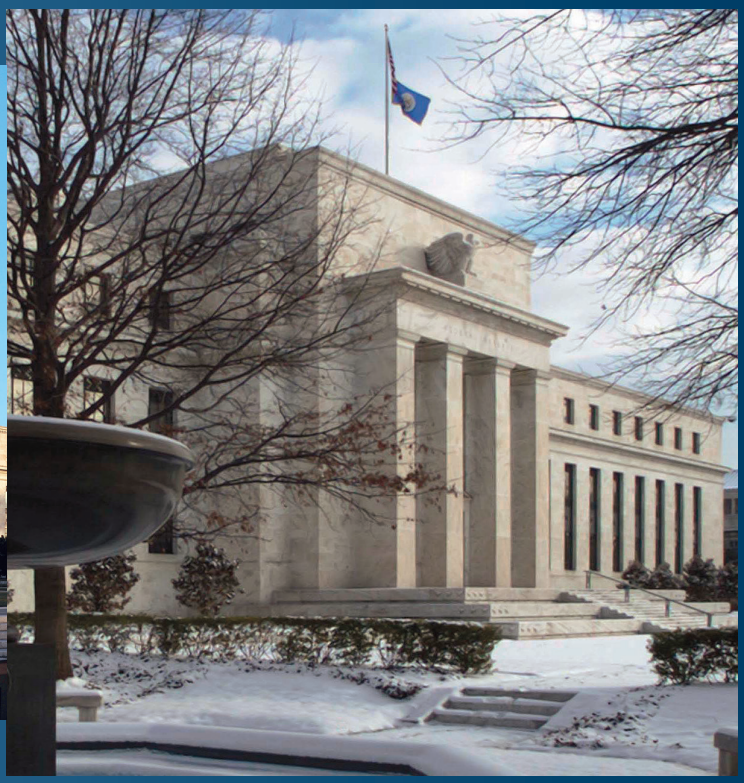
For use at 11:00 a.m. EST
March 3, 2023

Monetary Policy Report

March 3, 2023



Board of Governors of the Federal Reserve System

Letter of Transmittal

Board of Governors of the
Federal Reserve System

Washington, D.C., March 3, 2023

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

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

Sincerely,

Jerome H. Powell

Jerome H. Powell, Chair

Statement on Longer-Run Goals and Monetary Policy Strategy

Adopted effective January 24, 2012; as reaffirmed effective January 31, 2023

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.

Employment, inflation, and long-term interest rates fluctuate over time in response to economic and financial disturbances. Monetary policy plays an important role in stabilizing the economy in response to these disturbances. The Committee's primary means of adjusting the stance of monetary policy is through changes in the target range for the federal funds rate. The Committee judges that the level of the federal funds rate consistent with maximum employment and price stability over the longer run has declined relative to its historical average. Therefore, the federal funds rate is likely to be constrained by its effective lower bound more frequently than in the past. Owing in part to the proximity of interest rates to the effective lower bound, the Committee judges that downward risks to employment and inflation have increased. The Committee is prepared to use its full range of tools to achieve its maximum employment and price stability goals.

The maximum level of employment is a broad-based and inclusive goal that is not directly measurable and changes over time owing largely to nonmonetary factors that affect the structure and dynamics of the labor market. 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 shortfalls of employment from its maximum level, recognizing that such assessments are necessarily uncertain and subject to revision. The Committee considers a wide range of indicators in making these assessments.

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 judges that longer-term inflation expectations that are well anchored at 2 percent foster price stability and moderate long-term interest rates and enhance the Committee's ability to promote maximum employment in the face of significant economic disturbances. In order to anchor longer-term inflation expectations at this level, the Committee seeks to achieve inflation that averages 2 percent over time, and therefore judges that, following periods when inflation has been running persistently below 2 percent, appropriate monetary policy will likely aim to achieve inflation moderately above 2 percent for some time.

Monetary policy actions tend to influence economic activity, employment, and prices with a lag. In setting monetary policy, the Committee seeks over time to mitigate shortfalls of employment from the Committee's assessment of its maximum level and deviations of inflation from its longer-run goal. Moreover, sustainably achieving maximum employment and price stability depends on a stable financial system. 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 Committee's employment and inflation objectives are generally complementary. However, under circumstances in which the Committee judges that the objectives are not complementary, it takes into account the employment shortfalls and inflation 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 review these principles and to make adjustments as appropriate at its annual organizational meeting each January, and to undertake roughly every 5 years a thorough public review of its monetary policy strategy, tools, and communication practices.

Contents

List of Boxes

Note: This report reflects information that was publicly available as of 4 p.m. EST on March 1, 2023. Unless otherwise stated, the time series in the figures extend through, for daily data, February 28, 2023; for monthly data, January 2023; and, for quarterly data, 2022:Q4. In bar charts, except as noted, the change for a given period is measured to its final quarter from the final quarter of the preceding period.

Summary

Although inflation has slowed since the middle of last year as supply bottlenecks eased and energy prices declined, it remains well above the Federal Open Market Committee's (FOMC) objective of 2 percent. The labor market remains extremely tight, with robust job gains, the unemployment rate at historically low levels, and nominal wage growth slowing but still elevated. Real gross domestic product (GDP) growth picked up in the second half of 2022, although the underlying momentum in the economy likely remains subdued. Bringing inflation back to 2 percent will likely require a period of below-trend growth and some softening of labor market conditions.

In response to high inflation, the FOMC continued to rapidly increase interest rates and reduce its securities holdings. The Committee has raised the target range for the federal funds rate a further 3 percentage points since June, bringing the range to 4½ to 4¾ percent, and indicated that it anticipates that ongoing increases in the target range will be appropriate. The Federal Reserve has also reduced its holdings of Treasury securities and agency mortgage-backed securities by about $500 billion since June, further tightening financial conditions.

The Federal Reserve is acutely aware that high inflation imposes significant hardship, especially on those least able to meet the higher costs of essentials. The Committee is strongly committed to returning inflation to its 2 percent objective.

Recent Economic and Financial Developments

Inflation. Consumer price inflation, as measured by the 12-month change in the price index for personal consumption expenditures (PCE), was 5.4 percent in January, down from its peak of 7 percent last June but still well above the FOMC's 2 percent objective. Core PCE prices—which exclude volatile food and energy prices and are generally considered a better guide to the direction of future inflation—also slowed but still increased 4.7 percent over the 12 months ending in January. As supply chain bottlenecks have eased, increases in core goods prices slowed considerably in the second half of last year. Within core services prices, housing services inflation has been high, but slowing increases in rents for new tenants in the second half of last year point to lower inflation for housing services in the year ahead. For other services, however, price inflation remains elevated, and prospects for slowing inflation may depend in part on an easing of tight labor market conditions. Measures of longer-term inflation expectations remain within the range of values seen in the decade before the pandemic and continue to be broadly consistent with the FOMC's longer-run objective of 2 percent, suggesting that high inflation is not becoming entrenched.

The labor market. The labor market has remained extremely tight, with job gains averaging 380,000 per month since the middle of last year and the unemployment rate remaining at historical lows. Labor demand in many parts of the economy exceeds the supply of available workers, with the labor force participation rate essentially unchanged from one year ago. Nominal wage gains slowed over the second half of 2022, but they remain above the pace consistent with 2 percent inflation over the longer term, given prevailing trends in productivity growth.

Economic activity. Real GDP is reported to have fallen in the first half of 2022 but to have then risen at roughly a 3 percent pace in the second half. Some of the swings in growth reflect fluctuations in volatile expenditure categories such as net exports and inventory investment. Private domestic final demand, which excludes these volatile components, rose

at a subdued rate in both the first and second halves last year. Consumer spending has continued to rise at a solid pace, supported by the savings accumulated during the pandemic. However, manufacturing output declined in recent months, and the housing sector has continued to contract in response to elevated mortgage rates.

Financial conditions. Financial conditions have tightened further since June and are significantly tighter than a year ago. The FOMC has raised the target range for the federal funds rate a further 3 percentage points since June, and the market-implied expected path of the federal funds rate over the next year also shifted up notably. Yields on nominal Treasury securities across maturities have risen considerably further since June, while investment-grade corporate bond yields and mortgage rates have also increased but by less than Treasury rates. Equity prices were volatile but increased moderately on net. The rise in interest rates over the past year has weighed on financing activity. Issuance of leveraged loans and speculative-grade corporate bonds slowed substantially in the second half of the year, while investment-grade bond issuance declined modestly. Business loans at banks continued to grow in the second half of 2022 but decelerated in the fourth quarter. While business credit quality remains strong, some indicators of future business defaults are somewhat elevated. For households, mortgage originations continued to decline materially, although consumer loans (such as auto loans and credit cards) grew further. Delinquency rates for credit cards and auto loans rose last year.

Financial stability. Against the backdrop of a weaker economic outlook, higher interest rates, and elevated uncertainty since June, financial vulnerabilities remain moderate overall. Valuations in equity markets remained notable and ticked up, on net, as equity prices increased moderately even as earnings expectations declined late in the year. Real estate prices remain high relative to fundamentals, such as rents, despite a marked slowing in price increases. While market functioning remained orderly, market liquidity—the ability to trade assets without a large effect on market prices—remained low in several key asset markets, including in the Treasury market, when compared with levels before the COVID-19 pandemic. Nonfinancial business and household debt grew in line with GDP, leaving vulnerabilities associated with borrowing by businesses and households unchanged at moderate levels. Risk-based capital ratios at banks declined a touch last year but remain well above regulatory requirements. Funding risks at domestic banks and broker-dealers remain low, and the large banks at the core of the financial system continue to have ample liquidity. Prime and tax-exempt money market funds, as well as many bond and bank-loan mutual funds, continue to be susceptible to runs. (See the box "Developments Related to Financial Stability" in Part 1.)

International developments. Foreign economic growth moderated in the second half of last year, weighed down by the economic fallout of Russia's war against Ukraine and a slowdown in China related to COVID-19. Despite some signs of easing in headline inflation abroad, core foreign inflation remains high and inflationary pressures are broad, in part reflecting tight labor markets and the pass-through of past energy price increases to other prices. In response to persistently high inflation, many major foreign central banks, along with the Fed, have tightened the stance of monetary policy significantly since June. More recently, many foreign central banks slowed the pace of their policy rate increases, signaled that such a slowing is coming, or paused policy rate hikes to take stock of the effects of policy tightening thus far on their economies.

Financial conditions abroad have tightened modestly, on net, since the middle of last

year. Global sovereign bond yields rose from continued tightening of foreign monetary policy and spillovers from increases in U.S. yields. Equity prices abroad rose toward the end of the year amid surprising resilience of European economies and the removal of China's zero-COVID policy. Meanwhile, the trade-weighted exchange value of the U.S. dollar is a touch higher since mid-2022.

Monetary Policy

In response to high inflation, the Committee last year rapidly increased the target range for the federal funds rate and began reducing its securities holdings. Adjustments to both interest rates and the balance sheet are playing a role in firming the stance of monetary policy in support of the Committee's maximum-employment and price-stability goals.

Interest rate policy. The FOMC continued to swiftly increase the target range for the federal funds rate, bringing it to the current range of 4½ to 4¾ percent. In light of the cumulative tightening of monetary policy and the lags with which monetary policy affects economic activity and inflation, the Committee slowed the pace of policy tightening at the December and January meetings but indicated that it anticipates that ongoing increases in the target range will be appropriate in order to attain a stance of monetary policy that is sufficiently restrictive to return inflation to 2 percent over time.

Balance sheet policy. The Federal Reserve has continued the process of significantly reducing its holdings of Treasury and agency securities in a predictable manner.[1] Beginning in June of last year, principal payments from securities held in the System Open Market Account have been reinvested only to the extent that they exceeded monthly caps.

Special Topics

Employment and earnings across groups. At the onset of the pandemic, employment fell by more for disadvantaged groups than the overall population, but tight labor market conditions over the past two years have largely reversed those movements. As the labor market tightened, employment grew faster for African Americans and Hispanics, and for less educated workers, than for other workers. Wages have grown more rapidly for these workers also, as extremely strong labor demand has outstripped available labor supply. However, while disparities in employment have largely returned to pre-pandemic levels, there remain significant disparities in absolute levels of employment across groups. (See the box "Developments in Employment and Earnings across Demographic Groups" in Part 1.)

Weak labor supply. Even with labor demand remarkably strong, the labor force has been slow to recover from the pandemic, leaving a significant labor supply shortfall relative to the levels expected before the pandemic. More than half of that labor force shortfall reflects a lower labor force participation rate because of a wave of retirements beyond what would have been expected given demographic trends. The remaining shortfall is attributable to slower population growth, which in turn reflects both the higher mortality primarily due to COVID and lower rates of immigration in the first two years of the pandemic. (See the box "Why Has the Labor Force Recovery Been So Slow?" in Part 1.)

Monetary policy rules. Simple monetary policy rules, which prescribe a setting for the policy interest rate based on a small number of other economic variables, can provide useful guidance to policymakers. Since 2021, inflation has run well above the Committee's 2 percent

1. See the May 4, 2022, press release regarding the Plans for Reducing the Size of the Federal Reserve's Balance Sheet, available on the Board's website at https://www.federalreserve.gov/newsevents/pressreleases/monetary20220504b.htm.

longer-run objective, and labor market conditions have been very tight over the past year. As a result, simple monetary policy rules have prescribed levels for the federal funds rate that are well above those observed over the past decade. (See the box "Monetary Policy Rules in the Current Environment" in Part 2.)

Federal Reserve's balance sheet and money markets. The size of the Federal Reserve's balance sheet decreased as the Federal Reserve reduced its securities holdings. Reserve balances—the largest liability on the Federal Reserve's balance sheet—continued to fall. Take-up in the overnight reverse repurchase agreement (ON RRP) facility remained elevated, as low rates on repurchase agreements persisted amid still abundant liquidity and limited Treasury bill supply. The ON RRP facility continued to serve its intended purpose of helping to provide a floor under short-term interest rates and supporting effective implementation of monetary policy. Because of the significant increases in administered rates to address high inflation, the Federal Reserve's interest expenses rose considerably, and, as a result, net income turned negative. (See the box "Developments in the Federal Reserve's Balance Sheet and Money Markets" in Part 2.)

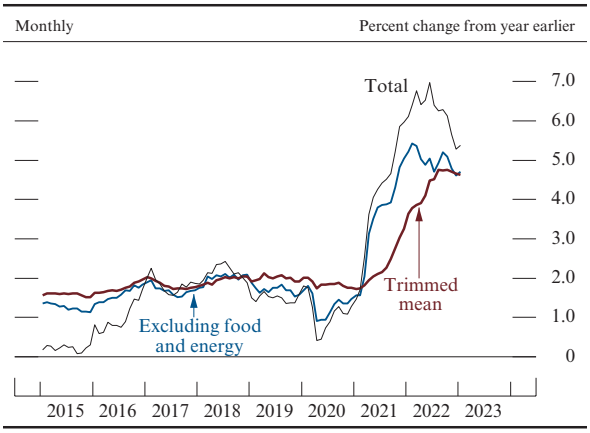
Part 1
Recent Economic and Financial Developments

Domestic Developments

Inflation has declined in recent months but remains elevated . . .

Inflation, as measured by the 12-month change in the price index for personal consumption expenditures (PCE), stepped down from its peak of 7.0 percent in June of last year to 5.4 percent in January, still notably above the Federal Open Market Committee's (FOMC) longer-run objective of 2 percent (figure 1). Core PCE prices—which exclude volatile food and energy prices and are generally considered a better guide to the direction of future inflation—rose 4.7 percent over the 12 months to January, down from the above 5 percent pace that prevailed last spring.[2]

1. Personal consumption expenditures price indexes

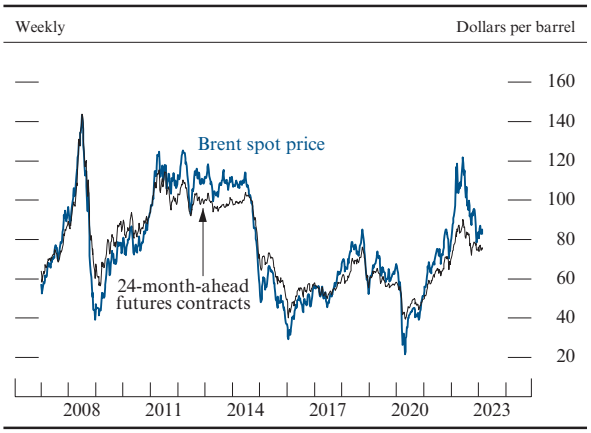


Source: For trimmed mean, Federal Reserve Bank of Dallas; for all else, Bureau of Economic Analysis; all via Haver Analytics.

