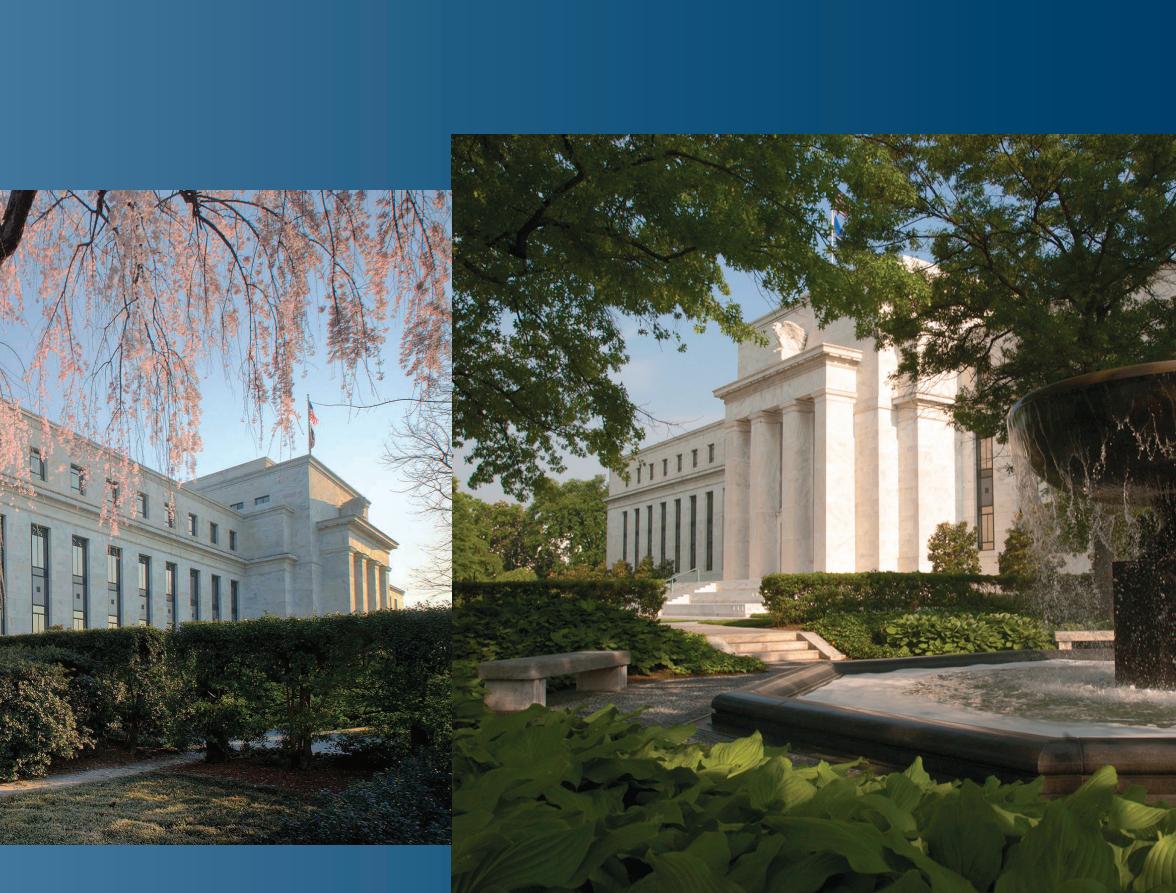


MONETARY POLICY REPORT

July 7, 2017



Board of Governors of the Federal Reserve System

LETTER OF TRANSMITTAL



BOARD OF GOVERNORS OF THE
FEDERAL RESERVE SYSTEM

Washington, D.C., July 7, 2017

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,

A handwritten signature in black ink that reads "Janet L. Yellen".

Janet L. Yellen, Chair

STATEMENT ON LONGER-RUN GOALS AND MONETARY POLICY STRATEGY

Adopted effective January 24, 2012; as amended effective January 31, 2017

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 4.8 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.

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NOTE: This report reflects information that was publicly available as of noon EDT on July 6, 2017.
Unless otherwise stated, the time series in the figures extend through, for daily data, July 5, 2017; for monthly data, June 2017; and, for quarterly data, 2017:Q1. 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.

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SUMMARY

Economic activity increased at a moderate pace over the first half of the year, and the jobs market continued to strengthen. Measured on a 12-month basis, inflation has softened some in the past few months. The Federal Open Market Committee (FOMC) judged that, on balance, current and prospective economic conditions called for a further gradual removal of policy accommodation. At its most recent meeting in June, the Committee boosted the target range for the federal funds rate to 1 to 1½ percent. The Committee also issued additional information regarding its plans for reducing the size of its balance sheet in a gradual and predictable manner.

Economic and Financial Developments

Labor markets. The labor market has strengthened further so far this year. Over the first five months of 2017, payroll employment increased 162,000 per month, on average, somewhat slower than the average monthly increase for 2016 but still more than enough to absorb new entrants into the labor force. The unemployment rate fell from 4.7 percent in December to 4.3 percent in May—modestly below the median of FOMC participants' estimates of its longer-run normal level. Other measures of labor utilization are also consistent with a relatively tight labor market. However, despite the broad-based strength in measures of employment, wage growth has been only modest, possibly held down by the weak pace of productivity growth in recent years.

Inflation. Consumer price inflation, as measured by the 12-month change in the price index for personal consumption expenditures, briefly reached the FOMC's 2 percent objective earlier this year, but it more recently has softened. The latest reading, for May, was 1.4 percent—still up from a year earlier when falling energy prices restrained overall

consumer prices. The 12-month measure of inflation that excludes food and energy items (so-called core inflation), which historically has been a better indicator than the headline figure of where overall inflation will be in the future, was also 1.4 percent over the year ending in May; this reading was a bit lower than it had been one year earlier. Measures of longer-run inflation expectations have been relatively stable, on balance, though some measures remain low by historical standards.

Economic growth. Real gross domestic product (GDP) is reported to have risen at an annual rate of about 1½ percent in the first quarter of 2017, but more recent data suggest growth stepped back up in the second quarter. Consumer spending was sluggish in the early part of the year but appears to have rebounded recently, supported by job gains, rising household wealth, and favorable consumer sentiment. Business investment has turned up this year after having been weak for much of 2016, and indicators of business sentiment have been strong. The housing market continues its gradual recovery. Economic growth has also been supported by recent strength in foreign activity.

Financial conditions. On balance, domestic financial conditions for businesses and households have continued to support economic growth. Long-term nominal Treasury yields and mortgage rates have decreased so far in 2017, although yields remain somewhat above levels that prevailed last summer. Broad measures of equity prices increased further during the first half of the year. Spreads of yields on corporate bonds over comparable-maturity Treasury securities decreased. Most types of consumer loans remained widely available, while mortgage credit stayed readily available for households with solid credit profiles but was still difficult to access for households with low credit scores or harder-to-document incomes.

In foreign financial markets, equity prices increased and risk spreads decreased amid generally firming economic growth and robust corporate earnings. The broad U.S. dollar index depreciated modestly against foreign currencies.

Financial stability. Vulnerabilities in the U.S. financial system remained, on balance, moderate. Contributing to the financial system's improved resilience, U.S. banks have substantial amounts of capital and liquidity. Valuation pressures across a range of assets and several indicators of investor risk appetite have increased further since mid-February. However, these developments in asset markets have not been accompanied by increased leverage in the financial sector, according to available metrics, or increased borrowing in the nonfinancial sector. Household debt as a share of GDP continues to be subdued, and debt owed by nonfinancial businesses, although elevated, has been either flat or falling in the past two years. (See the box "Developments Related to Financial Stability" in Part 1.)

Monetary Policy

Interest rate policy. Over the first half of 2017, the FOMC continued to gradually reduce the amount of monetary policy accommodation. Specifically, the Committee decided to raise the target range for the federal funds rate in March and in June, bringing it to the current range of 1 to 1¼ percent. Even with these rate increases, the stance of monetary policy remains accommodative, supporting some further strengthening in labor market conditions and a sustained return to 2 percent inflation.

The FOMC continues to expect that, with gradual adjustments in the stance of monetary policy, economic activity will expand at a moderate pace and labor market conditions will strengthen somewhat further. Inflation on a 12-month basis is expected to remain somewhat below 2 percent in the near term but to stabilize around the Committee's 2 percent

objective over the medium term. The federal funds rate is likely to remain, for some time, below levels that are expected to prevail in the longer run. Consistent with this outlook, in the most recent Summary of Economic Projections (SEP), compiled at the time of the June FOMC meeting, most participants projected that the appropriate level of the federal funds rate would be below its longer-run level through 2018. (The June SEP is presented in Part 3 of this report.) However, as the Committee has continued to emphasize, monetary policy is not on a preset course; the actual path of the federal funds rate will depend on the evolution of the economic outlook as informed by incoming data. In particular, the Committee is monitoring inflation developments closely.

Balance sheet policy. To help maintain accommodative financial conditions, the Committee has continued its existing policy of reinvesting principal payments from its holdings of agency debt and agency mortgage-backed securities in agency mortgage-backed securities and rolling over maturing Treasury securities at auction. In June, the FOMC issued an Addendum to the Policy Normalization Principles and Plans that provides additional details regarding the approach the FOMC intends to follow to reduce the Federal Reserve's holdings of Treasury and agency securities in a gradual and predictable manner. The Committee currently expects to begin implementing the balance sheet normalization program this year provided that the economy evolves broadly as anticipated. (See the box "Addendum to the Policy Normalization Principles and Plans" in Part 2.)

Special Topics

Education and climbing the economic ladder. Education, particularly a college degree, is often seen as a path to improved economic opportunities. However, despite the fact that young blacks and Hispanics have increased their educational attainment over the past

quarter-century, their representation in the top 25 percent of the income distribution for young people has not materially increased. In part, this outcome has occurred because educational attainment has increased for young non-Hispanic whites and Asians as well. While education continues to be an important determinant of whether one can climb the economic ladder, sizable differences in economic outcomes across race and ethnicity remain even after controlling for educational attainment. (See the box “Does Education Determine Who Climbs the Economic Ladder?” in Part 1.)

The global productivity slowdown. Over the past decade, labor productivity growth both in the United States and in other advanced economies has slowed markedly. This slowdown may reflect a waning of the effects from advances in information technology in the 1990s and early 2000s. Productivity growth may also be low because of the severity of the Global Financial Crisis, in part because spending for research and development was muted. Some of the factors restraining productivity growth may eventually fade, but it is difficult to ascertain whether the recent subdued performance of productivity represents a new normal. (See the box “Productivity Developments in the Advanced Economies” in Part 1.)

Liquidity in the corporate bond market. A series of changes, including regulatory reforms, since the Global Financial Crisis have likely altered financial institutions’ incentives to provide liquidity. Many market participants are particularly concerned with liquidity in markets for corporate bonds. However, the available evidence suggests that financial markets have performed well in recent years, with minimal impairment in liquidity, either in the market for corporate bonds or in markets for other assets. (See the box “Recent Developments in Corporate Bond Market Liquidity” in Part 1.)

Monetary policy rules. Monetary policymakers consider a wide range of information on current economic conditions and the outlook before deciding on a policy stance they deem most likely to foster the FOMC’s statutory mandate of maximum employment and stable prices. They also routinely consult monetary policy rules that connect prescriptions for the policy interest rate with variables associated with the dual mandate. The use of such rules requires careful judgments about the choice and measurement of the inputs into these rules as well as the implications of the many considerations these rules do not take into account. (See the box “Monetary Policy Rules and Their Role in the Federal Reserve’s Policy Process” in Part 2.)

PART 1

RECENT ECONOMIC AND FINANCIAL DEVELOPMENTS

Domestic Developments

The labor market tightened further during the first half of the year . . .

Labor market conditions continued to strengthen in the first five months of this year. On average, payrolls expanded 162,000 per month between January and May, a little slower than the average monthly employment gain in 2016 but still more than enough to absorb new entrants to the labor force and therefore consistent with a further tightening of the labor market (figure 1).

The unemployment rate has declined 0.4 percentage point since December 2016, and in May it stood at 4.3 percent, its lowest level since late 2000 and modestly below the median of Federal Open Market Committee (FOMC) participants' estimates of its longer-run normal level.

The labor force participation rate (LFPR)—that is, the share of adults either working or actively looking for work—was 62.7 percent in May and is little changed, on net, since early 2014 (figure 2). Along with other factors, the aging of the population implies a downward trend in participation, so the flattening out of the LFPR during the past few years is consistent with an overall picture of improving labor market conditions. The employment-to-population ratio—that is, the share of the population that is working—was 60 percent in May and has been increasing for the past couple of years, reflecting the combination of the declining unemployment rate and the flat LFPR.

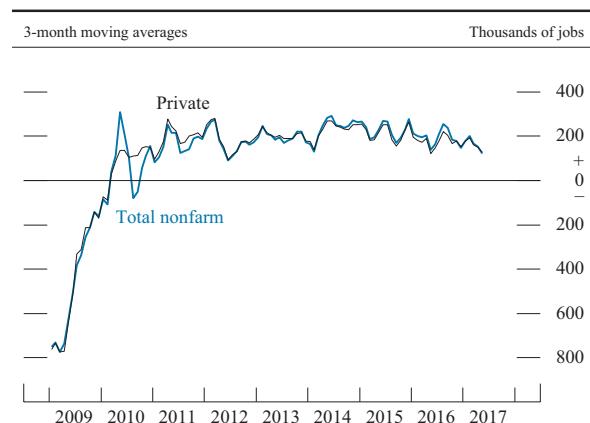
The strengthening condition of the labor market is evident in other measures as well. The number of people filing initial claims for unemployment insurance has fallen to the lowest level in decades. In addition, as reported in the Job Openings and Labor Turnover Survey, the rate of job openings remained

elevated in the first part of the year, while the rate of layoffs remained low; both are signs that firms' demand for labor is still solid. In addition, the rate of quits stayed high, an indication that workers are confident in their ability to obtain a new job. Another measure, the share of workers who are working part time but would prefer to be employed full time—which is part of the U-6 measure of underutilization from the Bureau of Labor Statistics—fell noticeably further in the first five months of 2017 (figure 3).

. . . though unemployment rates remain elevated for some demographic groups

Although the aggregate unemployment rate was at a 16-year low in May, there are substantial disparities across demographic groups (figure 4). Notably, the unemployment rate for whites averaged 4 percent during the first five months of the year, and the rate for Asians was about 3½ percent. However, the unemployment rates for Hispanics (5.4 percent) and African Americans (7.8 percent) were substantially higher. The differences in the unemployment rates across racial and ethnic groups are long-standing, and they also vary over the business cycle.

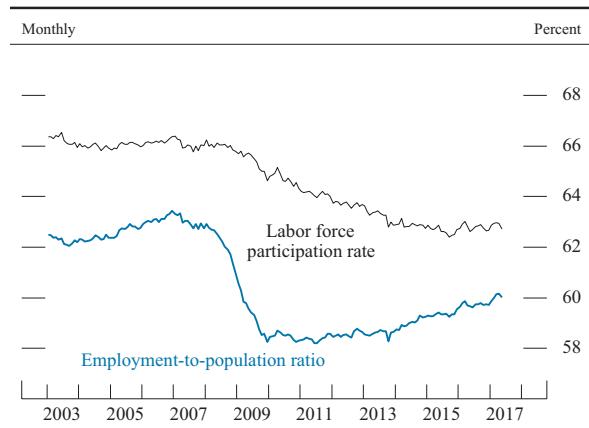
1. Net change in payroll employment



NOTE: The data extend through May 2017.

SOURCE: Department of Labor, Bureau of Labor Statistics.

2. Labor force participation rate and employment-to-population ratio



NOTE: The data extend through May 2017. Both series are a percentage of the population aged 16 and over.

SOURCE: Department of Labor, Bureau of Labor Statistics.

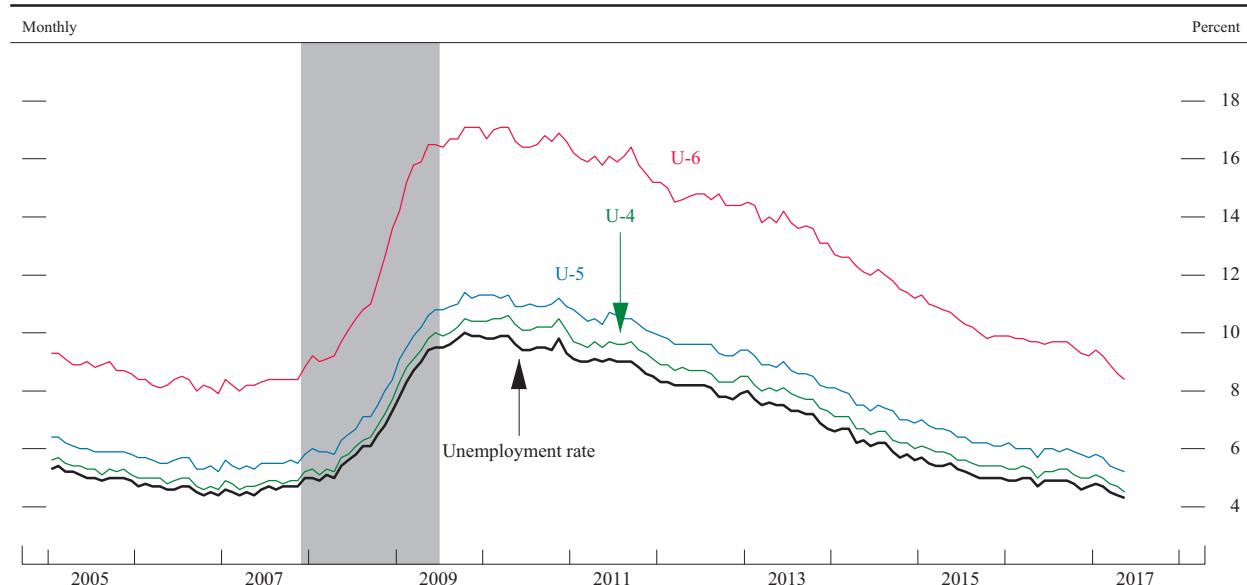
Indeed, the unemployment rates for blacks and Hispanics both rose considerably more than the rates for whites and Asians during the Great Recession, and their subsequent declines have been more rapid. On balance, however, the differences in unemployment rates across the groups have not narrowed relative to the pre-recession period. (For additional discussion on differences in economic outcomes by race and ethnicity, see the box “Does Education Determine Who Climbs the Economic Ladder?”)

Growth of labor compensation has been modest . . .

Indicators of hourly compensation suggest that wage growth has remained modest. Growth of compensation per hour in the business sector—a broad-based measure of wages, salaries, and benefits—has slowed in recent quarters and was $2\frac{1}{4}$ percent over the four quarters ending in 2017:Q1 (figure 5).¹

1. The recent data on compensation per hour reflect a decline in wages and salaries at the end of 2016, which

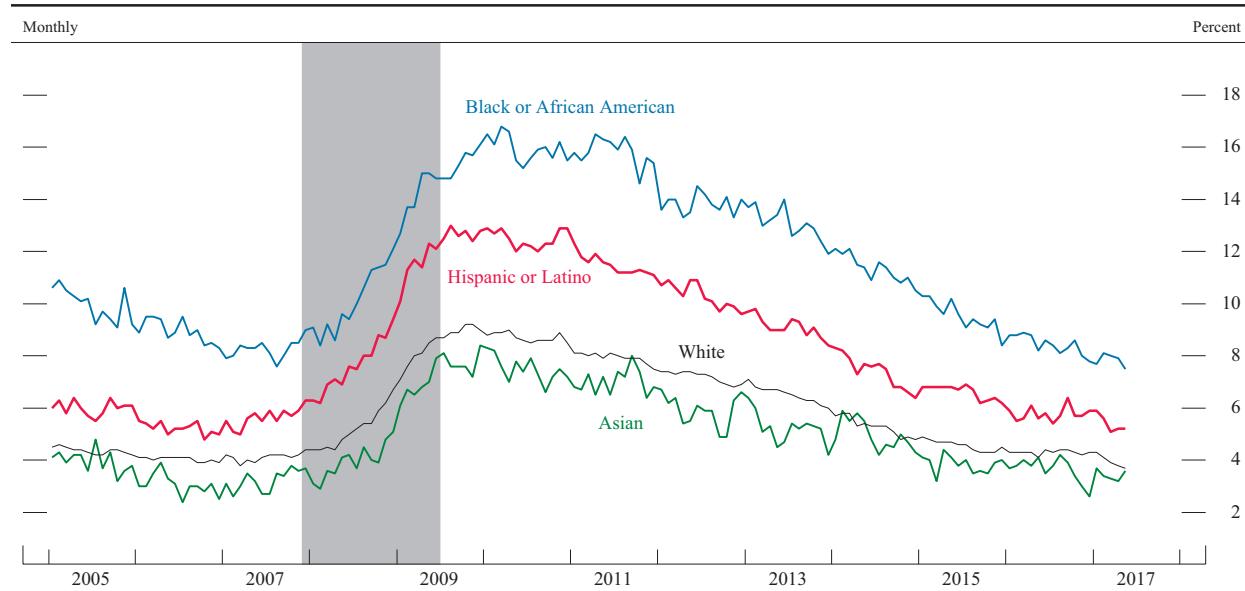
3. Measures of labor underutilization



NOTE: The data extend through May 2017. 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: Department of Labor, Bureau of Labor Statistics.

4. Unemployment rate by race and ethnicity



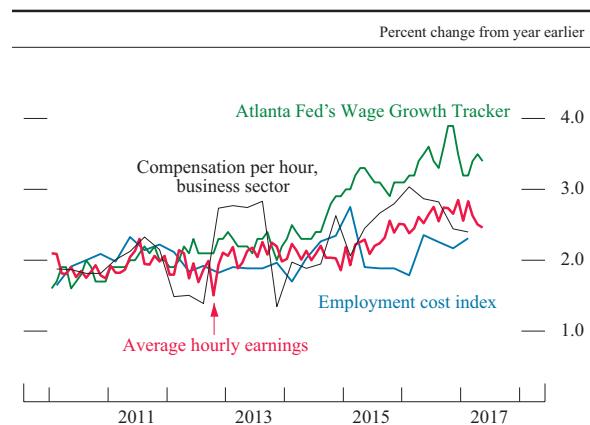
NOTE: The data extend through May 2017. Unemployment rate measures total unemployed as a percentage of the labor force. Persons whose ethnicity is identified as Hispanic or Latino may be of any race. The shaded bar indicates a period of business recession as defined by the National Bureau of Economic Research.

SOURCE: Department of Labor, Bureau of Labor Statistics.

This measure can be quite volatile even at annual frequencies (and a smoothed version is shown in figure 5 for that reason). The employment cost index—which also measures both wages and the cost to employers of providing benefits—also was up $2\frac{1}{4}$ percent in the first quarter relative to its year-ago level, about $\frac{1}{2}$ percentage point faster than its gain of a year earlier. Among measures limited to wages, average hourly earnings growth—at $2\frac{1}{2}$ percent through May—was little changed from a year ago, and a compensation measure computed by the Federal Reserve Bank of Atlanta that tracks median 12-month wage growth of individuals reporting to the Current Population Survey was about $3\frac{1}{2}$ percent in May, also similar to its reading from a year earlier.

might be the result of a shifting of bonuses or other types of income into 2017 in anticipation of a possible cut in personal income tax rates. If that is the case, the current estimate of compensation growth in the first quarter might be revised up once full data become available later this summer.

5. Measures of change in hourly compensation



NOTE: Business-sector compensation is the four-quarter percentage change of the four-quarter moving average. For the employment cost index, change is over the 12 months ending in the last month of each quarter; for average hourly earnings, change is from 12 months earlier, and the data extend through May 2017; for the Atlanta Fed's Wage Growth Tracker, the data are shown as a three-month moving average of the 12-month percent change and extend through May 2017.

SOURCE: Department of Labor, Bureau of Labor Statistics; Federal Reserve Bank of Atlanta, Wage Growth Tracker.

Does Education Determine Who Climbs the Economic Ladder?

The persistent gaps in economic outcomes by race and ethnicity in the United States raise important questions about how people ascend the economic ladder. Education, particularly a college degree, is often seen as a path to improved economic opportunities. Past research has shown that human capital in the form of education and experience can explain about one-third of the variation in wages across individuals.¹ However, while education continues to be an important determinant of whether one can climb the economic ladder, sizable differences in economic outcomes across race and ethnicity remain even after controlling for educational attainment.

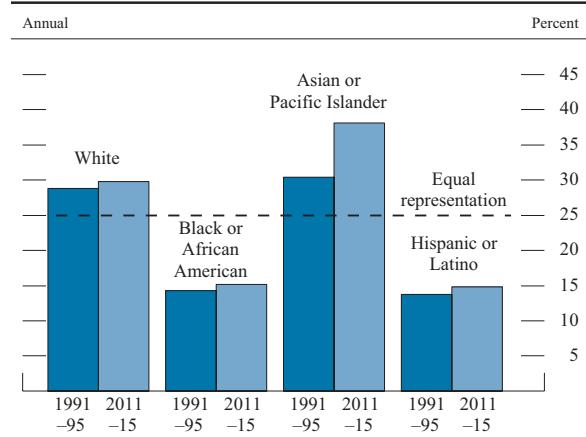
Data on earnings for two cohorts of young adult workers (aged 25 to 34) approximately a generation apart confirm both the gaps in economic outcomes and the lack of substantial upward progress for disadvantaged groups over the past quarter-century (figure A). People of this age typically have limited years of work experience, but most have completed their schooling. Therefore, focusing on young adults

allows us to better isolate the effect of education from the influence of other variables, including experience. Furthermore, research has shown that the level of wages received early in an individual's career persists over time and influences that individual's wage trajectory for years to come.² The figure shows the fraction of each group that has reached the top quartile of earnings for young adults as a whole. The black dashed line at 25 percent marks the fraction of each group that would be in this top quartile if each group were equally represented in proportion to its population size.³

Non-Hispanic whites, for example, are overrepresented in the top 25 percent of the earnings distribution of young adults for both cohorts, with just under 30 percent of the group in the top quartile in both the 1991–95 and 2011–15 periods. Black or African American young adults are underrepresented in the top quartile in both periods, at about 15 percent. Hispanics are likewise underrepresented, and again there has been little improvement over time. Asians stand out in terms of both high representation and changes over time, though these measures obscure the very high levels of inequality within this group.⁴

1. Pedro Carneiro and James J. Heckman (2003), "Human Capital Policy," in Benjamin M. Friedman, ed., *Inequality in America: What Role for Human Capital Policies?* (Cambridge, Mass.: MIT Press), pp. 77–239.

