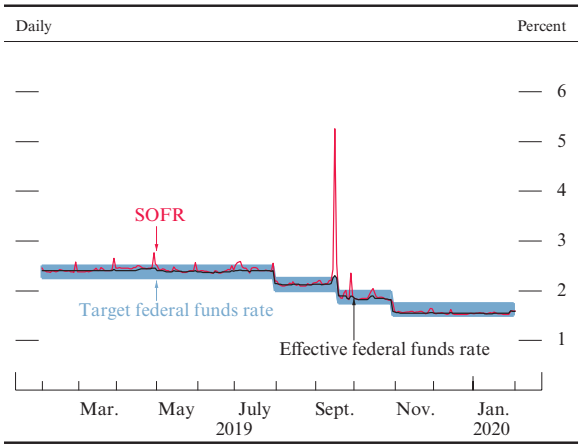
Consistent with its decision to implement monetary policy in a regime with an ample supply of reserves, on October 11, 2019, the Committee announced its decision to purchase Treasury bills at least into the second quarter of 2020 in order to maintain reserves at or above the level that prevailed in early September (as shown in figure B).[2] In addition, the FOMC announced

*(continued)*

1. See the Statement Regarding Monetary Policy Implementation, which is available on the Board's website at https://www.federalreserve.gov/newsevents/pressreleases/monetary20191011a.htm.

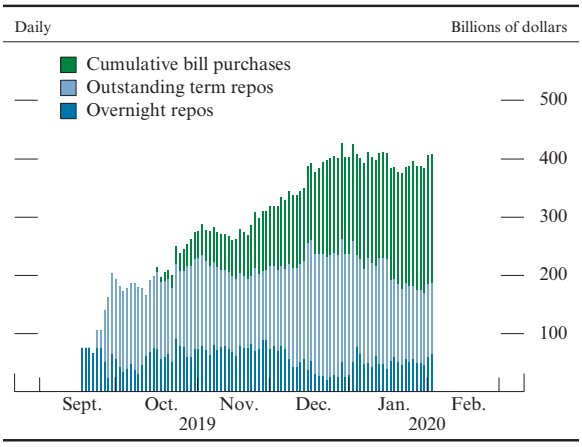
2. For additional information on the FOMC's plans to implement monetary policy over the longer run, see the

A. Selected money market rates




NOTE: The Secured Overnight Financing Rate (SOFR) is a broad measure of rates on overnight Treasury general collateral repurchase agreement (repo) transactions and bilateral Treasury repo transactions.
SOURCE: Federal Reserve Bank of New York; Federal Reserve Board.

B. Federal Reserve open market operations




NOTE: Data are at a business-day frequency, excluding the holidays on October 14, November 11, November 28, December 25, and January 1. Data begin September 18, 2019.
SOURCE: Federal Reserve Bank of New York; Federal Reserve Board staff calculations.

term and overnight repo operations to ensure that the supply of reserves remains ample even during periods of sharp increases in nonreserve liabilities and to mitigate the risk of money market pressures that could adversely affect policy implementation.[3] Repos outstanding, consisting of both overnight and term operations, have been about $209 billion per day, on average, since the announcement on October 11, 2019. These operations are expected to decline over time as Treasury bill purchases supply a larger base of reserves.

The Federal Reserve's open market operations—repo operations and bill purchases—lifted reserves to levels averaging about $1.6 trillion in early 2020. Besides adding reserves, the repo operations damped funding pressures in repo markets that may otherwise have passed through to the federal funds market. As such, the combination of repo operations and bill purchases fostered conditions that helped maintain the federal funds rate within the target range. Notably, with the provision of about $250 billion in liquidity via the Federal Reserve's repo operations, money market conditions were quite calm on year-end. Both secured and unsecured overnight funding rates printed in line with the interest rate on excess reserves (as indicated in figure A).

Statement Regarding Monetary Policy Implementation and Balance Sheet Normalization, which can be found on the Board's website at https://www.federalreserve.gov/newsevents/pressreleases/monetary20190130c.htm.

3. The Statement Regarding Monetary Policy Implementation indicated that the Federal Reserve would conduct term and overnight repo operations at least through January 2020. Such operations will now be continued at least through April 2020; see "Implementation Note Issued January 29, 2020," which is available on the Board's website at https://www.federalreserve.gov/newsevents/pressreleases/monetary20200129a1.htm.

# Part 3
## Summary of Economic Projections

*The following material appeared as an addendum to the minutes of the December 10–11, 2019, meeting of the Federal Open Market Committee.*

In conjunction with the Federal Open Market Committee (FOMC) meeting held on December 10–11, 2019, meeting participants submitted their projections of the most likely outcomes for real gross domestic product (GDP) growth, the unemployment rate, and inflation for each year from 2019 to 2022 and over the longer run. Each participant's projections were based on information available at the time of the meeting, together with his or her assessment of appropriate monetary policy—including a path for the federal funds rate and its longer-run value—and assumptions about other factors likely to affect economic outcomes. The longer-run projections represent each participant's assessment of the value to which each variable would be expected to converge, over time, under appropriate monetary policy and in the absence of further shocks to the economy.[14] "Appropriate monetary policy" is defined as the future path of policy that each participant deems most likely to foster outcomes for economic activity and inflation that best satisfy his or her individual interpretation of the statutory mandate to promote maximum employment and price stability.

Almost all participants expected that, under appropriate monetary policy, growth of real GDP in 2020 would run at or slightly above 1.9 percent, the median of current estimates of its longer-run rate. The median of the projections for the growth rate of real GDP edges down each year over the projection horizon and, for 2022, is modestly below the median of the current estimates of its longer-run rate. The median of the current projections for the unemployment rate was lower than that in the September Summary of Economic Projections (SEP) for each year of the projection period, and some participants reduced their estimates of the longer-run normal rate of unemployment, resulting in a slight decline in the median estimate. The medians of the projections for both total and core inflation, as measured by the four-quarter percent change in the price index for personal consumption expenditures (PCE), increase significantly from 2019 to 2020 and more modestly in 2021 to reach 2 percent that year. Almost all participants expected that inflation would be at or slightly above the Committee's 2 percent objective in 2021 and 2022. A couple more participants, relative to the September SEP, projected inflation to exceed 2 percent at some point during the projection period. The medians of the projections for both total and core inflation were unchanged for 2020 through 2022, compared with the September SEP. Table 1 and figure 1 provide summary statistics for the projections.

As shown in figure 2, a substantial majority of participants indicated that their expectations regarding the evolution of the economy, relative to the Committee's objectives of maximum employment and 2 percent inflation, would likely warrant keeping the federal funds at its current level through the end of 2020. Compared with the September SEP submissions, the median projection for the federal funds rate was 25 basis points lower in each year over the projection period and retained its modest upward tilt in 2021 and 2022. The median of participants' assessments of the appropriate level for the federal funds rate in 2022 was slightly below the median of estimates of its longer-run level; the median

14. One participant did not submit longer-run projections for real GDP growth, the unemployment rate, or the federal funds rate.

Table 1. Economic projections of Federal Reserve Board members and Federal Reserve Bank presidents, under their individual assumptions of projected appropriate monetary policy, December 2019

Percent

| Variable | Median[1] | | | | | Central tendency[2] | | | | | Range[3] | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2019 | 2020 | 2021 | 2022 | Longer run | 2019 | 2020 | 2021 | 2022 | Longer run | 2019 | 2020 | 2021 | 2022 | Longer run |
| Change in real GDP | 2.2 | 2.0 | 1.9 | 1.8 | 1.9 | 2.1–2.2 | 2.0–2.2 | 1.8–2.0 | 1.8–2.0 | 1.8–2.0 | 2.1–2.3 | 1.8–2.3 | 1.7–2.2 | 1.5–2.2 | 1.7–2.2 |
| September projection | 2.2 | 2.0 | 1.9 | 1.8 | 1.9 | 2.1–2.3 | 1.8–2.1 | 1.8–2.0 | 1.7–2.0 | 1.8–2.0 | 2.1–2.4 | 1.7–2.3 | 1.7–2.1 | 1.6–2.1 | 1.7–2.1 |
| Unemployment rate | 3.6 | 3.5 | 3.6 | 3.7 | 4.1 | 3.5–3.6 | 3.5–3.7 | 3.5–3.9 | 3.5–4.0 | 3.9–4.3 | 3.5–3.6 | 3.3–3.8 | 3.3–4.0 | 3.3–4.1 | 3.5–4.5 |
| September projection | 3.7 | 3.7 | 3.8 | 3.9 | 4.2 | 3.6–3.7 | 3.6–3.8 | 3.6–3.9 | 3.7–4.0 | 4.0–4.3 | 3.5–3.8 | 3.3–4.0 | 3.3–4.1 | 3.3–4.2 | 3.6–4.5 |
| PCE inflation | 1.5 | 1.9 | 2.0 | 2.0 | 2.0 | 1.4–1.5 | 1.8–1.9 | 2.0–2.1 | 2.0–2.2 | 2.0 | 1.4–1.7 | 1.7–2.1 | 1.8–2.3 | 1.8–2.2 | 2.0 |
| September projection | 1.5 | 1.9 | 2.0 | 2.0 | 2.0 | 1.5–1.6 | 1.8–2.0 | 2.0 | 2.0–2.2 | 2.0 | 1.4–1.7 | 1.7–2.1 | 1.8–2.3 | 1.8–2.2 | 2.0 |
| Core PCE inflation[4] | 1.6 | 1.9 | 2.0 | 2.0 | | 1.6–1.7 | 1.9–2.0 | 2.0–2.1 | 2.0–2.2 | | 1.6–1.8 | 1.7–2.1 | 1.8–2.3 | 1.8–2.2 | |
| September projection | 1.8 | 1.9 | 2.0 | 2.0 | | 1.7–1.8 | 1.9–2.0 | 2.0 | 2.0–2.2 | | 1.6–1.8 | 1.7–2.1 | 1.8–2.3 | 1.8–2.2 | |
| Memo: Projected appropriate policy path | | | | | | | | | | | | | | | |
| Federal funds rate | 1.6 | 1.6 | 1.9 | 2.1 | 2.5 | 1.6 | 1.6–1.9 | 1.6–2.1 | 1.9–2.6 | 2.4–2.8 | 1.6 | 1.6–1.9 | 1.6–2.4 | 1.6–2.9 | 2.0–3.3 |
| September projection | 1.9 | 1.9 | 2.1 | 2.4 | 2.5 | 1.6–2.1 | 1.6–2.1 | 1.6–2.4 | 1.9–2.6 | 2.5–2.8 | 1.6–2.1 | 1.6–2.4 | 1.6–2.6 | 1.6–2.9 | 2.0–3.3 |