. . . in part because energy prices declined in the second half of last year, while food price inflation slowed but remains high

After rising sharply in the first half of last year, oil prices peaked and have since declined. This decline comes mainly on global growth concerns and despite a European Union embargo on Russian crude oil and petroleum products (figure 2). As a result of these movements, gasoline prices declined over the second half of last year following their earlier large increases. On net, the PCE energy price index in January stood 10 percent above its level 12 months earlier (figure 3).

2. Spot and futures prices for crude oil

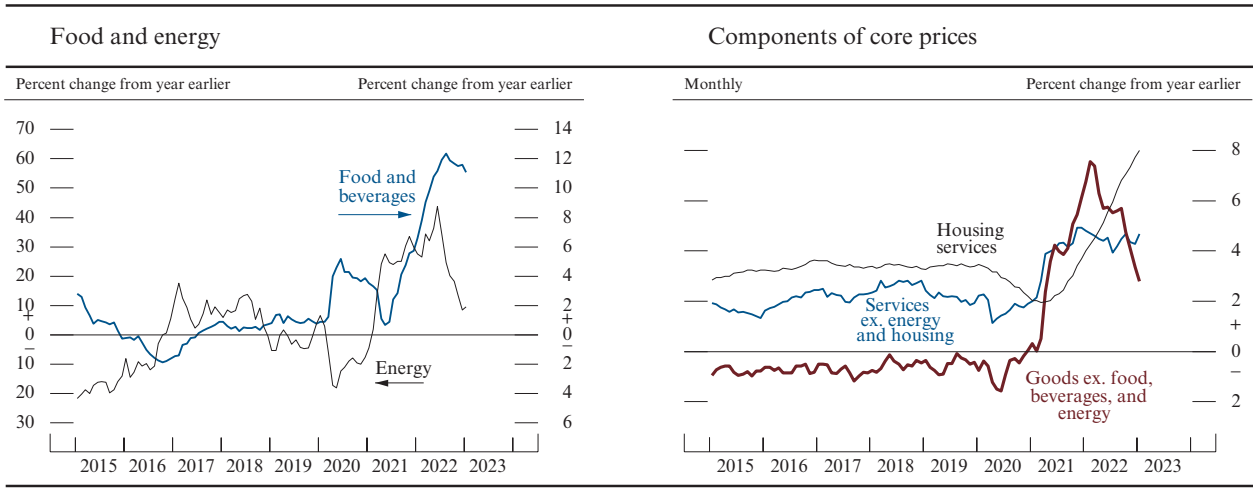


Note: The data are weekly averages of daily data and extend through February 24, 2023.
Source: ICE Brent Futures via Bloomberg.

Food price increases slowed in recent months, but, given earlier sizable increases, grocery store prices are up 11 percent over the 12 months ending in January. After having

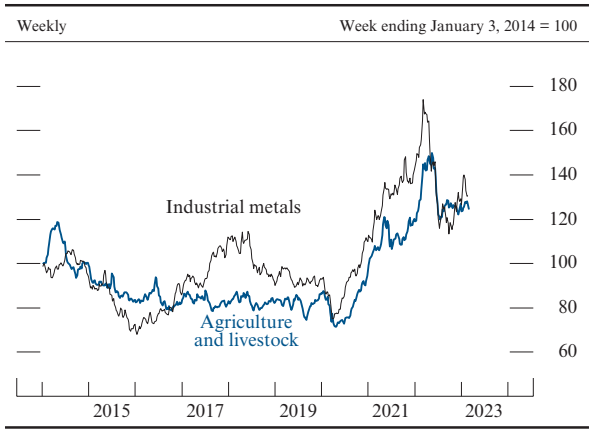
2. The latest 12-month changes in PCE prices are likely overstated at present (and will remain so until the annual revisions of the national income and product accounts in September) because they only incompletely incorporate new seasonally adjusted consumer price index data. The current overstatement in headline and core PCE inflation appears to be roughly 0.2 percentage point and 0.1 percentage point, respectively.

3. Subcomponents of personal consumption expenditures price indexes



NOTE: The data are monthly.
SOURCE: Bureau of Economic Analysis via Haver Analytics.

4. Spot prices for commodities



NOTE: The data are weekly averages of daily data and extend through February 24, 2023.
SOURCE: For industrial metals, S&P GSCI Industrial Metals Spot Index; for agriculture and livestock, S&P GSCI Agriculture & Livestock Spot Index; both via Haver Analytics.

spiked at the start of the war in Ukraine, prices of most food commodities (agricultural products and livestock) have stabilized in recent months, likely contributing to the recent slowing of food price increases (figure 4).

Prices of both energy and food are of particular importance for lower-income households, for which such necessities are a large share of expenditures.

Softer core goods prices reflect easing supply bottlenecks and declines in import prices . . .

Recent inflation performance has varied markedly across spending categories. Price increases for goods (outside of food and energy) slowed considerably in the latter part of 2022. Demand for these goods appears to have stabilized, and supply chain issues and other capacity constraints have waned. For example, transportation costs have fallen, and supplier delivery times have improved notably (figure 5). In addition, nonfuel import prices have declined, on net, since last spring, bringing the 12-month change down to around 1 percent from a peak of almost 8 percent early last year (figure 6). This moderation occurred following both the appreciation of the dollar that occurred earlier in the year and declines in commodity prices such as those for industrial metals.

The easing of inflation pressures in goods has been especially pronounced for durable goods, where prices have declined, on net, since June of last year. In particular, used motor vehicle prices, which skyrocketed in 2021 amid reduced production of new cars and trucks, have fallen more than 9 percent over that period.

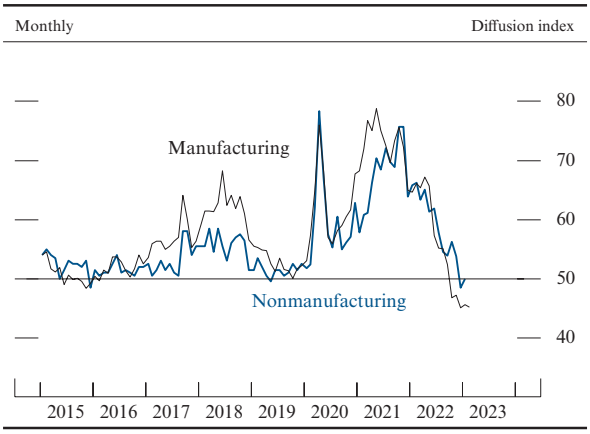
. . . while core services price inflation remains elevated

In contrast, core services price inflation remains elevated (figure 3). Housing services prices have risen especially rapidly, up 8 percent over the 12 months ending in January. However, market rents on new housing leases to new tenants, which had risen strongly over the past two years, have decelerated sharply and flattened out since autumn (figure 7). Because prices for housing services measure the rents paid by all tenants (and the equivalent rent implicitly paid by all homeowners)—including those whose leases have not yet come up for renewal—they tend to adjust slowly to changes in rental market conditions and should therefore be expected to decelerate over the year ahead. In contrast, prices for other core services—a broad group that includes services such as travel and dining, financial services, and car repair—rose 4.7 percent over the 12 months ending in January and have not yet shown clear signs of slowing. Some softening of labor market conditions will likely be required for core services price inflation to abate.

Measures of longer-term inflation expectations have remained contained, while shorter-term expectations have partially reversed their earlier increases

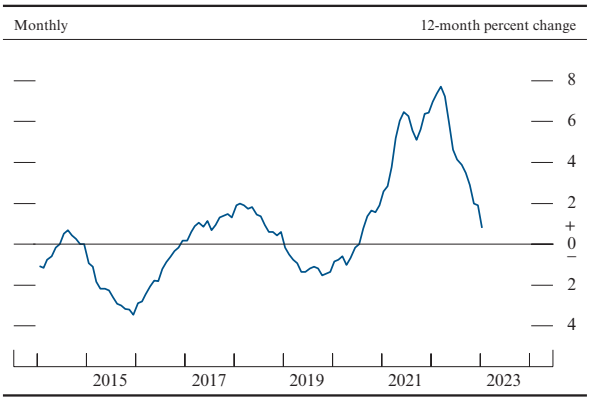
Inflation expectations likely influence actual inflation by affecting wage- and price-setting decisions. Over the past year, survey-based measures of expected inflation over a longer horizon remained within the range of values seen in the years before the pandemic and appear broadly consistent with the FOMC's longer-run 2 percent inflation objective. That is evident for the median value for expected inflation over the next 5 to 10 years from

5. Suppliers' delivery times



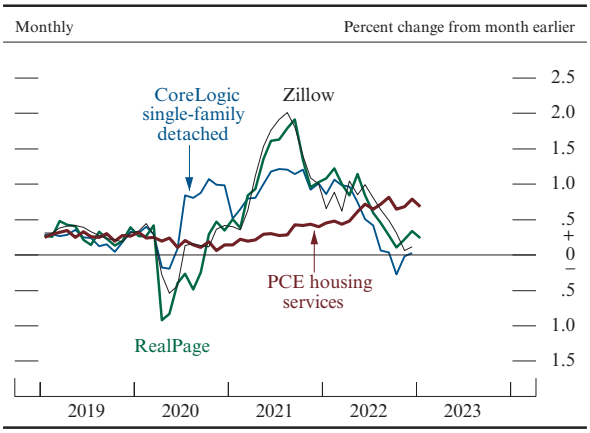
NOTE: Data for manufacturing extend through February 2023. Values greater than 50 indicate that more respondents reported longer delivery times relative to a month earlier than reported shorter delivery times.
SOURCE: Institute for Supply Management, *Report on Business*.

6. Nonfuel import price index



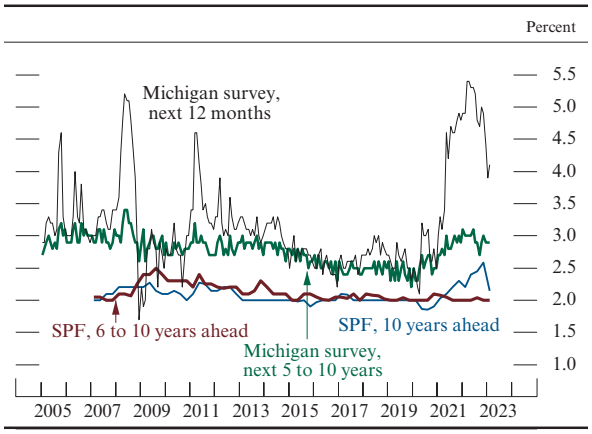
SOURCE: Bureau of Labor Statistics via Haver Analytics.

7. Housing rents



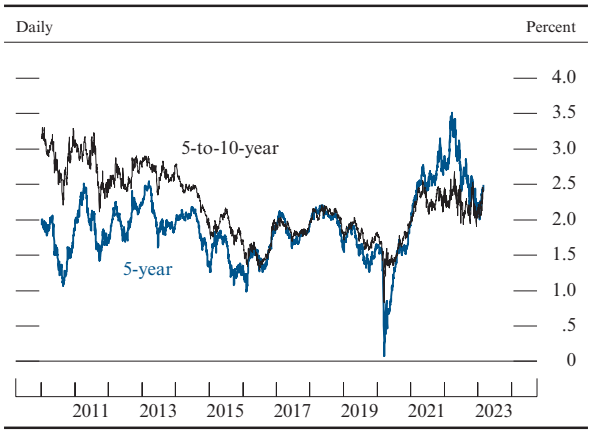
NOTE: CoreLogic and Zillow data extend through December 2022. Zillow, CoreLogic, and RealPage measure market-rate rents–that is, rents for a new lease by a new tenant.
SOURCE: Bureau of Economic Analysis, personal consumption expenditures (PCE), via Haver Analytics; CoreLogic, Inc.; Zillow, Inc.; RealPage, Inc.; Federal Reserve Board staff calculations.

8. Measures of inflation expectations



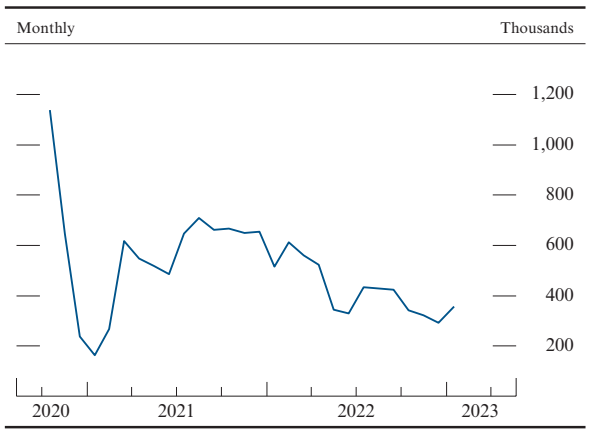
NOTE: The Survey of Professional Forecasters (SPF) data are quarterly, begin in 2007:Q1, and extend through 2023:Q1. The data for the Michigan survey are monthly and extend through February 2023.
SOURCE: University of Michigan Surveys of Consumers; Federal Reserve Bank of Philadelphia, SPF.

9. Inflation compensation implied by Treasury Inflation-Protected Securities



NOTE: The data are at a business-day frequency and are estimated from smoothed nominal and inflation-indexed Treasury yield curves.
SOURCE: Federal Reserve Bank of New York; Federal Reserve Board staff calculations.

10. Nonfarm payroll employment



NOTE: The data shown are a 3-month moving average of the change in nonfarm payroll employment.
SOURCE: Bureau of Labor Statistics via Haver Analytics.

the University of Michigan Surveys of Consumers (figure 8). And while expected inflation over the next 10 years in the Survey of Professional Forecasters, conducted by the Federal Reserve Bank of Philadelphia, has moved up somewhat, that increase is driven by expectations for the next few years: The median forecaster in the survey expects PCE price inflation to average 2 percent over the five years beginning five years from now.

Furthermore, inflation expectations over a shorter horizon—which tend to follow observed inflation and rose when inflation turned up—moved lower in the second half of 2022 and into 2023, accompanying the softer inflation readings over this period. In the Michigan survey, the median value for inflation expectations over the next year was 4.1 percent in February, a step-down from the values in the middle of 2022. Expected inflation for the next year from the Survey of Consumer Expectations, conducted by the Federal Reserve Bank of New York, has also moved lower in recent months.

Market-based measures of longer-term inflation compensation, which are based on financial instruments linked to inflation, are also broadly in line with readings seen in the years before the pandemic. A measure of inflation compensation over the next 5 years implied by Treasury Inflation-Protected Securities moved notably lower last year, and inflation compensation 5 to 10 years ahead still appears consistent with inflation returning to 2 percent (figure 9).

The labor market has continued to strengthen

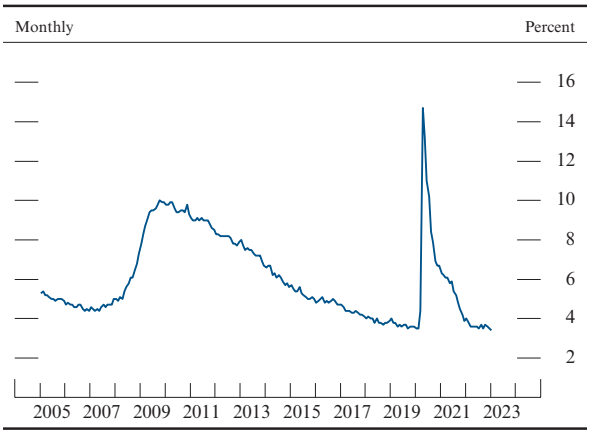
Payroll employment gains averaged 380,000 per month since the middle of 2022, down from the 445,000 per month pace in the first half but still quite robust (figure 10). Employment in the leisure and hospitality sector continued its steady recovery from the pandemic, and payrolls also increased robustly in health services and in state and

local governments.[3] Alternative indicators of employment—the Bureau of Labor Statistics' household survey, the Federal Reserve Board staff's measure of private employment using data from the payroll processing firm ADP, and the Quarterly Census of Employment and Wages—suggest a slower pace of job gains last year, particularly in the first half. However, these other indicators suggest continued job gains in recent months, roughly in line with published payroll data.

The unemployment rate has remained at historically low levels (figure 11). At 3.4 percent in January, the jobless rate was a touch below its level right before the pandemic. Unemployment rates among various age, educational attainment, gender, and ethnic and racial groups are also near their respective historical lows (figure 12). (The box "Developments in Employment and Earnings across Demographic Groups" provides further details.)