A. Percent of workers in top quartile of earnings among all young adults



NOTE: Data cover the preceding calendar year. Young adults include those aged 25 to 34. Earnings include wages, salaries, business income, and farm income. Threshold for crossing into the top earnings quartile is based on workers aged 25 to 34 only. The black dashed line marks 25 percent, the fraction of each group that would be in the top quartile if each group were equally represented in proportion to its population size.

SOURCE: U.S. Census Bureau, Current Population Survey, March 1992–2016.

2. See, for example, past research that shows that the average starting wage faced by a cohort is correlated with wages later on, such as George Baker, Michael Gibbs, and Bengt Holmstrom (1994), "The Wage Policy of a Firm," *Quarterly Journal of Economics*, vol. 109 (November), pp. 921–55. Furthermore, research also shows that higher national unemployment rates faced by a cohort are also correlated with lower wages later on; for instance, see Paul Beaudry and John DiNardo (1991), "The Effect of Implicit Contracts on the Movement of Wages over the Business Cycle: Evidence from Micro Data," *Journal of Political Economy*, vol. 99 (August), pp. 665–88; and Lisa B. Kahn (2010), "The Long-Term Labor Market Consequences of Graduating from College in a Bad Economy," *Labour Economics*, vol. 17 (April), pp. 303–16.

3. In other words, if 25 percent of a group reached the top quartile, then that group's share of the top quartile would be the same as its share in the full population.

4. See, for example, Christian E. Weller and Jeffrey Thompson (2016), *Wealth Inequality among Asian Americans Greater Than among Whites*, Center for American Progress (Washington: CFAP, December 20), <https://www.americanprogress.org/issues/race/reports/2016/12/20/295359/wealth-inequality-among-asian-americans-greater-than-among-whites>.

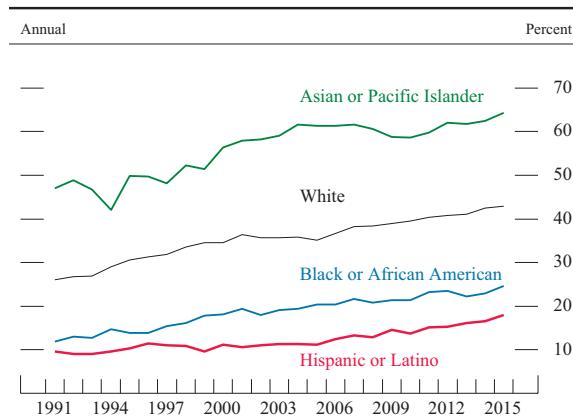
Note that it is possible for the within-group representation in the top quartile to improve for all groups because the composition of the young adult population by race and ethnicity is itself changing, with whites becoming a much smaller share and all other groups being stable or increasing as a share of the total population.

Overall, the representation of black and Hispanic workers in the top earnings quartile continues to lag in the later period. This lag in representation occurs despite the gains in educational attainment—the critical driver of improved incomes—that blacks and Hispanics have achieved over time. For both blacks and Hispanics, the share achieving a bachelor's degree or higher has doubled over the period of study (figure B). However, even with these improvements, the educational attainment gap between each of those groups and whites persists, because the fraction of whites attaining a bachelor's degree has also increased substantially in the past quarter-century.

Across all groups, it is true that completing a bachelor's degree or higher roughly doubles one's chances of reaching the top 25 percent of earners (figure C). This relationship strongly corroborates the conventional wisdom that, for many individuals, a college education can indeed represent a path to improved economic opportunities. However, even within this group, representation is substantially unequal, with college-educated white and Asian people much more likely to achieve the top quartile of income than their black or African American and Hispanic or Latino peers.

Here the interpretation of changes over time is a bit more nuanced, because the overall increase in college attainment among young adults implies increased competition for crossing into the top quartile of earnings. In the 1991–95 period, 35 percent of

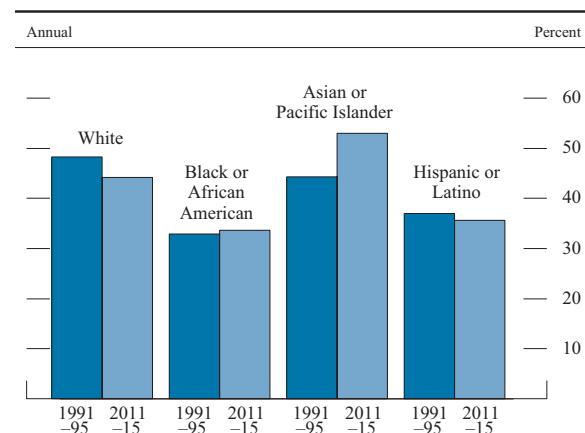
B. Percent of young adults with a bachelor's degree or higher



NOTE: Data cover the preceding calendar year. Young adults include those aged 25 to 34.

SOURCE: U.S. Census Bureau, Current Population Survey, March 1992–2016.

C. Percent of workers with a bachelor's degree in top quartile of earnings among all young adults



NOTE: Data cover the preceding calendar year. Young adults include those aged 25 to 34. Earnings include wages, salaries, business income, and farm income. Threshold for crossing into the top earnings quartile is based on workers aged 25 to 34 only.

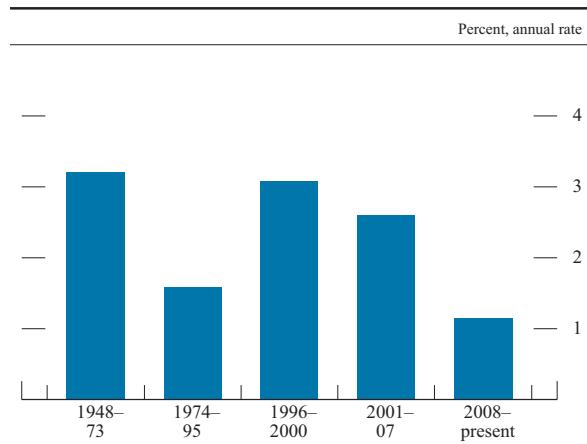
SOURCE: U.S. Census Bureau, Current Population Survey, March 1992–2016.

those in the top income quartile had only a bachelor's degree, and an additional 14 percent had gone on to receive a graduate degree. By the period from 2011 to 2015, these shares had risen to 42 percent and 24 percent, respectively, suggesting that the average skill level needed to reach the top quartile of income has increased between generations.

Taken together, these observations show that educational attainment can help young adults improve their lifetime earning potential. However, increased levels of educational attainment across all groups have created greater competition for positions at the top of the economic ladder. Even among those with college degrees, important differences remain in representation at the top of the income distribution by race and ethnicity. The relationship between educational attainment and economic outcomes is complex and heterogeneous across people, suggesting that the specific nature of that attainment—the types of degrees received and the specific schools attended, among other factors—may matter much more than previously thought.⁵

5. See, in particular, Raj Chetty, John Friedman, Emmanuel Saez, Nicholas Turner, and Danny Yagan (2017), "Mobility Report Cards: The Role of Colleges in Intergenerational Mobility," paper, Equality of Opportunity Project (Stanford, Calif.: Stanford University, EOAP), www.equality-of-opportunity.org/papers/coll_mrc_paper.pdf.

6. 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. The final period is measured from 2007:Q4 through 2017:Q1.

SOURCE: Department of Labor, Bureau of Labor Statistics.

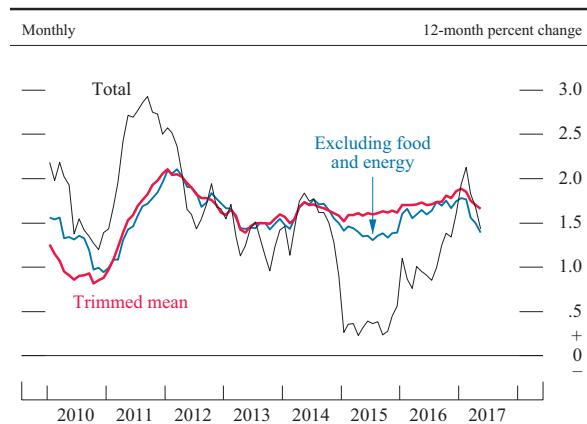
... and likely restrained by slow growth of labor productivity

These modest rates of compensation gain likely reflect the offsetting influences of a tightening labor market and persistently weak productivity growth. Since 2008, labor productivity has increased only about 1 percent per year, on average, well below the average pace from 1996 through 2007 and also below the gains in the 1974–95 period (figure 6). For most of the period since 2011, labor productivity growth has been particularly weak, although it has turned up in recent quarters. The longer-term softness in productivity growth may be partly attributable to the sharp pullback in capital investment during the most recent recession and the relatively modest rebound that followed. But there may be other explanations, too, and considerable debate remains about the reasons for the general slowdown in productivity growth. (For a more comprehensive discussion of productivity, see the box “Productivity Developments in the Advanced Economies.”)

Price inflation moved up but softened in the spring and remains below 2 percent

In the early months of 2017, consumer price inflation, as measured by the 12-month change in the price index for personal consumption expenditures (PCE), continued its climb from the very low levels that prevailed in 2015 and early 2016 when it was held down by falling oil and import prices. Indeed, consumer price inflation briefly reached the FOMC’s 2 percent objective earlier this year before falling back to 1.4 percent in May (figure 7). Core inflation, which typically provides a better indication than the headline measure of where overall inflation will be in the future, also was 1.4 percent over the 12 months ending in May, a slightly slower rate than a year earlier. As is the case with headline inflation, the 12-month measure of core inflation had been higher earlier this year, reaching 1.8 percent. Both measures of inflation have recently been held down by steep and likely idiosyncratic price

7. Change in the price index for personal consumption expenditures



NOTE: The data extend through May 2017; changes are from one year earlier.

SOURCE: For trimmed mean, Federal Reserve Bank of Dallas; for all else, U.S. Department of Commerce, Bureau of Economic Analysis.

declines for a few specific categories, including wireless telephone services and prescription drugs, which do not appear to be related to the overall trends in consumer prices. The 12-month change in the trimmed mean PCE price index—an alternative indicator of underlying inflation produced by the Federal Reserve Bank of Dallas—slowed by less than overall or core PCE price inflation over the past several months.

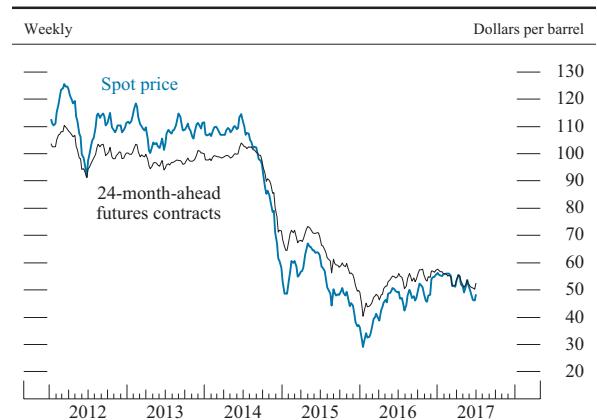
Oil prices declined somewhat but remain well above their early 2016 lows . . .

After rebounding from their early 2016 lows, oil prices leveled off early this year (figure 8). Since then they have declined somewhat, despite OPEC's decision in late May to renew its November 2016 agreement to reduce its oil production, thereby extending the November production cuts through early 2018. Reflecting lower crude oil prices as well as smaller retail margins, seasonally adjusted retail gasoline prices have also declined since the beginning of the year. Nevertheless, prices of both crude oil and retail gasoline remain above their early 2016 lows, and futures prices suggest that market participants expect oil prices to rise gradually in coming years.

. . . while prices of imports other than energy have been bolstered by higher commodity prices

Throughout 2015, nonfuel import prices declined because of appreciation of the dollar and declines in nonfuel commodity prices (figure 9). Nonfuel import prices stabilized last year and have risen since then, as the dollar stopped appreciating and supply disruptions boosted world prices of some nonfuel commodities, especially industrial supplies and metals. In recent months, depreciation of the dollar has further pushed up non-oil import prices, which are now slightly higher than in mid-2016.

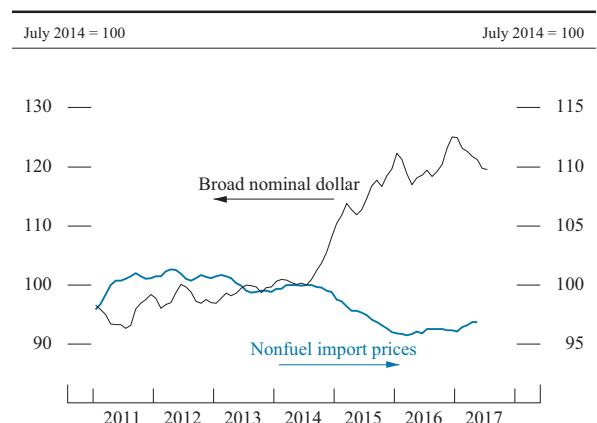
8. Brent spot and futures prices



NOTE: The data are weekly averages of daily data and extend through July 5, 2017.

SOURCE: NYMEX via Bloomberg.

9. Nonfuel import prices and U.S. dollar exchange rate



NOTE: The data are monthly, and the data for nonfuel import prices extend through May 2017.

SOURCE: Department of Labor, Bureau of Labor Statistics; Federal Reserve Board, Statistical Release H.10, "Foreign Exchange Rates."

Productivity Developments in the Advanced Economies

The slow pace of U.S. productivity growth has attracted much attention of late, with vigorous debate on whether the slowdown represents the lingering, but temporary, effect of the Global Financial Crisis (GFC) or marks the start of an era of prolonged lower economic growth. This discussion reviews recent productivity developments in the United States and the major advanced foreign economies (AFEs) and outlines possible causes of the slowdown.¹

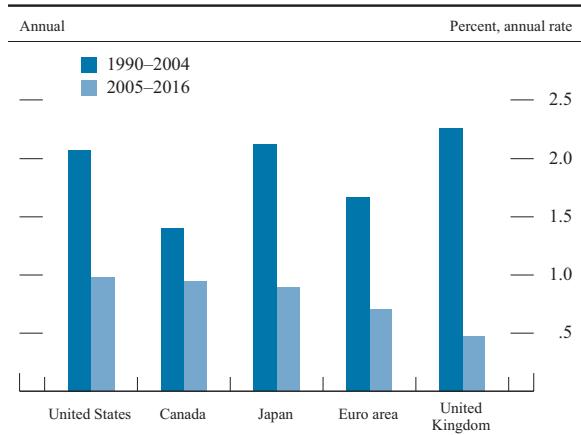
Over the past decade, labor productivity growth in advanced economies has weakened markedly (figure A). Labor productivity growth in the United States has averaged only 1 percent since 2005, about half the pace of the years 1990 to 2004.² Productivity growth has been even weaker in the AFEs, with the United Kingdom experiencing a meager $\frac{1}{2}$ percent growth. As shown in the table, the widespread slowdown in labor productivity growth reflects weak capital deepening and, more importantly, very poor performance of total factor productivity (TFP)—a measure of how efficiently labor and capital are combined to produce output.³ TFP across the advanced

1. Emerging market economies have also experienced declines in productivity growth in recent years, although not necessarily for the same reasons as in the advanced economies.

2. Here labor productivity is measured as overall gross domestic product per hour, in contrast to the business-sector measure shown in the main text. Productivity growth is faster in the business sector.

3. Capital deepening refers to increases in the amount of capital per worker.

A. Labor productivity growth



NOTE: Labor productivity is constructed as real gross domestic product per hour worked.

SOURCE: The Conference Board, Total Economy Database.

Accounting for labor productivity growth, 2005–2016

	Labor productivity growth	Contribution of capital deepening	Contribution of total factor productivity
United States	1	.7	.3
Canada	.9	1	-.1
Japan	.9	.9	0
Euro area	.7	.8	0
United Kingdom	.5	.5	0
<i>Cross-country average</i>			
2005–2016	.8	.8	0
1990–2004	1.9	1.2	.7

NOTE: Average annual rates.

SOURCE: The Conference Board, Total Economy Database.

economies has stagnated in the past decade against historical average growth of about $\frac{3}{4}$ percent.

A number of potential explanations have been put forward for the abysmal performance of TFP. Some authors emphasize structural factors that predate the GFC. For example, Gordon (2012) sees recent technological advances such as information technology (IT) as less revolutionary than earlier general-purpose technologies like electricity and internal combustion.⁴ Relatedly, Fernald (2015) provides evidence that the effects of the IT revolution—an important factor boosting productivity since the 1990s—began to fade in the early 2000s.⁵ There are signs, however, that the influence of IT is still spreading, as exemplified by the surge in cloud-computing technology investments in recent years, and we may not yet have reaped the full benefits of this major technological innovation. Under this more optimistic view, slow TFP growth may reflect a temporary “productive pause” as firms spend resources on activities such as equipment retooling, reorganization of management practices, and workforce training. After all, it took several decades for the full effect of electricity to materialize.⁶

4. Robert J. Gordon (2012), “Is U.S. Economic Growth Over? Faltering Innovation Confronts the Six Headwinds,” NBER Working Paper Series 18315 (Cambridge, Mass.: National Bureau of Economic Research, August).

5. John G. Fernald (2015), “Productivity and Potential Output before, during, and after the Great Recession,” in Jonathan A. Parker and Michael Woodford, eds., *NBER Macroeconomics Annual 2014*, vol. 29 (Chicago: University of Chicago Press), pp. 1–51.

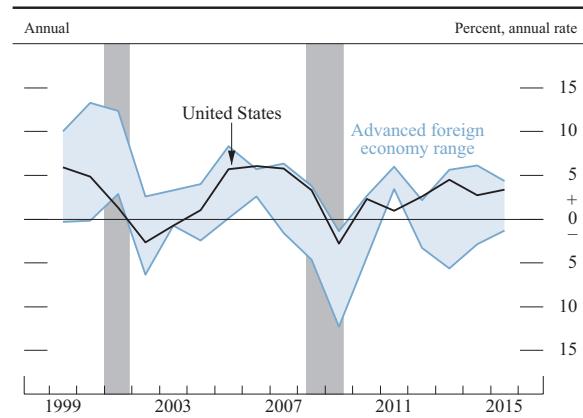
6. For a description of the lengthy process of diffusion of electrification, see Paul A. David (1990), “The Dynamo and the Computer: An Historical Perspective on the Modern Productivity Paradox,” *American Economic Review*, vol. 80 (May), pp. 355–61.

Other explanations blame the weak TFP growth on the unusual severity of the GFC. Some empirical evidence suggests that the “Schumpeterian” process in which workers move toward higher-productivity firms—a key source of productivity growth following previous recessions—has been greatly impaired since the GFC.⁷ In addition, measures of innovation such as research and development (R&D) spending fell sharply during the GFC, as shown in figure B, partly in response to tight financial conditions and weak demand. Declines in R&D tend to induce gradual and persistent declines in TFP, suggesting that the recent low TFP growth may in part be traced to GFC-induced weakness in R&D.⁸ In this view, the recent pickup in R&D spending could anticipate some normalization in productivity growth. Finally, the slowdown in TFP growth may also be related to the slowdown of global trade in the wake of the GFC. Conventional trade theories suggest that greater trade integration should bring productivity gains by facilitating the diffusion of new technologies and by allowing countries to specialize in the production of goods for which they have a comparative advantage. After decades of steady increases, however, trade integration appears to have plateaued in recent years (figure C).

In sum, it is difficult to ascertain whether the recent subdued performance of labor productivity represents a new normal. Some of the GFC-related factors restraining productivity growth may eventually fade, leading to a rise in productivity growth from its anemic post-GFC pace. However, to the extent that longer-run factors—such as the waning effects of the IT revolution—are at work, productivity growth in the future may be noticeably below historical averages. Sustained low rates of productivity growth would greatly restrain the improvement of living standards. In addition, they would put downward pressure on the

long-run neutral interest rate, making the policy rate more likely to reach its effective lower bound and thus constraining the ability of monetary policy to provide economic stimulus, even in the presence of shallow recessions.

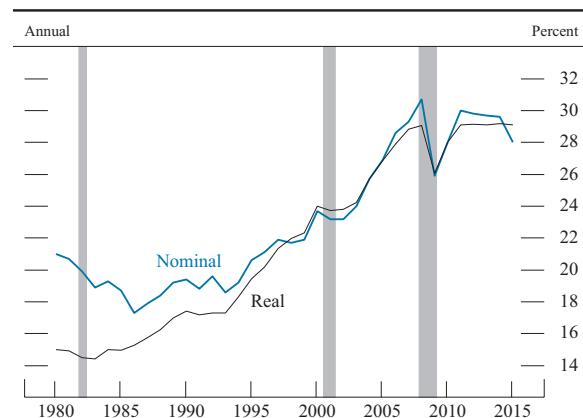
B. Change in private real research and development



NOTE: “Advanced foreign economy range” is the min-max range for Canada, Japan, the euro area, and the United Kingdom. U.S. data refer to real research and development (R&D) spending. Advanced foreign economy data refer to nominal R&D spending (in national currency) deflated by the gross domestic product (GDP) deflator. The shaded bars indicate periods of global recession defined as 55 percent of world GDP in recession.

SOURCE: Department of Commerce, Bureau of Economic Analysis for the United States; advanced foreign economies data downloaded from OECD Science, Technology and R&D Statistics, June 7, 2017; recession data are from Economic Cycle Research Institute (ECRI).

C. World trade as a share of gross domestic product



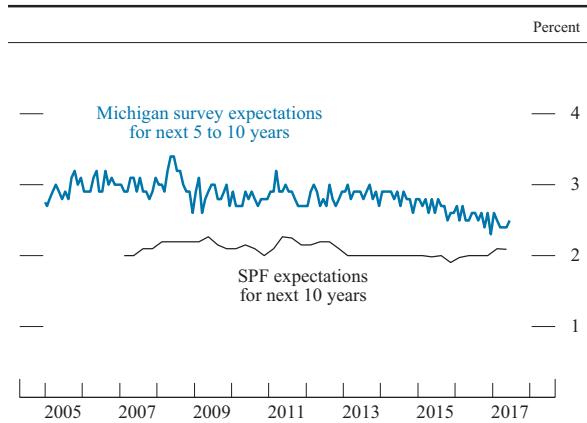
NOTE: The shaded bars indicate periods of global recession defined as 55 percent of world gross domestic product in recession.

SOURCE: World Development Indicators, World Bank; recession data are from Economic Cycle Research Institute (ECRI).

7. See Lucia Foster, Cheryl Grim, and John Haltiwanger (2016), “Reallocation in the Great Recession: Cleansing or Not?” *Journal of Labor Economics*, vol. 34 (S1, January), pp. S293–S331. For an analysis of the role of sectoral labor misallocation in accounting for the productivity slowdown in the United Kingdom, see Christina Patterson, Aysegul Sahin, Giorgio Topa, and Giovanni L. Violante (2016), “Working Hard in the Wrong Place: A Mismatch-Based Explanation to the U.K. Productivity Puzzle,” *European Economic Review*, vol. 84 (May), pp. 42–56.

8. See Patrick Moran and Albert Queralto (2017), “Innovation and the Productivity Growth Slowdown,” unpublished paper, May, https://sites.google.com/site/albertqueralto/home/research---albert-queralto/MQ_May2017.pdf.

10. Median inflation expectations



NOTE: The Michigan survey data are monthly. The SPF data for inflation expectations for personal consumption expenditures are quarterly and extend from 2007:Q1 through 2017:Q2.

SOURCE: University of Michigan Surveys of Consumers; Federal Reserve Bank of Philadelphia, Survey of Professional Forecasters (SPF).

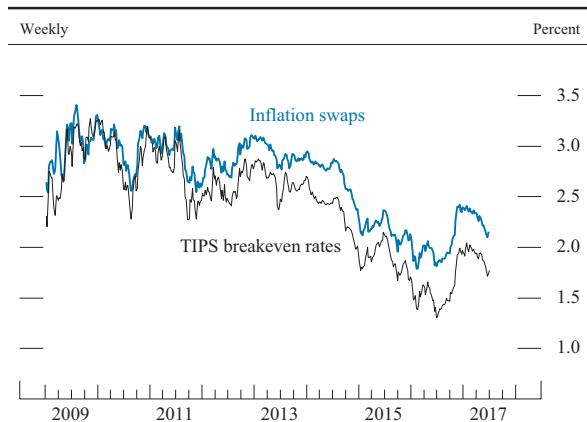
Survey-based measures of inflation expectations are little changed this year . . .

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 relatively stable so far in 2017. In the second-quarter 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 was 2.1 percent, the same as in the first quarter and little changed from the readings during 2016 (figure 10). In the University of Michigan Surveys of Consumers, the median value for inflation expectations over the next 5 to 10 years—which has been drifting downward for the past few years—has held about flat at a low level since late last year.

. . . while market-based measures of inflation compensation fell back somewhat

Inflation expectations can also be gauged by market-based measures of inflation compensation, though the inference is not straightforward because inflation compensation can be importantly affected by changes in premiums associated with risk and liquidity. Measures of longer-term inflation compensation—derived either from differences between yields on nominal Treasury securities and those on comparable Treasury Inflation-Protected Securities (TIPS) or from inflation swaps—have fallen back somewhat this year after having moved up in late 2016 (figure 11).² The TIPS-based measure of

11. 5-to-10-year-forward inflation compensation



NOTE: The data are weekly averages of daily data and extend through June 30, 2017. TIPS is Treasury Inflation-Protected Securities.

SOURCE: Federal Reserve Bank of New York; Barclays; Federal Reserve Board staff estimates.