Note: Projections of change in real gross domestic product (GDP) and projections for both measures of inflation are percent changes from the fourth quarter of the previous year to the fourth quarter of the year indicated. PCE inflation and core PCE inflation are the percentage rates of change in, respectively, the price index for personal consumption expenditures (PCE) and the price index for PCE excluding food and energy. Projections for the unemployment rate are for the average civilian unemployment rate in the fourth quarter of the year indicated. Each participant's projections are based on his or her assessment of appropriate monetary policy. Longer-run projections represent each participant's assessment of the rate to which each variable would be expected to converge under appropriate monetary policy and in the absence of further shocks to the economy. The projections for the federal funds rate are the value of the midpoint of the projected appropriate target range for the federal funds rate or the projected appropriate target level for the federal funds rate at the end of the specified calendar year or over the longer run. The September projections were made in conjunction with the meeting of the Federal Open Market Committee on September 17–18, 2019. One participant did not submit longer-run projections for the change in real GDP, the unemployment rate, or the federal funds rate in conjunction with the September 17–18, 2019, meeting, and one participant did not submit such projections in conjunction with the December 10–11, 2019, meeting.

1. For each period, the median is the middle projection when the projections are arranged from lowest to highest. When the number of projections is even, the median is the average of the two middle projections.
2. The central tendency excludes the three highest and three lowest projections for each variable in each year.
3. The range for a variable in a given year includes all participants' projections, from lowest to highest, for that variable in that year.
4. Longer-run projections for core PCE inflation are not collected.

estimate of the longer-run level was unchanged from its value in the September SEP.

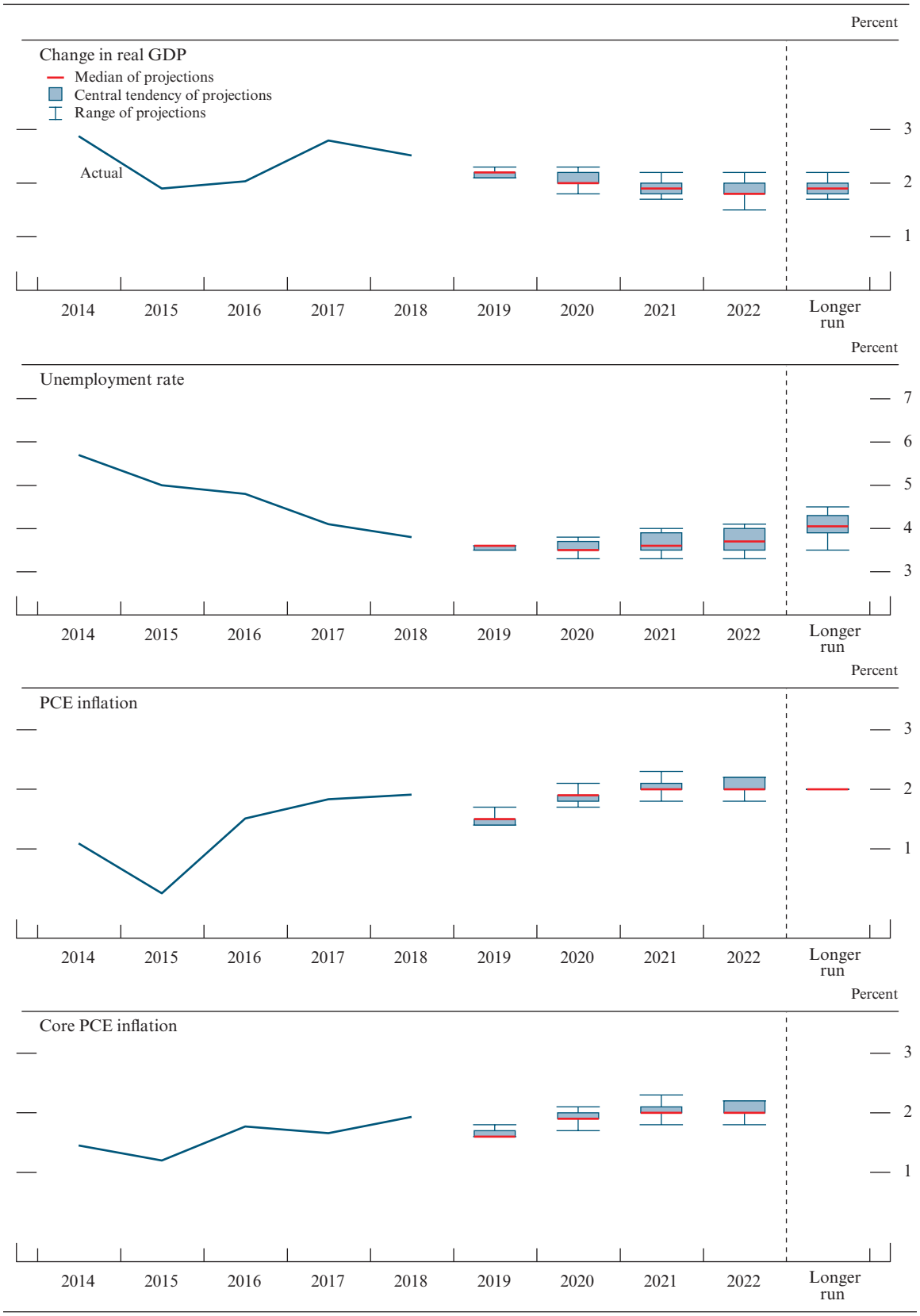
Most participants regarded the uncertainties around their projections as broadly similar to the average over the past 20 years. The majority of participants continued to assess the risks to their outlooks for real GDP growth as weighted to the downside and for the unemployment rate as weighted to the upside. However, compared with the September submissions, several participants shifted their assessments of the balance of risks around these projections to being broadly balanced. Most participants judged the risks to their inflation outlook as broadly balanced, though one-third of participants viewed the risks to their inflation projections as weighted to the downside; no participant assessed the risks to his or her inflation outlook as weighted to the upside. The uncertainties and risks around participants' projections for headline and core inflation were little changed from the September SEP.

## The Outlook for Real GDP Growth and Unemployment

As shown in table 1, the medians of participants' projections for real GDP growth in 2019 and 2020, conditional on their individual assessments of appropriate monetary policy, were 2.2 percent and 2.0 percent, respectively, a touch above the median estimate of the longer-run growth rate of 1.9 percent. The median of the projections for the growth rate of real GDP declines slowly over the projection horizon and, in 2022, is modestly below the median of the current estimates of its longer-run rate. The medians of the projections for real GDP growth in all four years of the projection period, as well as in the longer run, were unchanged from the September SEP.