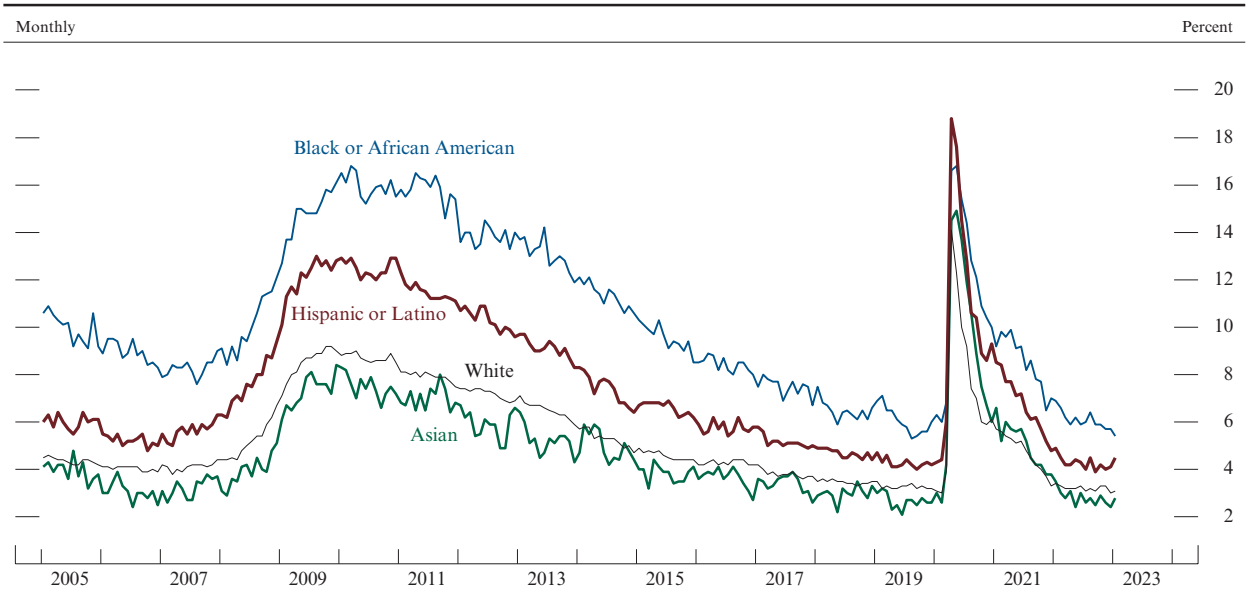
3. Two sectors where employment growth slowed notably in the second half were transportation and warehousing—where employment had expanded robustly since the onset of the pandemic—and retail trade.

11. Civilian unemployment rate



SOURCE: Bureau of Labor Statistics via Haver Analytics.

12. Unemployment rate, by race and ethnicity



NOTE: Unemployment rate measures total unemployed as a percentage of the labor force. Persons whose ethnicity is identified as Hispanic or Latino may be of any race. Small sample sizes preclude reliable estimates for Native Americans and other groups for which monthly data are not reported by the Bureau of Labor Statistics.

SOURCE: Bureau of Labor Statistics via Haver Analytics.

Developments in Employment and Earnings across Demographic Groups

As the labor market has recovered from the depths of the pandemic, conditions have become extremely tight. Tight labor markets, characterized by low unemployment and plentiful job openings, have historically proven especially beneficial to minorities and less educated workers.[1] These disproportionate benefits can help make up for disproportionate losses experienced by the same groups during recessions.

Tight labor market conditions have largely erased the pandemic-induced widening of the gaps in employment across different groups. As shown in the left panel of figure A, both men and women aged 25 to 54 with a high school degree or less saw much larger employment declines in early 2020 than workers with at least some college education, but by the end of 2022, this gap had almost entirely closed.[2] The same story is true among both Black or African American and Hispanic or Latino workers aged 25 to 54, as shown in the right panel. From mid-2021 through 2022, as labor market conditions became extremely tight, employment rose faster for the groups that saw larger initial declines. However, while disparities in employment have largely returned to pre-pandemic levels, these disparities are significant in absolute levels of employment across groups.

Differences in employment dynamics between groups during the pandemic stem from a mixture of demand and supply factors. On the labor demand side, for example, the leisure and hospitality sector experienced severe losses in 2020 but has seen a strong rebound in employment growth in the past two years. Since workers with a high school degree or less are historically more than twice as likely as workers with a college degree to be employed in leisure and hospitality, part of this group's unusually large employment decline and rebound is likely attributable to the fluctuations in labor demand from this sector.[3] On the labor supply side, many parents left work during the pandemic period when schools and childcare facilities were closed. This phenomenon appears to have been particularly acute for women, especially

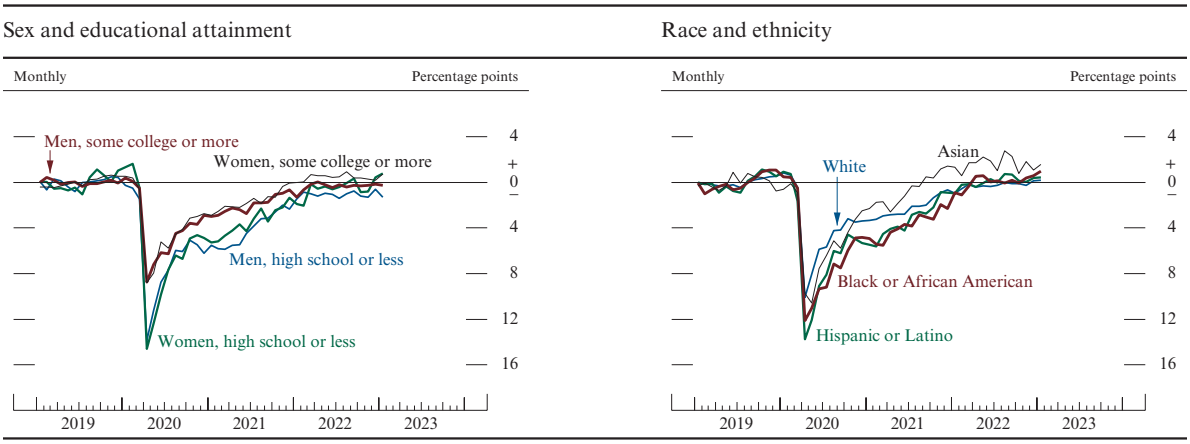
(continued)

1. See Arthur M. Okun (1973), "Upward Mobility in a High-Pressure Economy," *Brookings Papers on Economic Activity,* no. 1, pp. 207–61, https://www.brookings.edu/wp-content/uploads/1973/01/1973a_bpea_okun_fellner_greenspan.pdf; and Stephanie R. Aaronson, Mary C. Daly, William L. Wascher, and David W. Wilcox (2019), "Okun Revisited: Who Benefits Most from a Strong Economy?" *Brookings Papers on Economic Activity,* Spring, pp. 333–75, https://www.brookings.edu/wp-content/uploads/2019/03/aaronson_web.pdf.

2. Women saw slightly greater employment losses relative to men with a similar educational background at the beginning of the pandemic but also experienced a slightly more rapid recovery. The disproportionate effect of the pandemic on women contrasts with previous recessions, when employment has historically fallen more among men than women.

3. Similarly, Black or African American, Hispanic or Latino, and Asian workers are also overrepresented in the leisure and hospitality industry relative to white workers, although these differences are smaller than differences by education. See Guido Matias Cortes and Eliza Forsythe (2022), "Heterogeneous Labor Market Impacts of the COVID-19 Pandemic," *ILR Review*, vol. 76 (January), pp. 30–55.

A. Prime-age employment-to-population ratios compared with the 2019 average ratio, by group



NOTE: Prime age is 25 to 54. All series are seasonally adjusted by the Federal Reserve Board staff.
SOURCE: Bureau of Labor Statistics; U.S. Census Bureau, Current Population Survey; Federal Reserve Board staff calculations.

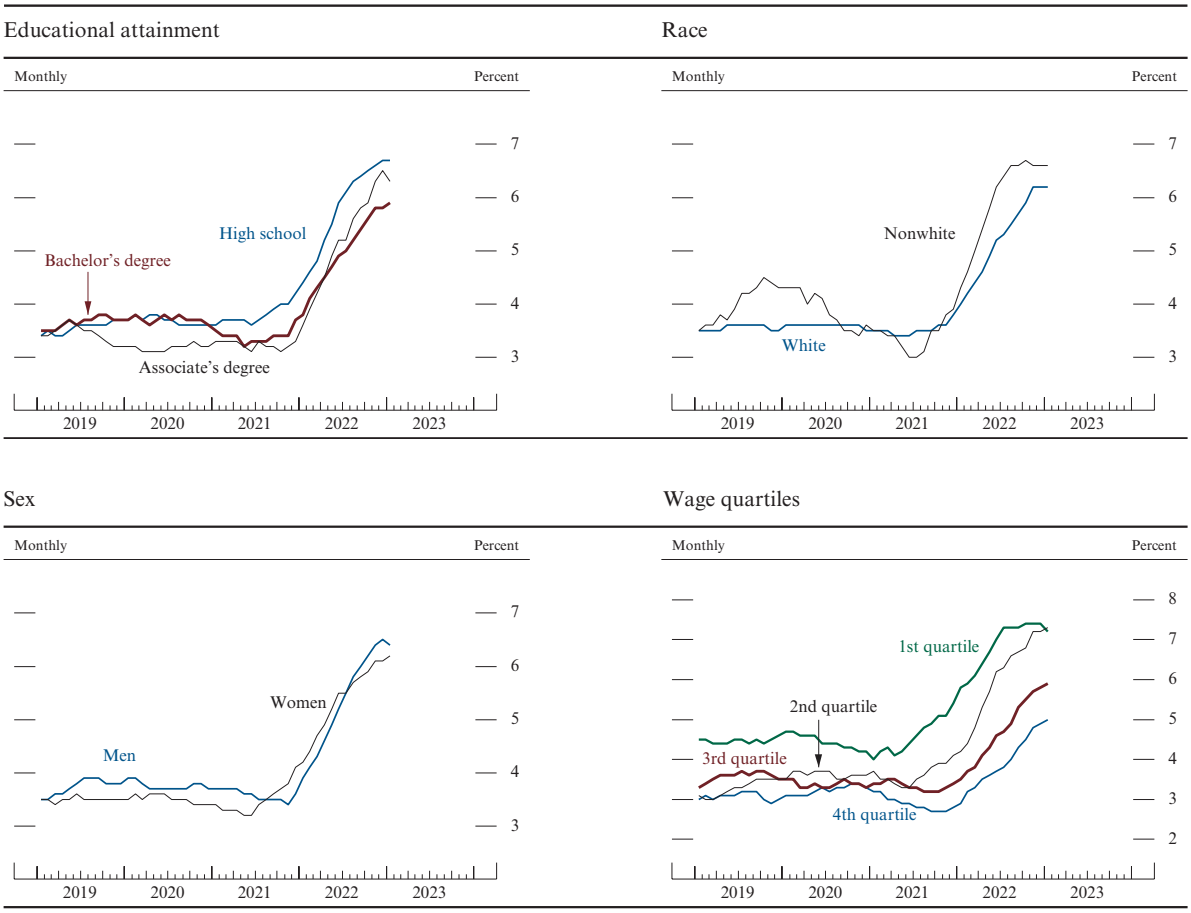
Black and Hispanic mothers, as well as those with less education.[4] (For more discussion of recent labor supply developments, see the box "Why Has the Labor Force Recovery Been So Slow?")

As labor market conditions have tightened, wage growth has risen sharply, especially for the least advantaged groups. As shown in the upper panels of figure B, growth of nominal hourly wages jumped in 2022, but growth was higher for non-college-educated workers than for college-educated workers and higher for nonwhite workers than for white workers. This largely reflects that wage growth has been consistently stronger at the lower end of the income distribution (see the lower-right panel).[5] Importantly, these higher rates of wage growth for less advantaged groups coincided with the faster increase in employment, indicating that labor supply could not keep up with the growth in labor demand.

4. See Joshua Montes, Christopher Smith, and Isabel Leigh (2021), "Caregiving for Children and Parental Labor Force Participation during the Pandemic," FEDS Notes (Washington: Board of Governors of the Federal Reserve System, November 5), https://www.federalreserve.gov/econres/notes/feds-notes/caregiving-for-children-and-parental-labor-force-participation-during-the-pandemic-20211105.htm.

5. Wage growth for the bottom quartile was a bit stronger than for other groups even before the pandemic, as labor market conditions tightened at the end of the previous expansion.

B. Nominal weekly earnings growth, by group



NOTE: Series show 12-month moving averages of the median percent change in the nominal hourly wage of individuals observed 12 months apart. In the bottom right panel, workers are assigned to wage quartiles based on the average of their wage reports in both Current Population Survey outgoing rotation group interviews; workers in the lowest 25 percent of the average wage distribution are assigned to the 1st quartile, and those in the top 25 percent are assigned to the 4th quartile.

SOURCE: Federal Reserve Bank of Atlanta, Wage Growth Tracker; Bureau of Labor Statistics; U.S. Census Bureau, Current Population Survey.

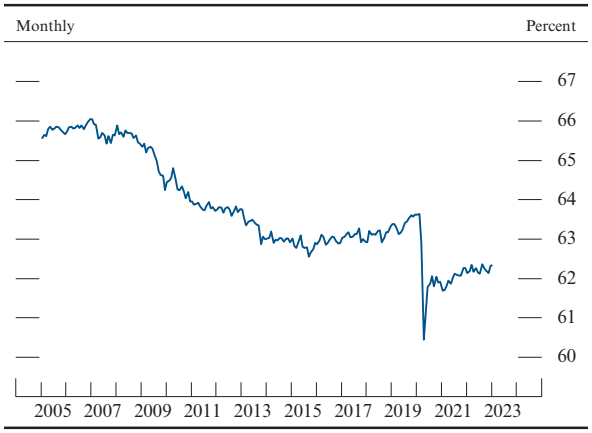
Labor demand has remained very strong, showing only tentative signs of easing . . .

Demand for labor continued to be very strong in the second half of 2022. The Job Openings and Labor Turnover Survey indicated that there were 11 million job openings at the end of December—down about 850,000 from the all-time high recorded last March but still more than 50 percent above pre-pandemic levels. An alternative measure of job vacancies constructed by Federal Reserve Board staff using job postings data from the large online job board Indeed also shows that vacancies moved gradually lower throughout 2022 but remain well above pre-pandemic levels. Many employers report having scaled back their hiring plans somewhat, though levels of anticipated hiring remain high by historical standards.[4] Also consistent with strong labor demand, initial claims for unemployment insurance have remained at historically low levels.

. . . while labor supply has increased only modestly . . .

Meanwhile, the supply of labor increased only modestly last year. The labor force participation rate, which measures the share of people either working or actively seeking work, was essentially flat last year and remains roughly 1¼ percentage points below its February 2020 level (figure 13).[5] (See the box "Why Has the Labor Force Recovery Been So Slow?")

13. Labor force participation rate



NOTE: The labor force participation rate is a percentage of the population aged 16 and over. Data are adjusted for the January 2022 updated population controls. See Bureau of Labor Statistics (2022), "Adjustments to Household Survey Population Estimates in January 2022," Current Population Survey Technical Documentation, February, https://www.bls.gov/cps/population-control-adjustments-2022.pdf.
SOURCE: Bureau of Labor Statistics via Haver Analytics.

4. For example, the (net) share of employers planning to increase payrolls in coming months, as reported by both the staffing firm ManpowerGroup and the National Federation of Independent Business, has come down in recent months but remains elevated.

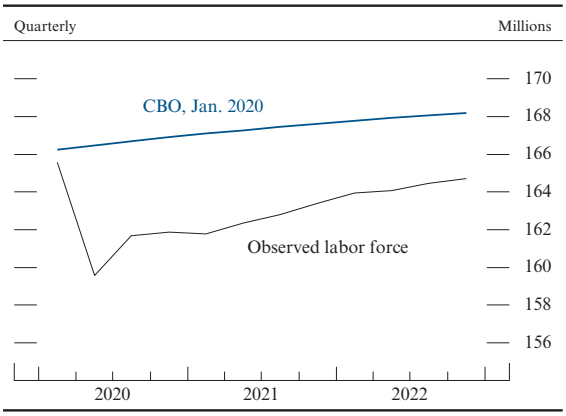
5. This labor force participation rate (LFPR) estimate and figure 13 adjust the historical data to account for the updated population estimates produced by the Census Bureau and incorporated by the Bureau of Labor Statistics in their January 2022 Employment Situation report. Without making an adjustment for these updated population estimates, the LFPR would erroneously appear to have improved more since the onset of the pandemic and to be only about 1 percentage point below its pre-pandemic level.