2. 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 headline 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

5-to-10-year-forward inflation compensation is now 1 $\frac{3}{4}$ percent, and the analogous measure of inflation swaps is now about 2 percent. Both measures are well below the 2 $\frac{1}{2}$ to 3 percent range that persisted for most of the 10 years before 2014.

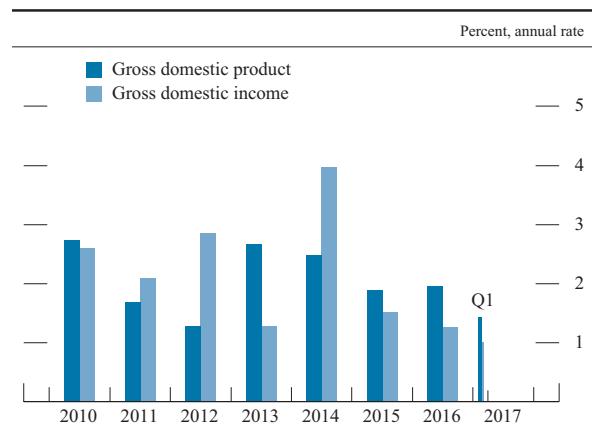
Real gross domestic product growth slowed in the first quarter, but spending by households and businesses appears to have picked up in recent months

After having moved up at an annual rate of 2 $\frac{3}{4}$ percent in the second half of 2016, real gross domestic product (GDP) is reported to have increased about 1 $\frac{1}{2}$ percent in the first quarter of this year (figure 12).³ The step-down in first-quarter growth was largely attributable to soft inventory investment and a lull in the growth of consumer spending; in contrast, net exports increased a bit, residential investment grew robustly, and spending by businesses surged. Indeed, business investment was strong enough that overall private domestic final purchases—that is, final purchases by U.S. households and businesses, which tend to carry more signal for future GDP growth than most other components of overall spending—moved up at an annual rate of about 3 percent in the first quarter. For more recent months, indicators of spending by consumers and businesses have been strong and suggest that growth of economic activity rebounded in the second quarter; thus, overall activity appears to have expanded moderately, on average, over the first half of the year.

some horizon. Focusing on inflation compensation 5 to 10 years ahead is useful, particularly for monetary policy, because such forward measures encompass market participants' views about where inflation will settle in the long term after developments influencing inflation in the short term have run their course.

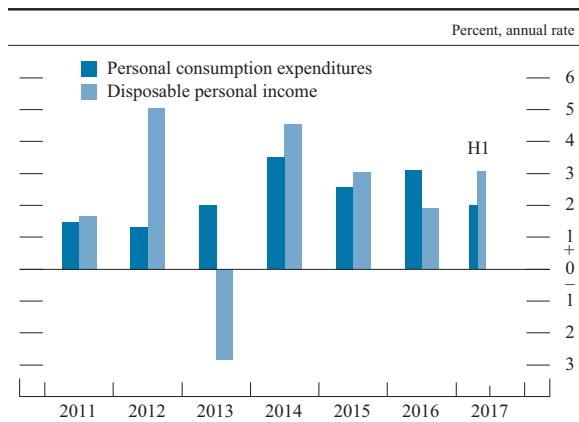
3. Real gross domestic income (GDI), which is conceptually the same as GDP but is constructed from different source data, had been rising at roughly the same rate as real GDP for most of 2016. However, real GDI was held down by the very weak reading for personal income in the fourth quarter of last year, which may prove to have been transitory.

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



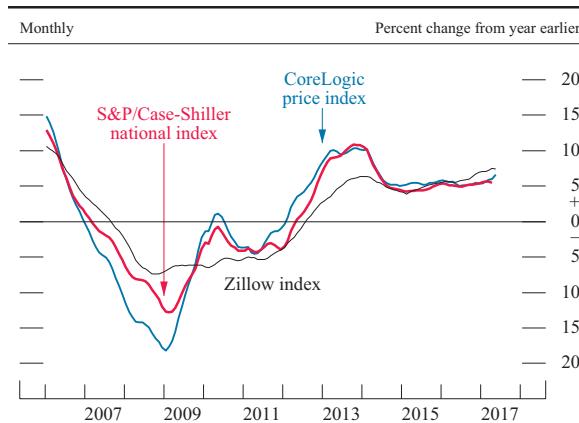
SOURCE: Department of Commerce, Bureau of Economic Analysis.

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



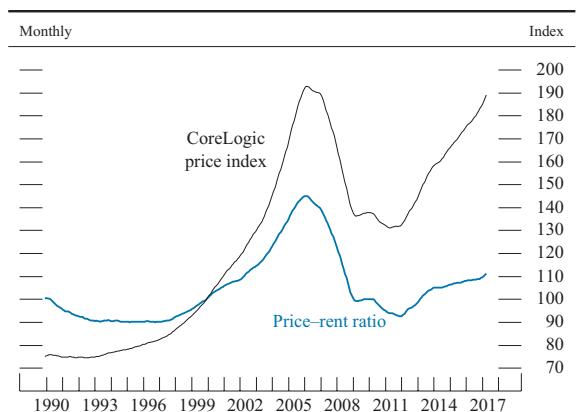
NOTE: The values for 2017:H1 are the annualized May/Q4 changes.
SOURCE: Department of Commerce, Bureau of Economic Analysis.

14. Prices of existing single-family houses



NOTE: The data for the S&P/Case-Shiller index extend through April 2017. The data for the CoreLogic and Zillow indexes extend through May 2017.
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.)

15. Nominal house prices and price-rent ratio



NOTE: The data extend through May 2017. The CoreLogic price index is seasonally adjusted by Federal Reserve Board staff. The price-rent ratio is the ratio of nominal house prices to the consumer price index of rent of primary residence. The data are indexed to 100 in January 2000.

SOURCE: For prices, CoreLogic; for rents, Department of Labor, Bureau of Labor Statistics.

The economic expansion continues to be supported by accommodative financial conditions, including the low cost of borrowing and easy access to credit for many households and businesses, continuing job gains, rising household wealth, and favorable consumer and business sentiment.

Gains in income and wealth continue to support consumer spending . . .

After increasing strongly in the second half of 2016, consumer spending in the first quarter of this year was tepid. Unseasonably warm weather depressed spending on energy services, and purchases of motor vehicles slowed from an unusually high pace late last year. However, household spending seems to have picked up in more recent months, as purchases of energy services returned to seasonal norms and retail sales firmed. All told, consumer spending increased at an annual rate of 2 percent over the first five months of this year, only a bit slower than in the past couple of years (figure 13).

Beyond spending, other indicators of consumers' economic well-being have been strong in the aggregate. The ongoing improvement in the labor market has supported further gains in real disposable personal income (DPI), a measure of income after accounting for taxes and adjusting for inflation. Real DPI increased at a solid annual rate of 3 percent over the first five months of this year.

Gains in the stock market and in house prices over the first half of the year have boosted household net wealth. Broad measures of U.S. equity prices have continued to increase in recent months after moving up considerably late last year and in the first quarter. House prices have also continued to climb, adding to the balance sheet strength of homeowners (figure 14). Indeed, nominal house price indexes are close to their peaks of the mid-2000s. However, while the ratio of house prices to rents has edged higher, it remains well below its previous peak (figure 15). As a result of the

increases in home and equity prices, aggregate household net worth has risen appreciably. In fact, at the end of the first quarter of 2017, household net worth was more than six times the value of disposable income, the highest-ever reading for that ratio (figure 16).

Consumer spending has also been supported by low burdens from debt service payments. The household debt service burden—the ratio of required principal and interest payments on outstanding household debt to disposable income, measured for the household sector as a whole—has remained at a very low level by historical standards. As interest rates rise, the debt burden will move up only gradually, as most household debt is in fixed-interest products.

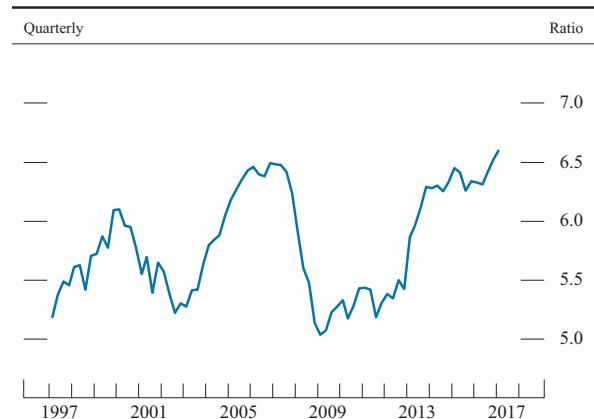
... as does credit availability

Consumer credit has continued to expand this year but more moderately than in 2016 (figure 17). Financing conditions are generally favorable, with auto and student loans remaining widely available and outstanding balances continuing to expand at a robust, albeit somewhat reduced, pace. Even though delinquency rates on most types of consumer debt have remained low by historical standards, credit card and auto loan delinquencies among subprime borrowers have drifted up some. Possibly in response to this deteriorating credit performance, banks have tightened standards for credit cards and auto lending. Mortgage credit has remained readily available for households with solid credit profiles, but it was still difficult to access for households with low credit scores or harder-to-document incomes.

Consumer confidence is strong

Consumers have remained optimistic about their financial situation. As measured by the Michigan survey, consumer sentiment was solid through most of 2016, likely reflecting rising income and job gains. Sentiment moved up appreciably after the presidential election last November and has remained at a high level so far this year (figure 18). Furthermore,

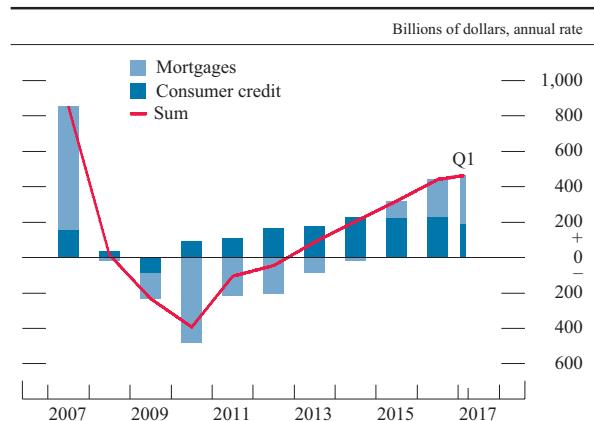
16. Wealth-to-income ratio



NOTE: 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, Department of Commerce, Bureau of Economic Analysis.

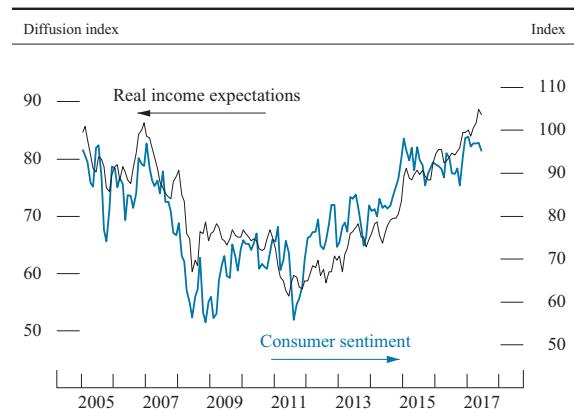
17. Changes in household debt



NOTE: Changes are calculated from year-end to year-end except 2017 changes, which are calculated from Q1 to Q1.

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

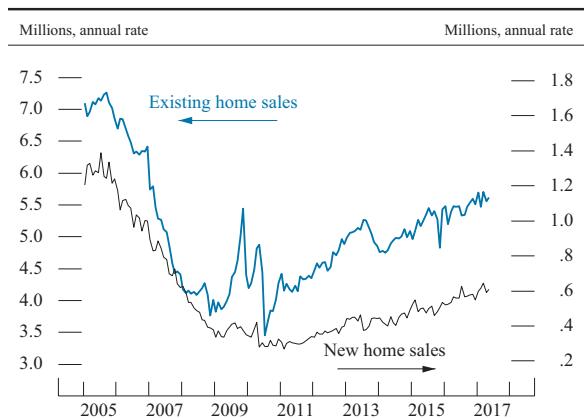
18. Indexes of consumer sentiment and income expectations



NOTE: The consumer sentiment data are monthly and are indexed to 100 in 1966. The real income expectations data are calculated as the net percentage of survey respondents expecting family income to go up more than prices during the next year or two plus 100 and are shown as a three-month moving average.

SOURCE: University of Michigan Surveys of Consumers.

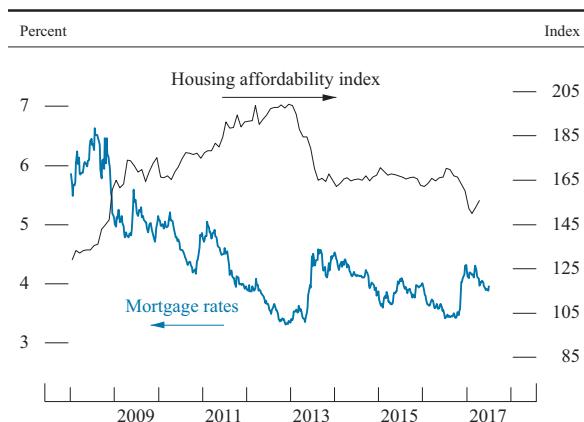
19. New and existing home sales



NOTE: The data extend through May 2017. 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, Census Bureau; for existing home sales, National Association of Realtors.

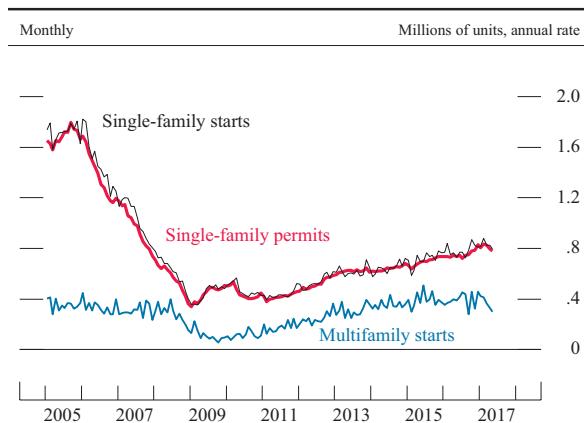
20. Mortgage rates and housing affordability



NOTE: The housing affordability index data are monthly through April 2017, and the mortgage rate data are weekly through July 6, 2017. At an index value of 100, a median-income family has exactly enough income to qualify for a median-priced home mortgage. Housing affordability is seasonally adjusted by Board staff.

SOURCE: For housing affordability index, National Association of Realtors; for mortgage rates, Freddie Mac Primary Mortgage Market Survey.

21. Private housing starts and permits



NOTE: The data extend through May 2017.

SOURCE: Department of Commerce, Bureau of the Census.

the share of households expecting real income to rise over the next year or two has gone up markedly in the past few months and is now in line with its pre-recession level.

Activity in the housing sector has improved modestly

Several indicators of housing activity have continued to strengthen gradually this year. Sales of existing homes have gained, on net, while house prices have continued to rise and mortgage rates have remained low, even though they are up from last year (figures 19 and 20). In addition, single-family housing starts registered a slight increase, on average, in the first five months of the year, although multifamily housing starts have slipped (figure 21). Despite the modest increase in construction activity, the months' supply of homes for sale has remained near the low levels seen in 2016, and the aggregate vacancy rate has fallen back to levels observed in the mid-2000s. Lean inventories are likely to support further gains in homebuilding activity going forward.

Business investment has turned up after a period of weakness . . .

Led by a surge in spending on drilling and mining structures, real outlays for business investment—that is, private nonresidential fixed investment—rose robustly at the beginning of the year after having been about flat for 2016 as a whole (figure 22). The sharp gains in drilling and mining in the first quarter mark a turnaround for the sector; energy-sector investment had declined noticeably following the drop in oil prices that began in mid-2014 and ran through early 2016. More recently, rapid increases in the number of drilling rigs in operation suggest that investment in this area remained strong in the second quarter of this year.

Moreover, business spending on equipment and intangibles (such as research and development) advanced solidly at the beginning of the year after having been

roughly flat in 2016. Furthermore, indicators of business spending are generally upbeat: Orders and shipments of capital goods have posted net gains in recent months, and indexes of business sentiment and activity remain elevated after having improved significantly late last year.

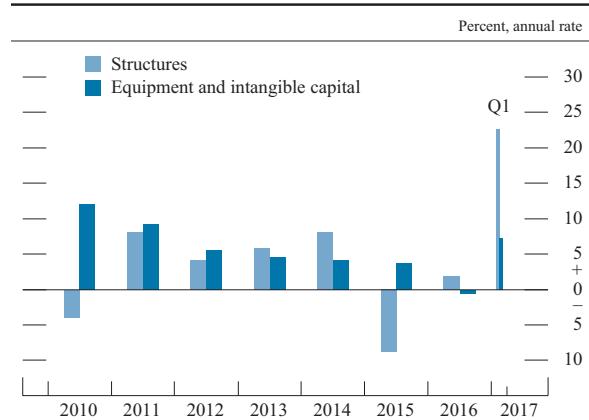
... while corporate financing conditions have remained accommodative

Aggregate flows of credit to large nonfinancial firms have remained solid, supported in part by continued low interest rates (figure 23). The gross issuance of corporate bonds was robust during the first half of 2017, and yields on both speculative- and investment-grade corporate bonds remained low by historical standards (figure 24). Gross equity issuance by nonfinancial firms stayed solid, on average, as seasoned equity offerings continued at a robust pace and the pace of initial public offerings picked up from the low levels seen in 2016.

Despite the pickup in business investment, demand for business loans was subdued early this year, and outstanding commercial and industrial (C&I) loans on banks' books contracted in the first quarter. In the April Senior Loan Officer Opinion Survey on Bank Lending Practices (SLOOS), banks reported a broad-based decline in demand for C&I loans during the first quarter of 2017 even as lending standards on such loans were reported to be basically unchanged.⁴ Banks also reported weaker demand for commercial real estate loans as well as a continued tightening of standards on such loans. However, lending to large nonfinancial firms appeared to be strengthening somewhat during the second quarter. Meanwhile, measures of small business credit demand remained weak amid stable supply.

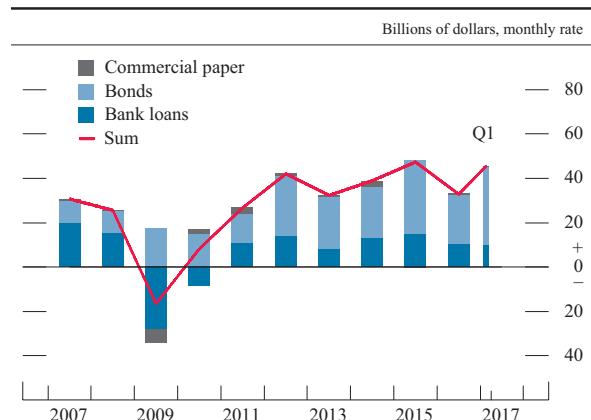
4. The SLOOS is available on the Board's website at <https://www.federalreserve.gov/data/sloos/sloos.htm>.

22. Change in real private nonresidential fixed investment



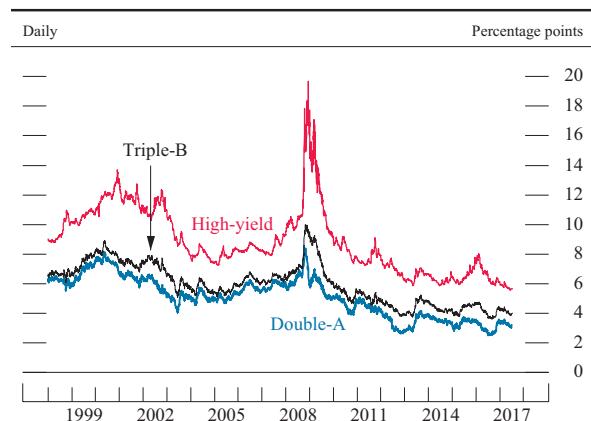
SOURCE: Department of Commerce, Bureau of Economic Analysis.

23. Selected components of net debt financing for nonfinancial businesses



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

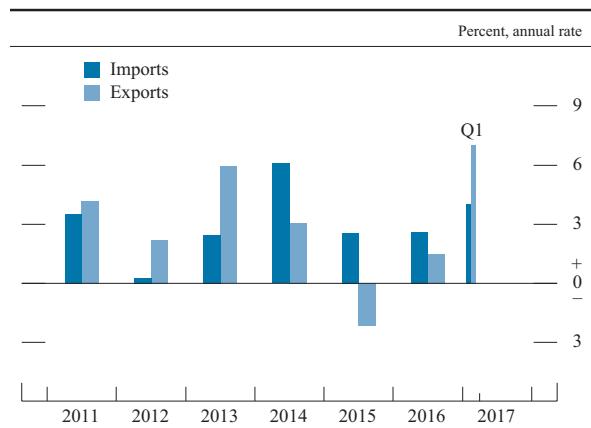
24. Corporate bond yields, by securities rating



NOTE: The yields shown are yields on 10-year bonds.

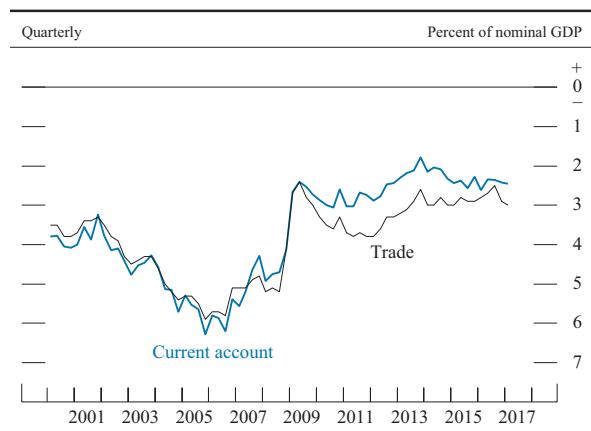
SOURCE: BofA Merrill Lynch Global Research, used with permission.

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



SOURCE: Department of Commerce, Bureau of Economic Analysis.

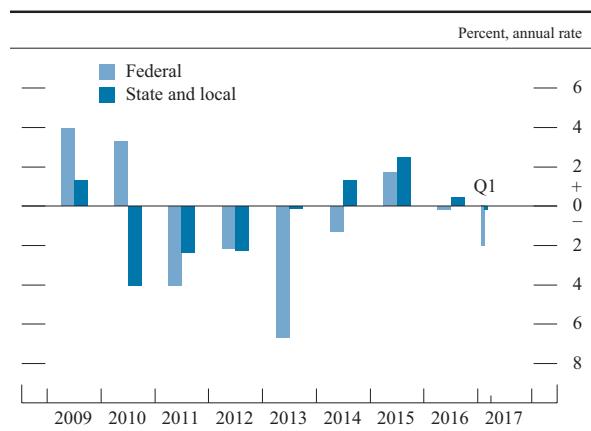
26. U.S. trade and current account balances



NOTE: GDP is gross domestic product.

SOURCE: Department of Commerce, Bureau of Economic Analysis.

27. Change in real government expenditures on consumption and investment



SOURCE: Department of Commerce, Bureau of Economic Analysis.

U.S. exports grew at a faster pace

In the first quarter of 2017, U.S. real exports increased briskly and broadly following moderate growth in the second half of last year that was driven by a surge in agricultural exports (figure 25). At the same time, real import growth declined somewhat from its strong pace in the second half of last year. As a result, real net exports contributed slightly to U.S. real GDP growth in the first quarter. Available trade data through May suggest that the growth of real exports slowed to a modest pace in the second quarter. Nevertheless, the average pace of export growth appears to have stepped up in the first half of 2017 compared with last year, partly reflecting stronger growth abroad and a diminishing drag from earlier dollar appreciation. All told, the available data for the first half of this year suggest that net exports added a touch to U.S. real GDP growth and that the nominal trade deficit widened slightly relative to GDP (figure 26).

Federal fiscal policy had a roughly neutral effect on economic growth . . .

Federal purchases moved sideways in 2016, and policy actions had little effect on federal taxes or transfers (figure 27). Under currently enacted legislation, federal fiscal policy will likely again have a roughly neutral influence on the growth in real GDP this year.

After narrowing significantly for several years, the federal unified deficit has widened from about 2½ percent of GDP in fiscal year 2015 to 3¼ percent currently. Although expenditures as a share of GDP have been relatively stable over this period at a little under 21 percent, receipts moved lower in 2016 and have edged down further so far this year to roughly 17½ percent of GDP (figure 28). The ratio of federal debt held by the public to nominal GDP is quite elevated relative to historical norms. Nevertheless, the deficit remains small enough to roughly stabilize this ratio in the neighborhood of 75 percent (figure 29).

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

The fiscal position of most state and local governments is stable, although there is a range of experiences across these governments. Many state governments are experiencing lackluster revenue growth, as income tax collections have been only edging up, on average, in recent quarters. In contrast, house price gains have continued to push up property tax revenues at the local level. Employment growth in the state and local government sector has been anemic so far this year following a pace of hiring in 2016 that was the strongest since 2008. Outlays for construction by these governments have been declining (figure 30).

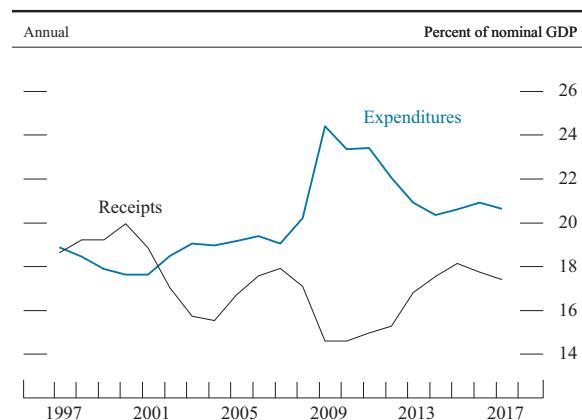
Financial Developments

The expected path for the federal funds rate flattened

The path for the expected federal funds rate implied by market quotes on interest rate derivatives has flattened, on net, since the end of December, moving higher for 2017 but slightly lower further out (figure 31). The expected policy path moved up at the beginning of the year, reportedly reflecting investor perceptions that expansionary fiscal policy would likely be forthcoming over the near term, but subsequently fell amid some waning of these expectations as well as FOMC communications that were interpreted as signaling a somewhat slower pace of policy rate increases than had been anticipated.