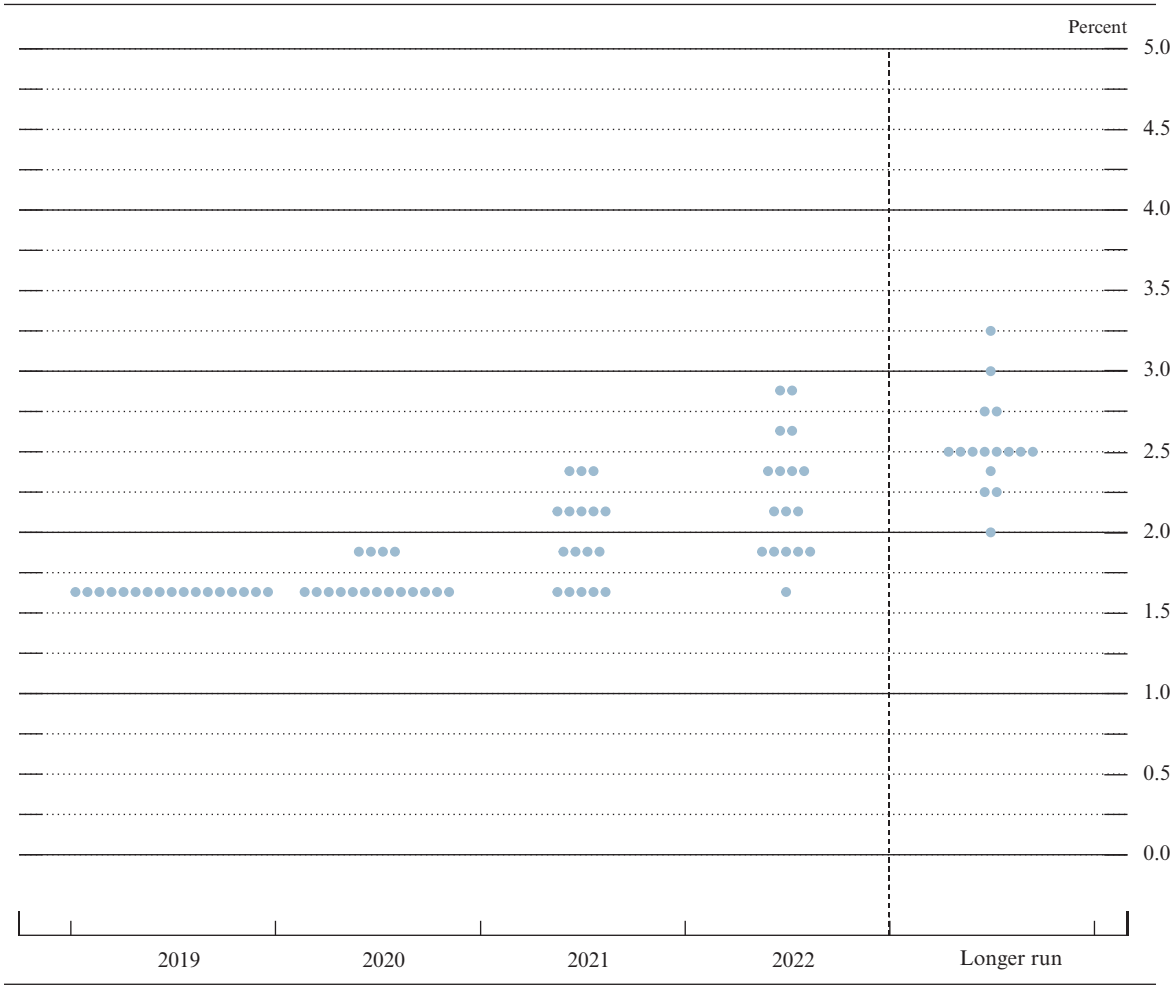
A majority of participants marked down their projections of the unemployment rate in each year of the projection period, and some participants lowered their estimates of the

Figure 1. Medians, central tendencies, and ranges of economic projections, 2019–22 and over the longer run




NOTE: Definitions of variables and other explanations are in the notes to table 1. The data for the actual values of the variables are annual.

Figure 2. FOMC participants' assessments of appropriate monetary policy: Midpoint of target range or target level for the federal funds rate




NOTE: Each shaded circle indicates the value (rounded to the nearest ⅛ percentage point) of an individual participant's judgment of the midpoint of the appropriate target range for the federal funds rate or the appropriate target level for the federal funds rate at the end of the specified calendar year or over the longer run. One participant did not submit longer-run projections for the federal funds rate.

longer-run normal rate of unemployment. As a result, the medians of the projections for the unemployment rate in the fourth quarter of 2020 through 2022 were 3.5 percent, 3.6 percent, and 3.7 percent, respectively, each 0.2 percentage point lower than in the September projections. The median estimate of the longer-run normal rate of unemployment was 4.1 percent, 0.1 percentage point lower than in September.

Figures 3.A and 3.B show the distributions of participants' projections for real GDP growth and the unemployment rate, respectively, from 2019 to 2022 and in the longer run. The distribution of individual projections for real GDP growth for 2020 tilted slightly higher, as many participants upgraded their projections a bit relative to those in the September SEP, although the median projection was unchanged. The distributions of individual projections of real GDP growth in 2021 and 2022 and in the longer run were little changed overall. The distributions of individual projections for the unemployment rate from 2020 to 2022 and in the longer run shifted lower relative to those in September.

## The Outlook for Inflation

As shown in table 1, the median projection for core PCE price inflation was 1.6 percent for 2019, a modest decrease from the September projections. The medians of the projections for both total and core PCE price inflation were each 1.9 percent in 2020 and 2.0 percent in both 2021 and 2022—all unchanged from September. Figures 3.C and 3.D show the distributions of participants' views about their outlooks for inflation. Although the medians of the projections for total and core PCE price inflation from 2020 through 2022 were unchanged from the September SEP, a couple more participants projected inflation to be slightly above the Committee's 2 percent objective in 2022.

## Appropriate Monetary Policy

Figure 3.E shows the distributions of participants' judgments regarding the appropriate target—or midpoint of the target range—for the federal funds rate at the end of each year from 2019 to 2022 and over the longer run. A substantial majority of participants projected a federal funds rate of 1.63 percent for the end of 2020. Four participants assessed that the most likely appropriate rate at year-end for 2020 would be 1.88 percent. For subsequent years, the medians of the projections were 1.88 percent at the end of 2021 and 2.13 percent at the end of 2022. The distribution of participants' estimates of the longer-run level of the federal funds rate was little changed, and the median estimate was unchanged from September at 2.50 percent.

Compared with the projections prepared for the September SEP, a number of participants marked down their assessments of the appropriate level of the federal funds rate at the end of 2020, reflecting in part the reduction in the target range at the October meeting and causing both the range and central tendency of projections for 2020 to narrow considerably. Some participants lowered their projections for the appropriate level in 2021 and 2022. The median projection for the federal funds rate was 25 basis points lower in each year in the projection period. Realized inflation running persistently below target and risks associated with trade policy and foreign economic growth were cited as key factors informing participants' judgments about the appropriate path for the federal funds rate.

## Uncertainty and Risks

In assessing the appropriate path of the federal funds rate, FOMC participants take account of the range of possible economic outcomes, the likelihood of those outcomes, and the potential benefits and costs should they occur. As a reference, table 2 provides measures of forecast uncertainty—based on the forecast errors of various private and government forecasts over the past 20 years—for real GDP growth, the unemployment rate, and total PCE price inflation. Those measures are represented graphically in the "fan charts" shown in the top panels of figures 4.A, 4.B, and 4.C. The fan charts display the SEP medians for the three variables surrounded by symmetric confidence intervals derived from the forecast errors reported in table 2. If the degree of uncertainty attending these