Why Has the Labor Force Recovery Been So Slow?

By many measures, the labor market has recovered strongly. Unemployment is low, job growth has been robust, and job opportunities are abundant. However, the labor market has underperformed in one key dimension: The labor force, or the number of people working or looking for work, is well below levels projected by most observers before the pandemic. This shortfall has contributed to a widening gap between labor demand and labor supply and to widespread labor shortages.

One estimate of the shortfall compares the labor force that the nation has now to the labor force that might have been expected given past economic and demographic trends. One way to make such a comparison is to look at what professional forecasters at some point in the past expected the labor force to be now. For example, comparing the current level of the labor force with the Congressional Budget Office's January 2020 projection of its current level suggests a shortfall of about 3½ million (figure A).[1] That figure is likely an upper bound on the true shortfall, in light of new data not yet incorporated into the Census Bureau's publicly available population estimates and so not in these calculations.[2] Even so, the shortfall appears large and economically significant, and it reflects both a lower labor force participation rate and slower population growth than was expected without the pandemic (figure B).

A. Labor force relative to an ex-pandemic counterfactual



NOTE: The "CBO, Jan. 2020" line appends the Congressional Budget Office's (CBO) January 2020 projected labor force growth onto the level of the labor force at the start of the pandemic through the end of 2022.
SOURCE: Congressional Budget Office; Federal Reserve Board staff calculations.

B. Decomposition of the current labor force shortfall

Millions of people

Total shortfall	3.5
LFPR	2.1
Population	1.4
Excess deaths since COVID	.5
Net migration slowdown since COVID	.9

Note: The labor force shortfall is calculated over the period from 2019:Q4 to 2022:Q4.
Source: Current Population Survey; CDC mortality statistics; staff calculations.

Lower labor force participation

The labor force participation rate dropped sharply at the onset of the pandemic and has remained persistently below pre-pandemic levels ever since then (figure 13, main text). Earlier in the pandemic, the low level of participation reflected several pandemic-related influences (figure C). Many people left the labor force to care for sick relatives or for children learning

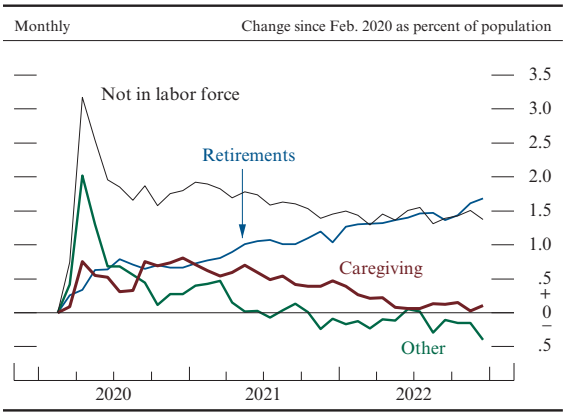
(continued on next page)

1. All analysis in this discussion is through the end of 2022 and based on data from the Current Population Survey that are adjusted for the January 2022 updated population controls as described in the main text. To account for the effect of those population controls on the level of the labor force, the shortfall is calculated by appending the Congressional Budget Office's (CBO) January 2020 projected labor force growth from the start of the pandemic through the end of 2022 onto the level of the labor force just before the start of the pandemic that is adjusted for population controls. The CBO projected the labor force participation rate (LFPR) to decline about ¼ percentage point per year from 2020 onward, consistent with the downward pressure on the LFPR from the aging of the baby boomers into retirement ages. The CBO also projected the population to increase at an average annual rate of 2.1 million from 2020 onward. See Congressional Budget Office (2020), *The Budget and Economic Outlook: 2020 to 2030* (Washington: CBO, January), https://www.cbo.gov/publication/56073.

2. This analysis does not adjust for the updated January 2023 population controls. The January 2023 updated population controls revised up the level of the labor force in December 2022 by 871,000 people, which suggests that the labor force shortfall may be materially smaller. However, as the detailed population estimates are not yet available, it is not possible to precisely estimate the level of the labor force before the pandemic that reflects the January 2023 updated population controls.

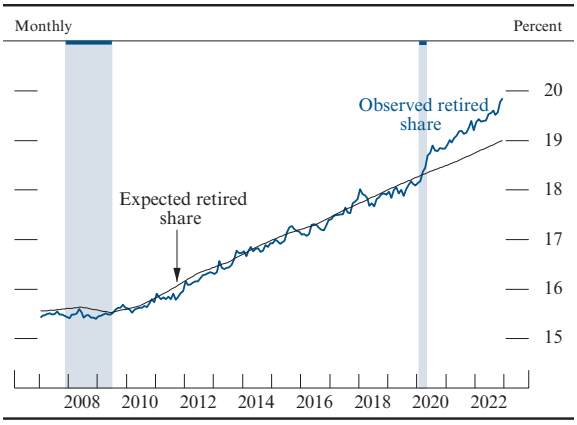
Why Has the Labor Force Recovery Been So Slow? *(continued)*

C. Nonparticipation in the labor force as a percent of the population and by reason, relative to February 2020



NOTE: The curves show estimates of the percent of the population indicating they are not in the labor force for various reasons, relative to February 2020 values. The "Other" category includes disability, illness, school, and all other reasons. The data extend through December 2022.
SOURCE: Staff estimates using microdata from the Current Population Survey, Bureau of Labor Statistics.

D. Retired share of the population (aged 16 and older), actual relative to expected



NOTE: Data are adjusted for the January 2022 updated population controls. The shaded bars indicate periods of business recession as defined by the National Bureau of Economic Research. The data extend through December 2022.
SOURCE: Joshua Montes, Christopher Smith, and Juliana Dajon (2022), "'The Great Retirement Boom': The Pandemic-Era Surge in Retirements and Implications for Future Labor Force Participation," Finance and Economics Discussion Series 2022-081 (Washington: Board of Governors, November), https://doi.org/10.17016/FEDS.2022.081.

remotely. Others withdrew because they were sick with COVID-19 or feared getting COVID-19 at work. Many others retired early. As COVID concerns have waned, the influence of caregiving and fears of contracting COVID at work have diminished, whereas the contribution of retirements has increased. As a result, essentially all of the current participation rate shortfall can be accounted for by the higher percentage of the population that is retired.

The retired share of the population jumped sharply at the onset of the pandemic (figure D, blue line). Some of this increase was to be expected. In the decade leading up to the pandemic, retirements increased steadily as the baby-boom cohort aged. If the pandemic had not occurred, this trend of rising retirements would have likely continued (figure D, black line). Currently, however, the total number of people retired is well above that expected level. Excess retirements (the difference between total and expected) number roughly 2.2 million and are concentrated among older Americans, particularly among people aged 65 and over.[3]

Several factors have led to people retiring before they otherwise would have. Health concerns likely contributed to a portion of the excess retirements, as COVID poses a particularly large risk to the health of older people. In addition, many older workers lost their jobs early in the pandemic when layoffs were historically high, and finding new employment may have been particularly difficult for those workers given pandemic-related disruptions to the work environment and health concerns. Indeed, workers aged 65 and over who lost their job during the pandemic had much lower reemployment rates and much higher rates of labor force exit than did similarly aged displaced

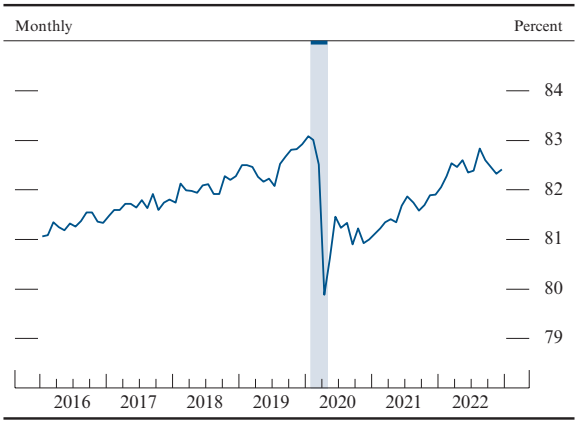
(continued)

3. For more on pandemic retirements, see Joshua Montes, Christopher Smith, and Juliana Dajon (2022), " 'The Great Retirement Boom': The Pandemic-Era Surge in Retirements and Implications for Future Labor Force Participation," Finance and Economics Discussion Series 2022-081 (Washington: Board of Governors of the Federal Reserve System, November), https://doi.org/10.17016/FEDS.2022.081.

workers in the years just before the pandemic.[4] Further, increases in wealth, fueled by gains in the stock market and rising house prices in the first two years of the pandemic, may have allowed some people to retire early, and research suggests that excess retirements have been largest among college-educated and white workers—the groups that likely benefited most from the stock market and house price gains earlier in the pandemic. There is little sign yet of a reduction in excess retirements. Instead, older workers are still retiring at higher rates than before the pandemic, and retirees are not returning to the labor force in sufficient numbers to reduce the total number of retirees.

In contrast, participation for those aged 25 to 54 (prime age) has mostly returned to pre-COVID levels (figure E). This recovery likely reflects the abundance of job opportunities and strong wage growth as well as the waning influence of COVID-related factors. However, the prime-age participation rate did move somewhat lower the last few months of 2022. Although the drag on participation from caregiving has diminished since the first year of the pandemic, it remains elevated relative to its pre-pandemic level and, in fact, moved higher over the second half of 2022—perhaps because many caretakers have been unable to participate in the labor force because of flu, COVID, or other respiratory illness among their children and other family members.[5] Further, many workers are still out of work because they are sick with COVID or continue to suffer lingering symptoms from previous COVID infections ("long COVID"), and their illness is likely depressing participation to some extent.[6]

E. Labor force participation rate for prime-age people



NOTE: The shaded bar indicates a period of business recession as defined by the National Bureau of Economic Research. The data extend through December 2022.
SOURCE: Bureau of Labor Statistics via Haver Analytics.

Lower population growth

The second contributor to the labor force shortfall is slower population growth. Over the decade before the pandemic, the population increased about 1 percent per year. Since the start of 2020, annual population growth has slowed to about ½ percent per year, on average, resulting in slower labor force growth for a given participation rate. That slowdown reflects two factors. First, primarily because of COVID, mortality over the past few years has far exceeded what was expected before the pandemic; even though the mortality was concentrated among older Americans who are less likely to be working, it still has contributed about 500,000 to the labor force shortfall. Second, pandemic-related restrictions on entry into

(continued on next page)

4. See Bureau of Labor Statistics (2022), "Displaced Workers Summary," Economic News Release, August 26, https://www.bls.gov/news.release/disp.nr0.htm.

5. For more on how caregiving burdens affected labor force participation in the first year and a half of the pandemic, see, for example, Joshua Montes, Christopher Smith, and Isabel Leigh (2021), "Caregiving for Children and Parental Labor Force Participation during the Pandemic," FEDS Notes (Washington: Board of Governors of the Federal Reserve System, November 5), https://doi.org/10.17016/2380-7172.3013.

6. See, for example, Gopi Shah Goda and Evan J. Soltas (2022), "The Impacts of COVID-19 Illnesses on Workers," NBER Working Paper Series 30435 (Cambridge, Mass.: National Bureau of Economic Research, September), https://doi.org/10.3386/w30435; Louise Sheiner and Nasiha Salwati (2022), "How Much Is Long COVID Reducing Labor Force Participation? Not Much (So Far)," Hutchins Center Working Paper Series 80 (Washington: Brookings Institution, October), https://www.brookings.edu/wp-content/uploads/2022/10/WP80-Sheiner-Salwati_10.27.pdf; and Brendan M. Price (2022), "Long COVID, Cognitive Impairment, and the Stalled Decline in Disability Rates," FEDS Notes (Washington: Board of Governors of the Federal Reserve System, August 5), https://doi.org/10.17016/2380-7172.3189.

Why Has the Labor Force Recovery Been So Slow? *(continued)*

the U.S. substantially slowed total immigration in the first two years of the pandemic. Although net migration rebounded considerably in 2022, lower net international migration since the start of the pandemic has lowered the labor force by as much as 900,000 people relative to pre-pandemic trends.[7]

Looking ahead

Due to the aging of the population, a meaningful reversal of the run-up in the retired share of the population seems unlikely, and the labor force participation rate is likely to remain well below its level from before the pandemic. It is possible that some of those who retired during the pandemic will reenter the labor force, but the persistently high level of excess retirements suggests this reentry is not yet happening. In contrast, some further gains in labor force participation among younger people may be possible. Over the five years before the pandemic, the participation rate for 25-to-54-year-olds increased significantly, partially reversing a multidecade decline in their labor force participation, and the participation rate for this group seemed poised for further gains had the pandemic not occurred. However, even if further increases in participation among younger people occur, those increases would likely only gradually reduce the overall labor force shortfall.

Regarding population growth, as pandemic-related restrictions on immigration have eased, immigration has started to rebound. If net migration continues to move higher, it may help alleviate labor shortages, as immigrant workers have tended to work in industries and jobs where labor shortages appear particularly acute, such as childcare, health care, and accommodation and food services.[8]

7. There is considerable uncertainty about the contribution of changes in immigration since the start of the pandemic to the labor force shortfall, especially in light of the revisions to the historical level of the labor force due to the January 2023 updated population controls and because of the pickup in immigration over 2022, which lowered its contribution to the labor force shortfall. The 900,000-person contribution of lower immigration to the labor force shortfall is likely an upper-bound estimate.

8. Immigration had slowed markedly in the few years before the pandemic. If immigration rises only to the relatively low levels prevailing before the pandemic, the population will grow at a historically low rate.

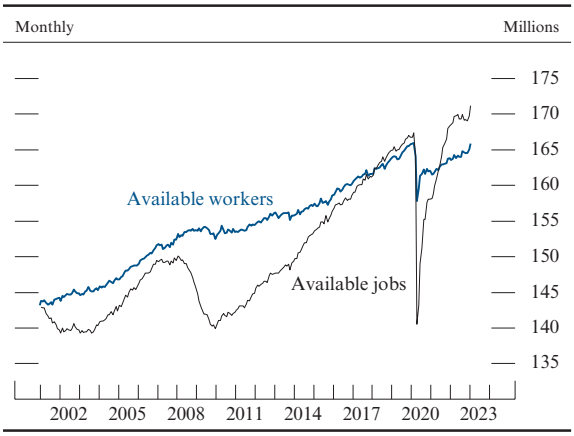
. . . resulting in an extremely tight labor market

As a result, the labor market remains extremely tight despite some tentative signs of modest easing. The number of total available jobs (measured by total employment plus posted job openings) continues to far exceed the number of available workers (measured by the size of the labor force). This jobs–workers gap was 5.3 million at the end of the year, down about 600,000 from the peak recorded last March but still very elevated by historical standards (figure 14).[6] The share of workers quitting jobs each month, an indicator of the availability of attractive job prospects, was 2.7 percent at the end of the year, somewhat below the all-time high of 3 percent reported a year earlier but still elevated. Similarly, households' and small businesses' perceptions of labor market tightness have come down from their recent peaks but remain high. And many employers across Federal Reserve Districts reported some easing of hiring and retention difficulties but continued to view labor market conditions as tight.[7]

Wage growth has slowed but remains elevated

Wage growth slowed in the second half of 2022 but was still elevated (figure 15). Total hourly compensation as measured by the employment cost index increased at an annual rate of 4.1 percent in the second half of last year, a strong gain but a step-down from the 6.0 percent increase observed during the first half. Increases in average hourly earnings (a less comprehensive measure of compensation) have slowed as well, rising 4.4 percent over the 12 months to January, down from 5.7 percent over the preceding 12 months. Wage growth as computed by the Federal Reserve Bank of

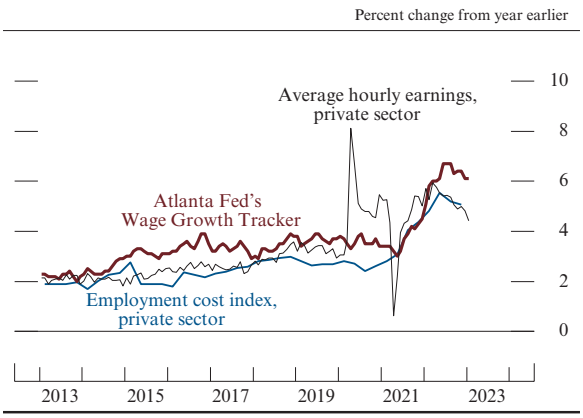
14. Available jobs versus available workers



NOTE: Available jobs are employment plus job openings as of the end of the previous month. Available workers are the labor force. Data are adjusted for the January 2022 updated population controls. See Bureau of Labor Statistics (2022), "Adjustments to Household Survey Population Estimates in January 2022," Current Population Survey Technical Documentation, February, https://www.bls.gov/cps/population-control-adjustments-2022.pdf.