Survey-based measures of the expected path of policy also moved up for 2017. Most of the respondents to the Federal Reserve Bank of New York's Survey of Primary Dealers and Survey of Market Participants—which were conducted just before the June FOMC meeting—projected an additional 25 basis point increase in the FOMC's target range for the federal funds rate, relative to what they projected in surveys conducted before the December FOMC meeting, as the most likely outcome for this year.

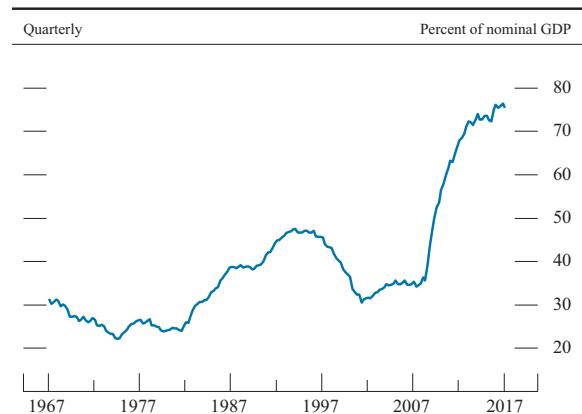
28. Federal receipts and expenditures



NOTE: Through 2016, receipts and expenditures are for fiscal years (October to September); gross domestic product (GDP) is for the four quarters ending in Q3. For 2017, receipts and expenditures are for the 12 months ending in May, and GDP is the average of 2016:Q4 and 2017:Q1. Receipts and expenditures are on a unified-budget basis.

SOURCE: Office of Management and Budget.

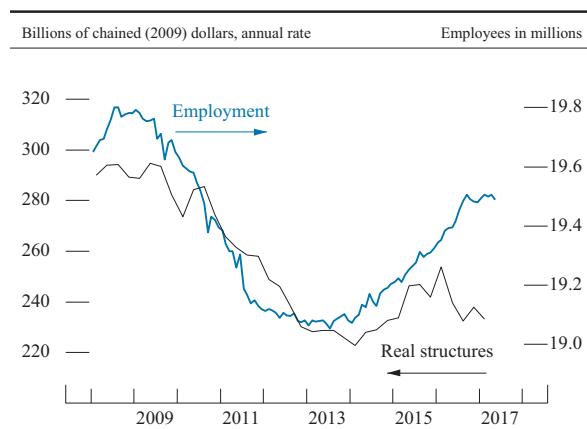
29. Federal government debt held by the public



NOTE: 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, Department of Commerce, Bureau of Economic Analysis; for federal debt, Federal Reserve Board, Statistical Release Z.1, "Financial Accounts of the United States."

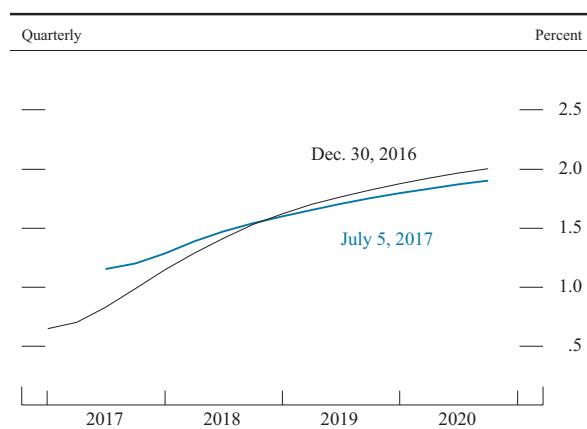
30. State and local employment and structures investment



NOTE: The employment data are monthly and extend through May 2017, and the structures data are quarterly.

SOURCE: For employment data, Department of Labor, Bureau of Labor Statistics; for structures data, Department of Commerce, Bureau of Economic Analysis.

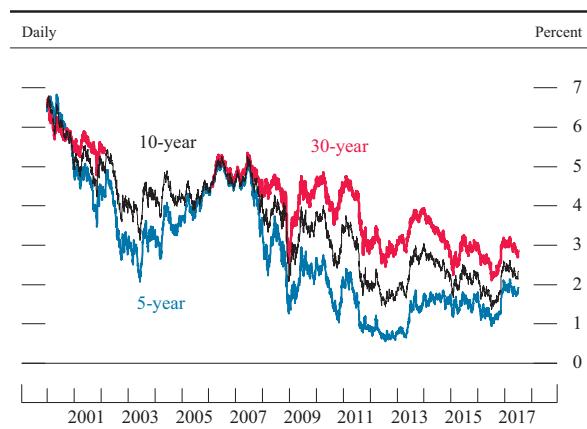
31. Market-implied federal funds rate



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 5, 2017, is compared with that as of December 30, 2016. The path is estimated with a spline approach, assuming a term premium of 0 basis points. The data extend through 2020:Q4.

SOURCE: Bloomberg; Federal Reserve Board staff estimates.

32. Yields on nominal Treasury securities



NOTE: The Treasury ceased publication of the 30-year constant maturity series on February 18, 2002, and resumed that series on February 9, 2006.

SOURCE: Department of the Treasury.

Expectations for the number of rate hikes in 2018 were about unchanged. Market-based measures of uncertainty about the policy rate approximately one to two years ahead decreased slightly, on balance, from their year-end levels.

Longer-term nominal Treasury yields remain low

After rising significantly during the second half of 2016, yields on medium- and longer-term nominal Treasury securities have decreased 5 to 25 basis points, on net, so far in 2017 (figure 32). The decrease in longer-term nominal yields since the beginning of the year largely reflects declines in inflation compensation due in part to soft incoming data on inflation, with real yields little changed on net. Consistent with the changes in Treasury yields, yields on 30-year agency mortgage-backed securities (MBS)—an important determinant of mortgage interest rates—decreased slightly over the first half of the year (figure 33). Treasury and MBS yields picked up somewhat in late June, driven in part by increases in government yields overseas. However, yields remain quite low by historical standards.

Broad equity price indexes increased further . . .

Broad U.S. equity indexes continued to increase during the period (figure 34). Equity prices were reportedly supported by lower interest rates and increased optimism that corporate earnings will continue to strengthen this year. Stock prices of companies in the technology sector increased notably on net. After rising significantly toward the end of last year, stock prices of banks performed about in line with the broader market during the first half of 2017. The implied volatility of the S&P 500 index one month ahead—the VIX—decreased, on net, ending the period close to the bottom of its historical range. (For a discussion of financial stability issues, see the box “Developments Related to Financial Stability.”)

... and risk spreads on corporate bonds decreased

Bond spreads for investment- and speculative-grade firms decreased, and spreads for speculative-grade firms now stand near the bottom of their historical ranges.

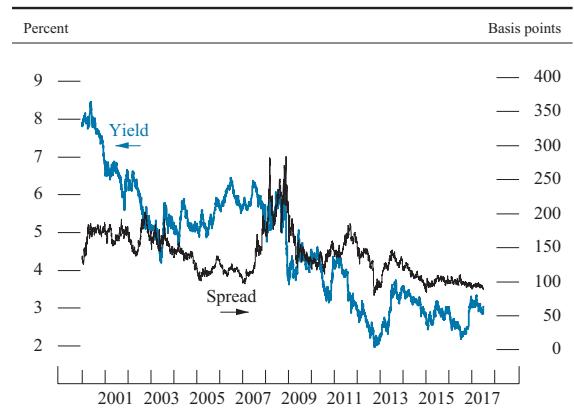
Treasury and mortgage securities markets have functioned well

Available indicators of Treasury market functioning remained stable over the first half of 2017. A variety of liquidity metrics—including bid-ask spreads, bid sizes, and estimates of transaction costs—either improved or remained unchanged over the period, displaying no notable signs of liquidity pressures. The agency MBS market also continued to function well. (For a detailed discussion of corporate bond market functioning, see the box “Recent Developments in Corporate Bond Market Liquidity.”)

Money market rates have moved up in line with increases in the FOMC's target range

Conditions in domestic short-term funding markets have remained stable so far in 2017. Yields on a broad set of money market instruments moved higher in response to the FOMC's policy actions in March and June. The effective federal funds rate generally traded near the middle of the target range and was closely tracked by the overnight Eurodollar rate. The spread between the three-month LIBOR (London interbank offered rate) and the OIS (overnight index swap) rate has returned to historical norms over the first half of 2017, declining from the elevated levels that prevailed at the end of last year around the implementation of the Securities and Exchange Commission money market fund reform.

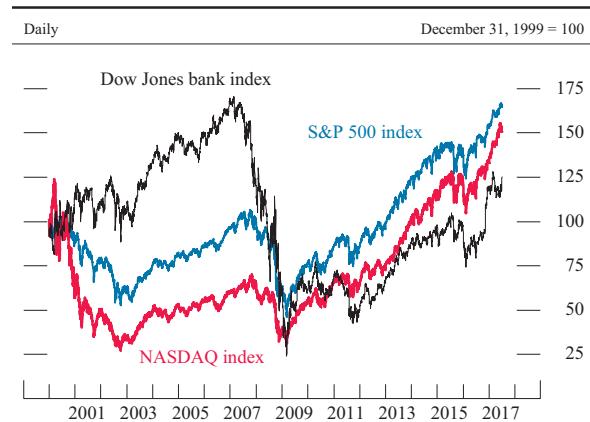
33. Yield and spread on agency mortgage-backed securities



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.

34. Equity prices



SOURCE: Standard & Poor's Dow Jones Indices and NASDAQ index via Bloomberg. (For Dow Jones Indices licensing information, see the note on the Contents page.)

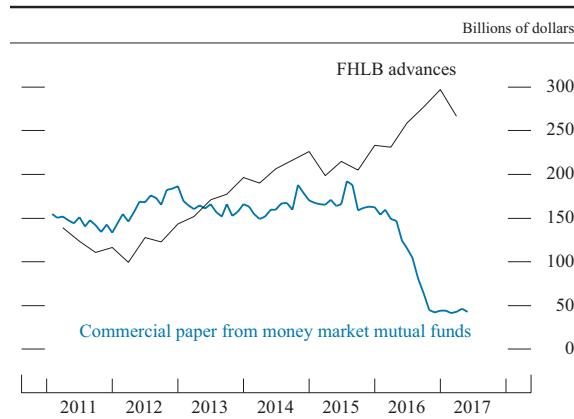
Developments Related to Financial Stability

Vulnerabilities in the U.S. financial system remain moderate on balance. Capital and liquidity ratios at most large U.S. banks continue to be at historical highs, and reliance on short-term wholesale funding at these institutions has continued to decline. Valuation pressures across a range of assets and several indicators of investor risk appetite have increased further since mid-February, but apparent high risk appetite in asset markets has not led to increased borrowing in the nonfinancial sector. Debt owed by nonfinancial corporations remains elevated, although it has been flat or falling in the past two years. Household debt as a share of gross domestic product has remained subdued, and new borrowing has been driven primarily by households with strong credit histories.

The strong capital position of the financial sector has contributed to the improved resilience of the U.S. financial system. Regulatory capital ratios at most bank holding companies have continued to be historically high, mainly as a result of the higher regulatory capital requirements. At the same time, measures of bank profitability have increased modestly on a year-on-year basis. Regulatory capital ratios at insurance companies are also high by historical standards.

Vulnerabilities stemming from maturity and liquidity transformation in the financial sector remain low. High-quality liquid asset holdings at all large domestic bank holding companies are above regulatory liquidity coverage ratio requirements. Moreover, banks have continued to replace short-term wholesale funding, such as commercial paper held by money market mutual funds (also referred to as money market funds, or MMFs), with relatively more stable core deposits. The use of Federal Home Loan Bank (FHLB) advances as a source of funding for the banks, which had increased notably through 2016, has fallen slightly in the first quarter of 2017 (figure A). The MMF reforms, designed by the Securities and Exchange Commission and fully implemented in October 2016, have led to a shift of about \$1.2 trillion in assets from prime funds—which can hold a range of risky instruments, including commercial paper issued by banks—to government funds, which can hold only assets collateralized by Treasury and agency securities. This shift has reduced the risk of runs on MMFs. However, run risk could increase if investors shift out of MMFs into more

A. Selected funding for large banks



NOTE: Commercial paper from money market mutual fund data are monthly and extend through May 2017. Federal Home Loan Bank (FHLB) data are quarterly and are seasonally adjusted. FHLB advances data for different subsets of Comprehensive Capital Analysis and Review banks depending on their use of each funding source.

SOURCE: U.S. Securities and Exchange Commission, Form N-MFP, “Monthly Schedule of Portfolio Holdings of Money Market Funds,” accessed via the Office of Financial Research; Federal Financial Institutions Examinations Council, Call Report Form FFIEC 031, “Consolidated Reports of Condition and Income for a Bank with Domestic and Foreign Offices.”

opaque and fragile alternative vehicles. Thus, continued monitoring of this sector is important. The FHLBs have increased their issuance of short-maturity liabilities, mainly to government funds. However, the FHLBs have not reduced the maturity of their own assets, which increases their liquidity mismatch and potential vulnerability to funding strains. This mismatch has also been highlighted by the Federal Housing Finance Agency, which continues to evaluate ways to formalize its supervisory expectations regarding the appropriate amount of short-term funding of long-term assets by the FHLBs.¹

Valuation pressures have increased further across a range of assets, including Treasury securities, equities, corporate bonds, and commercial real estate (CRE).

1. See Melvin L. Watt (2017), “Prepared Remarks,” speech delivered at the 2017 Federal Home Loan Bank Directors’ Conference, Washington, May 23, <https://www.fhfa.gov/Media/PublicAffairs/Pages/Prepared-Remarks-of-Melvin-L-Watt-Director-of-FHFA-FHLBank-Directors-Conference.aspx>.

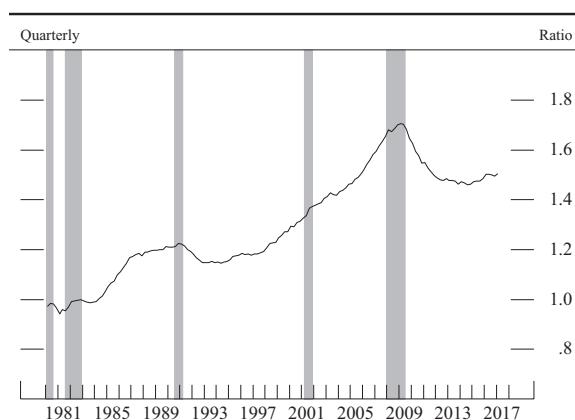
Term premiums on Treasury securities continue to be in the lower part of their historical distribution. A sudden rise in term premiums to more normal levels poses a downside risk to long-maturity Treasury prices, which could in turn affect the prices of other assets. Forward equity price-to-earnings ratios rose a bit further and are now at their highest levels since the early 2000s, while a measure of the risk premium embedded in high-yield corporate bond spreads declined a touch from an already low level, implying high asset valuations in this market as well. Prices of CRE have continued to advance at a rapid clip amid slowing rent growth and rising interest rates, though there are signs of tightening credit conditions in CRE markets. In contrast, farmland prices have declined, albeit more slowly than prevailing rents, implying that farmland price-to-rent ratios have continued to move up to very high levels. In derivatives markets, investor compensation for bearing near-term volatility risk has remained low, suggesting a sustained investor risk appetite.

The ratio of private nonfinancial (household and nonfinancial business) debt to gross domestic product, shown in figure B, remains below the estimates of its

long-term upward trend. The debt-to-income ratio of households has changed little over the past few years and remains at a relatively low level. Moreover, new borrowing is concentrated among borrowers with high credit scores. In contrast, the leverage of nonfinancial corporations continues to be notably elevated. New borrowing is concentrated among firms with stronger balance sheets, and the total outstanding amount of speculative-grade bonds and leveraged loans edged down, especially in the oil sector.

As part of its effort to reduce regulatory burden while promoting the financial stability of the United States, the Federal Reserve Board has taken two key steps since mid-February. First, member agencies of the Federal Financial Institutions Examination Council, including the Board, issued a joint report to the Congress under the Economic Growth and Regulatory Paperwork Reduction Act of 1996 detailing their review of regulations affecting smaller financial institutions, such as community banks, and describing burden-reducing actions the agencies plan to take.² Second, the Board and the Federal Deposit Insurance Corporation jointly announced the completion of their evaluation of the 2015 resolution plans of 16 domestic banks and separately issued resolution plan guidance to 4 foreign banks.³ The agencies identified shortcomings in one domestic firm's resolution plan, which must be satisfactorily addressed in the firm's 2017 plan by December 31. For foreign banking organizations, resolution plans are focused on their U.S. operations, and guidance issued to these organizations reflects the significant restructuring they have undertaken to form intermediary holding companies.

B. Private nonfinancial sector credit-to-GDP ratio



NOTE: The shaded bars indicate periods of business recession as defined by the National Bureau of Economic Research.

SOURCE: Federal Reserve Board, Statistical Release Z.1, "Financial Accounts of the United States"; Department of Commerce, Bureau of Economic Analysis, national income and product accounts (NIPA), Table 1.1.5; Gross Domestic Product; Board staff calculations.

2. See Board of Governors of the Federal Reserve System (2017), "Banking Agencies Issue Joint Report to Congress under the Economic Growth and Regulatory Paperwork Reduction Act of 1996," press release, March 21, <https://www.federalreserve.gov/newsevents/pressreleases/bcreg20170321a.htm>.

3. See Board of Governors of the Federal Reserve System (2017), "Agencies Complete Resolution Plan Evaluation of 16 Domestic Firms; Provide Resolution Plan Guidance to Four Foreign Banking Organizations," press release, March 24, <https://www.federalreserve.gov/newsevents/pressreleases/bcreg20170324a.htm>.

Recent Developments in Corporate Bond Market Liquidity

Market liquidity refers to the extent to which investors can rapidly execute sizable securities transactions at a low cost and with a limited price effect. A high degree of market liquidity facilitates informationally efficient market pricing and lowers the returns required by investors to hold financial assets; it therefore decreases the cost of valuable economic projects and so contributes to the efficient allocation of capital. Moreover, liquidity conditions that are resilient in the face of economic and financial shocks reduce the risk of excess volatility and fire sale losses, thus helping mitigate systemic risk.

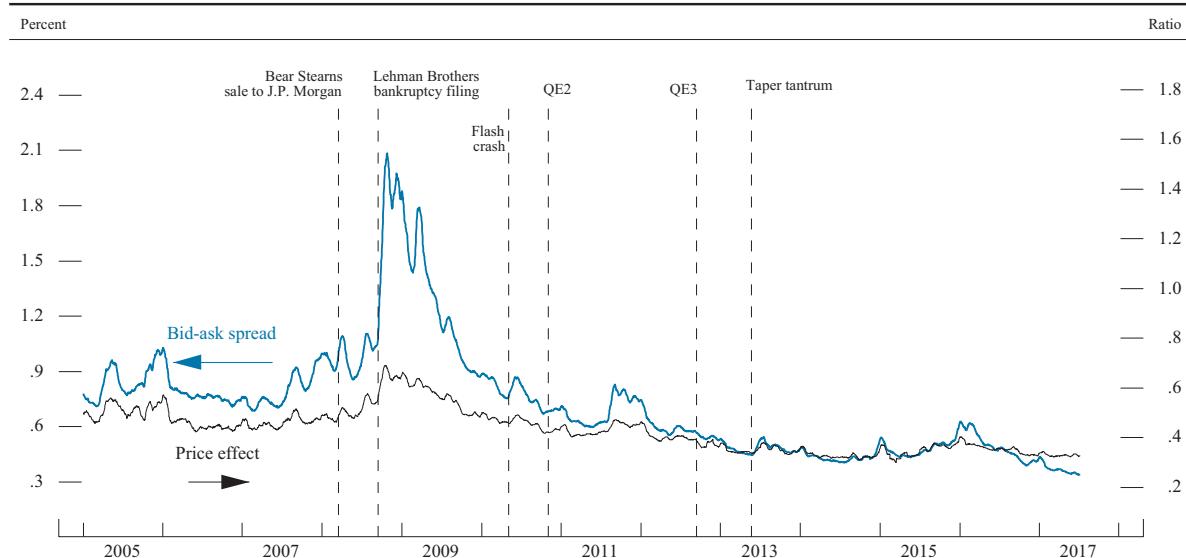
Financial institutions that serve as “market makers,” by posting prices and standing ready to buy or sell, are critical to healthy liquidity in the markets for certain assets, including corporate bonds. A series of changes, including regulatory reforms, since the Global Financial Crisis have likely altered financial institutions’ incentives to provide liquidity, raising concerns about decreased liquidity in these markets, especially during periods of market stress. However, the available evidence does not point to any substantial impairment in liquidity in major financial markets in recent

years. In addition, financial markets have generally performed well during recent episodes of financial stress.¹ Even in instances in which liquidity conditions in certain markets appear to have deteriorated, the effects have been mild and suggest limited economic consequences. In the remainder of this discussion, we illustrate these points with emphasis on the market for corporate bonds.

In recent years, market participants have been particularly concerned with liquidity conditions in the corporate bond market because the securities are traded less frequently, and the liquidity provision has relied more heavily on dealer intermediation, than in many other markets. However, a range of conventional metrics of liquidity indicate that liquidity strains in corporate bond markets have been minimal. Figure A

1. For a discussion of the behavior of bond prices during recent flash events (that is, extremely rapid and large price moves during very short periods), see Jerome H. Powell (2015), “Structure and Liquidity in Treasury Markets,” speech delivered at the Brookings Institution, Washington, August 3, <https://www.federalreserve.gov/newsevents/speech/powell20150803a.htm>.

A. Mean bid-ask spread and market effect for corporate bonds



NOTE: The data are daily. The bid-ask spread is the 21-day moving average of the difference between trade size weighted-average dealer bid prices and ask prices of non-defaulted bonds on the secondary market, scaled by the midprice. Price effect data are the 21-day moving average of the Amihud (2002) measure (see footnote 2), which is defined as the daily average of the ratio of the absolute value of the percentage price changes to transaction volume for non-defaulted bonds on the secondary market that traded at least 10 times between 10:30 a.m. and 3:30 p.m. Excludes 144a bonds.

SOURCE: FINRA Trade Reporting and Compliance Engine; Thomson Reuters SDC Platinum; Mergent Fixed Income Securities Database; Moody's Default and Recovery Database.

shows that the estimated mean effective bid-ask spread for U.S. corporate bonds has remained low in recent years. Before the financial crisis, bid-ask spreads averaged about 1 percent of the price of the bond. This measure of trading costs skyrocketed during the financial crisis but has returned to the range seen before the crisis. Measures of the effect of trades on prices follow a similar pattern and have been fairly stable in recent years.² In addition, other measures related to factors associated with market liquidity, such as trends in average trade size and turnover, also suggest market liquidity conditions are benign.³

That said, some recent work suggests that these traditional measures of transaction costs might exaggerate the degree of liquidity in part because dealers have increasingly shifted from acting as principals to acting as agents to reduce their risk

exposure, resulting in tighter bid-ask spreads.⁴ Indeed, many market participants have expressed a concern that declines in dealer inventories may reflect in part a reduced willingness or capacity of the primary dealers to make markets, which may in turn lead to lower liquidity.

Figure B shows that primary dealers' inventories of corporate bonds (including foreign bonds issued in the United States), which are predominantly used for market making, indeed began to decline sharply following the Bear Stearns collapse in March 2008 and fell further after Lehman Brothers failed in October 2008. Such a sharp decline in dealer inventories may be the result of dealers' actions on their own, reflecting changes in risk preferences in reaction to the financial crisis. In addition, changing

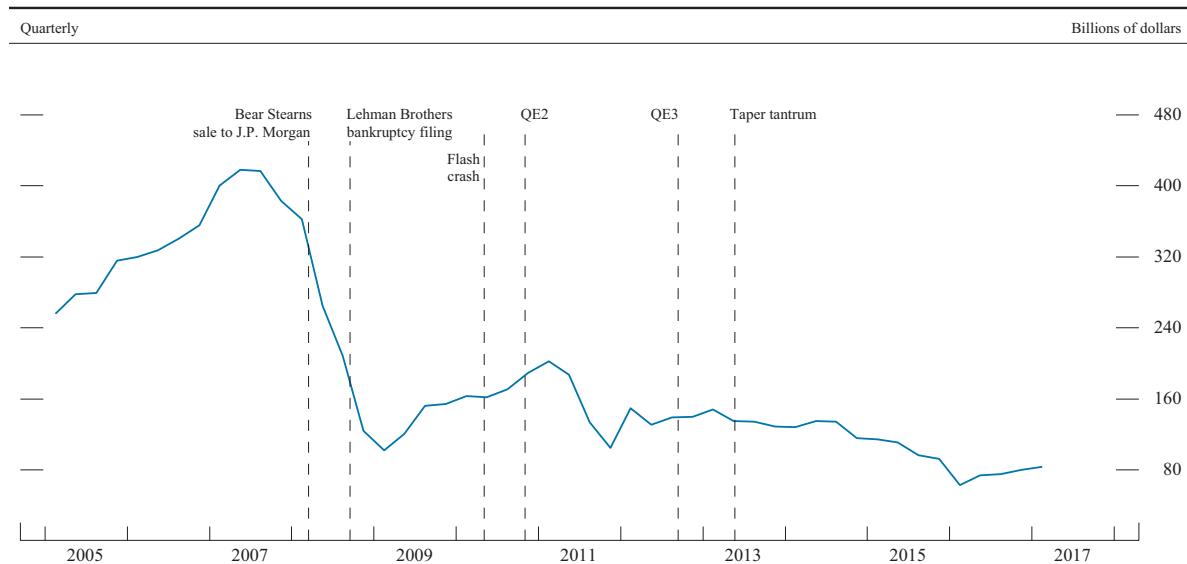
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2. See Yakov Amihud (2002), "Illiquidity and Stock Returns: Cross-Section and Time-Series Effects," *Journal of Financial Markets*, vol. 5 (January), pp. 31–56. The Amihud price effect measure is defined as the ratio of the percentage change in price (in absolute value) and the daily trading volume.