Table 2. Average historical projection error ranges

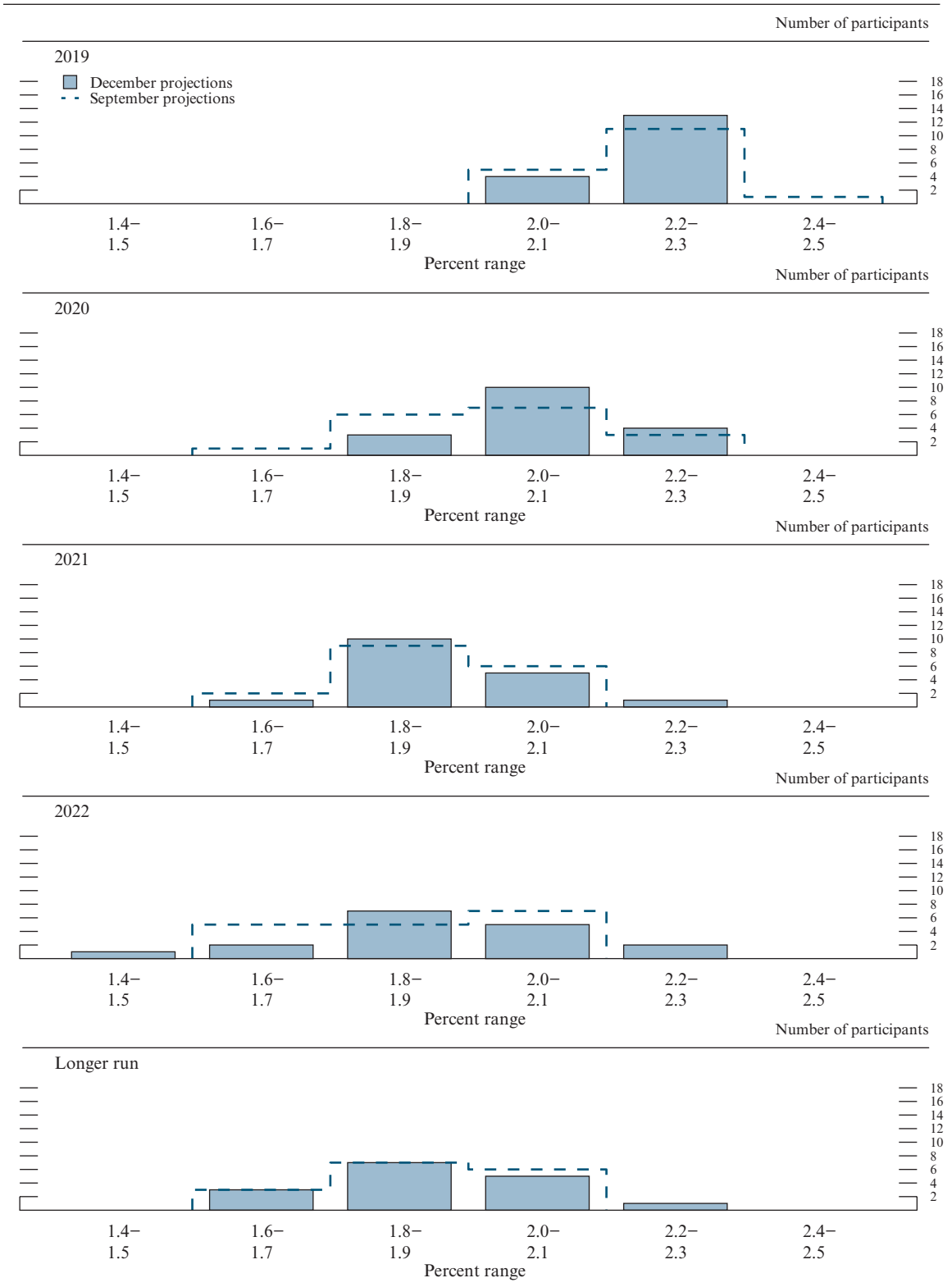
Percentage points

| Variable | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|
| Change in real GDP[1] | ±0.8 | ±1.6 | ±2.0 | ±2.0 |
| Unemployment rate[1] | ±0.1 | ±0.8 | ±1.5 | ±1.9 |
| Total consumer prices[2] | ±0.2 | ±0.9 | ±1.0 | ±0.9 |
| Short-term interest rates[3] | ±0.1 | ±1.4 | ±2.0 | ±2.4 |

Note: Error ranges shown are measured as plus or minus the root mean squared error of projections for 1999 through 2018 that were released in the winter by various private and government forecasters. As described in the box "Forecast Uncertainty," under certain assumptions, there is about a 70 percent probability that actual outcomes for real GDP, unemployment, consumer prices, and the federal funds rate will be in ranges implied by the average size of projection errors made in the past. For more information, see David Reifschneider and Peter Tulip (2017), "Gauging the Uncertainty of the Economic Outlook Using Historical Forecasting Errors: The Federal Reserve's Approach," Finance and Economics Discussion Series 2017-020 (Washington: Board of Governors of the Federal Reserve System, February), https://dx.doi.org/10.17016/FEDS.2017.020.

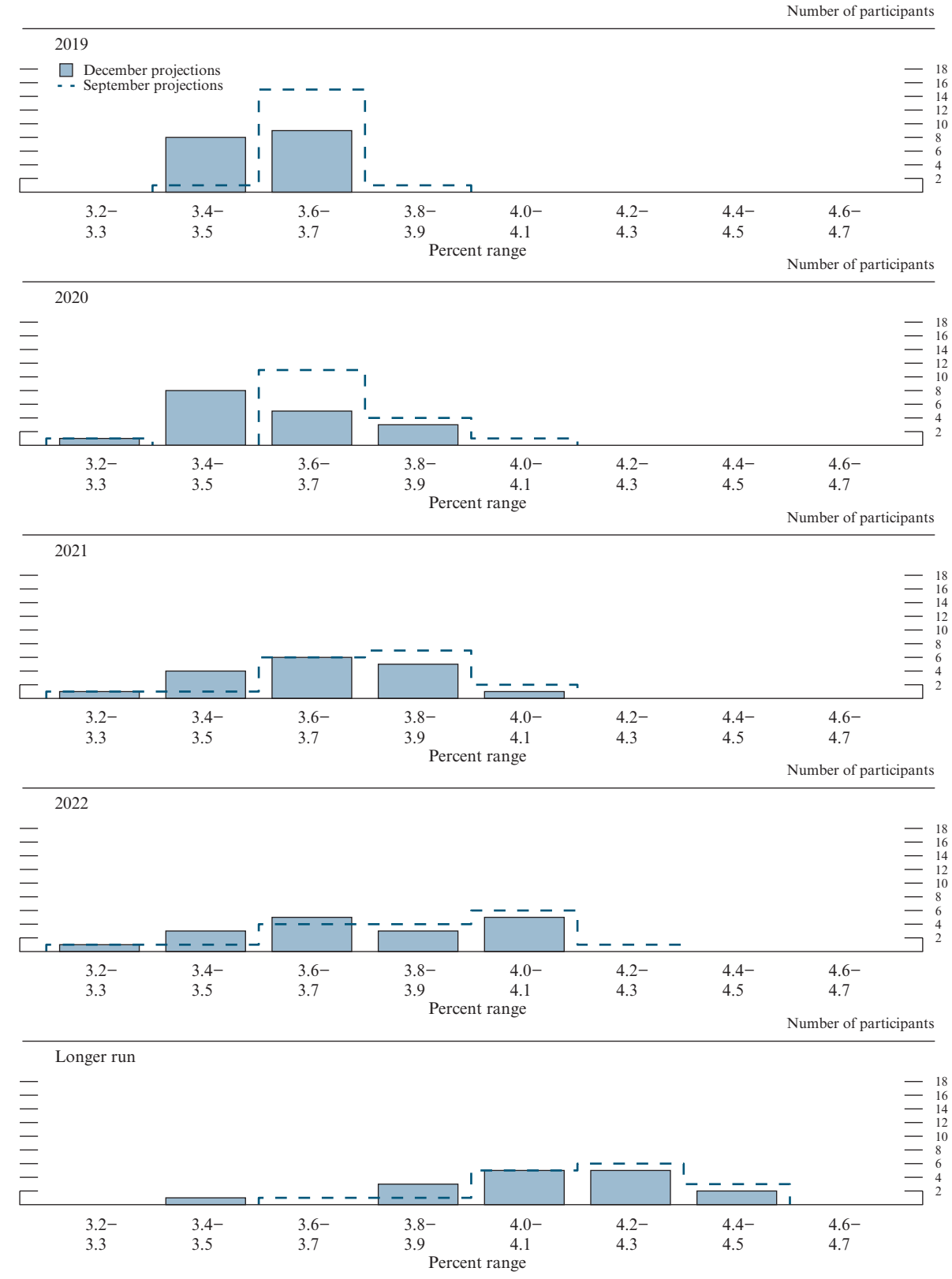
1. Definitions of variables are in the general note to table 1.
2. Measure is the overall consumer price index, the price measure that has been most widely used in government and private economic forecasts. Projections are percent changes on a fourth quarter to fourth quarter basis.
3. For Federal Reserve staff forecasts, measure is the federal funds rate. For other forecasts, measure is the rate on 3-month Treasury bills. Projection errors are calculated using average levels, in percent, in the fourth quarter.

Figure 3.A. Distribution of participants' projections for the change in real GDP, 2019–22 and over the longer run