SOURCE: Bureau of Labor Statistics; Job Openings and Labor Turnover Survey; all via Haver Analytics; Federal Reserve Board staff calculations.

15. Measures of change in hourly compensation



NOTE: For the private-sector employment cost index, change is over the 12 months ending in the last month of each quarter; for private-sector average hourly earnings, the data are 12-month percent changes; for the Atlanta Fed's Wage Growth Tracker, the data are shown as a 3-month moving average of the 12-month percent change.

SOURCE: Bureau of Labor Statistics; Federal Reserve Bank of Atlanta, Wage Growth Tracker; all via Haver Analytics.

6. The ratio of job openings to unemployment shows that there were 1.9 job openings per unemployed person in December 2022. For comparison, this ratio averaged 1.2 in 2019 and 0.6 over the 10-year period from 2010 to 2019.

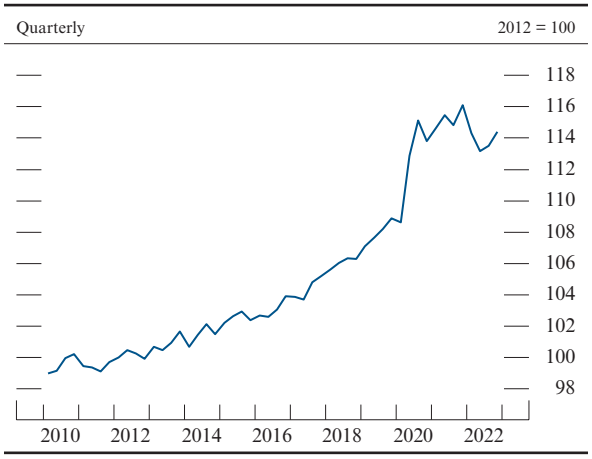
7. See the January 2023 Beige Book, available on the Board's website at https://www.federalreserve.gov/monetarypolicy/publications/beige-book-default.htm.

Atlanta, which tracks the median 12-month wage growth of individuals responding to the Current Population Survey, was 6.1 percent in January, down from its peak last summer but well above the 3 to 4 percent pace reported over the previous few years.

Following a period of strong growth, labor productivity weakened last year

The extent to which wage gains raise firms' costs and act as a source of inflation pressure depends importantly on the pace of productivity growth. Productivity rose at a rapid average pace of 3¼ percent over 2020 and 2021, but it declined last year as output growth slowed and employment growth held up (figure 16). In retrospect, much of the strong productivity growth in 2020 and 2021 seems to have been the result of temporary pandemic-related factors such that the decline in 2022 may reflect a normalization as productivity moves back toward its trend. In 2021, as the economy reopened, firms struggled to hire workers, and many firms temporarily operated with overstretched workforces.[8] Subsequently, the slowdown in aggregate demand last year allowed many firms to catch up in their hiring.[9]

16. U.S. labor productivity



NOTE: The data are output per hour in the nonfarm business sector.
SOURCE: Bureau of Labor Statistics via Haver Analytics.

The pace of productivity growth going forward remains very uncertain. Productivity growth averaged only about 1 percent per year during the expansion that preceded the pandemic recession, and it is possible that the economy will return to a similar low-productivity growth regime. However, it also seems possible that the high rate of new business formation, widespread adoption of remote-work technology, and the wave of

8. In 2020, there were also significant composition effects boosting labor productivity, as pandemic-induced employment losses were largest in lower-productivity services sectors. Employment composition looks to have largely normalized by 2021.

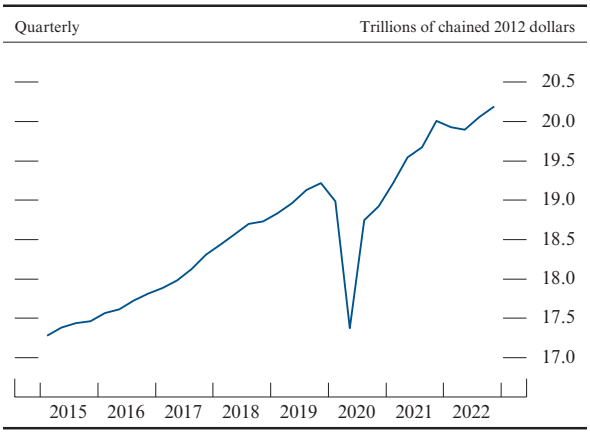
9. Consistent with this view, the November 2022 Beige Book reported that many employers cited concerns that their workforce was being overworked as an important reason for hiring; see that publication, which can be found on the Board's website at https://www.federalreserve.gov/monetarypolicy/files/BeigeBook_20221130.pdf.

labor-saving investments that the pandemic brought about could boost productivity growth above that pace in coming years.

Momentum in gross domestic product has slowed

After the strong rebound in 2021 from the pandemic-induced recession, economic activity lost momentum last year. Although real gross domestic product (GDP) is reported to have risen at a solid 3.0 percent pace in the second half of 2022, growth in real private domestic final purchases—consumer spending plus residential and business fixed investment, a measure of output that often better reflects the underlying momentum of economic activity—slowed to just a 0.6 percent pace (figure 17). Consumer spending growth held up last year, but the fundamentals that underpin household spending have deteriorated. Business investment rose moderately in the second half of 2022, although new orders indexes, business sentiment, and profit expectations suggest that spending growth may slow. And activity in the housing sector contracted sharply last year in response to elevated mortgage rates. Finally, manufacturing output moved lower, on net, over the past few months, with surveys of manufacturing pointing to continued weakness in coming months. Diffusion indexes of new orders from various manufacturing surveys are well into contractionary territory, and backlogs of existing orders have declined sharply.

17. Real gross domestic product

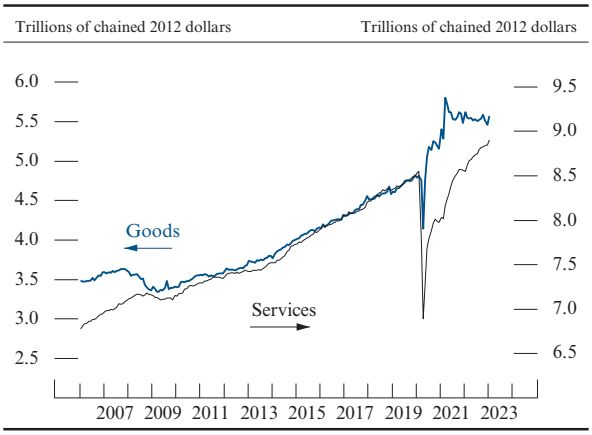


SOURCE: Bureau of Economic Analysis via Haver Analytics.

Consumer spending grew moderately last year . . .

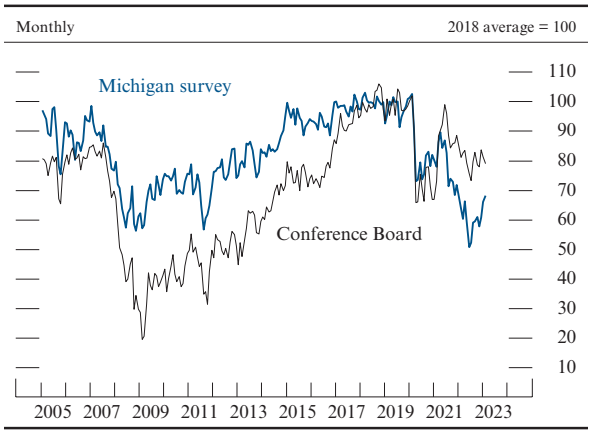
Consumer spending adjusted for inflation grew at a 1.8 percent rate in the second half of 2022, about the same pace as in the first half of the year. And, averaging through some recent volatility, consumer spending has continued to look solid in the most recent data. Spending increases over the past year have been concentrated in services, whereas spending on goods has remained roughly flat since mid-2021 following its surge during 2020 and early 2021, suggesting that consumers' spending habits have been returning toward their pre-pandemic patterns (figure 18).

18. Real personal consumption expenditures



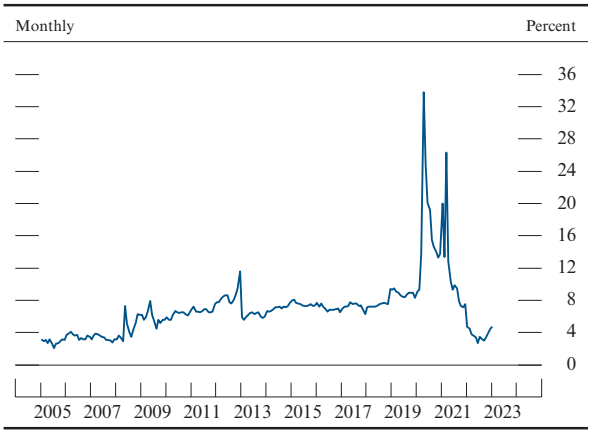
NOTE: The data are monthly.
SOURCE: Bureau of Economic Analysis via Haver Analytics.

19. Indexes of consumer sentiment



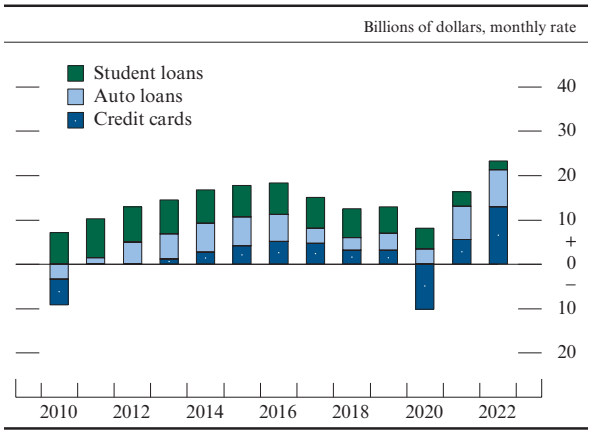
NOTE: The data extend through February 2023.
SOURCE: University of Michigan Surveys of Consumers; Conference Board.

20. Personal saving rate



SOURCE: Bureau of Economic Analysis via Haver Analytics.

21. Consumer credit flows



SOURCE: Federal Reserve Board, Statistical Release G.19, "Consumer Credit."

. . . even as real disposable income fell and consumer confidence was low

The fundamentals for household spending, however, appear to be somewhat less supportive of spending growth. Despite the sizable increases in jobs and wages last year, after factoring in the rise in prices, higher tax payments, and reduced transfers, real disposable income fell 1.4 percent in 2022. And the University of Michigan index of consumer sentiment remains very low by historical standards despite a move higher in the second half of 2022 (figure 19).

As real incomes fell, households likely relied on the savings that had been accumulated during the pandemic as well as higher wealth—reflecting, in part, house price gains over the past few years that outweighed the drag from recent equity price declines—to fund continued consumption. As a result, the personal saving rate fell to its lowest levels since the Great Recession (figure 20).

Consumer financing conditions have tightened somewhat

Interest rates on credit cards and auto loans continued to increase last year and are now higher than the levels observed in 2018 at the peak of the previous monetary policy tightening cycle. In addition, banks reported tighter lending standards across consumer credit products in the second half of 2022, in part reflecting increases in delinquency rates and concerns about further future deterioration in credit performance. After reaching record lows in 2021, delinquency rates for credit cards and auto loans rose last year. That said, the share of delinquent balances for credit cards remained low, while that for auto loans is just a little above its pre-pandemic level. Despite these tighter financial conditions, financing has been generally available to support consumer spending, and consumer credit continued to expand in the past several months (figure 21). Total credit card balances have increased across the credit score distribution, and auto loans continued to rise at a robust pace.

Housing market activity has declined sharply

After rising further over the summer, mortgage rates have fallen back some but remain roughly 3 percentage points higher than their levels a year ago (figure 22). Although mortgage credit broadly remains available, the move up in mortgage rates (along with the earlier large home price increases) has greatly reduced affordability and further depressed homebuying sentiment, leading to a sharp decline in demand to purchase homes. Home sales fell precipitously last year and are now at levels seen during the financial crisis, while house prices have ceased their sharp increases (figures 23 and 24).

The drop in housing demand, combined with a larger-than-normal backlog of homes already in the construction pipeline, has led builders to sharply cut back the number of new housing starts. Single-family starts collapsed from their 2021 highs, though multifamily starts have held up, likely supported by a shift in demand toward rentals given the decline in purchase affordability (figure 25).

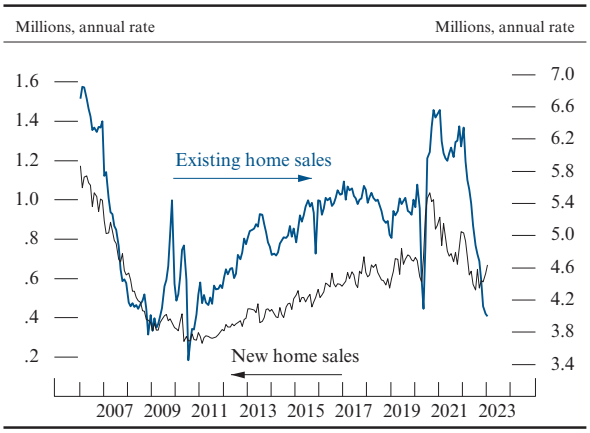
Capital spending grew at a solid pace in the second half last year but has been slowing

Business investment in equipment and intangible capital grew at a solid 5 percent pace in the second half of 2022 (figure 26). The increase in part reflects a jump in spending on transportation equipment, as supply bottlenecks in the motor vehicles sector eased and aircraft shipments stepped up. Excluding the volatile transportation category, investment in equipment and intangibles declined in the fourth quarter, likely reflecting tighter financial conditions for businesses as well as tepid growth in demand. In contrast, investment in nonresidential structures—which tends to respond with a lag to economic conditions—has shown signs of turning up of late, after falling further last year amid ongoing pandemic-related weakness in demand for categories such as office buildings.

22. Mortgage interest rates

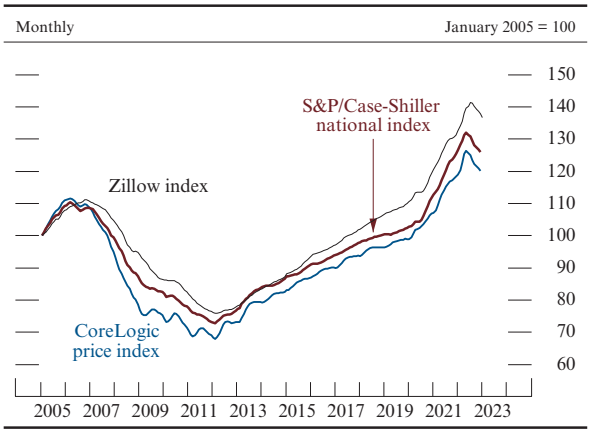
NOTE: The data are contract rates on 30-year, fixed-rate conventional home mortgage commitments and extend through February 23, 2023.
SOURCE: Freddie Mac Primary Mortgage Market Survey.

23. New and existing home sales



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

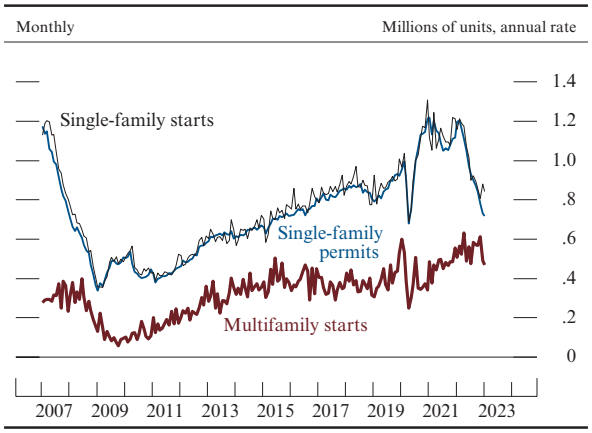
24. Real prices of existing single-family houses



NOTE: Series are deflated by the personal consumption expenditures price index. CoreLogic is not seasonally adjusted. The data for S&P Case-Shiller and CoreLogic extend through December 2022.