3. For detailed definitions of trade size and turnover in the context of corporate bond markets, see Francesco Trebbi and Kairong Xiao (2015), "Regulation and Market Liquidity," NBER Working Paper Series 21739 (Cambridge, Mass.: National Bureau of Economic Research, November).

4. See Jaewon Choi and Yesol Huh (2016), "Customer Liquidity Provision: Implications for Corporate Bond Transaction Costs," unpublished paper, July (revised January 2017), https://sites.google.com/site/yesolhuh/research/Choi_Huh_CLP.pdf. The authors suggest that transactions in which dealers act simply as brokers (that is, agents), rather than as intermediaries that hold assets on their balance sheets (principals), could reflect price concessions that dealers make to entice counterparties into the other side of a trade so that the dealers will not need to hold the traded assets.

B. Broker-dealer holdings of corporate and foreign bonds



SOURCE: Federal Reserve Board, Statistical Release Z.1, "Financial Accounts of the United States," L.130 Security Brokers and Dealers, June 8, 2017.

Recent Developments in Corporate Bond Market Liquidity (continued)

regulations—such as the Volcker rule and the supplementary leverage ratio, which aimed to make the financial system safer and sounder—and changes in technology may have contributed to the continued trend of lower dealer inventories.⁵

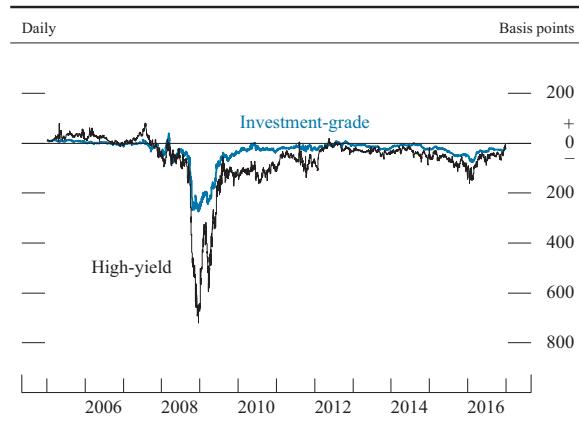
The factors affecting a dealer's willingness or capacity to facilitate trading may also affect other activities such as arbitrage trading, which equates prices for financing arrangements with economically similar risks. Therefore, impediments in arbitrage may also indicate market illiquidity. One widely studied no-arbitrage relationship is the so-called CDS–bond basis, the difference between bonds' credit default swap (CDS) spreads and bond-implied credit spreads.⁶ Figure C shows that the CDS–bond basis for corporate bonds was close to zero before the crisis, widened dramatically during the crisis (indicating a significant unrealized arbitrage opportunity), and has returned to a level closer to, but still below, zero in recent years. More recently, the CDS–bond basis has narrowed further.

Overall, the degree to which dealer balance sheet constraints affect corporate bond market liquidity depends not only on dealers' capacity and willingness to provide liquidity, but also on the extent to which nonbank financial institutions such as hedge funds, mutual funds, and insurance companies fill any lost market-making capacity. Other factors such as changes in technology, risk preferences, and investor composition also interact to shape the trading

5. See Tobias Adrian, Nina Boyarchenko, and Or Shachar (forthcoming), "Dealer Balance Sheets and Bond Liquidity Provision," *Journal of Monetary Economics*. They find that dealers subject to stricter regulations after the crisis are less able to intermediate customer trades in the corporate bond market. Also see Jack Bao, Maureen O'Hara, and Alex Zhou (2016), "The Volcker Rule and Market-Making in Times of Stress," Finance and Economics Discussion Series 2016-102 (Washington: Board of Governors of the Federal Reserve System, December), <https://www.federalreserve.gov/econresdata/feds/2016/files/2016102pap.pdf>. They show that recently downgraded bonds trade with a higher price effect after the introduction of the Volcker rule, although Anderson and Stulz find no such effects. See Mike Anderson and René M. Stulz (2017), "Is Post-Crisis Bond Liquidity Lower?" NBER Working Paper Series 23317 (Cambridge, Mass.: National Bureau of Economic Research, April).

6. For a more detailed discussion of the CDS–bond basis, see Nina Boyarchenko, Pooja Gupta, Nick Steele, and Jacqueline Yen (2016), "Trends in Credit Market Arbitrage," Staff Report 784 (New York: Federal Reserve Bank of New York, July; revised July 2016), https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr784.pdf.

C. CDS (credit default swap)–bond basis



NOTE: Data extend through December 30, 2016. The figure plots the CDS–bond basis for investment-grade and high-yield bonds. The CDS–bond basis is from J.P. Morgan and is computed for investment-grade and high-yield corporate bonds as the average difference between each bond's market CDS spread (interpolated to the bond maturity) and the theoretical CDS spread implied by the bond yield. See Boyarchenko and others (2016) in footnote 6 for details.

SOURCE: J.P. Morgan, CDS Data. (For additional information about the data from J.P. Morgan, see the note on the Contents page.)

environment.⁷ There are indications that market structure has changed in recent years, and trades in certain situations and market segments might have been more costly at times. But markets have also adjusted, and some measures of dislocation have lessened with these adjustments. In summary, liquidity conditions have been quite good overall since the Global Financial Crisis. The sharp deterioration of market liquidity during 2007 and 2008 illustrates clearly that the most significant risk has been distress at financial institutions. Any modest potential effects of regulation on liquidity should be balanced with the gains to resilience at large financial institutions associated with regulation.

7. See Darrell Duffie (2012), "Market Making under the Proposed Volcker Rule," Working Paper 3118 (Stanford, Calif.: Stanford Graduate School of Business, January), available at <https://www.gsb.stanford.edu/faculty-research/working-papers/market-making-under-proposed-volcker-rule>. He argues that the negative effect the Volcker rule may have on market liquidity in the short run may disappear in the long run as nonbanks step in to provide liquidity. See also Hendrik Bessembinder, Stacey E. Jacobson, William F. Maxwell, and Kumar Venkataraman (2016), "Capital Commitment and Illiquidity in Corporate Bonds," unpublished paper, March, <http://finance.bus.utk.edu/UTSMC/documents/BillMaxwellPapertopresent042016.pdf>. The authors find that bank dealers are less willing to provide liquidity now than in the recent past, while nonbank dealers are now more willing.

Bank credit continued to expand, though at a slower pace than in 2016, and bank profitability improved

Aggregate credit provided by commercial banks continued to increase through the first quarter of 2017, though at a slower pace than in 2016, leaving the ratio of total commercial bank credit to nominal GDP slightly lower (figure 35). The expansion of core loans slowed during 2017, consistent with banks' reports in the April SLOOS of weakened demand for most loan categories and tighter lending standards for commercial real estate loans. However, the growth of core loans appeared to be picking up somewhat during the second quarter. Measures of bank profitability have continued to improve so far this year but remained below their historical averages (figure 36).

Credit conditions in municipal bond markets have generally been stable

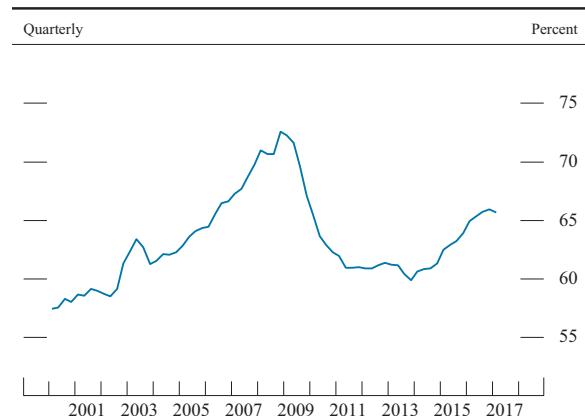
Credit conditions in municipal bond markets have generally remained stable since year-end. Over that period, yield spreads on 20-year general obligation municipal bonds over comparable-maturity Treasury securities were little changed on balance. Puerto Rico filed to enter a court-supervised process to restructure its debt after it failed to reach an agreement with bondholders, and several credit rating agencies downgraded the bond ratings of the state of Illinois. However, these events have had no noticeable effect on broader municipal bond markets.

International Developments

Foreign financial market conditions eased

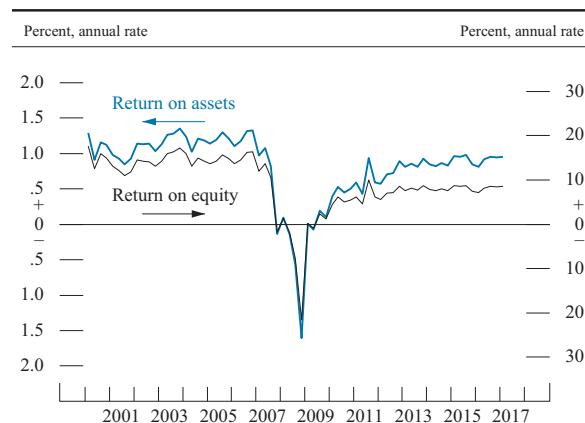
Financial market conditions in both the advanced foreign economies (AFEs) and the emerging market economies (EMEs) have generally eased since January. Better-than-expected data releases, robust corporate earnings, and the passage of risk events—such as national elections in some European countries—boosted investor confidence. Broad

35. 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"; Department of Commerce, Bureau of Economic Analysis.

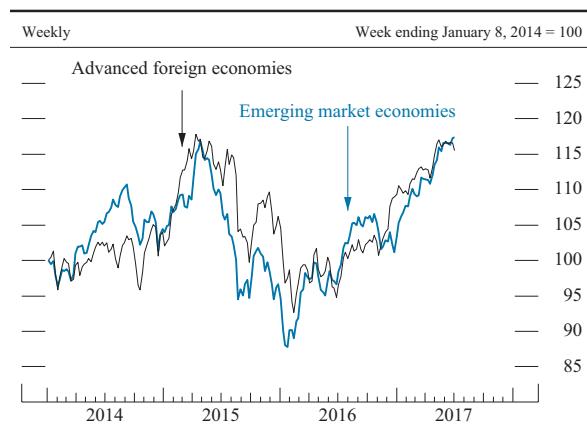
36. Profitability of bank holding companies



NOTE: The data are quarterly and are seasonally adjusted.

SOURCE: Federal Reserve Board, Form FR Y-9C, Consolidated Financial Statements for Bank Holding Companies.

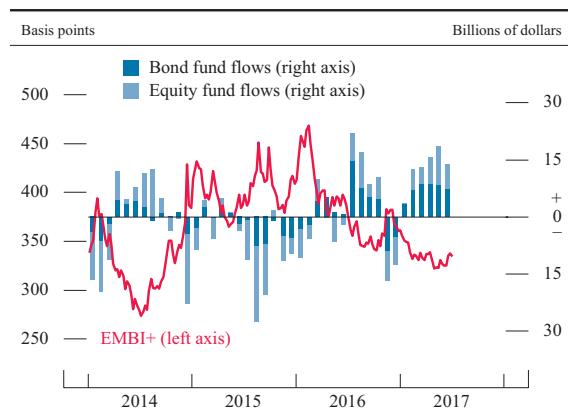
37. Equity indexes for selected foreign economies



NOTE: The data are weekly averages of daily data and extend through July 5, 2017.

SOURCE: For advanced foreign economies, MSCI EAFE Index via Thomson Reuters Eikon with Datastream for Office; for emerging market economies, MSCI Emerging Markets Index via Thomson Reuters Eikon with Datastream for Office.

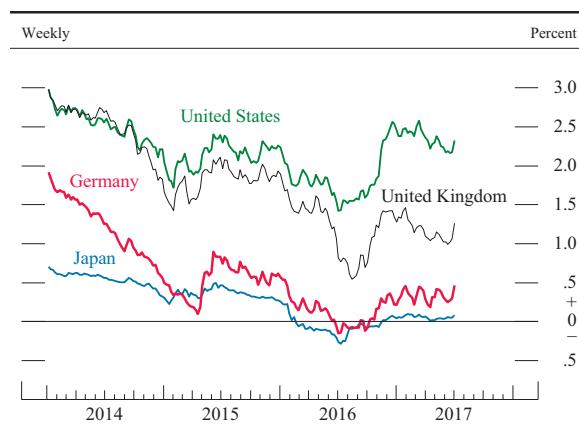
38. Emerging market mutual fund flows and spreads



NOTE: The EMBI+ data are weekly averages of daily data and extend through July 5, 2017. The EPFR data are monthly sums of weekly data. The fund flows data exclude funds located in China.

SOURCE: For bond and equity fund flows, EPFR Global; for EMBI+, J.P. Morgan Emerging Markets Bond Index Plus via Bloomberg.

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



NOTE: The data are weekly averages of daily benchmark yields and extend through July 5, 2017.

SOURCE: Bloomberg.

equity indexes in advanced and emerging foreign economies rose further (figure 37). In addition, spreads of emerging market sovereign bonds over U.S. Treasury securities narrowed, and capital flows into emerging market mutual funds picked up (figure 38). Government bond yields in the AFEs generally remained very low, partly reflecting investor expectations that substantial monetary policy accommodation would be required for some time (figure 39). In the United Kingdom, softer macroeconomic data and uncertainty about future policies and growth as the country begins the process of exiting the European Union also weighed on yields. However, AFE government bond yields picked up somewhat in late June, partly reflecting investors' focus on remarks by officials from some AFE central banks suggesting possible shifts toward less accommodative policy stances. In the euro area, bank supervisors intervened to prevent the disorderly failure of a few small to medium-sized lenders in Italy and Spain; business disruptions were minimal, and spillovers to other European banks were limited.

The dollar depreciated somewhat

Since the start of the year, the broad dollar index—a measure of the trade-weighted value of the dollar against foreign currencies—has depreciated about 5 percent, on balance, after rising more than 20 percent between mid-2014 and late 2016 (figure 40). The weakening since the start of the year partly reflected growing uncertainty about prospects for more expansionary U.S. fiscal policy as well as mounting confidence in the foreign economic outlook. The euro rose against the dollar following the French presidential election, and the Mexican peso appreciated substantially as the Mexican central bank tightened monetary policy and as investor concerns about the potential for substantial disruptions of U.S.–Mexico trade appeared to ease.

Economic activity in the AFEs grew at a solid pace

In the first quarter, real GDP grew at a solid pace in Canada, the euro area, and Japan, partly reflecting robust growth in fixed investment in all three economies (figure 41). In contrast, economic growth slowed to a tepid pace in the United Kingdom, reflecting weaker consumption growth and a decline in exports. In most AFEs, economic survey indicators, such as purchasing manager surveys, generally remained consistent with continued economic growth at a solid pace during the second quarter.

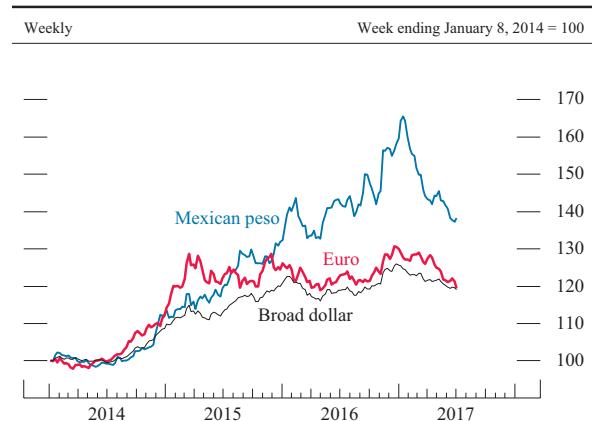
Inflation leveled off in most AFEs . . .

In late 2016, consumer price inflation (measured as a 12-month percent change) rose substantially in most AFEs, partly reflecting increases in energy prices (figure 42). Since then, inflation has leveled off in Japan and declined somewhat in the euro area as upward pressure from energy prices eased, core inflation stayed low, and wage growth was subdued even as unemployment rates declined further in both economies. In contrast, in the United Kingdom, headline inflation rose well above the Bank of England's (BOE) 2 percent target, largely reflecting upward pressure from the substantial sterling depreciation since the Brexit referendum in June 2016.

. . . and AFE central banks maintained highly accommodative monetary policies

AFE central banks kept their policy rates at historically low levels, and the Bank of Japan kept its target range for 10-year government bond yields near zero. The European Central Bank (ECB) maintained its asset purchase program, though it slightly reduced the pace of purchases, and the BOE completed the bond purchase program it announced last August. However, the Bank of Canada, BOE, and ECB have recently suggested that if growth continues to reduce resource slack, some policy accommodation could be withdrawn. The ECB remarked that the forces

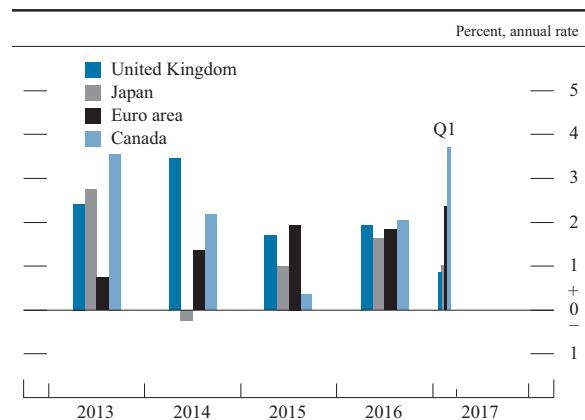
40. U.S. dollar exchange rate indexes



NOTE: The data, which are in foreign currency units per dollar, are weekly averages of daily data and extend through July 5, 2017.

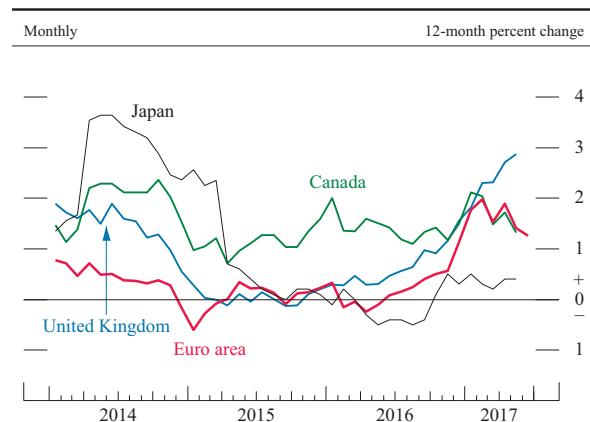
SOURCE: Federal Reserve Board, Statistical Release H.10, "Foreign Exchange Rates."

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



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.

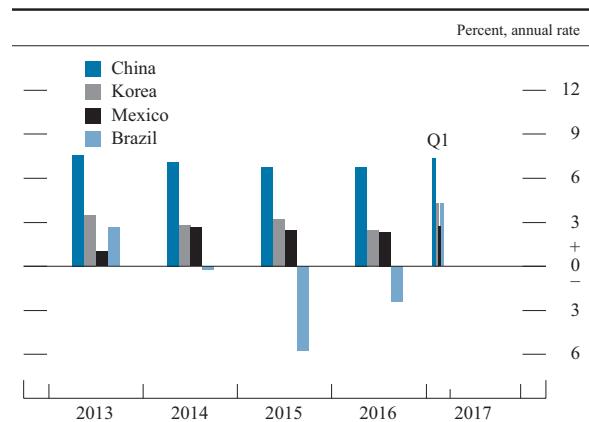
42. Inflation in selected advanced foreign economies



NOTE: The data for the euro area incorporate the flash estimate for June 2017. The data for Canada, Japan, and the United Kingdom extend through May 2017.

SOURCE: For the United Kingdom, Office for National Statistics; for Japan, Ministry of International Affairs and Communications; for the euro area, Statistical Office of the European Communities; for Canada, Statistics Canada; all via Haver Analytics.

43. 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.

SOURCE: For China, China National Bureau of Statistics; 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.

holding down inflation could be temporary. The BOE indicated that some monetary accommodation might need to be removed if the tradeoff between supporting employment and expediting the return of inflation to its target is reduced.

In EMEs, Asian growth was solid . . .

Chinese economic activity was robust in the first quarter of 2017 as a result of solid domestic and external demand (figure 43). More recent indicators suggest that growth moderated in the second quarter as Chinese authorities tightened financial conditions and as export growth slowed. In some other emerging Asian economies, growth picked up in early 2017 as a result of stronger external demand and manufacturing activity. However, growth of the region's exports, especially to China, slowed so far in the second quarter.

. . . and many Latin American economies continue their tepid recovery

In Mexico, growth decelerated a touch in the first quarter of 2017, partly reflecting a slowdown in private consumption following sharp hikes in domestic fuel prices. These price hikes, together with the effects of earlier peso depreciation on import prices, contributed to a sharp rise in Mexican inflation, which prompted the Bank of Mexico to further tighten monetary policy. Following a prolonged period of contraction, the Brazilian economy posted solid growth in the first quarter of 2017, partly reflecting a surge in exports and a strong harvest. However, domestic demand has remained very weak amid high unemployment and heightened political tensions, and indicators of economic activity have stepped down recently. In Brazil and some other South American economies, declining inflation has led central banks to reduce their policy interest rates.

PART 2

MONETARY POLICY

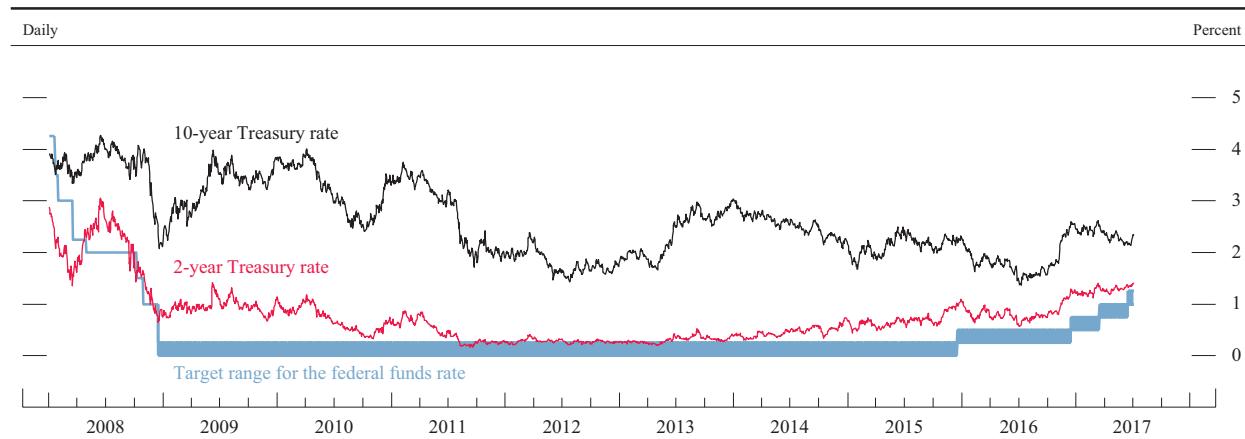
The Federal Open Market Committee raised the federal funds rate target range in March and June

Over the past year and a half, the Federal Open Market Committee (FOMC) has been gradually increasing its target range for the federal funds rate as the economy continued to make progress toward the Committee's objectives of maximum employment and price stability. After having raised the target range for the federal funds rate last December, the Committee decided to raise the target range again in March and in June, bringing it to 1 to 1¼ percent (figure 44).⁵ The FOMC's decisions reflected the progress the economy has made, and is expected to make, toward the Committee's objectives.

When the Committee met in March, it decided to raise the target range for the federal funds rate to ¾ to 1 percent. Available information suggested that the labor market had continued

5. See Board of Governors of the Federal Reserve System (2017), "Federal Reserve Issues FOMC Statement," press release, March 15, <https://www.federalreserve.gov/newsreleases/monetary20170315a.htm>; and Board of Governors of the Federal Reserve System (2017), "Federal Reserve Issues FOMC Statement," press release, June 14, <https://www.federalreserve.gov/newsreleases/monetary20170614a.htm>.

44. 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.

to strengthen even as growth in economic activity slowed during the first quarter. Inflation measured on a 12-month basis had moved up appreciably and was close to the Committee's 2 percent longer-run objective. Core inflation, which excludes volatile energy and food prices, continued to run somewhat below 2 percent.

The data available at the time of the June FOMC meeting suggested a rebound in economic activity in the second quarter, leaving the projected average pace of growth over the first half of the year at a moderate level. The labor market had continued to strengthen, with the unemployment rate falling nearly ½ percentage point since the beginning of the year to 4.3 percent in May, a low level by historical standards and modestly below the median of FOMC participants' estimates of its longer-run normal level. Inflation measured on a 12-month basis had declined over the previous few months but was still up significantly since last summer. Like the headline inflation measure, core inflation was running somewhat below 2 percent. With employment expected to remain near its maximum sustainable level, the Committee continued to expect that inflation would move up and stabilize around 2 percent over the next couple of years, in line with the Committee's

longer-run objective. In view of realized and expected labor market conditions and inflation, the Committee decided to raise the target another $\frac{1}{4}$ percentage point to a range of 1 to $1\frac{1}{4}$ percent.

Monetary policy continues to support economic growth

Even with the gradual reductions in the amount of policy accommodation to date, the Committee judges that the stance of monetary policy remains accommodative, thereby supporting some further strengthening in labor market conditions and a sustained return to 2 percent inflation. In particular, the federal funds rate appears to remain somewhat below its neutral level—that is, the level of the federal funds rate that is neither expansionary nor contractionary.

In evaluating the stance of monetary policy, policymakers routinely consult prescriptions from a variety of policy rules, which can serve as useful benchmarks. However, the use and interpretation of such prescriptions require careful judgments about the choice and measurement of the inputs to these rules as well as the implications of the many considerations these rules do not take into account (see the box “Monetary Policy Rules and Their Role in the Federal Reserve’s Policy Process”).

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

The FOMC has continued to emphasize that, in determining the timing and size of future adjustments to the target range for the federal funds rate, it will assess realized and expected economic conditions relative to its objectives of maximum employment and 2 percent inflation. This assessment will take into account a wide range of information, including measures of labor market conditions, indicators of inflation pressures and inflation expectations, and readings on financial and international developments. The Committee will carefully monitor actual and

expected inflation developments relative to its symmetric inflation goal.