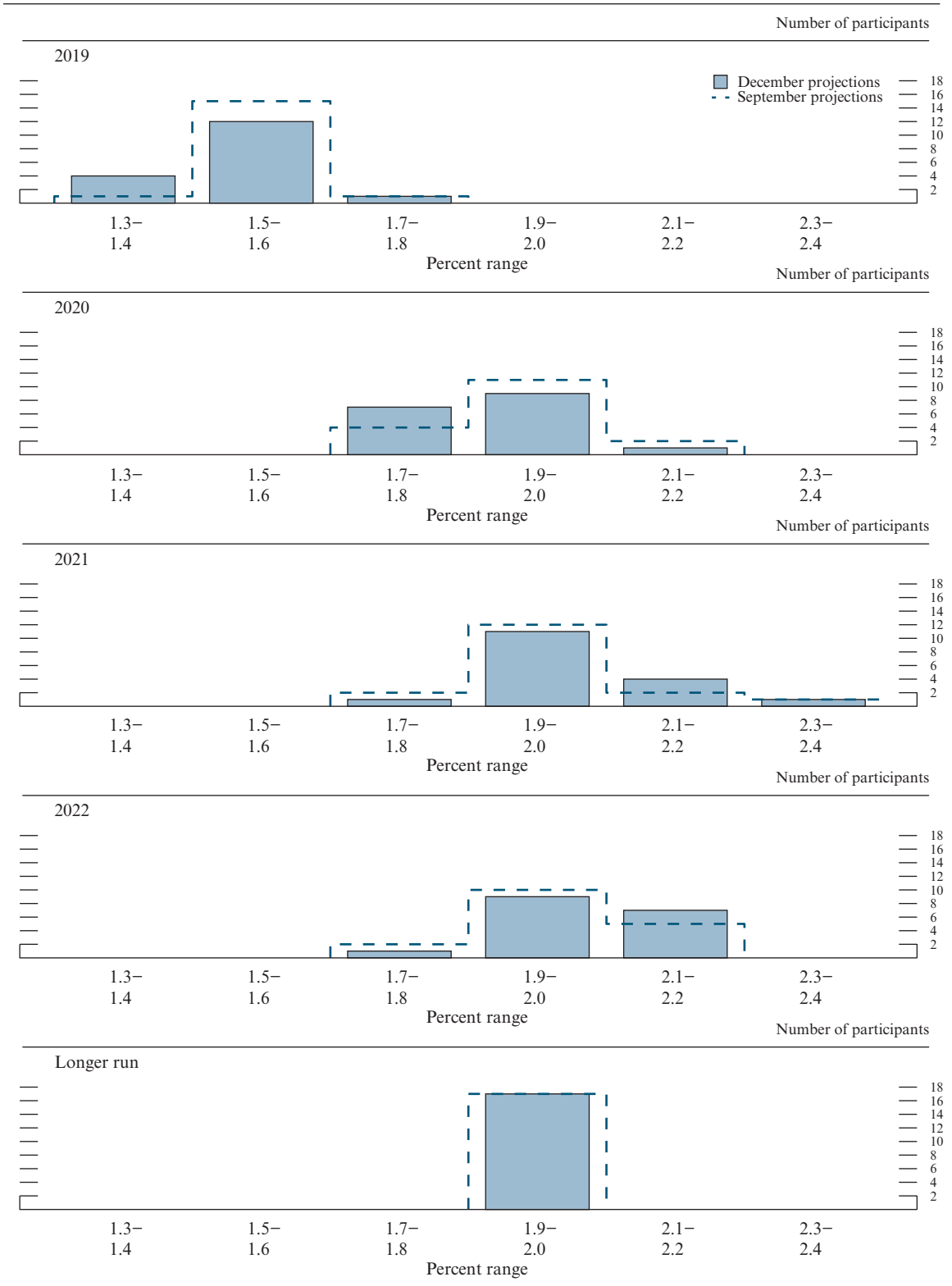

NOTE: Definitions of variables and other explanations are in the notes to table 1.

Figure 3.B. Distribution of participants' projections for the unemployment rate, 2019–22 and over the longer run



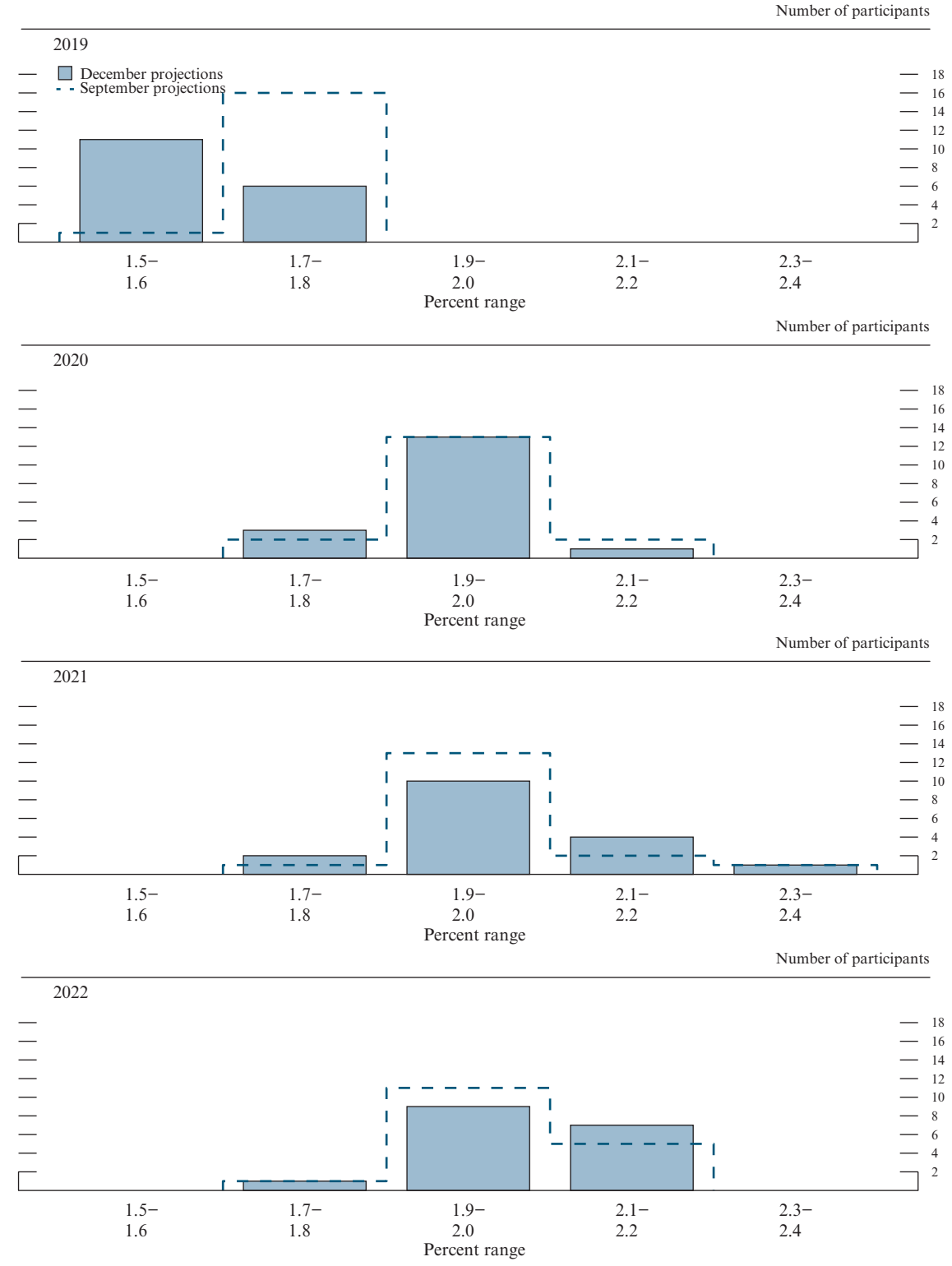

NOTE: Definitions of variables and other explanations are in the notes to table 1.

Figure 3.C. Distribution of participants' projections for PCE inflation, 2019–22 and over the longer run



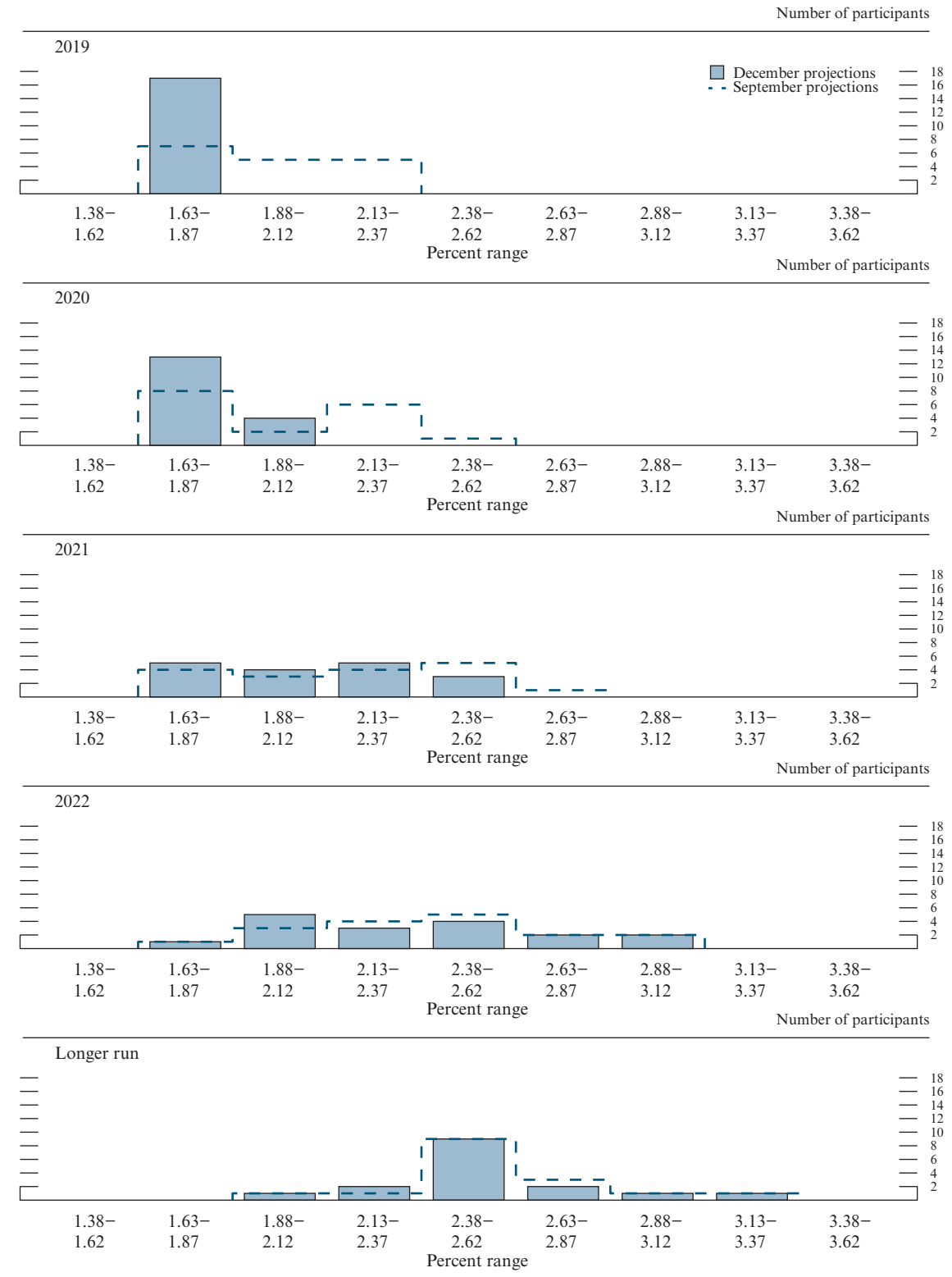

NOTE: Definitions of variables and other explanations are in the notes to table 1.