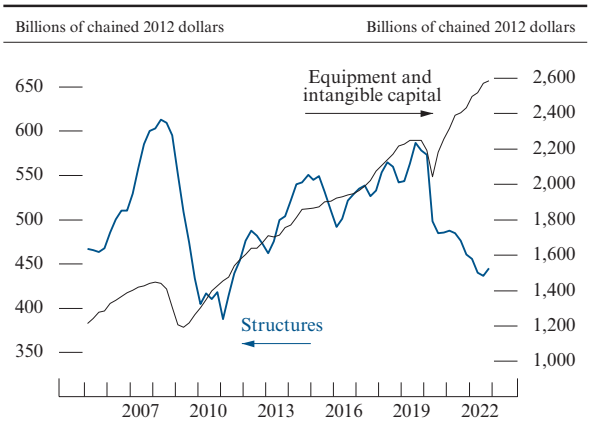
SOURCE: Bureau of Economic Analysis via Haver Analytics; CoreLogic Home Price Index; Zillow, Inc., Real Estate Data; S&P/Case-Shiller U.S. National Home Price Index. The S&P/Case-Shiller index is a product of S&P Dow Jones Indices LLC and/or its affiliates. (For Dow Jones Indices licensing information,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

25. Private housing starts and permits



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

26. Real business fixed investment



NOTE: Business fixed investment is known as "private nonresidential fixed investment" in the national income and product accounts. The data are quarterly.

SOURCE: Bureau of Economic Analysis via Haver Analytics.

While business sentiment has declined significantly and financial conditions have tightened, survey indicators of capital spending plans have continued to hold up and remain above levels that would normally be associated with a sharp downturn in capital spending.

Business financing conditions tightened, but credit generally remained available

Credit remained available to most nonfinancial corporations but at generally higher interest rates and under tighter financial conditions more broadly. Issuance of leveraged loans and speculative-grade corporate bonds slowed substantially in the second half of the year, while investment-grade bond issuance declined modestly. Banks tightened lending standards on commercial and industrial loans and commercial real estate loans over the third and fourth quarters of 2022. Credit remained tight for lower-rated borrowers and tightened further for bank-dependent borrowers. Business loans at banks continued to grow in the second half of 2022 but started to decelerate in the fourth quarter, thus moderating the robust pace of growth observed earlier in the year. Despite the increase in borrowing costs, credit quality has remained strong for most nonfinancial firms. However, some predictors of future business defaults suggest that defaults are more likely.

Meanwhile, financing conditions for small businesses have remained stable over the past year. While credit supply appears to have tightened slightly and interest rates on small business loans have risen notably in recent months, credit availability is broadly in line with pre-pandemic levels. Loan performance remains strong but shows signs of weakening, as default and delinquency rates remain below their pre-pandemic levels but have risen moderately since last spring.

Trade softened amid slowing goods demand

After growing at a notable pace during the first half of the year, real imports declined in the second half, reflecting softening domestic demand for goods (figure 27). Real exports

increased modestly, restrained by the past appreciation of the dollar and weak foreign demand. Real exports of services, especially travel services, continue to slowly recover but remain subdued. The current account deficit as a share of GDP narrowed over the second half of last year but remains wider than before the pandemic.

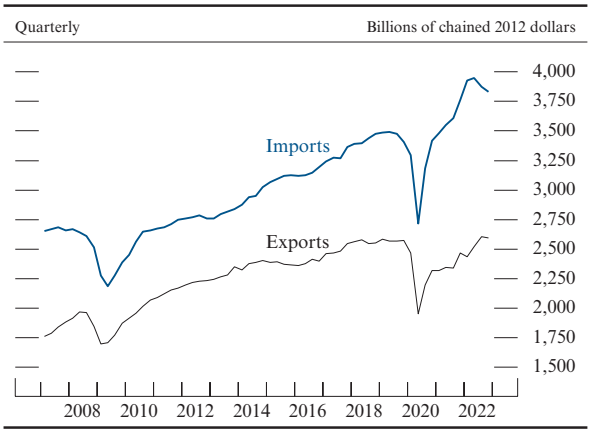
The support to economic activity from federal fiscal actions has largely phased out

The federal government enacted a historic set of fiscal policies to alleviate hardship caused by the pandemic and to support the economic recovery. Policies such as stimulus checks, supplemental unemployment insurance, and child tax credit payments aided households; grants-in-aid supported state and local governments; and business support programs such as the Paycheck Protection Program helped support firms. The support to the level of GDP from these temporary policies has been diminishing, and their unwinding likely imposed a drag on GDP growth in 2022 as the effects on spending waned.

The budget deficit fell sharply from pandemic highs, causing growth in federal debt to moderate

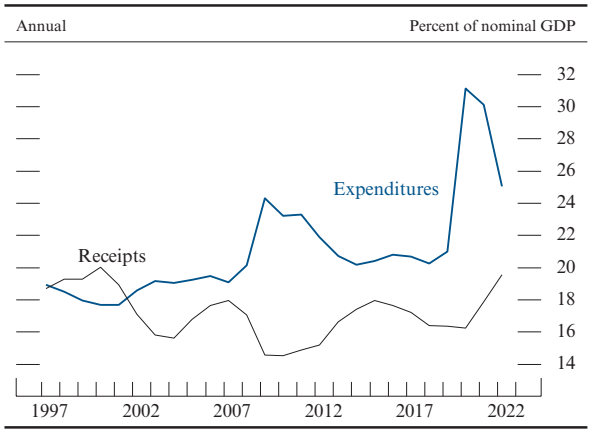
Fiscal policies enacted since the start of the pandemic, combined with the effects of automatic stabilizers—the reduction in tax receipts and the increase in transfers that occur because of subdued economic activity—caused the federal deficit to surge to 15 percent of GDP in fiscal 2020 and to more than 12 percent in fiscal 2021 (figure 28).[10] However,

27. Real imports and exports of goods and services



SOURCE: Bureau of Economic Analysis via Haver Analytics.

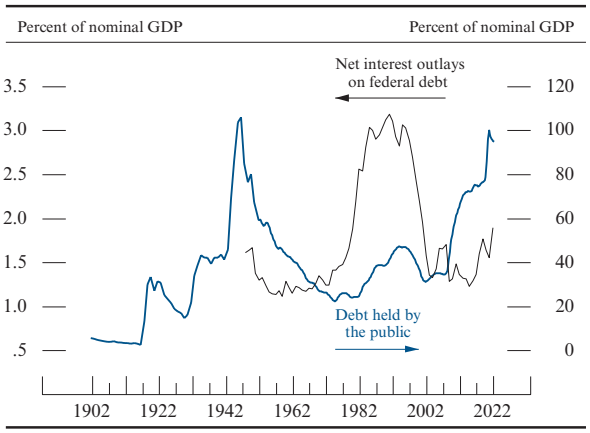
28. Federal receipts and expenditures



NOTE: The receipts and expenditures data are on a unified-budget basis and are for fiscal years (October through September); gross domestic product (GDP) data are on a 4-quarter basis ending in Q3.
SOURCE: Department of the Treasury, Financial Management Service; Office of Management and Budget and Bureau of Economic Analysis via Haver Analytics.

10. For more information, see Congressional Budget Office (2020), "The Budgetary Effects of Laws Enacted in Response to the 2020 Coronavirus Pandemic, March and April 2020," June, https://www.cbo.gov/system/files/2020-06/56403-CBO-covid-legislation.pdf; Congressional Budget Office (2021), "The Budgetary Effects of Major Laws Enacted in Response to the 2020–21 Coronavirus Pandemic, December 2020 and March 2021," September, https://www.cbo.gov/system/files/2021-09/57343-Pandemic.pdf; and Congressional Budget Office (2021), "Senate Amendment 2137 to H.R. 3684, the Infrastructure Investment and Jobs Act, as Proposed on August 1, 2021," August 9, https://www.cbo.gov/system/files/2021-08/hr3684_infrastructure.pdf.

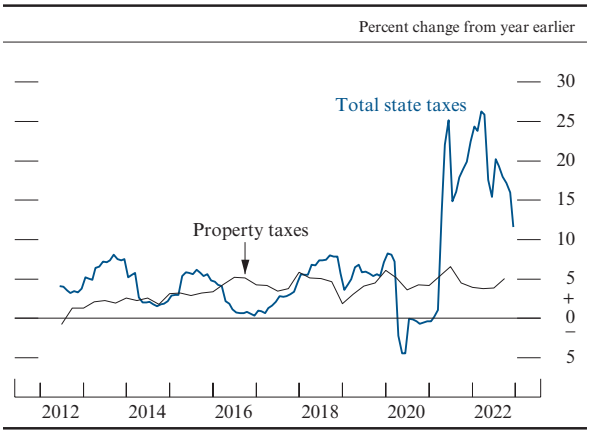
29. Federal government debt and net interest outlays



NOTE: The data for net interest outlays are annual, begin in 1948, and extend through 2022. Net interest outlays are the cost of servicing the debt held by the public. 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. The data for federal debt are annual from 1901 to 1951 and a four-quarter moving average thereafter and extend through 2022:Q3. GDP is gross domestic product.

SOURCE: For GDP, Bureau of Economic Analysis via Haver Analytics; for federal debt, Congressional Budget Office and Federal Reserve Board, Statistical Release Z.1, "Financial Accounts of the United States."

30. State and local tax receipts



NOTE: State tax data are year-over-year percent changes of 12-month moving averages, begin in June 2012, extend through December 2022, and are aggregated over all states except Wyoming, for which data are not available. Revenues from Washington, D.C., are also excluded. The data extend only through September 2022 for New Mexico and November 2022 for Nevada and South Dakota, as these states have longer reporting lags than others. Property tax data are year-over-year percent changes of 4-quarter moving averages, begin in 2012:Q2, extend through 2022:Q3, and are primarily collected by local governments.

SOURCE: Monthly State Government Tax Revenue Data via Urban Institute; U.S. Census Bureau, Quarterly Summary of State and Local Government Tax Revenue.

with pandemic-related fiscal support fading and receipts on the rise, the deficit fell to 5.5 percent of GDP in 2022.

As a result of the unprecedented fiscal support enacted early in the pandemic, federal debt held by the public jumped roughly 20 percentage points to 100 percent of GDP in fiscal 2020—the highest debt-to-GDP ratio since 1947 (figure 29). With deficits falling and economic growth rebounding since fiscal 2020, the debt-to-GDP ratio has since leveled off but is expected to remain elevated compared with the years before the pandemic. With interest rates on the rise, net interest outlays have recently picked up and are expected to continue to grow over the next few years.

State and local government budget positions remain strong . . .

Federal policymakers provided a historical level of fiscal support to state and local governments during the pandemic, leaving the sector in a strong budget position overall. In addition, total state tax collections rose appreciably in 2021 and 2022, pushed up by the economic recovery (figure 30). In response to their strong budget positions, lawmakers cut state taxes by roughly $16 billion in state fiscal year 2023 according to the National Association of State Budget Officers.

At the local level, property taxes have continued to rise, and the typically long lags between changes in the market value of real estate and changes in taxable assessments suggest that property tax revenues will continue to grow despite the recent sharp deceleration in house prices.

. . . yet employment and construction outlays are still below their pre-pandemic levels

Despite the strong fiscal position of state and local governments, the sector's payrolls have regained approximately three-fourths of their sizable pandemic losses, and real infrastructure spending by these governments is 10 percent below pre-pandemic levels. Nevertheless, both infrastructure outlays and employment showed

signs of a recovery in the second half of 2022 (figure 31).

Financial Developments

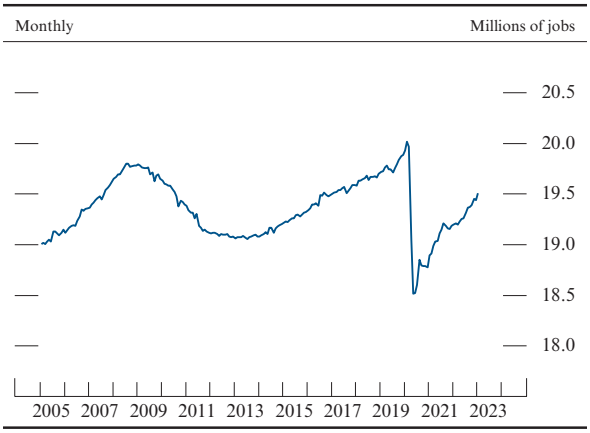
The expected level of the federal funds rate over the next year shifted up notably

The FOMC raised the target range for the federal funds rate a further 3 percentage points since June. Market-based measures of the path of the federal funds rate expected to prevail through the first half of 2024 also shifted up notably over the same period (figure 32).[11] According to these market-based measures, investors anticipate that the federal funds rate will peak at more than 5 percent in mid-2023, which is about 2 percentage points higher than the peak rate that had been expected in June. The market path implies that market participants believe that the federal funds rate will fall gradually starting around the fourth quarter of 2023 and will reach about 3.3 percent by the end of 2025. The results of the Survey of Primary Dealers and the Survey of Market Participants, both conducted by the Federal Reserve Bank of New York in January, similarly indicate that respondents' projections of the most likely path of the federal funds rate over 2023 and 2024 shifted up significantly since June.[12]

Yields on U.S. nominal Treasury securities also rose considerably

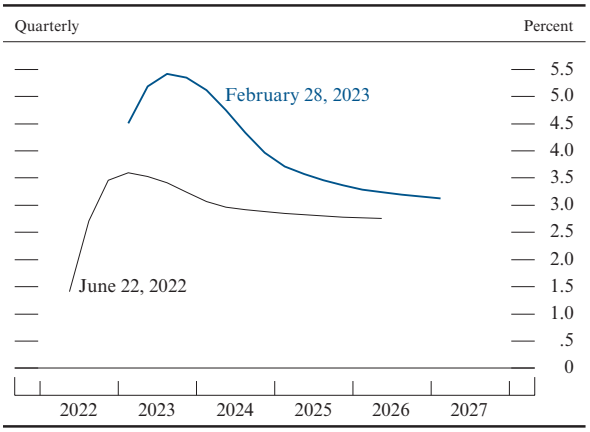
Short-term yields have increased substantially further since June, reflecting expectations for a higher path for the federal funds rate, while long-term yields have risen notably further, following a considerable rise in yields across maturities over the first half of 2022 (figure 33). The increases in nominal yields

31. State and local government payroll employment



SOURCE: Bureau of Labor Statistics via Haver Analytics.

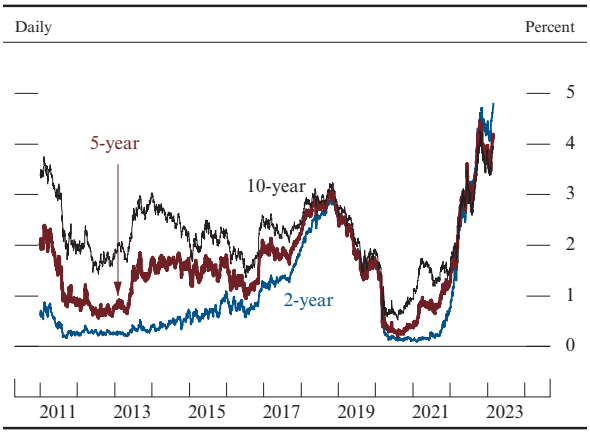
32. Market-implied federal funds rate path



NOTE: The federal funds rate path is implied by quotes on overnight index swaps—a derivative contract tied to the effective federal funds rate. The implied path as of June 22, 2022, is compared with that as of February 28, 2023. The path is estimated with a spline approach, assuming a term premium of 0 basis points. The June 22, 2022, path extends through 2026:Q2 and the February 28, 2023, path through 2027:Q1.

SOURCE: Bloomberg; Federal Reserve Board staff estimates.

33. Yields on nominal Treasury securities

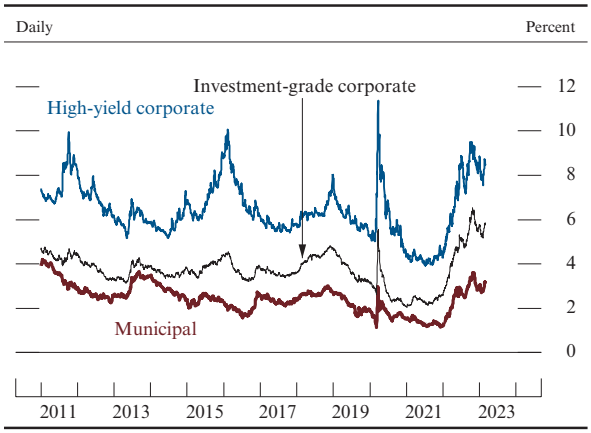


SOURCE: Department of the Treasury via Haver Analytics.