The Committee currently expects that the ongoing strength in the economy will warrant gradual increases in the federal funds rate, and that the federal funds rate will likely remain, for some time, below the levels that the Committee expects to prevail in the longer run. Consistent with this outlook, in the most recent Summary of Economic Projections, which was compiled at the time of the June FOMC meeting, most FOMC participants projected that the appropriate level of the federal funds rate would be below its longer-run level through 2018.⁶

The size of the Federal Reserve’s balance sheet has remained stable so far this year

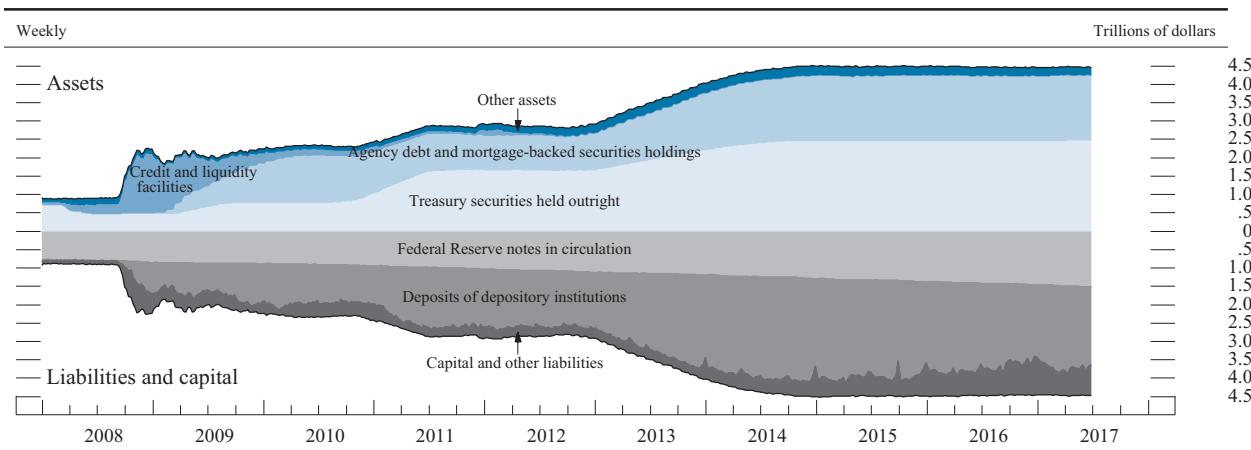
To help maintain accommodative financial conditions, the Committee has continued its existing policy of reinvesting principal payments from its holdings of agency debt and agency mortgage-backed securities in agency mortgage-backed securities and rolling over maturing Treasury securities at auction. Consequently, the Federal Reserve’s total assets have held steady at around \$4.5 trillion, with holdings of U.S. Treasury securities at \$2.5 trillion and holdings of agency debt and agency mortgage-backed securities at approximately \$1.8 trillion (figure 45). Total liabilities on the Federal Reserve’s balance sheet were also mostly unchanged over the first half of 2017.

The Committee intends to implement a balance sheet normalization program

In June, policymakers augmented the Committee’s Policy Normalization Principles and Plans issued in September 2014 by providing additional details regarding the approach the FOMC intends to use to reduce

6. See the June 2017 Summary of Economic Projections, which appeared as an addendum to the minutes of the June 13–14, 2017, meeting of the Federal Open Market Committee and is included as Part 3 of this report.

45. 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 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 June 28, 2017.

SOURCE: Federal Reserve Board, Statistical Release H.4.1, “Factors Affecting Reserve Balances.”

the Federal Reserve’s holdings of Treasury and agency securities once normalization of the federal funds rate is well under way.⁷ The Committee intends to gradually reduce the Federal Reserve’s securities holdings by decreasing its reinvestment of the principal payments it receives from the securities held in the System Open Market Account. Specifically, such payments will be reinvested only to the extent that they exceed gradually rising caps. Initially, these caps will be set at relatively low levels to limit the volume of securities that private investors will have to absorb. The Committee currently expects that, provided the economy evolves broadly as anticipated, it would likely begin to implement the program this year. In addition, the Committee affirmed that changing the target range for the federal funds rate remains its primary means of adjusting the stance of monetary policy (see the box “Addendum to the Policy Normalization Principles and Plans”).

The Federal Reserve’s implementation of monetary policy has continued smoothly

The Federal Reserve successfully raised the effective federal funds rate in March and June of 2017 by increasing the interest rate paid on reserve balances along with the interest rate offered on overnight reverse repurchase agreements (ON RRP). Specifically, the Federal Reserve increased the interest rate paid on required and excess reserve balances to 1.00 percent in March and 1.25 percent in June while increasing the ON RRP offering rate to 0.75 percent in March and 1.00 percent in June. In addition, the Board of Governors approved ¼ percentage point increases in the discount rate (the primary credit rate) in March and June. In both March and June, the effective federal funds rate rose near the middle of its new target range amid orderly trading conditions in money markets, closely tracked by most other overnight money market rates.

Usage of the ON RRP facility, which had increased late last year as a result of higher demand by government money market funds in the wake of last October’s money fund reform, has declined some, on average, in recent months. However, usage has remained somewhat above its levels of one year ago.

7. See Board of Governors of the Federal Reserve System (2017), “FOMC Issues Addendum to the Policy Normalization Principles and Plans,” press release, June 14, <https://www.federalreserve.gov/newsreleases/monetary20170614c.htm>.

Monetary Policy Rules and Their Role in the Federal Reserve's Policy Process

What are monetary policy rules?

Monetary policy rules are formulas that prescribe a tight link between a small number of economic variables—typically including the gap between actual and target inflation along with an estimate of resource slack in the economy—and the setting of a policy rate, such as the federal funds rate.¹ While policy rules can provide helpful guidance for policymakers, their interpretation requires careful judgment about the measurement of the inputs to these rules and the implications of the many considerations these rules do not take into account.

Policy rules can incorporate key principles of good monetary policy. One key principle is that monetary policy should respond in a predictable way to changes in economic conditions. A second key principle is that monetary policy should be accommodative when inflation is below the desired level and employment is below its maximum sustainable level; conversely, monetary policy should be restrictive when the opposite holds. A third key principle is that, to stabilize inflation, the policy rate should be adjusted 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 as well as other rules discussed later: the “balanced approach” rule, the “adjusted Taylor (1993)” rule, the “change” rule, and the “first difference” rule (figure A).² These policy rules generally embody the three key principles of good monetary policy noted earlier. Each rule takes into account two gaps—the difference between inflation and its objective (2 percent as measured by the price index for personal consumption expenditures (PCE), in the case of the Federal Reserve) as well as the difference between the

1. There is a lengthy academic and intellectual debate about using rules to guide monetary policy; prominent examples of rules heavily discussed in the literature and influential on policymaking in earlier periods include the gold standard and Milton Friedman’s constant money growth rule.

2. The Taylor (1993) rule was first 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. The change rule was discussed in John B. Taylor (1999), “The Robustness and Efficiency of Monetary Policy Rules as Guidelines for

rate of unemployment in the longer run (u^{LR}) and the current unemployment rate.³ Unlike the other rules, the first-difference rule considers the change in the unemployment gap rather than its level.

The Taylor (1993), balanced-approach, and adjusted Taylor (1993) rules provide prescriptions for the *level* of the federal funds rate and require an estimate of the neutral real interest rate in the longer run (r^{LR})—that is, the level of the real federal funds rate that is expected to be consistent with sustaining maximum employment and stable inflation in the longer run.⁴ In contrast, the change and first-difference rules prescribe how the level of the federal funds rate at a given time should be altered from its previous level—that is, they indicate how the existing rate should *change* over time. The adjusted Taylor (1993) rule recognizes that the federal funds rate cannot be reduced materially below zero, implying that interest rate policy alone may not be able to provide enough policy accommodation during periods when the unadjusted Taylor (1993) rule prescribes setting the federal funds rate below zero. To make up for the cumulative shortfall in accommodation (Z_t), the adjusted rule prescribes only a gradual return of the policy rate to the (positive) levels prescribed by the unadjusted Taylor (1993) rule as the economy recovers.

The small number of variables involved in policy rules makes them easy to use. However, the U.S.

Interest Rate Setting by the European Central Bank,” *Journal of Monetary Economics*, vol. 43 (June), pp. 655–79. Finally, the first-difference rule was introduced 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.

3. The 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 what GDP would be if the economy was operating at maximum employment). The rules in figure A represent slack in resource utilization using the unemployment gap instead, because that gap better captures the Federal Open Market Committee’s statutory goal to promote maximum employment. Movements in these alternative measures of resource utilization are highly correlated. For more information, see the note below figure A.

4. Taylor-type rules—including John Taylor’s original rule—have often been estimated assuming that the value of the neutral real interest rate in the longer run, r^{LR} , is equal to 2 percent, which roughly corresponds to the average historical value of the real federal funds rate before the financial crisis.

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	$R_t^{BA} = r_t^{LR} + \pi_t + 0.5(\pi_t - \pi^{LR}) + 2(u_t^{LR} - u_t)$
Taylor (1993) rule, adjusted	$R_t^{T93adj} = \text{maximum } \{R_t^{T93} - Z_t, 0\}$
Change rule	$R_t^C = R_{t-1} + 1.2(\pi_t - \pi^{LR}) + 2(u_t^{LR} - u_t)$
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^C , and R_t^{FD} represent the values of the nominal federal funds rate prescribed by the Taylor (1993), balanced-approach, adjusted Taylor (1993), change, and first-difference rules, respectively.

R_t denotes the actual nominal federal funds rate for quarter t , π_t is four-quarter price inflation for quarter t , and u_t is the unemployment rate in quarter t . r_t^{LR} is the level of the neutral real federal funds rate in the longer run that, on average, is expected to be consistent with sustaining maximum employment and inflation at its 2 percent longer-run objective, π^{LR} . u_t^{LR} is the rate of unemployment 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.

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) in order to represent the rules in terms of the FOMC's statutory goals. Historically, movements in the output and unemployment gaps have been highly correlated. Footnote 2 provides references for the policy rules.

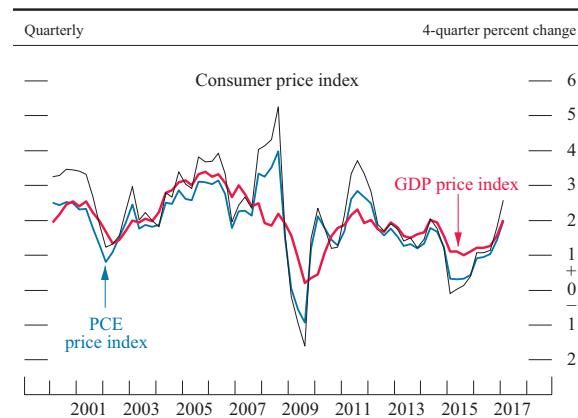
economy is highly complex, and these rules, by their very nature, do not capture that complexity. For example, while the unemployment rate is an important measure of the state of the labor market, it often lags business cycle developments and does not provide a complete measure of slack or tightness. In practice, Federal Open Market Committee (FOMC) policymakers examine a great deal of information about the labor market to gauge its health; this information includes broader measures of labor underutilization, the labor force participation rate, employment, hours worked, and the rates of job openings, hiring, layoffs, and quits, as well as anecdotal information not easily reduced to numerical indexes.⁵

Another issue related to the implementation of rules involves the measurement of the variables that drive the prescriptions generated by the rules. For example, there are many measures of inflation, and they do not always move together or by the same amount. The broadest measure of inflation, shown by the percent change in the gross domestic product price index, displays notable differences from measures that gauge changes in consumer prices (figure B). Even measures that focus

(continued on next page)

5. For a discussion of these and other metrics of the labor market, see Hess Chung, Bruce Fallick, Christopher Nekarda,

B. Inflation measures



SOURCE: Gross domestic product (GDP) and personal consumption expenditures (PCE) data are from the Bureau of Economic Analysis, Gross Domestic Product: Implicit Price Deflator (GDPDEF) and Personal Consumption Expenditures, retrieved from FRED, Federal Reserve Bank of St. Louis; consumer price index data are from the Department of Labor, Bureau of Labor Statistics.

and David Ratner (2014), "Assessing the Change in Labor Market Conditions," FEDS Notes (Washington: Board of Governors of the Federal Reserve System, May 22), <https://www.federalreserve.gov/econresdata/notes/feds-notes/2014/assessing-the-change-in-labor-market-conditions-20140522.html>.

Monetary Policy Rules and Their Role in the Federal Reserve's Policy Process (continued)

on the prices paid by consumers differ importantly. For example, inflation as measured by the consumer price index (or CPI) has generally been somewhat higher historically than inflation measured using the PCE price index (the index to which the FOMC's 2 percent longer-run inflation objective refers). Core inflation, meaning inflation excluding changes in food and energy prices, is less volatile than headline inflation and is often used in estimating monetary policy rules because it has historically been a good predictor of future headline inflation (figure C).

In addition, both the level of the neutral real interest rate in the longer run and the level of the unemployment rate that is sustainable in the longer run are difficult to estimate precisely, and estimates made in real time may differ substantially from estimates made later on, after the relevant economic data have been revised and additional data have become available.⁶ For example, since 2000, respondents to the Blue Chip survey have markedly reduced their projections of the longer-run level of the real short-term interest rate (figure D). Survey respondents have also made considerable changes over time to their estimates of the rate of unemployment in the longer run, with consequences for the unemployment gap. Revisions of this magnitude to the neutral real interest rate and the rate of unemployment in the longer run can have important implications for the federal funds rate prescribed by monetary policy rules. Sensible estimation of policy rules requires that policymakers take into account these changes in the projected values of longer-run rates as they occur over time.

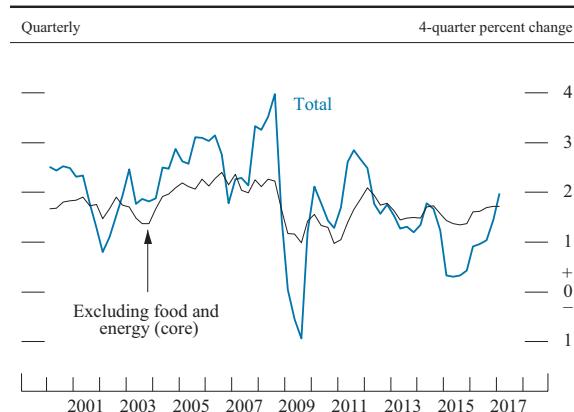
Furthermore, the prescribed responsiveness of the federal funds rate to its determinants differs across policy rules. For example, the sensitivity of the federal funds rate to the unemployment gap in the balanced-approach rule is twice as large as it is in the Taylor (1993) rule. The fact that the policy interest rate responds differently to the inflation and unemployment gaps in the different policy rules means that the rules provide different tradeoffs between stabilizing inflation and stabilizing unemployment.

Finally, monetary policy rules do not take account of broader risk considerations. For example, policymakers

6. The change and first-difference rules shown in figure A reduce the need for good estimates of longer-run rates because they do not require an estimate of the neutral real interest rate in the longer run. However, these rules have their own shortcomings. For example, research suggests that such rules will result in greater volatility in employment and inflation relative to what would be obtained under the Taylor (1993) and balanced-approach rules unless the estimates of the neutral real federal funds rate in the longer run and the rate of unemployment in the longer run are sufficiently far from their true values.

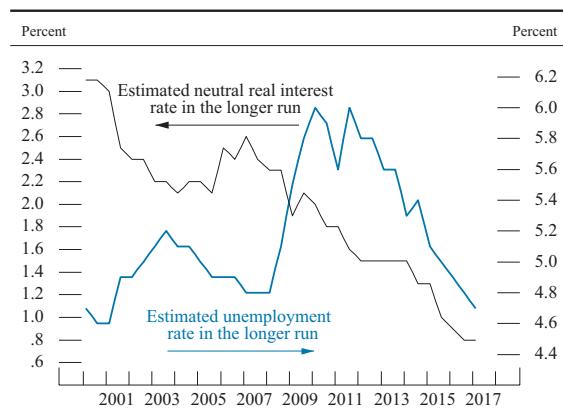
routinely assess risks to financial stability. Furthermore, over the past few years, with the federal funds rate still close to zero, the FOMC has recognized that it would have limited scope to respond to an unexpected weakening in the economy by lowering short-term interest rates. This asymmetric risk has, in recent years, provided a sound rationale for following a more gradual path of rate increases than that prescribed by policy rules. (Asymmetric risk need not always provide a rationale for a more gradual path; if the risks were strongly tilted toward substantial and persistent overheating and too-high inflation, the asymmetric

C. Total inflation versus core inflation



SOURCE: Bureau of Economic Analysis.

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



NOTE: The data for the estimated neutral real interest rate in the longer run and the estimated unemployment rate in the longer run are biannual and have been interpolated to yield quarterly values. The estimated neutral real interest rate in the longer run equals the three-month Treasury bill rate projected in the long run deflated by the long-run projected annual change in the price index for gross domestic product.

SOURCE: Wolters Kluwer, Blue Chip Economic Indicators.

risk could argue for higher rates than prescribed by simple rules.)

How does the FOMC use monetary policy rules?

In the briefing materials prepared for FOMC meetings, Federal Reserve staff regularly report prescriptions for the current setting of the federal funds rate from a number of monetary policy rules.⁷ FOMC policymakers discussed prescriptions from monetary policy rules as long ago as 1995 and have consulted them routinely since 2004. The materials that FOMC policymakers see also include forecasts of how the federal funds rate and key macro indicators would evolve, under each of the rules, several years into the future. Policymakers weigh this information, along with other information bearing on the economic outlook.⁸

Different monetary policy rules often offer quite different prescriptions for the federal funds rate; moreover, there is no obvious metric for favoring one rule over another. While monetary policy rules

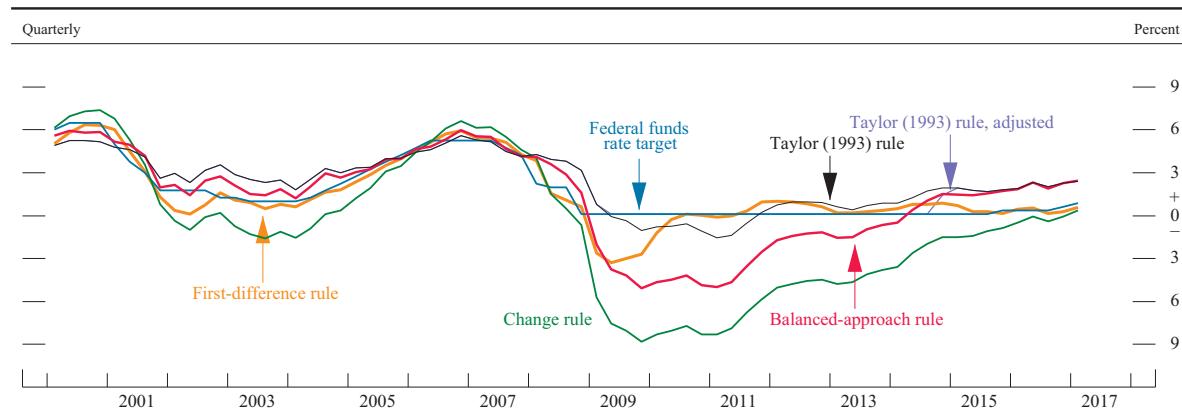
7. Prescriptions from monetary policy rules are included in the Board staff's Tealbook (previously the Bluebook); the precise set of rules presented has changed from time to time. The transcripts and briefing materials for FOMC meetings through 2011 are available on the Board's website at https://www.federalreserve.gov/monetarypolicy/fomc_historical.htm. In the materials from 2011, the policy rule prescriptions are contained in the Monetary Policy Strategies section of Tealbook B.

8. The briefing materials that FOMC policymakers review regularly include the Board staff's baseline forecast for the economy and model simulations of a variety of alternative scenarios intended to provide a sense of the effects of other plausible developments that were not included in the staff's baseline forecast.

often agree about the direction (up or down) in which policymakers should move the federal funds rate, they frequently disagree about the appropriate level of that rate. Historical prescriptions from policy rules differ from one another and also differ from the Committee's target for the federal funds rate, as shown in figure E. (These prescriptions are calculated using both the actual data and the estimates of the neutral real interest rate in the longer run and of the rate of unemployment in the longer run—data and estimates that were available to FOMC policymakers at the time.) Moreover, the rules sometimes prescribe setting short-term interest rates well below zero—a setting that is not feasible. With the exception of the adjusted Taylor (1993) rule, which imposes a lower limit of zero, all of the rules shown in figure E called for the federal funds rate to turn negative in 2009 and to stay below zero for several years thereafter. Thus, these rules indicated that the Federal Reserve should provide more monetary stimulus than could be achieved by setting the federal funds rate at zero. While all of the policy rules have called for higher values of the federal funds rate in recent years, the pace of tightening that the rules prescribe has varied widely. Prescriptions from these rules for the level of the federal funds rate in the first quarter of 2017 ranged from 37 basis points (change rule) to 2.5 percent (balanced-approach rule).⁹

9. As noted earlier, the adjusted rule limits increases in the federal funds rate for a time during economic recoveries to make up for past shortfalls in accommodation caused by the zero lower limit on interest rates. This principle can also be applied to the prescriptions of the other rules. If applied to the balanced-approach rule, for example, it would have called for the federal funds rate to have remained at zero at least through the first quarter of 2017.

E. Historical federal funds rate prescriptions from simple policy rules



NOTE: The rules use real-time historical values of inflation, the federal funds rate, and the unemployment rate. Inflation is measured as the four-quarter percent change in the price index for personal consumption expenditures excluding food and energy. Quarterly projections of long-run values for the federal funds rate and the unemployment rate are derived through interpolations of biannual projections from Blue Chip Economic Indicators. The long-run value for inflation is taken as 2 percent.

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

Addendum to the Policy Normalization Principles and Plans

Adopted effective September 16, 2014; as amended effective June 14, 2017

All participants agreed to augment the Committee's Policy Normalization Principles and Plans by providing the following additional details regarding the approach the FOMC intends to use to reduce the Federal Reserve's holdings of Treasury and agency securities once normalization of the level of the federal funds rate is well under way.¹

- The Committee intends to gradually reduce the Federal Reserve's securities holdings by decreasing its reinvestment of the principal payments it receives from securities held in the System Open Market Account. Specifically, such payments will be reinvested only to the extent that they exceed gradually rising caps.
 - For payments of principal that the Federal Reserve receives from maturing Treasury securities, the Committee anticipates that the cap will be \$6 billion per month initially and will increase in steps of \$6 billion at three-month intervals over 12 months until it reaches \$30 billion per month.
 - For payments of principal that the Federal Reserve receives from its holdings of agency debt and mortgage-backed securities, the Committee anticipates that the cap will be \$4 billion per month initially and will increase in steps of \$4 billion at three-month intervals over 12 months until it reaches \$20 billion per month.

1. The Committee's Policy Normalization Principles and Plans were adopted on September 16, 2014, and are available at www.federalreserve.gov/monetarypolicy/files/FOMC_PolicyNormalization.pdf. On March 18, 2015, the Committee adopted an addendum to the Policy Normalization Principles and Plans, which is available at www.federalreserve.gov/monetarypolicy/files/FOMC_PolicyNormalization.20150318.pdf.

- The Committee also anticipates that the caps will remain in place once they reach their respective maximums so that the Federal Reserve's securities holdings will continue to decline in a gradual and predictable manner until the Committee judges that the Federal Reserve is holding no more securities than necessary to implement monetary policy efficiently and effectively.

- Gradually reducing the Federal Reserve's securities holdings will result in a declining supply of reserve balances. The Committee currently anticipates reducing the quantity of reserve balances, over time, to a level appreciably below that seen in recent years but larger than before the financial crisis; the level will reflect the banking system's demand for reserve balances and the Committee's decisions about how to implement monetary policy most efficiently and effectively in the future. The Committee expects to learn more about the underlying demand for reserves during the process of balance sheet normalization.
- The Committee affirms that changing the target range for the federal funds rate is its primary means of adjusting the stance of monetary policy. However, the Committee would be prepared to resume reinvestment of principal payments received on securities held by the Federal Reserve if a material deterioration in the economic outlook were to warrant a sizable reduction in the Committee's target for the federal funds rate. Moreover, the Committee would be prepared to use its full range of tools, including altering the size and composition of its balance sheet, if future economic conditions were to warrant a more accommodative monetary policy than can be achieved solely by reducing the federal funds rate.

PART 3

SUMMARY OF ECONOMIC PROJECTIONS

The following material appeared as an addendum to the minutes of the June 13–14, 2017, meeting of the Federal Open Market Committee.

In conjunction with the Federal Open Market Committee (FOMC) meeting held on June 13–14, 2017, meeting participants submitted their projections of the most likely outcomes for real output growth, the unemployment rate, and inflation for each year from 2017 to 2019 and over the longer run.⁸ Each participant's projection was 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.⁹ 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.¹⁰ "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 Federal Reserve's objectives of maximum employment and stable prices.

All participants who submitted longer-run projections expected that, under appropriate monetary policy, growth in real gross domestic product (GDP) this year would run somewhat above their individual estimates of its longer-run rate. Over half of these participants expected that economic growth would slow a bit in 2018, and almost all of them expected that in 2019 economic growth would run at or near its longer-run level. All participants who submitted longer-run projections expected that the unemployment rate would run below their estimates of its longer-run normal level in 2017 and remain below that level through 2019. The majority of participants also lowered their estimates of the longer-run normal rate of unemployment by 0.1 to 0.2 percentage point. All participants projected that inflation, as measured by the four-quarter percentage change in the price index for personal consumption expenditures (PCE), would run below 2 percent in 2017 and then step up in the next two years; over half of them projected that inflation would be at the Committee's 2 percent objective in 2019, and all judged that inflation would be within a couple of tenths of a percentage point of the objective in that year. Table 1 and figure 1 provide summary statistics for the projections.

8. Four members of the Board of Governors, one fewer than in March 2017, were in office at the time of the June 2017 meeting and submitted economic projections. The office of the president of the Federal Reserve Bank of Richmond was vacant at the time of this FOMC meeting; First Vice President Mark L. Mullinix submitted economic projections.