Figure 3.D. Distribution of participants' projections for core PCE inflation, 2019–22



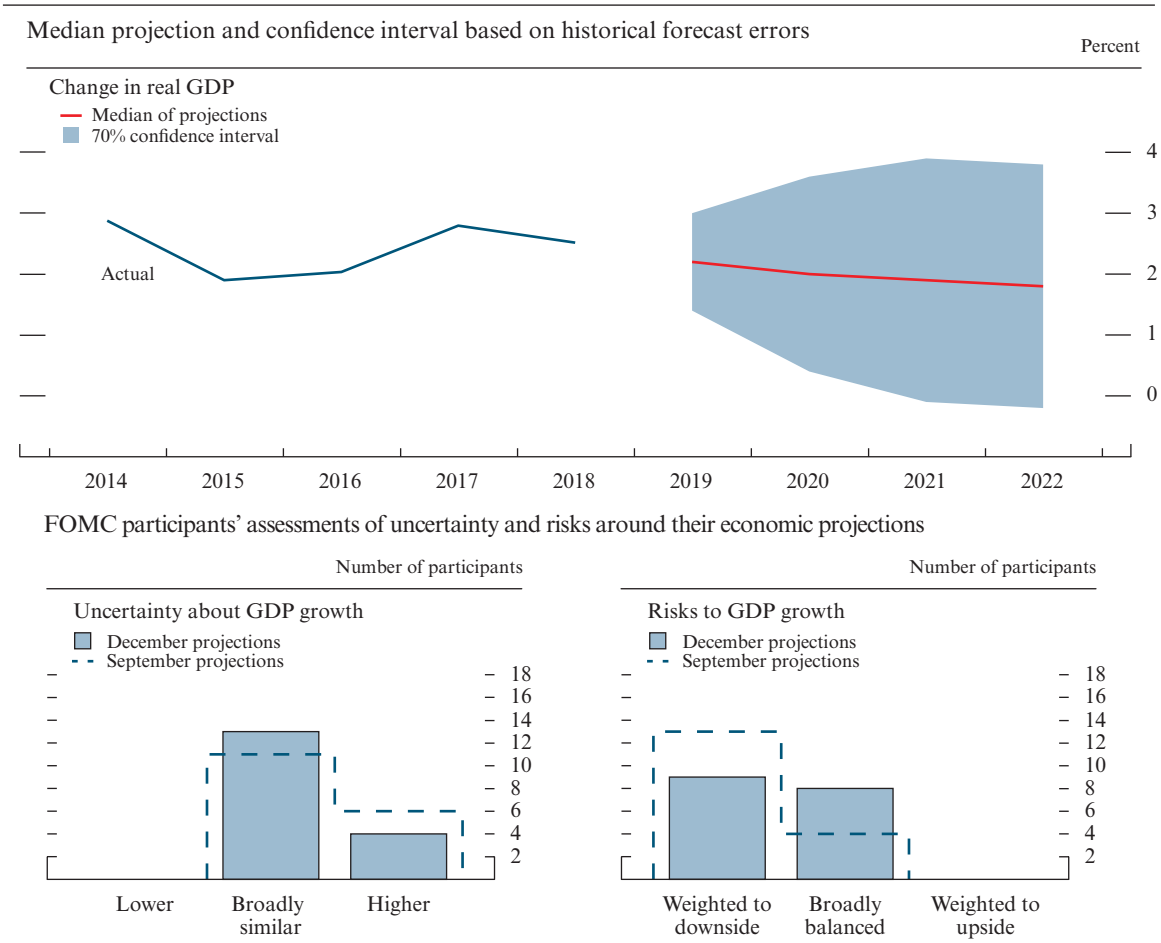

NOTE: Definitions of variables and other explanations are in the notes to table 1.

Figure 3.E. Distribution of participants' judgments of the midpoint of the appropriate target range for the federal funds rate or the appropriate target level for the federal funds rate, 2019–22 and over the longer run



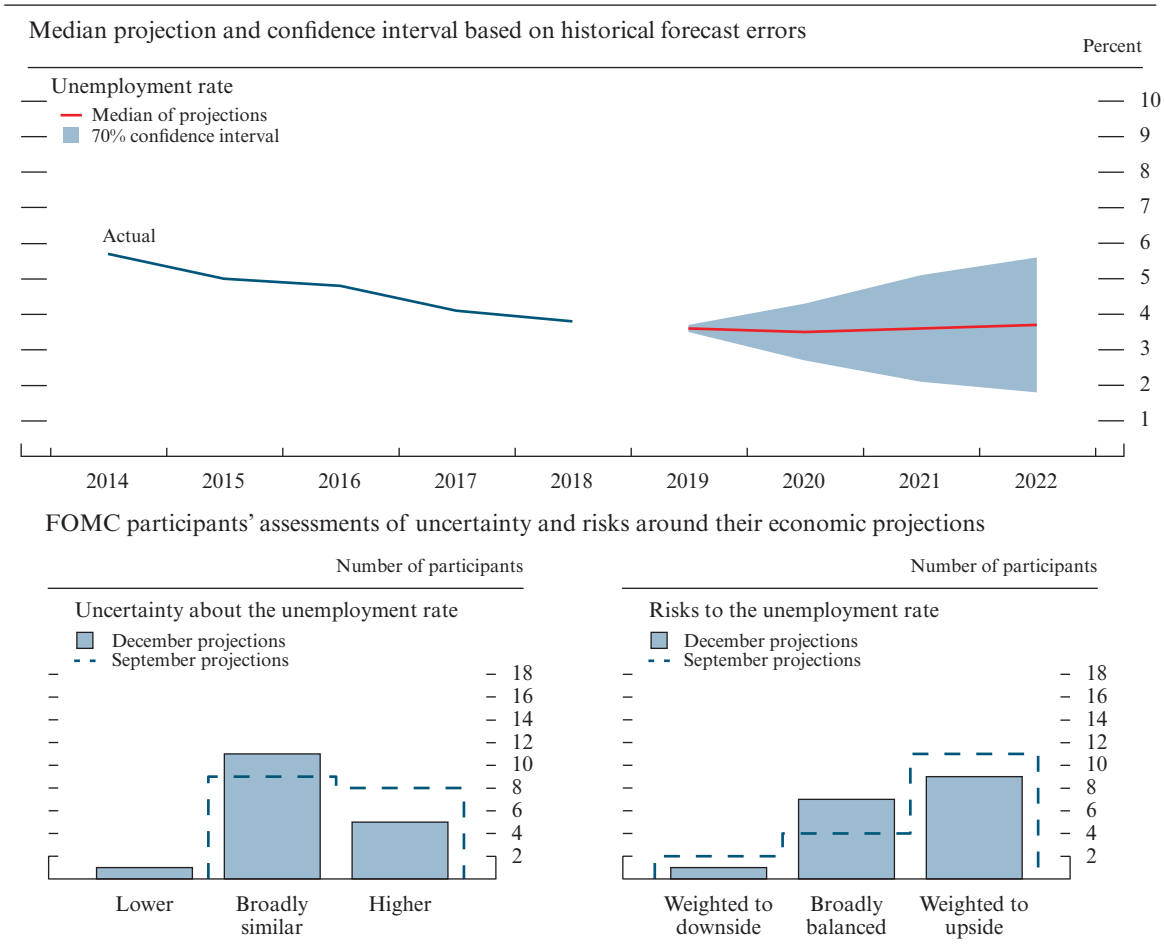

NOTE: Definitions of variables and other explanations are in the notes to table 1.