11. These measures are based on market prices for effective federal funds overnight interest rate swaps and are not adjusted for term premiums.

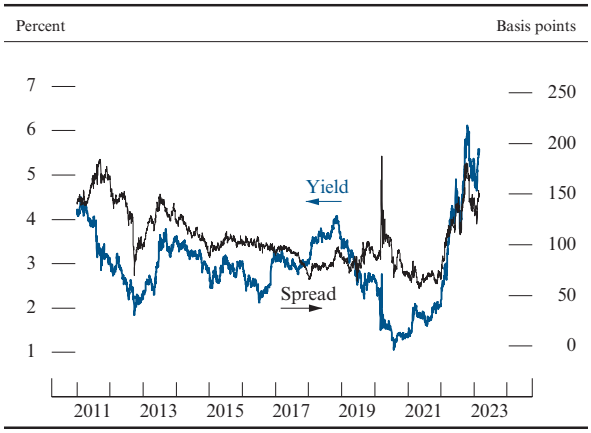
12. The results of the Survey of Primary Dealers and the Survey of Market Participants are available on the Federal Reserve Bank of New York's website at https://www.newyorkfed.org/markets/primarydealer_survey_questions.html and https://www.newyorkfed.org/markets/survey_market_participants, respectively.

34. Corporate bond yields, by securities rating, and municipal bond yield



NOTE: Investment-grade corporate reflects the effective yield of the ICE Bank of America Merrill Lynch (BofAML) triple-B U.S. Corporate Index (C0A4). High-yield corporate reflects the effective yield of the ICE BofAML High Yield Index (H0A0). Municipal reflects the yield to worst of the ICE BofAML U.S. Municipal Securities Index (U0A0).
SOURCE: ICE Data Indices, LLC, used with permission.

35. Yield and spread on agency mortgage-backed securities



NOTE: The data are daily. Yield shown is for the uniform mortgage-backed securities 30-year current coupon, the coupon rate at which new mortgage-backed securities would be priced at par, or face, value, for dates after May 31, 2019; for earlier dates, the yield shown is for the Fannie Mae 30-year current coupon. Spread shown is to the average of the 5-year and 10-year nominal Treasury yields.
SOURCE: Department of the Treasury; J.P. Morgan. Courtesy of J.P. Morgan Chase & Co., Copyright 2023.

since June were primarily accounted for by higher real yields, consistent with expectations for more restrictive monetary policy.

Yields on other long-term debt increased modestly

After increasing substantially over the first half of 2022, corporate bond yields for investment-grade borrowers and yields for municipal borrowers have increased moderately further since June, while yields for speculative-grade corporate borrowers are about unchanged (figure 34). Corporate and municipal bond spreads over comparable-maturity Treasury securities have declined somewhat since June, particularly so for speculative-grade corporate bonds, and are now near levels prevailing shortly before the pandemic. Corporate and municipal credit quality remains strong, and defaults have been low in 2022 and thus far in 2023. However, an indicator of future business defaults is elevated.

Yields on agency mortgage-backed securities (MBS)—an important pricing factor for home mortgage rates—generally moved in line with longer-dated Treasury yields since June and have increased notably on net (figure 35). The MBS spread remains elevated relative to pre-pandemic levels, at least partly resulting from the large amount of interest rate volatility, which reduces the value of holding MBS.

Broad equity price indexes increased moderately, on net, amid substantial volatility

After declining sharply over the first half of 2022, broad equity price indexes have been volatile and have increased moderately since June, on net, as inflation pressures showed some signs of easing and earnings remained resilient (figure 36). One-month option-implied volatility on the S&P 500 index—the VIX—has declined notably but remains moderately above the median of its historical distribution (figure 37). (For a discussion of financial

stability issues, see the box "Developments Related to Financial Stability.")

Major asset markets functioned in an orderly way, but some measures suggest persistence of low liquidity

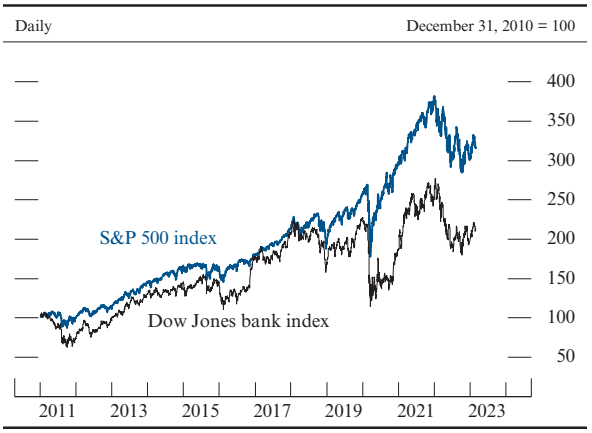
Consistent with ongoing higher interest rate volatility, liquidity conditions in the Treasury cash market continue to remain low relative to pre-pandemic levels. Market depth—a measure of the availability of contracts to trade at best quoted prices—for Treasury securities remains near historically low levels, particularly for short-term Treasury securities, and bid-ask spreads remain elevated relative to pre-pandemic levels. However, trading volumes in Treasury securities markets have remained about in line with historical levels, and market functioning has not been materially impaired. Equity market liquidity has improved somewhat since the summer but is still strained compared with pre-COVID levels. Corporate and municipal secondary bond markets continue to function well; transaction costs in these markets remained fairly low by historical standards.

Short-term funding market conditions remained stable

Conditions in short-term funding markets have remained stable. Increases in the FOMC's target range for the federal funds rate were transmitted effectively to other overnight rates. The effective federal funds rate and other unsecured overnight rates have been a few basis points below the interest rate on reserve balances since June. Secured overnight rates have been somewhat lower than unsecured rates but have shown some signs of firming more recently.

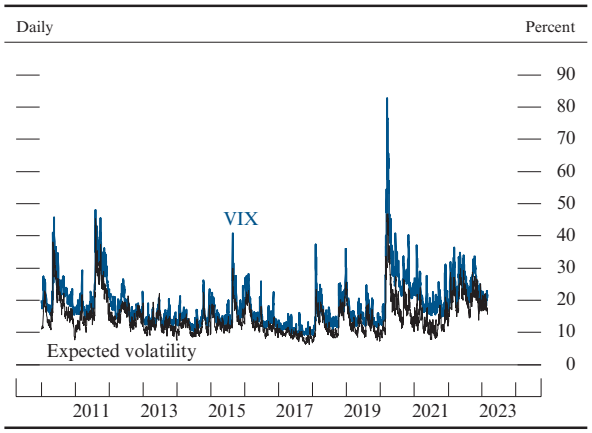
Prime money market funds (MMFs) have seen a notable increase in assets under management (AUM) since June, but government MMF AUM have remained relatively flat. Both prime and government MMFs have shortened their portfolios' weighted average maturities to

36. Equity prices



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

37. S&P 500 volatility



NOTE: The VIX is an option-implied volatility measure that represents the expected annualized variability of the S&P 500 index over the following 30 days. The expected volatility series shows a forecast of 1-month realized volatility, using a heterogeneous autoregressive model based on 5-minute S&P 500 returns.

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

Developments Related to Financial Stability

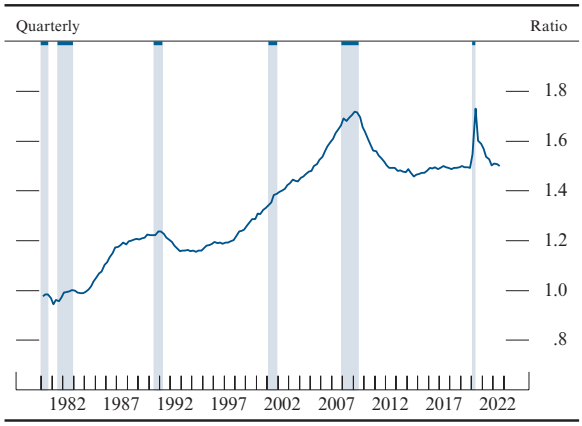
This discussion reviews vulnerabilities in the U.S. financial system. The framework used by the Federal Reserve Board for assessing the resilience of the U.S. financial system focuses on financial vulnerabilities in four broad areas: asset valuations, business and household debt, leverage in the financial sector, and funding risks. Against the backdrop of a weaker economic outlook, higher interest rates, and elevated uncertainty over the second half of the year, financial vulnerabilities remain moderate overall. Valuation pressures in equity markets increased modestly, and real estate prices continued to be high relative to fundamentals, such as rents, despite a marked slowing in price increases. Nonfinancial business and household debt grew in line with gross domestic product (GDP), leaving vulnerabilities associated with borrowing by businesses and households unchanged at moderate levels, and vulnerabilities from financial-sector leverage remained well within their historical range. Funding risks at domestic banks are low, but structural vulnerabilities persist at some money market funds, bond funds, and stablecoins.

Broad equity prices increased moderately since the middle of last year even as earning expectations fell as the economic outlook weakened. As a result, overall valuation pressures, as measured by the ratio of prices to expected earnings, ticked up. Spreads on corporate bonds declined moderately over the past six months and remain roughly in line with their historical median. The prices of several crypto-assets fell substantially after a widely publicized bankruptcy filing in November, but spillovers from crypto markets to the broader financial system were limited. Residential real estate valuations remain elevated despite the rise in mortgage rates and sharply decelerating real estate prices, as the increase in house prices over the past two years has substantially exceeded the increase in rents. Similarly, commercial real estate prices relative to the income associated with such properties remain high by historical standards. Indicators for market liquidity such as market depth, a measure of the availability of contracts to trade at best quoted prices, and price impact, a measure of how much prices move in response to large directional orders, remain low in several important markets—including the Treasury market—relative to pre-pandemic levels. However, market functioning remained orderly.

The total combined debt of households and nonfinancial businesses grew roughly in line with GDP, leaving the credit-to-GDP ratio roughly flat and close to its pre-pandemic level (figure A). Household balance sheets remained strong, with continued buffers of excess savings built up over 2020 and 2021 and sizable home equity cushions. Most of the increases in real household debt were accounted for by borrowers with prime credit scores, for whom delinquency rates remain low and stable. In contrast, some signs of increased stress have become apparent for households at the lower end of the income distribution as delinquency rates for near-prime and subprime borrowers have risen. Business leverage continues to be elevated by historical standards, but indicators of credit quality have remained solid and, thus far, the increase in interest rates has not weighted materially on the ability of businesses to service their debt.

(continued)

A. Private nonfinancial-sector credit-to-GDP ratio



NOTE: Data extend through 2022:Q3. The shaded bars indicate periods of business recession as defined by the National Bureau of Economic Research. GDP is gross domestic product.

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

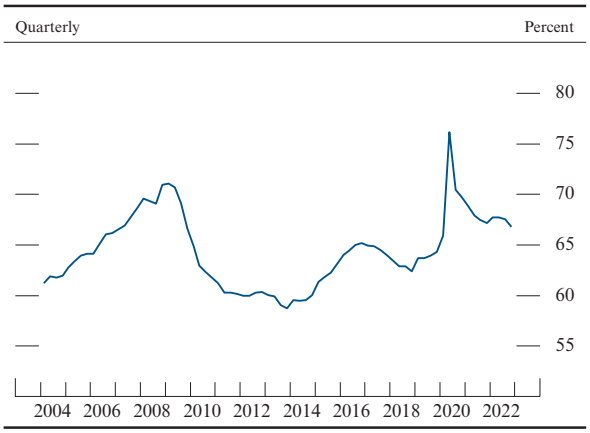
Vulnerabilities from financial-sector leverage are roughly in line with historically average levels. Risk-based capital ratios at domestic bank holding companies declined last year, in part due to strong loan growth, but remain well above regulatory requirements. Moreover, even as rising interest rates have led to declines in the value of available-for-sale securities held on bank balance sheets, earnings and credit quality remain strong for banks. Leverage at certain nonbank financial institutions, including life insurers and hedge funds, has remained near historical highs. While data limitations and the complexity of hedge fund strategies can obscure the true nature of leverage in that sector, one common measure of hedge fund leverage, the ratio of gross notional exposure to equity capital, remained elevated in the third quarter of 2022—the most recent data available.

Funding risks at domestic banks and broker-dealers remain low. Liquidity coverage ratios indicate that large banks continue to have ample liquidity to meet severe deposit outflows. However, prime and tax-exempt money market funds, as well as certain other cash-investment vehicles, remain susceptible to runs. Many bond and bank-loan mutual funds continue to be vulnerable to large redemptions, because they hold assets that can become illiquid amid stress.

Near-term risks to financial stability are little changed. A recession would likely limit the ability of some households and firms to service their debt, potentially increasing delinquency rates. If a recession were to coincide with higher-than-expected inflation and interest rates, the strains on households, businesses, and the financial sector would be exacerbated. Moreover, low liquidity in some financial markets may amplify the volatility of asset prices, impair market functioning, and cause funding pressures at financial intermediaries. International developments such as Russia's continuing war against Ukraine or stresses in China could cause some strains in parts of the U.S. financial system. Finally, cyber risk in the financial system, defined as the risk of loss or operational disruptions relating to dependence on computer systems and digital technology, has increased over time and could impair the U.S. financial system.

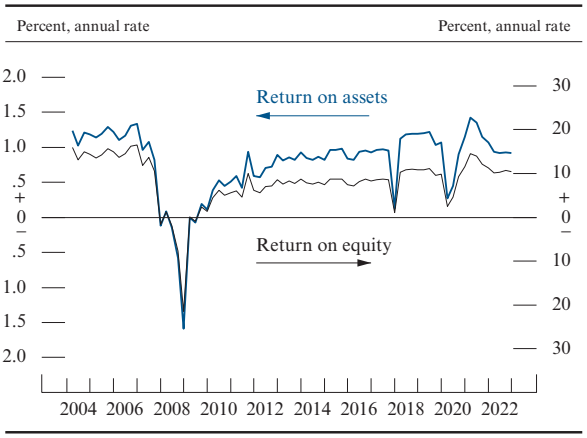
near historical lows, likely in response to the continued increase in short-term rates and fund managers' uncertainty about the future path of interest rates. Both elevated AUM and short weighted average maturities at MMFs, as well as a limited supply of Treasury bills, have contributed to continuing elevated take-up at the Federal Reserve's overnight reverse repurchase agreement facility.

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



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

39. Profitability of bank holding companies



NOTE: The data are quarterly.
SOURCE: Federal Reserve Board, Form FR Y-9C, Consolidated Financial Statements for Holding Companies.

Bank credit continued to expand, but growth decelerated in the fourth quarter

Total loans and leases outstanding at commercial banks have continued to expand since June, although the pace of growth has moderated in recent months (figure 38). Banks reported tighter standards and weaker demand for most loan categories over the third and fourth quarters of 2022 in the October and January Senior Loan Officer Opinion Surveys on Bank Lending Practices. Interest rates on bank loans increased through the second half of 2022, in line with the current tightening cycle. Bank profitability in the second half of 2022 remained robust overall, driven by strong net interest income, but revenues and earnings in the fourth quarter were generally weaker, particularly among banks with a greater share of income derived from investment banking activities (figure 39). Bank equity prices increased moderately, on net, in line with broader equity price indexes (figure 36). Delinquency rates on bank loans remained low in the fourth quarter of 2022 relative to historical averages. However, loan loss provisions have increased in recent quarters, consistent with banks' expectations for credit losses to increase in the future, and delinquency rates rose slightly last year for some loan types such as credit cards and auto loans.

International Developments

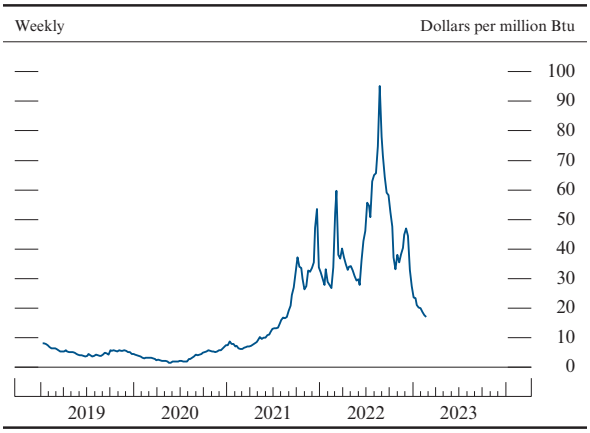
Economic activity abroad has softened . . .