9. All participants submitted their projections in advance of the FOMC meeting; no projections were revised following the release of economic data on the morning of June 14.

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

As shown in figure 2, participants generally expected that evolving economic conditions would likely warrant further gradual increases in the federal funds rate to achieve and sustain maximum employment and 2 percent inflation. Although some participants raised or lowered their federal funds rate projections since March, the median projections for the federal funds rate in 2017 and 2018 were essentially unchanged, and the median projection in 2019 was slightly lower; the median projection for the longer-run federal funds rate was

Table 1. Economic projections of Federal Reserve Board members and Federal Reserve Bank presidents under their individual assessments of projected appropriate monetary policy, June 2017

Percent

Variable	Median ¹				Central tendency ²				Range ³			
	2017	2018	2019	Longer run	2017	2018	2019	Longer run	2017	2018	2019	Longer run
Change in real GDP	2.2	2.1	1.9	1.8	2.1–2.2	1.8–2.2	1.8–2.0	1.8–2.0	2.0–2.5	1.7–2.3	1.4–2.3	1.5–2.2
March projection.....	2.1	2.1	1.9	1.8	2.0–2.2	1.8–2.3	1.8–2.0	1.8–2.0	1.7–2.3	1.7–2.4	1.5–2.2	1.6–2.2
Unemployment rate.....	4.3	4.2	4.2	4.6	4.2–4.3	4.0–4.3	4.1–4.4	4.5–4.8	4.1–4.5	3.9–4.5	3.8–4.5	4.5–5.0
March projection.....	4.5	4.5	4.5	4.7	4.5–4.6	4.3–4.6	4.3–4.7	4.7–5.0	4.4–4.7	4.2–4.7	4.1–4.8	4.5–5.0
PCE inflation.....	1.6	2.0	2.0	2.0	1.6–1.7	1.8–2.0	2.0–2.1	2.0	1.5–1.8	1.7–2.1	1.8–2.2	2.0
March projection.....	1.9	2.0	2.0	2.0	1.8–2.0	1.9–2.0	2.0–2.1	2.0	1.7–2.1	1.8–2.1	1.8–2.2	2.0
Core PCE inflation ⁴	1.7	2.0	2.0		1.6–1.7	1.8–2.0	2.0–2.1		1.6–1.8	1.7–2.1	1.8–2.2	
March projection.....	1.9	2.0	2.0		1.8–1.9	1.9–2.0	2.0–2.1		1.7–2.0	1.8–2.1	1.8–2.2	
Memo: Projected appropriate policy path												
Federal funds rate	1.4	2.1	2.9	3.0	1.1–1.6	1.9–2.6	2.6–3.1	2.8–3.0	1.1–1.6	1.1–3.1	1.1–4.1	2.5–3.5
March projection.....	1.4	2.1	3.0	3.0	1.4–1.6	2.1–2.9	2.6–3.3	2.8–3.0	0.9–2.1	0.9–3.4	0.9–3.9	2.5–3.8

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 March projections were made in conjunction with the meeting of the Federal Open Market Committee on March 14–15, 2017. 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 March 14–15, 2017, meeting, and one participant did not submit such projections in conjunction with the June 13–14, 2017, 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.

unchanged. However, the economic outlook is uncertain, and participants noted that their economic projections and assessments of appropriate monetary policy could change in response to incoming information.

In general, participants viewed the uncertainty attached to their projections as broadly similar to the average of the past 20 years, although a couple of participants saw the uncertainty associated with their real GDP growth forecasts as higher than average. Most participants judged the risks around their projections for economic growth, the unemployment rate, and inflation as broadly balanced.

Figures 4.A through 4.C for real GDP growth, the unemployment rate, and inflation, respectively, present “fan charts” as well as charts of participants’ current assessments of the uncertainty and risks surrounding the economic projections. The fan charts (the panels at the top of these three figures) show the median projections surrounded by

confidence intervals that are computed from the forecast errors of various private and government projections made over the past 20 years. The width of the confidence interval for each variable at a given point is a measure of forecast uncertainty at that horizon. For all three macroeconomic variables, these charts illustrate that forecast uncertainty is substantial and generally increases as the forecast horizon lengthens. Reflecting, in part, the uncertainty about the future evolution of GDP growth, the unemployment rate, and inflation, participants’ assessments of appropriate monetary policy are also subject to considerable uncertainty. To illustrate the uncertainty regarding the appropriate path for monetary policy, figure 5 shows a comparable fan chart around the median projections for the federal funds rate.¹¹ As with the

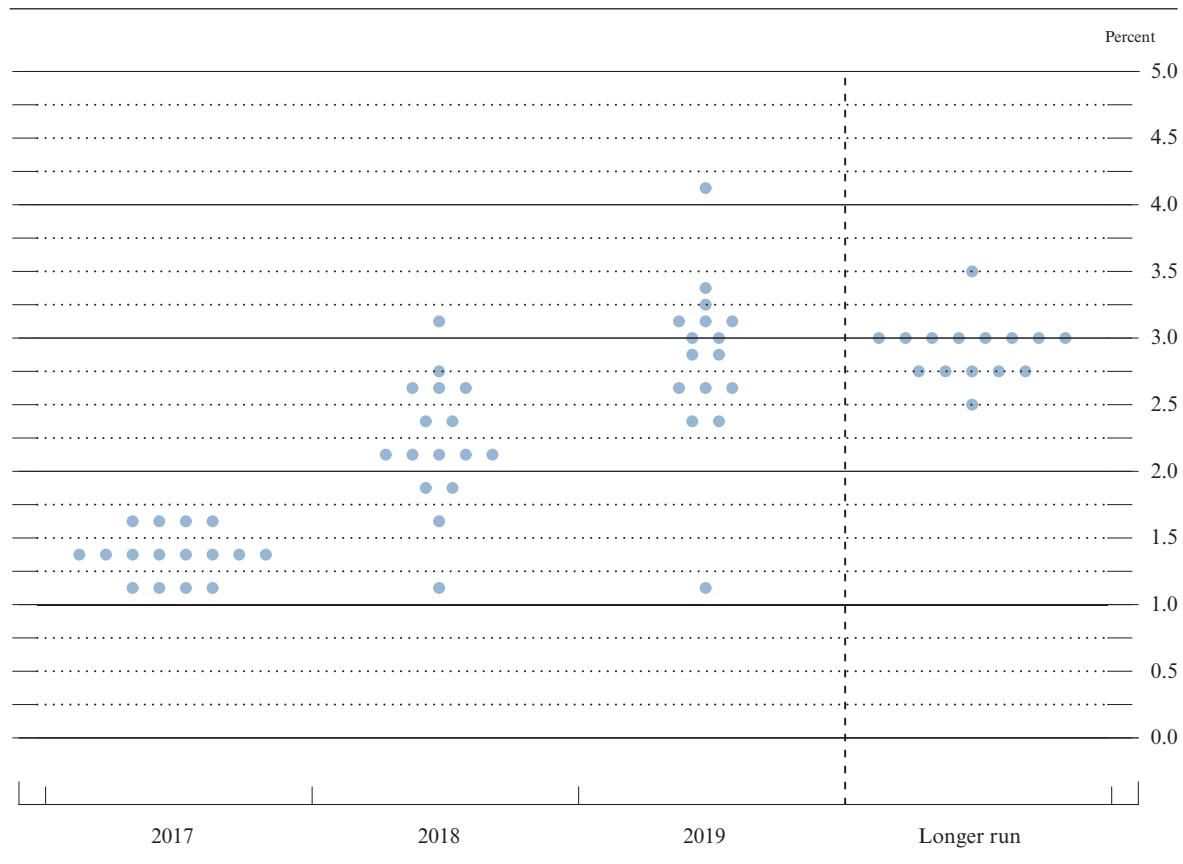
11. The fan chart for the federal funds rate depicts the uncertainty about the future path of appropriate monetary policy and is closely connected with the uncertainty about the future value of economic variables. In contrast, the dot plot shown in figure 2 displays the

Figure 1. Medians, central tendencies, and ranges of economic projections, 2017–19 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 1/8 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.

macroeconomic variables, forecast uncertainty for the federal funds rate is substantial and increases at longer horizons.

The Outlook for Economic Activity

The median of participants' projections for the growth rate of real GDP, conditional on their individual assumptions about appropriate monetary policy, was 2.2 percent in 2017, 2.1 percent in 2018, and 1.9 percent in 2019; the median of projections for the longer-run normal rate of real GDP growth

dispersion of views across individual participants about the appropriate level of the federal funds rate.

was 1.8 percent. Compared with the March Summary of Economic Projections (SEP), the medians of the forecasts for real GDP growth over the period from 2017 to 2019, as well as the median assessment of the longer-run growth rate, were mostly unchanged. Fewer than half of the participants incorporated expectations of fiscal stimulus into their projections, and a couple indicated that they had marked down the magnitude of expected fiscal stimulus relative to March.

All participants revised down their projections for the unemployment rate in the fourth quarter of 2017 and of 2018, and almost all also revised down their projections for the

unemployment rate in the fourth quarter of 2019. Many who did so cited recent lower-than-expected readings on unemployment. The median of the projections for the unemployment rate was 4.3 percent in 2017 and 4.2 percent in each of 2018 and 2019, 0.2 percentage point and 0.3 percentage point lower than in the March projections, respectively. The majority of participants also revised down their estimates of the longer-run normal rate of unemployment by 0.1 or 0.2 percentage point, and the median longer-run level was 4.6 percent, down 0.1 percentage point from March.

Figures 3.A and 3.B show the distributions of participants' projections for real GDP growth and the unemployment rate from 2017 to 2019 and in the longer run. The distribution of individual projections for real GDP growth for this year shifted up, with some participants now expecting real GDP growth between 2.4 and 2.5 percent and none seeing it below 2 percent. The distributions of projected real GDP growth in 2018, 2019, and in the longer run were broadly similar to the distributions of the March projections. The distributions of individual projections for the unemployment rate shifted down noticeably for 2017 and 2018. Most participants projected an unemployment rate of 4.2 or 4.3 percent at the end of this year, and the majority anticipated an unemployment rate between 4.0 and 4.3 percent at the end of 2018. Participants' projections also shifted down in 2019 but were more dispersed than the distributions of their projected unemployment rates in the two earlier years. The distribution of projections for the longer-run normal unemployment rate shifted down modestly.

The Outlook for Inflation

The median of projections for headline PCE price inflation this year was 1.6 percent, down 0.3 percentage point from March. As in March, median projected inflation was 2.0 percent in 2018 and 2019. About half of the participants anticipated that inflation

would continue to run a bit below 2 percent in 2018, while only one participant expected inflation above 2 percent in that year—and, in that case, just modestly so. More than half projected that inflation would be equal to the Committee's objective in 2019. A few participants projected that inflation would run slightly below 2 percent in that year, while several projected that it would run a little above 2 percent. The median of projections for core PCE price inflation was 1.7 percent in 2017, a decline of 0.2 percentage point from March; the median projection for 2018 and 2019 was 2.0 percent, as in the March projections.

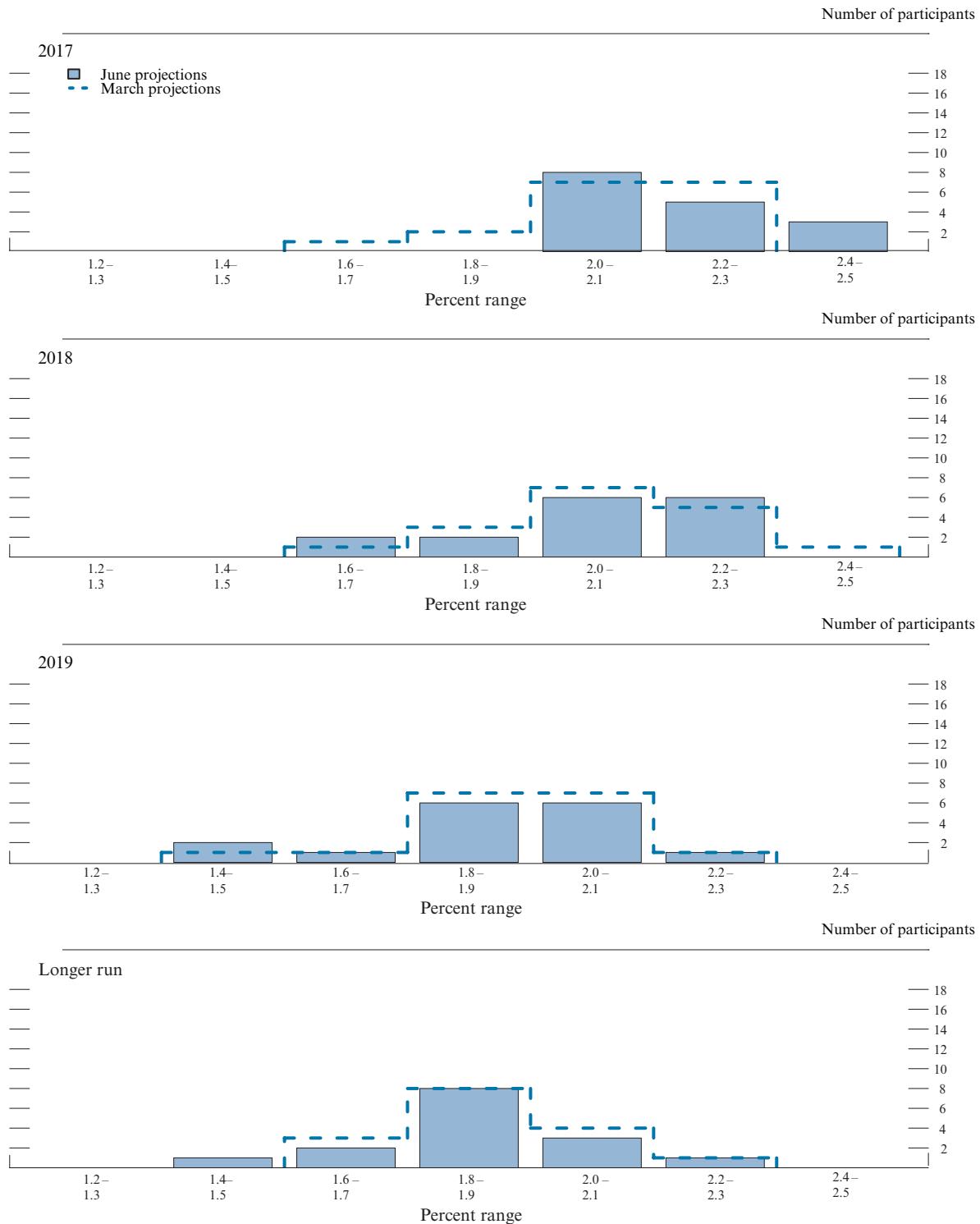
Figures 3.C and 3.D provide information on the distributions of participants' views about the outlook for inflation. The distributions of projections for headline PCE price inflation and for core PCE price inflation in 2017 shifted down noticeably from March, while the distributions for both measures of inflation in 2018 shifted down slightly. Many participants cited recent surprisingly low readings on inflation as a factor contributing to the revisions in their inflation forecasts.

Appropriate Monetary Policy

Figure 3.E provides the distribution 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 2017 to 2019 and over the longer run.¹² The distribution for 2017 was less dispersed than that in March, while the distribution for 2018 was slightly less

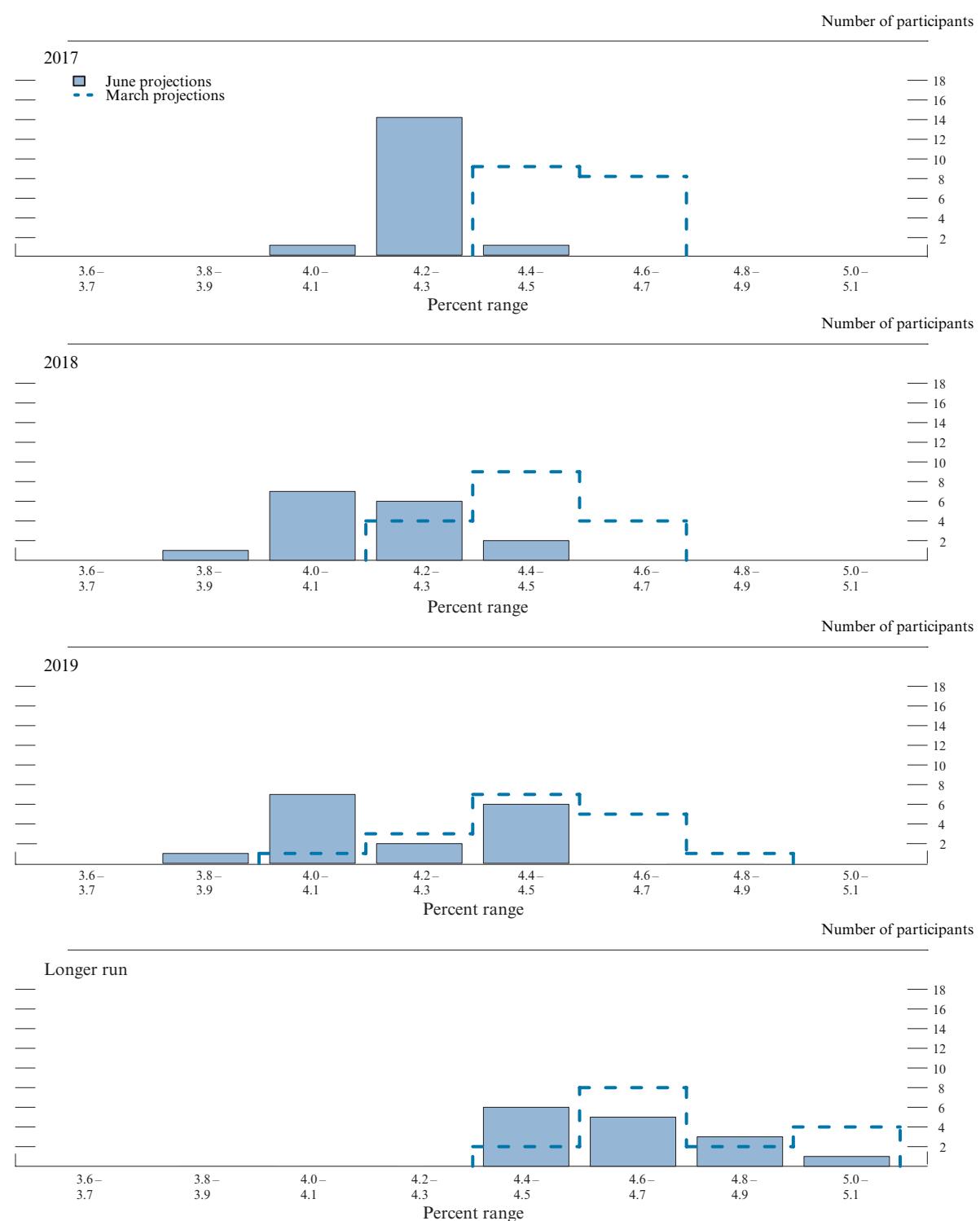
12. One participant's projections for the federal funds rate, real GDP growth, the unemployment rate, and inflation were informed by the view that there are multiple possible medium-term regimes for the U.S. economy, that these regimes are persistent, and that the economy shifts between regimes in a way that cannot be forecast. Under this view, the economy currently is in a regime characterized by expansion of economic activity with low productivity growth and a low short-term real interest rate, but longer-term outcomes for variables other than inflation cannot be usefully projected.

Figure 3.A. Distribution of participants' projections for the change in real GDP, 2017–19 and over the longer run



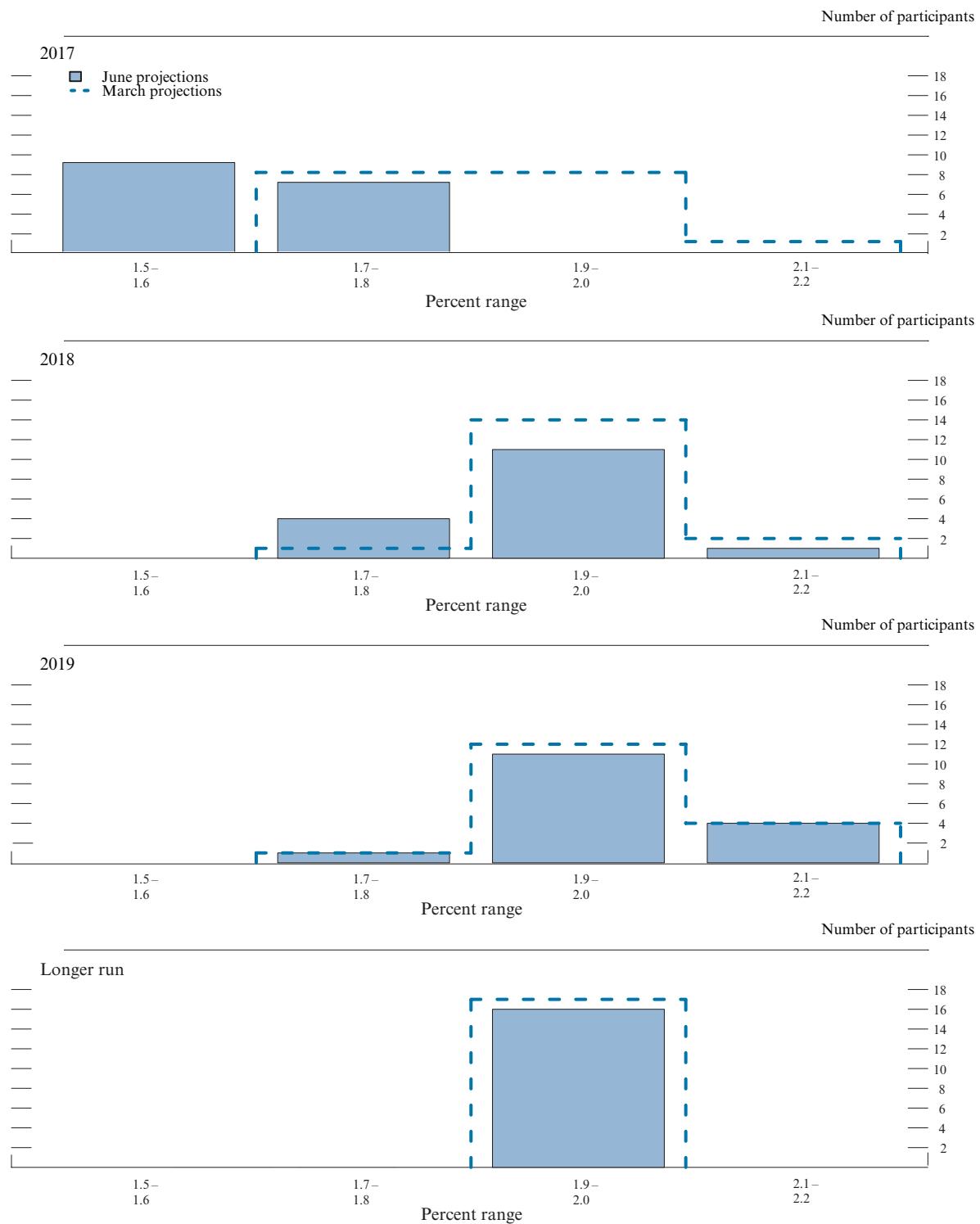
NOTE: Definitions of variables and other explanations are in the notes to table 1.

Figure 3.B. Distribution of participants' projections for the unemployment rate, 2017–19 and over the longer run



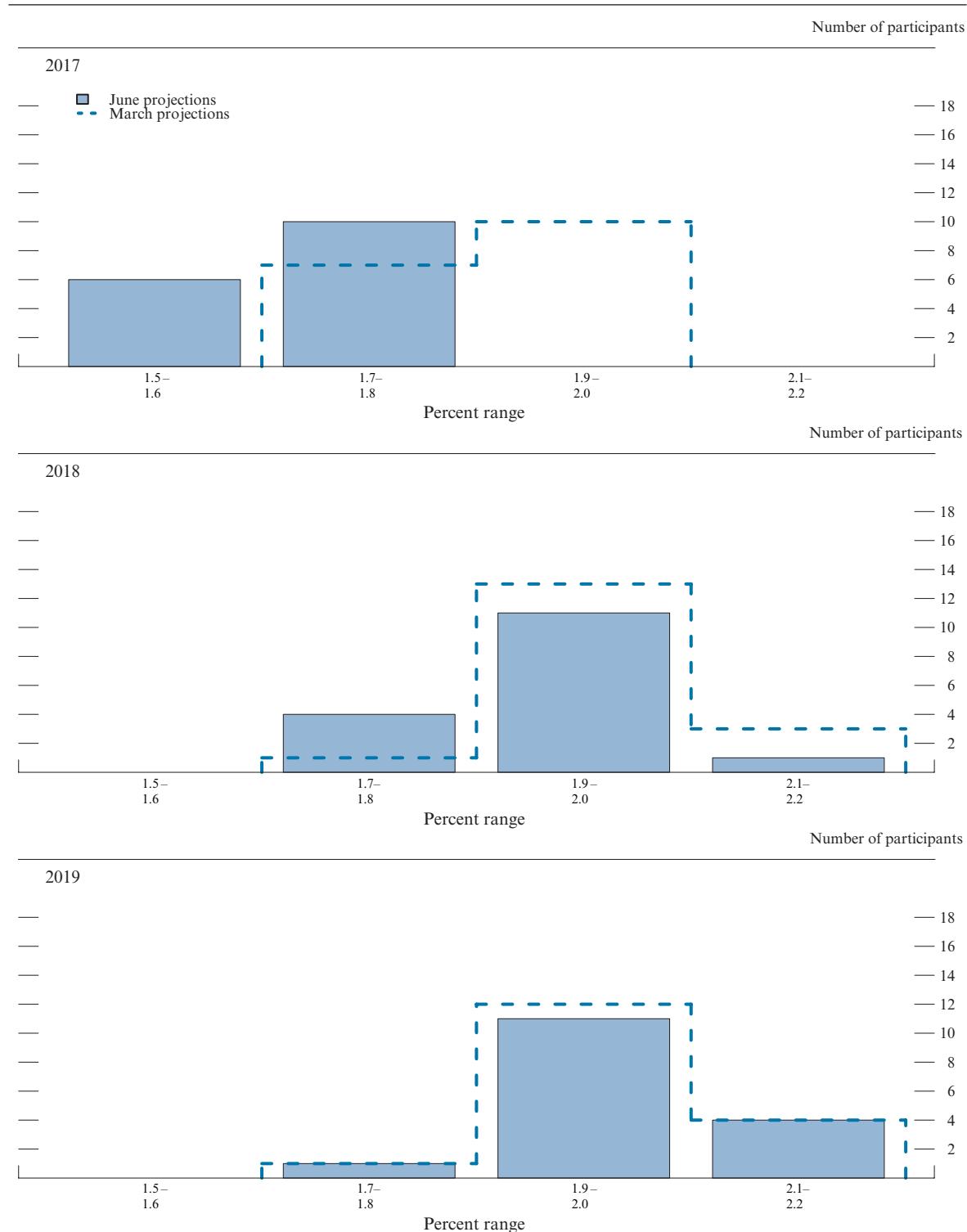
NOTE: Definitions of variables and other explanations are in the notes to table 1.