Figure 4.A. Uncertainty and risks in projections of GDP growth



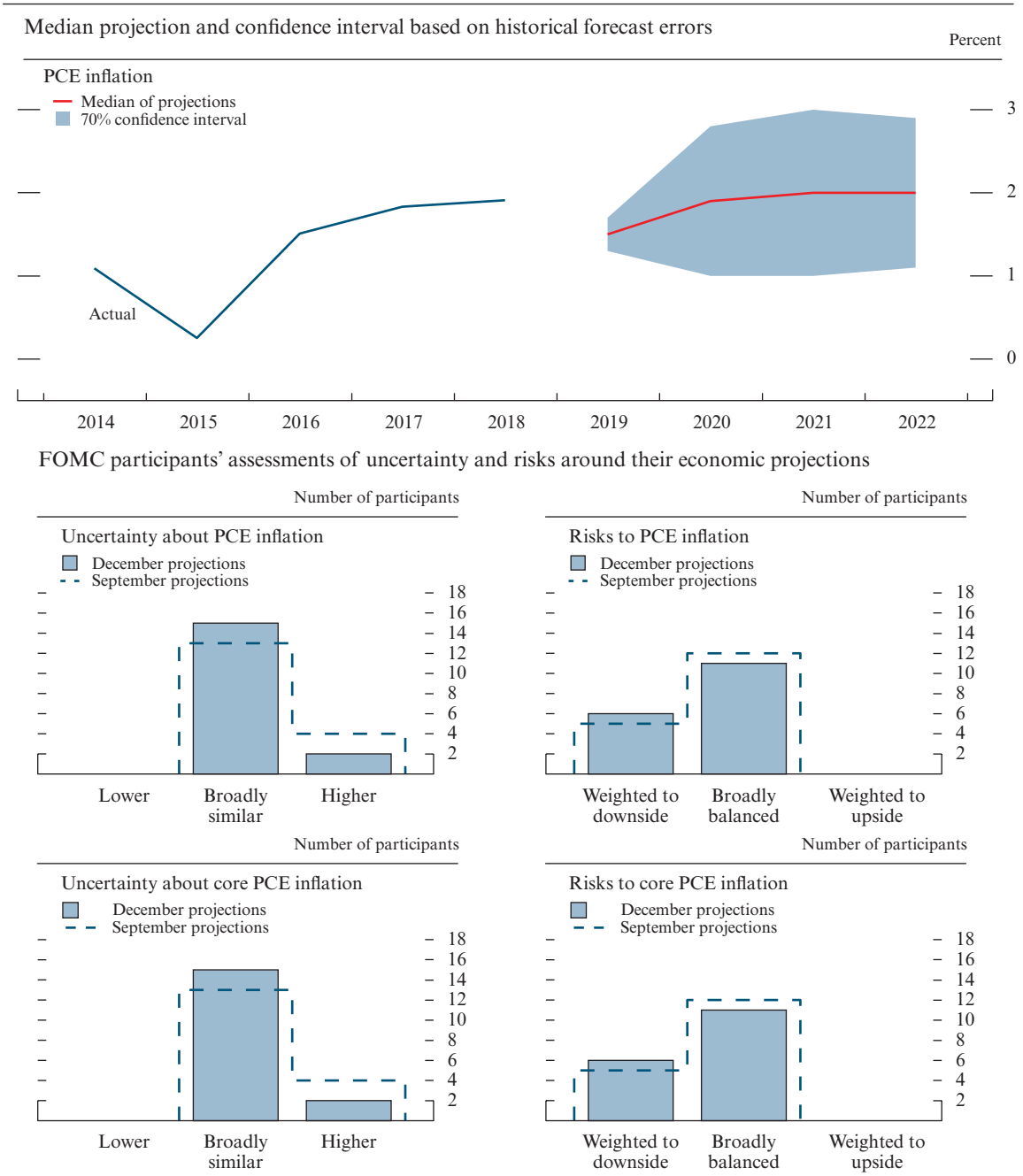

NOTE: The blue and red lines in the top panel show actual values and median projected values, respectively, of the percent change in real gross domestic product (GDP) from the fourth quarter of the previous year to the fourth quarter of the year indicated. The confidence interval around the median projected values is assumed to be symmetric and is based on root mean squared errors of various private and government forecasts made over the previous 20 years; more information about these data is available in table 2. Because current conditions may difer from those that prevailed, on average, over the previous 20 years, the width and shape of the confidence interval estimated on the basis of the historical forecast errors may not reflect FOMC participants' current assessments of the uncertainty and risks around their projections; these current assessments are summarized in the lower panels. Generally speaking, participants who judge the uncertainty about their projections as "broadly similar" to the average levels of the past 20 years would view the width of the confidence interval shown in the historical fan chart as largely consistent with their assessments of the uncertainty about their projections. Likewise, participants who judge the risks to their projections as "broadly balanced" would view the confidence interval around their projections as approximately symmetric. For definitions of uncertainty and risks in economic projections, see the box "Forecast Uncertainty."

Figure 4.B. Uncertainty and risks in projections of the unemployment rate




NOTE: The blue and red lines in the top panel show actual values and median projected values, respectively, of the average civilian unemployment rate in the fourth quarter of the year indicated. The confidence interval around the median projected values is assumed to be symmetric and is based on root mean squared errors of various private and government forecasts made over the previous 20 years; more information about these data is available in table 2. Because current conditions may difer from those that prevailed, on average, over the previous 20 years, the width and shape of the confidence interval estimated on the basis of the historical forecast errors may not reflect FOMC participants' current assessments of the uncertainty and risks around their projections; these current assessments are summarized in the lower panels. Generally speaking, participants who judge the uncertainty about their projections as "broadly similar" to the average levels of the past 20 years would view the width of the confidence interval shown in the historical fan chart as largely consistent with their assessments of the uncertainty about their projections. Likewise, participants who judge the risks to their projections as "broadly balanced" would view the confidence interval around their projections as approximately symmetric. For definitions of uncertainty and risks in economic projections, see the box "Forecast Uncertainty."

Figure 4.C. Uncertainty and risks in projections of PCE inflation




NOTE: The blue and red lines in the top panel show actual values and median projected values, respectively, of the percent change in the price index for personal consumption expenditures (PCE) from the fourth quarter of the previous year to the fourth quarter of the year indicated. The confidence interval around the median projected values is assumed to be symmetric and is based on root mean squared errors of various private and government forecasts made over the previous 20 years; more information about these data is available in table 2. Because current conditions may difer from those that prevailed, on average, over the previous 20 years, the width and shape of the confidence interval estimated on the basis of the historical forecast errors may not reflect FOMC participants' current assessments of the uncertainty and risks around their projections; these current assessments are summarized in the lower panels. Generally speaking, participants who judge the uncertainty about their projections as "broadly similar" to the average levels of the past 20 years would view the width of the confidence interval shown in the historical fan chart as largely consistent with their assessments of the uncertainty about their projections. Likewise, participants who judge the risks to their projections as "broadly balanced" would view the confidence interval around their projections as approximately symmetric. For definitions of uncertainty and risks in economic projections, see the box "Forecast Uncertainty."

projections is similar to the typical magnitude of past forecast errors and the risks around the projections are broadly balanced, then future outcomes of these variables would have about a 70 percent probability of being within these confidence intervals. For all three variables, this measure of uncertainty is substantial and generally increases as the forecast horizon lengthens.

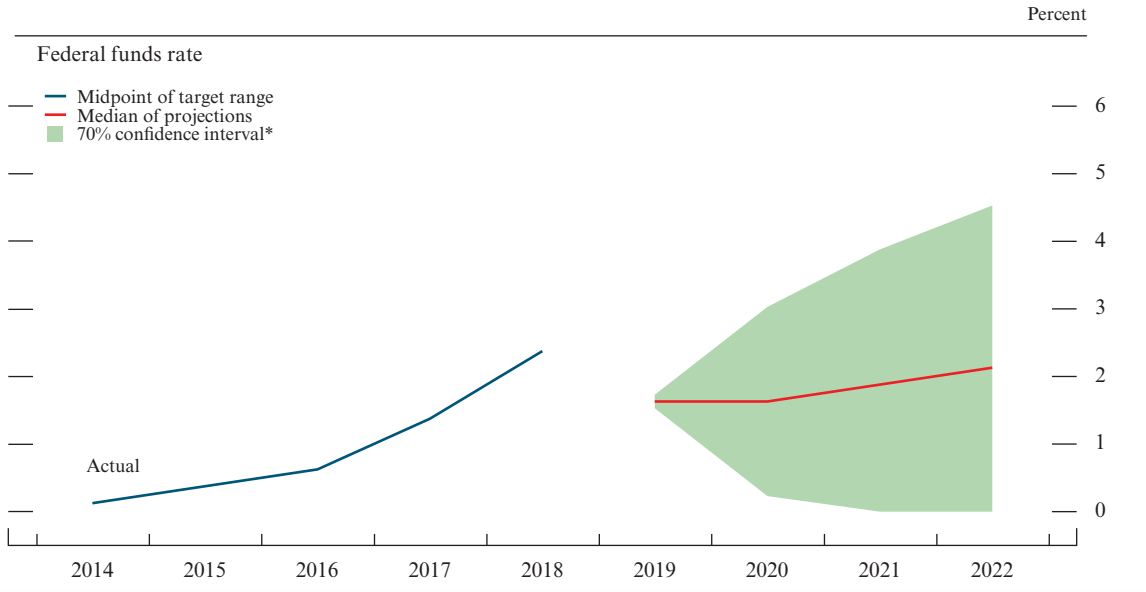
Participants' assessments of the level of uncertainty surrounding their individual economic projections are shown in the bottom-left panels of figures 4.A, 4.B, and 4.C. A substantial majority of participants viewed the uncertainty surrounding each of the four economic variables as being broadly similar to the average over the past 20 years.