Figure 3.C. Distribution of participants' projections for PCE inflation, 2017–19 and over the longer run



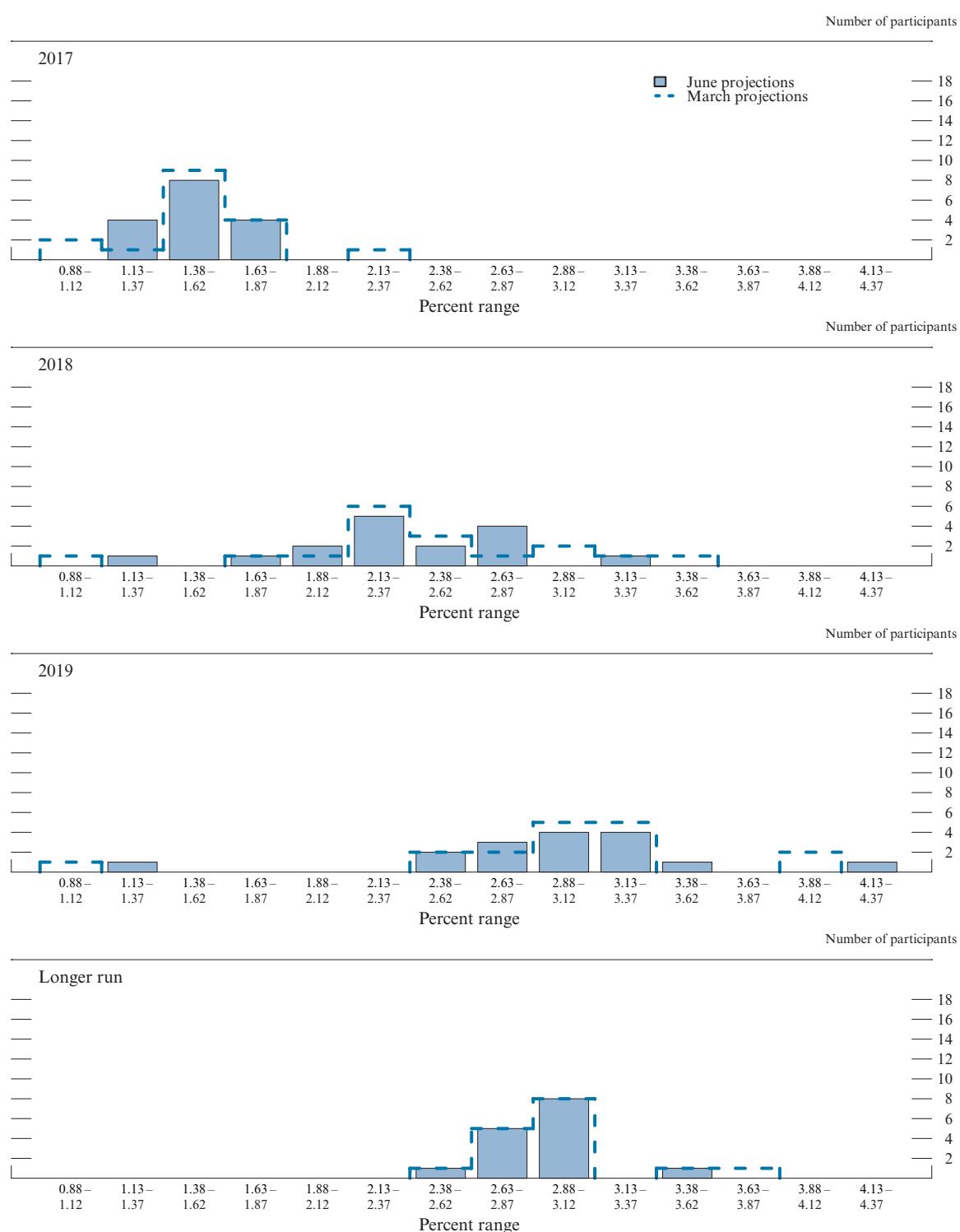
NOTE: Definitions of variables and other explanations are in the notes to table 1.

Figure 3.D. Distribution of participants' projections for core PCE inflation, 2017–19



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, 2017–19 and over the longer run



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

dispersed. The distributions in 2019 and in the longer run were broadly similar to those in March. The median projections of the federal funds rate continued to show gradual increases, with the median assessment for 2017 standing at 1.38 percent, consistent with three 25 basis point increases this year. Thereafter, the medians of the projections were 2.13 percent at the end of 2018 and 2.94 percent at the end of 2019; the median of the longer-run projections of the federal funds rate was 3.00 percent.

In discussing their June projections, many participants continued to express the view that the appropriate upward trajectory of the federal funds rate over the next few years would likely be gradual. That anticipated pace reflected a few factors, such as a neutral real interest rate that was currently low and was expected to move up only slowly as well as a gradual return of inflation to the Committee's 2 percent objective. Several participants judged that a slightly more accommodative path of monetary policy than in their previous projections would likely be appropriate, citing an apparently slower rate of progress toward the Committee's 2 percent inflation objective. In their discussions of appropriate monetary policy, half of the participants commented on the Committee's reinvestment policy; all of those who did so expected a change in reinvestment policy before the end of this year.

Uncertainty and Risks

Projections of economic variables are subject to considerable uncertainty. In assessing the path of monetary policy that, in their view, is likely to be most appropriate, FOMC participants take account of the range of possible outcomes, the likelihood of those outcomes, and the potential benefits and costs to the economy should they occur. Table 2 provides one measure of forecast uncertainty for the change in real GDP, the unemployment rate, and total consumer price inflation—the root mean squared error (RMSE) for forecasts made over the past 20 years. This measure of

Table 2. Average historical projection error ranges

Percentage points

Variable	2017	2018	2019
Change in real GDP ¹	±1.4	±2.0	±2.2
Unemployment rate ¹	±0.4	±1.2	±1.8
Total consumer prices ²	±0.8	±1.0	±1.0
Short-term interest rates ³ ...	±0.7	±2.0	±2.2

NOTE: Error ranges shown are measured as plus or minus the root mean squared error of projections for 1997 through 2016 that were released in the summer 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 Reischneider 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), available at www.federalreserve.gov/econresdata/feds/2017/files/2017020pap.pdf.

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. Projection is percent change, fourth quarter of the previous year to the fourth quarter of the year indicated.

3. For Federal Reserve staff forecasts, measure is the federal funds rate. For other forecasts, measure is the rate on 3-month Treasury bills. Historical projections are the average level, in percent, in the fourth quarter of the year indicated.

forecast uncertainty is incorporated graphically in the top panels of figures 4.A, 4.B, and 4.C, which display fan charts plotting the median SEP projections for the three variables surrounded by symmetric confidence intervals derived from the RMSEs presented in table 2. If the degree of uncertainty attending these projections is similar to the typical magnitude of past forecast errors and if the risks around the projections are broadly balanced, future outcomes of these variables would have about a 70 percent probability of occurring within these confidence intervals. For all three variables, this measure of forecast uncertainty is substantial and generally increases as the forecast horizon lengthens.

FOMC participants may judge that the width of the historical fan charts shown in figures 4.A through 4.C does not adequately capture their current assessments of the degree of uncertainty that surrounds their economic projections. Participants' assessments of the current level of uncertainty surrounding their economic projections are shown in the bottom-left panels of figures 4.A, 4.B, and 4.C. All or nearly all participants viewed the uncertainty attached to their economic projections as

broadly similar to the average of the past 20 years, with three fewer participants than in March seeing uncertainty about GDP growth, the unemployment rate, and inflation as higher than its historical average.¹³ In their discussion of the uncertainty attached to their current projections, most participants again expressed the view that, at this point, uncertainty surrounding prospective changes in fiscal and other government policies is very large or that there is not yet enough information to make reasonable assumptions about the timing, nature, and magnitude of the changes.

The fan charts—which are constructed so as to be symmetric around the median projections—also may not fully reflect participants' current assessments of the balance of risks to their economic projections. Participants' assessments of the balance of risks to their economic projections are shown in the bottom-right panels of figures 4.A, 4.B, and 4.C. As in March, most participants judged the risks to their projections of real GDP growth, the unemployment rate, headline inflation, and core inflation as broadly balanced—in other words, as broadly consistent with a symmetric fan chart. Three participants judged the risks to the unemployment rate as weighted to the downside, and one participant judged the risks as weighted to the upside (as shown in the lower-right panel of figure 4.B). In addition, the balance of risks to participants' inflation projections shifted down slightly from March (shown in the lower-right panels of figure 4.C), as two fewer participants judged the risks to inflation to be weighted to the upside and two more viewed the risks as weighted to the downside.

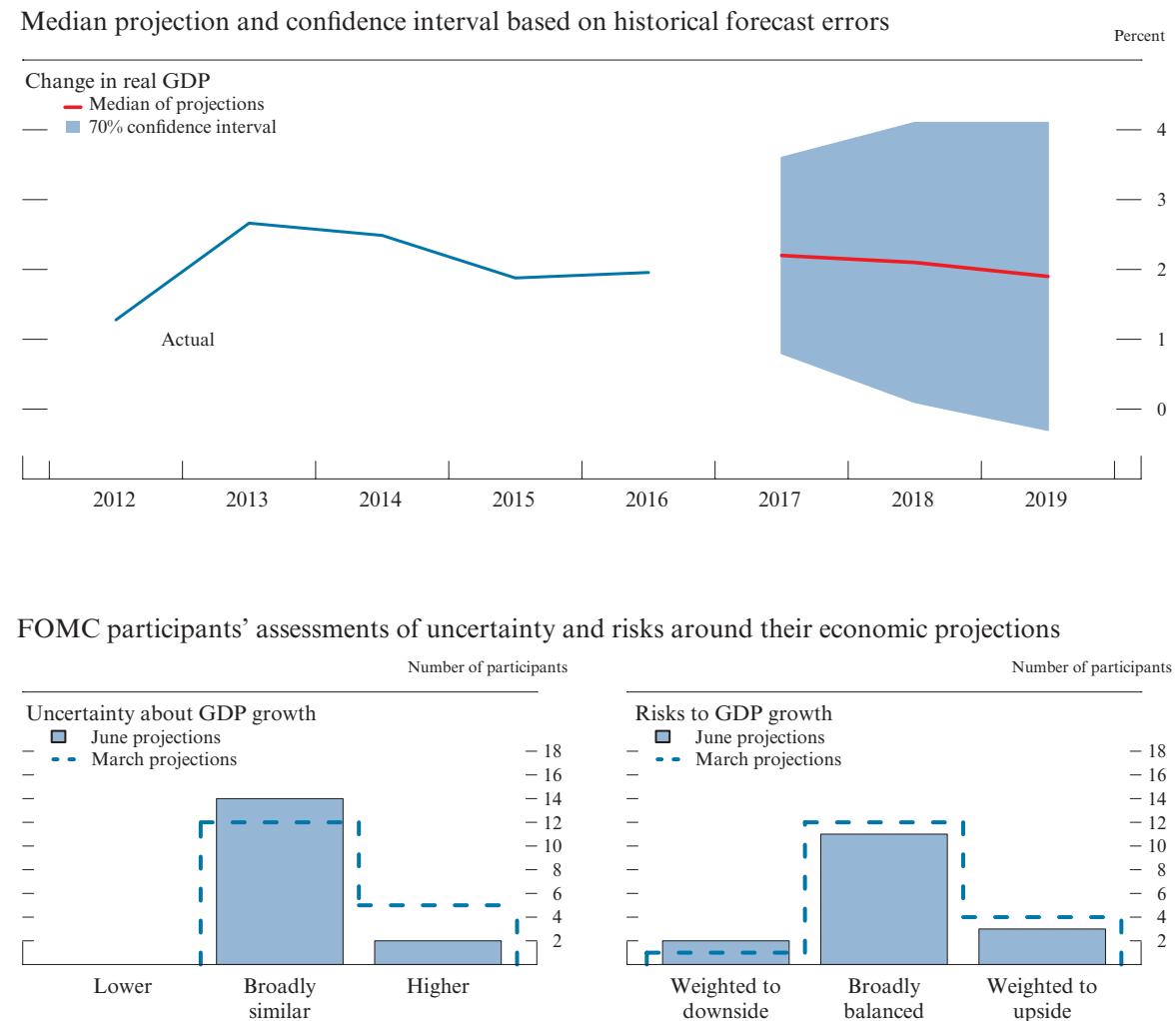
13. At the end of this summary, the box "Forecast Uncertainty" discusses the sources and interpretation of uncertainty in the economic forecasts and explains the approach used to assess the uncertainty and risks attending the participants' projections.

Participants' assessments of the future path of the federal funds rate consistent with appropriate policy are also subject to considerable uncertainty, reflecting in part uncertainty about the evolution of GDP growth, the unemployment rate, and inflation over time. The final line in table 2 shows the RMSEs for forecasts of short-term interest rates. These RMSEs are not strictly consistent with the SEP projections for the federal funds rate, in part because the SEP projections are not forecasts of the likeliest outcomes but rather reflect each participant's individual assessment of appropriate monetary policy. However, the associated confidence intervals provide a sense of the likely uncertainty around the future path of the federal funds rate generated by the uncertainty about the macroeconomic variables and additional adjustments to monetary policy that may be appropriate to offset the effects of shocks to the economy.

Figure 5 shows a fan chart plotting the median SEP projections for the appropriate path of the federal funds rate surrounded by confidence intervals derived from the results presented in table 2. As with the macroeconomic variables, forecast uncertainty is substantial and increases at longer horizons.¹⁴

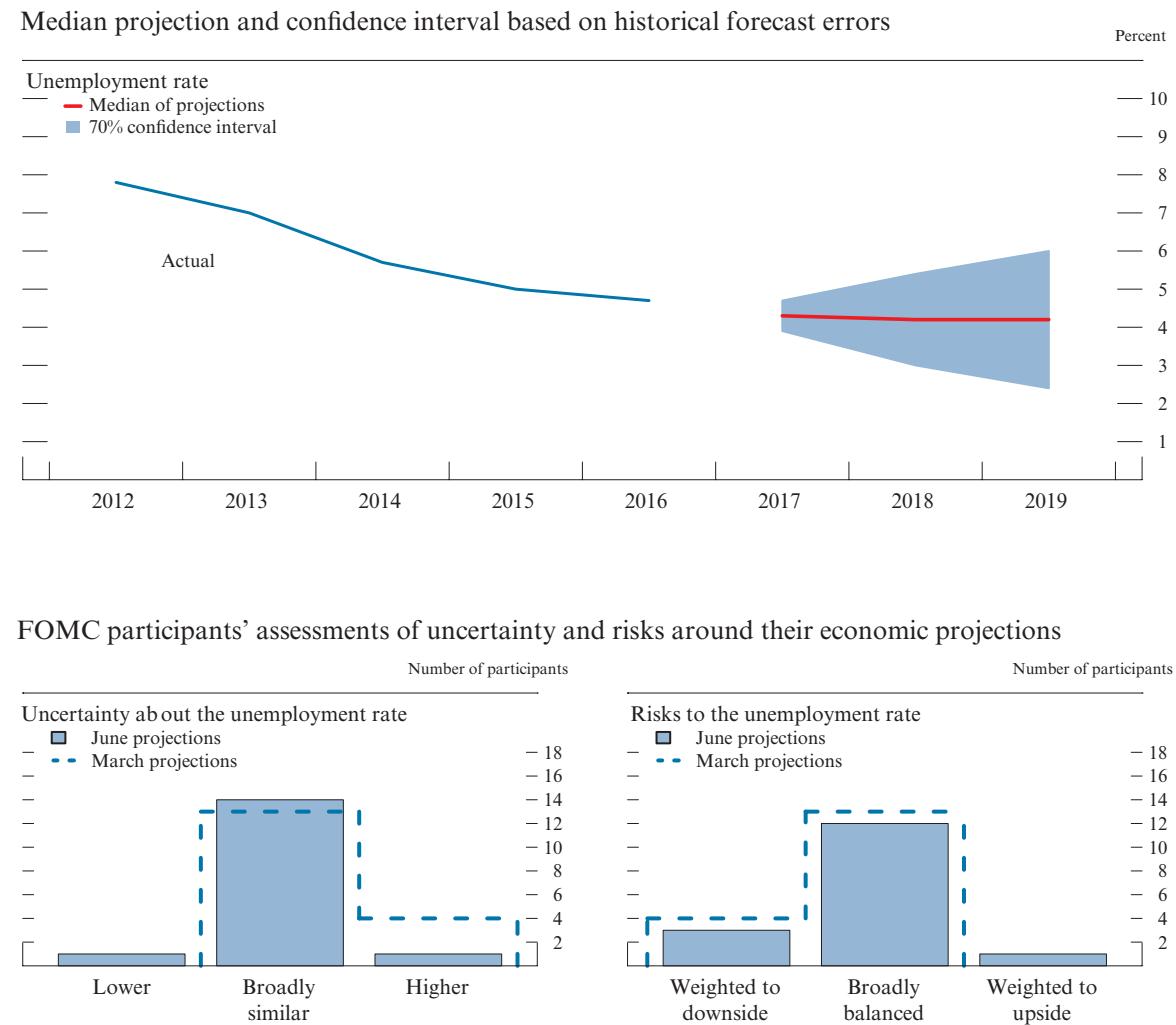
14. If at some point in the future the confidence interval around the federal funds rate were to extend below zero, it would be truncated at zero for purposes of the chart shown in figure 5; zero is the bottom of the lowest target range for the federal funds rate that has been adopted by the Committee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

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



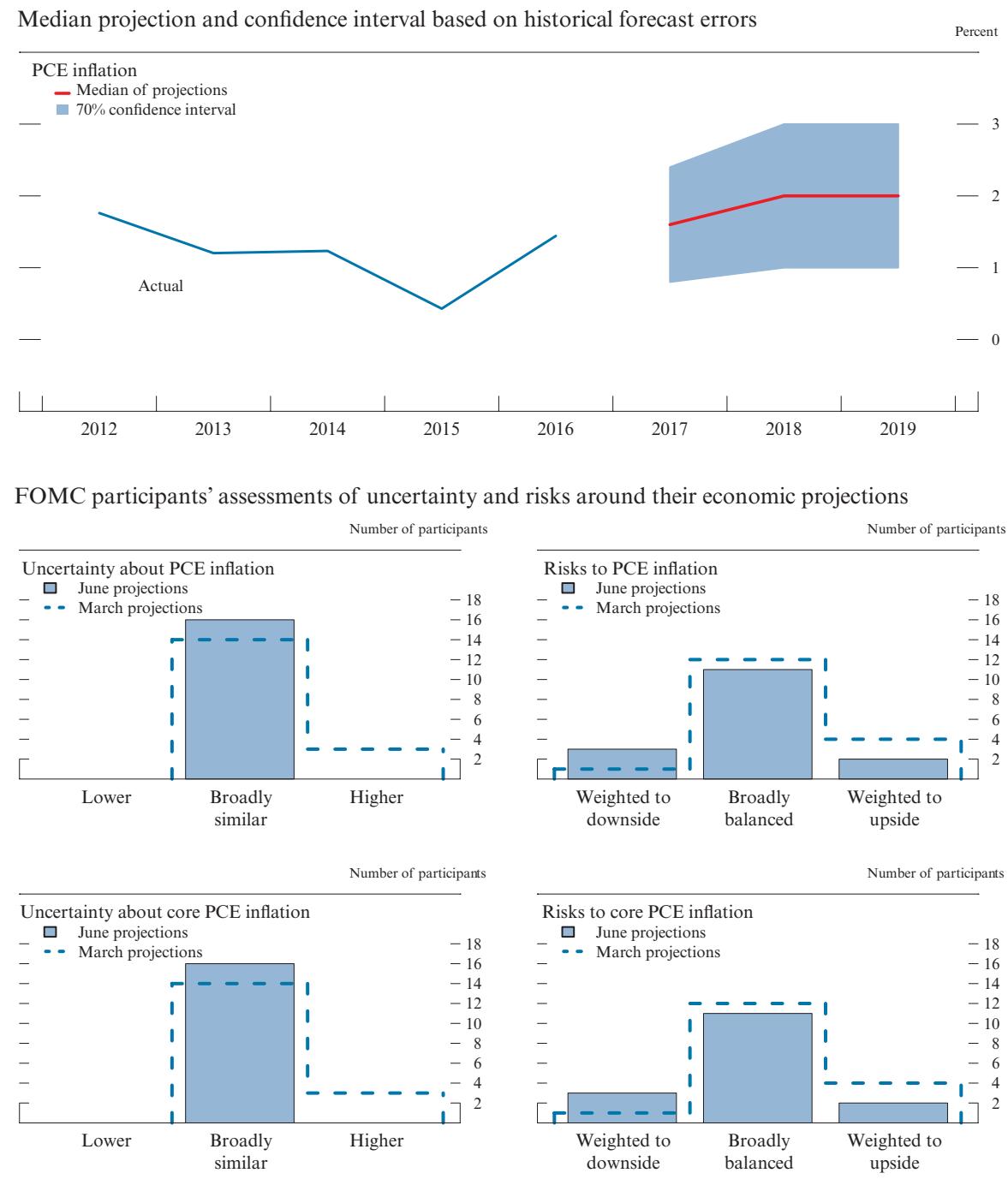
NOTE: The blue and red lines in the top panel show actual values and median projected values, respectively, of the percent change in real gross domestic product (GDP) from the fourth quarter of the previous year to the fourth quarter of the year indicated. The confidence interval around the median projected 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 differ 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



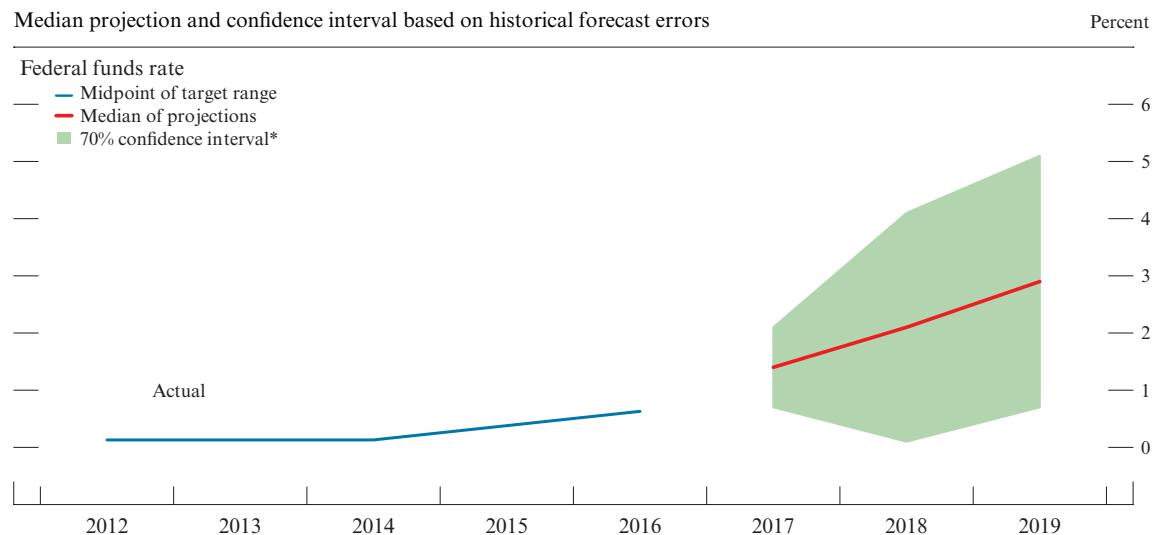
Note: The blue and red lines in the top panel show actual values and median projected values, respectively, of the average civilian unemployment rate in the fourth quarter of the year indicated. The confidence interval around the median projected values is assumed to be symmetric and is based on root 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 differ 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 differ 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 5. Uncertainty 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 offset 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 differ 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 Reports* 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 1.6 to 4.4 percent in the current year, 1.0 to 5.0 percent in the second year, and 0.8 to 5.2 percent in the third year. The corresponding 70 percent confidence intervals for overall inflation would be 1.2 to 2.8 percent in the current year, and 1.0 to 3.0 percent in the second and third years. 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. 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
BOE	Bank of England
C&I	commercial and industrial
DPI	disposable personal income
ECB	European Central Bank
EME	emerging market economy
FOMC	Federal Open Market Committee; also, the Committee
GDP	gross domestic product
LFPR	labor force participation rate
LIBOR	London interbank offered rate
MBS	mortgage-backed securities
Michigan survey	University of Michigan Surveys of Consumers
OIS	overnight index swap
ON RRP	overnight reverse repurchase agreement
OPEC	Organization of the Petroleum Exporting Countries
PCE	personal consumption expenditures
SEP	Summary of Economic Projections
SLOOS	Senior Loan Officer Opinion Survey on Bank Lending Practices
S&P	Standard & Poor's
TIPS	Treasury Inflation-Protected Securities