Because the fan charts are constructed to be symmetric around the median projections, they do not reflect any asymmetries in the balance of risks that participants may see in their economic projections. Participants' assessments of the balance of risks to their current economic projections are shown in the bottom-right panels of figures 4.A, 4.B, and 4.C. Relative to the September SEP, more participants saw the risks to the outlook for real GDP growth and the unemployment rate as broadly balanced, although a small majority continued to view the risks to their outlooks for real GDP growth as weighted to the downside and for the unemployment rate as weighted to the upside. Most participants continued to judge the risks to their inflation outlook as broadly balanced, while some participants viewed the risks to their inflation outlook as weighted to the downside. No participant assessed the risks to his or her inflation outlook as weighted to the upside.

In discussing the uncertainty and risks surrounding their economic projections, some participants mentioned trade developments and concerns about foreign economic growth as sources of uncertainty or downside risk to the U.S. economic growth outlook. In contrast, the underlying strength of both consumer spending and the labor market was cited as balancing the risks around the growth outlook. In addition, most of the participants who shifted their balance of risks for output growth to "broadly balanced" cited more accommodative monetary policy as a contributing factor. For the inflation outlook, the possibility that inflation expectations could be drifting below levels consistent with the FOMC's 2 percent inflation objective was viewed as a downside risk. A couple of participants mentioned higher tariffs as a source of upside risk to their inflation outlook.

Participants' assessments of the appropriate future path of the federal funds rate are also subject to considerable uncertainty. Because the Committee adjusts the federal funds rate in response to actual and prospective developments over time in key economic variables—such as real GDP growth, the unemployment rate, and inflation—uncertainty surrounding the projected path for the federal funds rate importantly reflects the uncertainties about the paths for these economic variables, along with other factors. Figure 5 provides a graphic representation of this uncertainty, plotting the SEP median for the federal funds rate surrounded by symmetric confidence intervals derived from the results presented in table 2. As with the macroeconomic variables, the forecast uncertainty surrounding the appropriate path of the federal funds rate is substantial and increases for longer horizons.

Figure 5. Uncertainty and risks in projections of the federal funds rate




NOTE: The blue and red lines are based on actual values and median projected values, respectively, of the Committee's target for the federal funds rate at the end of the year indicated. The actual values are the midpoint of the target range; the median projected values are based on either the midpoint of the target range or the target level. The confidence interval around the median projected values is based on root mean squared errors of various private and government forecasts made over the previous 20 years. The confidence interval is not strictly consistent with the projections for the federal funds rate, primarily because these projections are not forecasts of the likeliest outcomes for the federal funds rate, but rather projections of participants' individual assessments of appropriate monetary policy. Still, historical forecast errors provide a broad sense of the uncertainty around the future path of the federal funds rate generated by the uncertainty about the macroeconomic variables as well as additional adjustments to monetary policy that may be appropriate to onset the effects of shocks to the economy.

The confidence interval is assumed to be symmetric except when it is truncated at zero—the bottom of the lowest target range for the federal funds rate that has been adopted in the past by the Committee. This truncation would not be intended to indicate the likelihood of the use of negative interest rates to provide additional monetary policy accommodation if doing so was judged appropriate. In such situations, the Committee could also employ other tools, including forward guidance and large-scale asset purchases, to provide additional accommodation. Because current conditions may difer from those that prevailed, on average, over the previous 20 years, the width and shape of the confidence interval estimated on the basis of the historical forecast errors may not reflect FOMC participants' current assessments of the uncertainty and risks around their projections.

* The confidence interval is derived from forecasts of the average level of short-term interest rates in the fourth quarter of the year indicated; more information about these data is available in table 2. The shaded area encompasses less than a 70 percent confidence interval if the confidence interval has been truncated at zero.

## Forecast Uncertainty

The economic projections provided by the members of the Board of Governors and the presidents of the Federal Reserve Banks inform discussions of monetary policy among policymakers and can aid public understanding of the basis for policy actions. Considerable uncertainty attends these projections, however. The economic and statistical models and relationships used to help produce economic forecasts are necessarily imperfect descriptions of the real world, and the future path of the economy can be affected by myriad unforeseen developments and events. Thus, in setting the stance of monetary policy, participants consider not only what appears to be the most likely economic outcome as embodied in their projections, but also the range of alternative possibilities, the likelihood of their occurring, and the potential costs to the economy should they occur.

Table 2 summarizes the average historical accuracy of a range of forecasts, including those reported in past *Monetary Policy Report*s and those prepared by the Federal Reserve Board's staff in advance of meetings of the Federal Open Market Committee (FOMC). The projection error ranges shown in the table illustrate the considerable uncertainty associated with economic forecasts. For example, suppose a participant projects that real gross domestic product (GDP) and total consumer prices will rise steadily at annual rates of, respectively, 3 percent and 2 percent. If the uncertainty attending those projections is similar to that experienced in the past and the risks around the projections are broadly balanced, the numbers reported in table 2 would imply a probability of about 70 percent that actual GDP would expand within a range of 2.2 to 3.8 percent in the current year, 1.4 to 4.6 percent in the second year, and 1.0 to 5.0 percent in the third and fourth years. The corresponding 70 percent confidence intervals for overall inflation would be 1.8 to 2.2 percent in the current year, 1.1 to 2.9 percent in the second year, 1.0 to 3.0 percent in the third year, and 1.1 to 2.9 percent in the fourth year. Figures 4.A through 4.C illustrate these confidence bounds in "fan charts" that are symmetric and centered on the medians of FOMC participants' projections for GDP growth, the unemployment rate, and inflation. However, in some instances, the risks around the projections may not be symmetric. In particular, the unemployment rate cannot be negative; furthermore, the risks around a particular projection might be tilted to either the upside or the downside, in which case the corresponding fan chart would be asymmetrically positioned around the median projection.

Because current conditions may differ from those that prevailed, on average, over history, participants provide judgments as to whether the uncertainty attached to their projections of each economic variable is greater than, smaller than, or broadly similar to typical levels of forecast uncertainty seen in the past 20 years, as presented in table 2 and reflected in the widths of the confidence intervals shown in the top panels of figures 4.A through 4.C.

*(continued)*

Participants' current assessments of the uncertainty surrounding their projections are summarized in the bottom-left panels of those figures. Participants also provide judgments as to whether the risks to their projections are weighted to the upside, are weighted to the downside, or are broadly balanced. That is, while the symmetric historical fan charts shown in the top panels of figures 4.A through 4.C imply that the risks to participants' projections are balanced, participants may judge that there is a greater risk that a given variable will be above rather than below their projections. These judgments are summarized in the lower-right panels of figures 4.A through 4.C.

As with real activity and inflation, the outlook for the future path of the federal funds rate is subject to considerable uncertainty. This uncertainty arises primarily because each participant's assessment of the appropriate stance of monetary policy depends importantly on the evolution of real activity and inflation over time. If economic conditions evolve in an unexpected manner, then assessments of the appropriate setting of the federal funds rate would change from that point forward. The final line in table 2 shows the error ranges for forecasts of short-term interest rates. They suggest that the historical confidence intervals associated with projections of the federal funds rate are quite wide. It should be noted, however, that these confidence intervals are not strictly consistent with the projections for the federal funds rate, as these projections are not forecasts of the most likely quarterly outcomes but rather are projections of participants' individual assessments of appropriate monetary policy and are on an end-of-year basis. However, the forecast errors should provide a sense of the uncertainty around the future path of the federal funds rate generated by the uncertainty about the macroeconomic variables as well as additional adjustments to monetary policy that would be appropriate to offset the effects of shocks to the economy.

If at some point in the future the confidence interval around the federal funds rate were to extend below zero, it would be truncated at zero for purposes of the fan chart shown in figure 5; zero is the bottom of the lowest target range for the federal funds rate that has been adopted by the Committee in the past. This approach to the construction of the federal funds rate fan chart would be merely a convention; it would not have any implications for possible future policy decisions regarding the use of negative interest rates to provide additional monetary policy accommodation if doing so were appropriate. In such situations, the Committee could also employ other tools, including forward guidance and asset purchases, to provide additional accommodation.

While figures 4.A through 4.C provide information on the uncertainty around the economic projections, figure 1 provides information on the range of views across FOMC participants. A comparison of figure 1 with figures 4.A through 4.C shows that the dispersion of the projections across participants is much smaller than the average forecast errors over the past 20 years.

# Abbreviations

| | |
|---|---|
| AFE | advanced foreign economy |
| CBO | Congressional Budget Office |
| CDFI | community development financial institution |
| C&I | commercial and industrial |
| CPI | consumer price index |
| EME | emerging market economy |
| FOMC | Federal Open Market Committee; also, the Committee |
| GDP | gross domestic product |
| IP | industrial production |
| JOLTS | Job Openings and Labor Turnover Survey |
| LFPR | labor force participation rate |
| LIBOR | London interbank offered rate |
| MBS | mortgage-backed securities |
| MMF | money market fund |
| ON RRP | overnight reverse repurchase agreement |
| OPEC | Organization of the Petroleum Exporting Countries |
| PCE | personal consumption expenditures |
| repo | repurchase agreement |
| SEP | Summary of Economic Projections |
| SLOOS | Senior Loan Officer Opinion Survey on Bank Lending Practices |
| SOMA | System Open Market Account |
| TGA | Treasury General Account |
| TIPS | Treasury Inflation-Protected Securities |
| VIX | implied volatility for the S&P 500 index |