Following solid growth early last year, foreign economic growth slowed, especially at the end of the year, weighed down by a COVID-related slowdown in China, the economic fallout of Russia's war against Ukraine, and tighter financial conditions. A stringent clampdown on COVID cases in the fall brought a marked deceleration in Chinese economic activity. In Europe, GDP growth stepped down notably in the second half of the year as high energy prices compressed real incomes and depressed confidence of households and businesses. In addition to tighter financial conditions, weaker global demand also damped activity in emerging market economies (EMEs), where exports have fallen notably.

More recently, however, economic indicators suggest that a recovery has started to take hold in China following the rapid abandonment of its zero-COVID policy. In Europe, economic activity, although still subdued, is proving more resilient than expected and is being supported by a sharp fall in natural gas prices to below their levels preceding the Russian invasion of Ukraine in 2022 (figure 40).

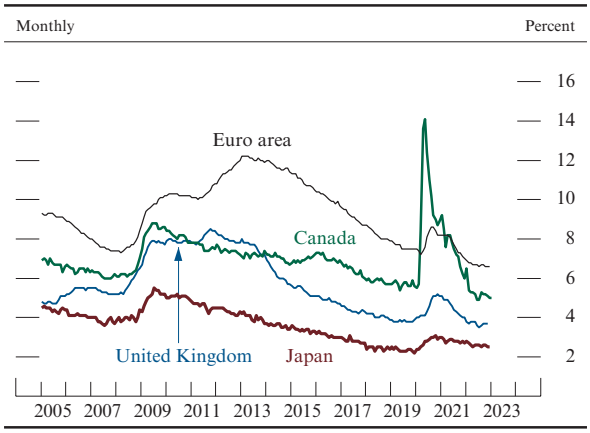
Despite softer activity in the second half of last year, labor markets remained strong in most advanced foreign economies (AFEs), with unemployment rates at or near decades lows (figure 41). As in the U.S., low jobless rates in part reflect continued high labor demand. Job vacancy rates in AFEs eased slightly in recent months but remain near historically high levels, pointing to continued difficulties in hiring. In addition, labor supply challenges in some foreign economies have contributed to tight labor market conditions. For example, the labor force participation rate in the U.K. has not risen back to its pre-pandemic level, reflecting the slow ongoing recovery from a broad range of pandemic-related factors, including long-term

40. European Union natural gas prices



NOTE: The data are weekly averages of daily data and extend through February 24, 2023.
SOURCE: ICE Dutch TTF Futures via Haver Analytics.

41. Unemployment rate in selected advanced foreign economies

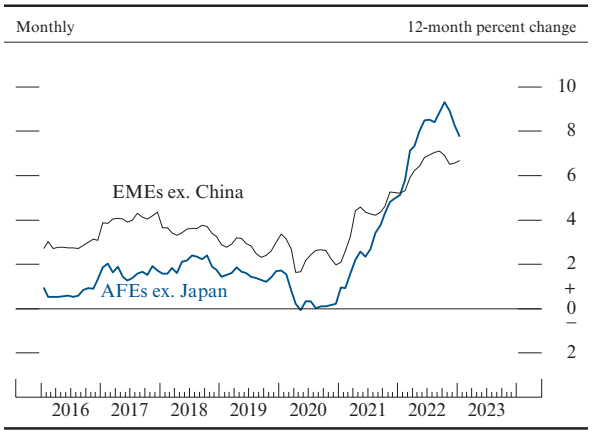


NOTE: The data for the United Kingdom extend through November 2022 and are centered 3-month averages of monthly data. The data for the euro area and Japan extend through December 2022.
SOURCE: For the United Kingdom, Office for National Statistics; for Japan, Ministry of Health, Labour and Welfare; for the euro area, Statistical Office of the European Communities; for Canada, Statistics Canada; all via Haver Analytics.

sickness and early retirements. In Canada, reduced immigration flows at the onset of the pandemic and an aging population have contributed to slower labor force growth in recent years.

Global supply chains continued to normalize over the latter half of 2022, helped by the slowdown in foreign economic growth. Transportation and production bottlenecks continued to abate amid weakening demand for goods. Recent data suggest that congestion at U.S. ports has broadly decreased. Container spot prices have declined sharply, especially for shipping from China to the West Coast. Both air cargo and ocean cargo transit times from Asia to North America have declined from their early 2022 peaks.

42. Consumer price inflation in foreign economies



NOTE: The advanced foreign economy (AFE) aggregate is the average of Canada, the euro area, and the United Kingdom, weighted by shares of U.S. non-oil goods imports. The emerging market economy (EME) aggregate is the average of Argentina, Brazil, Chile, Colombia, Hong Kong, India, Indonesia, Israel, Malaysia, Mexico, Philippines, Russia, Saudi Arabia, Singapore, South Korea, Taiwan, Thailand, and Vietnam, weighted by shares of U.S. non-oil goods imports. The inflation measure is the Harmonised Index of Consumer Prices for the euro area and the consumer price index for other economies.
SOURCE: Haver Analytics.

. . . and foreign inflationary pressures have broadened . . .

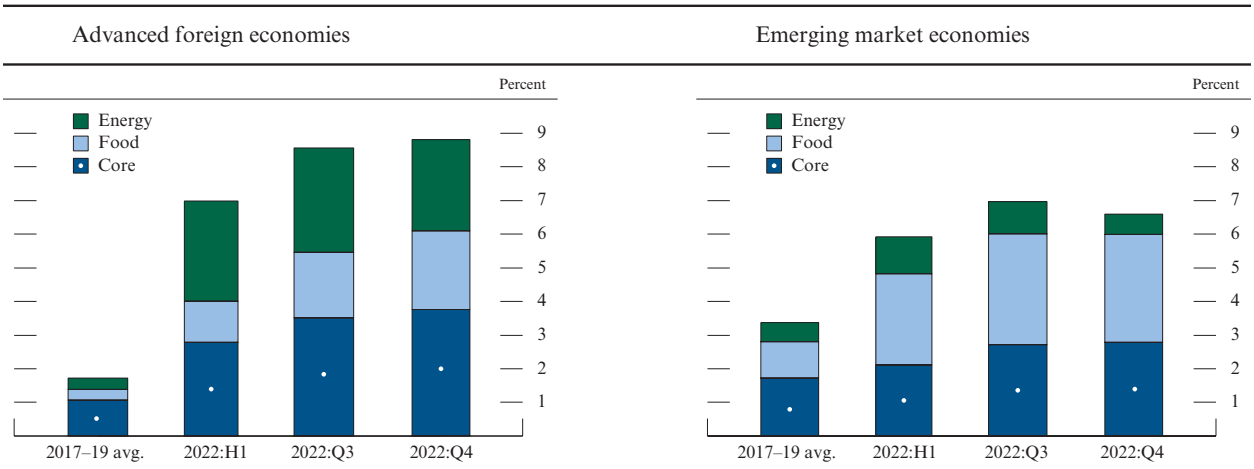
Foreign headline inflation abroad has started falling as effects of earlier commodity price increases have waned, though the decline so far has been less pronounced than in the U.S. (figure 42). Energy inflation has moderated in foreign economies, but food inflation remained strong through year-end (figure 43).

While headline inflation has begun easing, core inflation has been running firmly above its pre-COVID average in the second half of 2022. Pass-through from past energy price increases into other prices, robust wage growth stemming from tight labor markets, and past exchange rate depreciation in some economies have all contributed to elevated core inflation abroad. Core goods inflation has begun moderating, helped by fewer supply bottlenecks and a rebalancing of consumption away from goods. Services inflation, however, remains persistent.

. . . leading many foreign central banks to continue tightening monetary policy

In response to persistent inflationary pressures, foreign central banks—especially those in AFEs—raised policy rates expeditiously. Some also started reducing, or laid out plans to reduce, the size of their balance sheets. In

43. Foreign consumer price inflation components



NOTE: The advanced foreign economy (AFE) aggregate is the average of Canada, the euro area, and the United Kingdom, weighted by shares of U.S. non-oil goods imports. The emerging market economy (EME) aggregate is the average of Argentina, Brazil, Chile, Colombia, Hong Kong, India, Indonesia, Israel, Malaysia, Mexico, Philippines, Russia, Saudi Arabia, Singapore, South Korea, Taiwan, Thailand, and Vietnam, weighted by shares of U.S. non-oil goods imports. The inflation measure is the Harmonised Index of Consumer Prices for the euro area and the consumer price index for other economies. The key identifies bars in order from top to bottom. The data show percent changes from year-ago levels.
SOURCE: Haver Analytics.

light of the cumulative increase in policy rates and signs that inflation is easing, many foreign central banks have in recent months slowed the pace of their policy rate increases, signaled that such a slowing is coming, or paused policy rate hikes to take stock of the effects of policy tightening thus far on their economies. Even so, most foreign central banks have communicated that they would maintain sufficiently restrictive policy stances to lower inflation to target.

The European Central Bank has communicated its intention to continue raising its policy rate, citing strong underlying price pressures, while the Bank of England has signaled additional tightening will be warranted if inflationary pressures, especially from the labor market, prove more persistent than anticipated. Both these central banks have indicated that future policy decisions depend on realized progress toward their inflation goals. In January, the Bank of Canada conveyed that it was pausing policy rate hikes to assess the effect of the cumulative rise in interest rates on inflation and the economy. That said, the Bank of Canada also warned that it stood ready to raise its policy rate further if needed to lower inflation to its 2 percent target. In contrast to other

foreign central banks, and notwithstanding a widening of the trading band on 10-year Japanese government bond yields, the Bank of Japan reaffirmed that it intends to maintain accommodative monetary conditions "as long as it is necessary" to achieve its 2 percent inflation target, including by conducting further asset purchases.

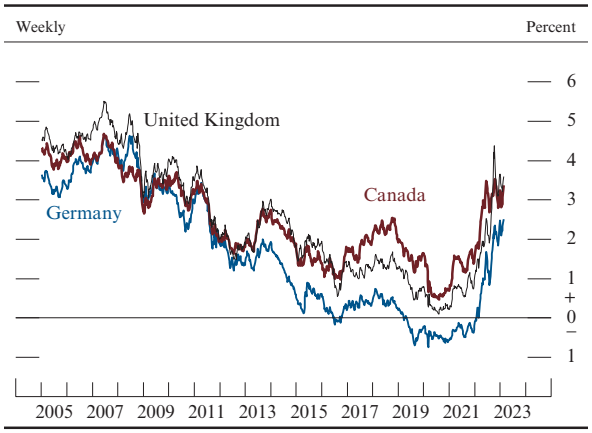
Within EMEs, the Central Bank of Brazil has left its policy rate unchanged since the middle of 2022 but recently indicated that it will resume tightening the stance of policy if reductions in inflation do not progress as expected. Other EME central banks, including the Bank of Mexico and Reserve Bank of India, have conveyed the possibility of further rate increases given still-elevated core inflation.

The synchronous nature of the recent increases in global interest rates has raised concerns about possible adverse international spillovers of tighter monetary policy. Simulations from global macroeconomic models suggest that U.S. monetary policy actions can produce notable spillovers abroad, especially given the dollar's dominant role in international trade and finance. Spillovers from foreign economies' policy actions to the U.S. can be sizable as well, particularly when many central banks tighten policy simultaneously.[13]

Financial conditions abroad have tightened

Since the middle of last year, market-based measures of monetary policy expectations and sovereign bond yields have moved significantly higher in many AFEs (figure 44). The rise in sovereign bond yields reflects rapid tightening in monetary policy and spillovers from higher U.S. yields. Fiscal announcements in the U.K. in late September drove significant global bond market volatility and yield increases, although

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



NOTE: The data are weekly averages of daily benchmark yields and extend through February 24, 2023.
SOURCE: Bloomberg.

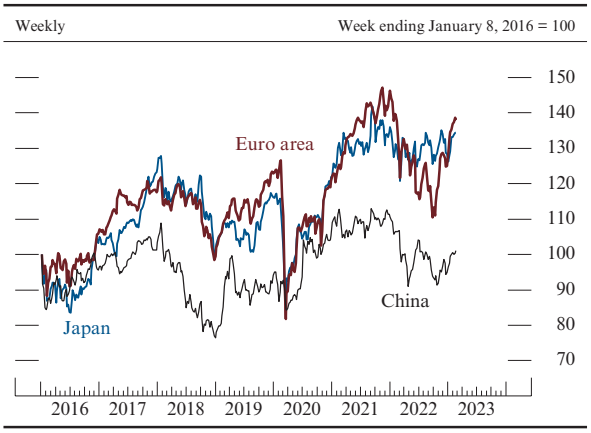
13. For a discussion of these spillovers, their channels of transmission, and their likely effects on growth, see Dario Caldara, Francesco Ferrante, and Albert Queralto (2022), "International Spillovers of Tighter Monetary Policy," FEDS Notes (Washington: Board of Governors of the Federal Reserve System, December 22), https://doi.org/10.17016/2380-7172.3238.

these moves largely retraced following changes in government policy plans. The Bank of Japan widened the trading band of its yield curve control policy framework, allowing Japanese 10-year interest rates to rise and leading Japanese yields across the curve to rise. Euro-area yields rose amid communications from the European Central Bank that were perceived as more restrictive than expected.

After declining over the first half of last year, prices of foreign risky assets turned higher toward the end of the year. Foreign equity indexes increased across major economies, buoyed by moderation in U.S. and European inflation readings and by recent economic developments that suggest improved growth prospects in China and Europe (figure 45). In addition, equities abroad were supported by China's shift away from its zero-COVID policy, which led to improved sentiment regarding China's medium-term growth prospects. Financial conditions in EMEs have improved since year-end. Outflows from EME-focused investment funds, which had been slowing toward the end of last year, turned to inflows this year, while EME sovereign spreads are little changed.

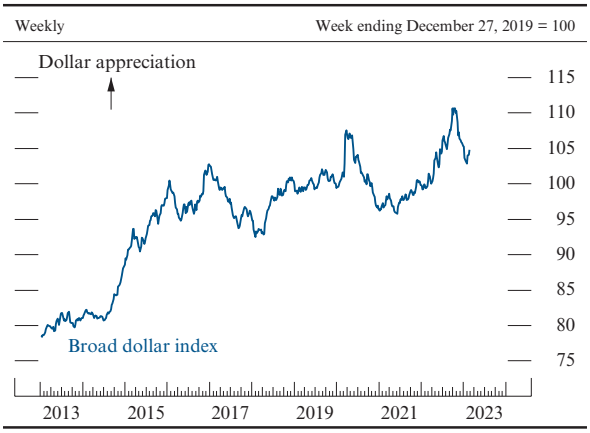
The broad dollar index—a measure of the trade-weighted value of the dollar against foreign currencies—continued to rise over the summer and through the beginning of the fourth quarter but, more recently, has largely reversed those increases (figure 46). Widening yield differentials between the U.S. and the rest of the world and concerns around foreign growth pushed the dollar higher through October of last year, prompting several central banks, especially in Asia, to intervene in foreign exchange markets to support their currencies. Since peaking in October, the dollar has largely retraced those gains, reflecting softer inflation data in the U.S., tighter monetary policy abroad, and better prospects for foreign economic growth. Still, the broad dollar index remains stronger than it was in early 2021. After reaching multidecade lows against the dollar in October, the Japanese yen rebounded following the adjustment of the Bank of Japan's yield curve control policy.

45. Equity indexes for selected foreign economies



NOTE: The data are weekly averages of daily data and extend through February 24, 2023.
SOURCE: For the euro area, Dow Jones Euro Stoxx Index; for Japan, Tokyo Stock Price Index; for China, Shanghai Composite Index; all via Bloomberg. (For Dow Jones Indices licensing information, see the note on the Contents page.)

46. U.S. dollar exchange rate index



NOTE: The data, which are in foreign currency units per dollar, are weekly averages of daily values of the broad dollar index. The data extend through February 24, 2023. As indicated by the leftmost arrow, increases in the data reflect U.S. dollar appreciation and decreases reflect U.S. dollar depreciation.
SOURCE: Federal Reserve Board, Statistical Release H.10, "Foreign Exchange Rates."

Part 2
Monetary Policy

The Federal Open Market Committee continued to increase the federal funds rate . . .

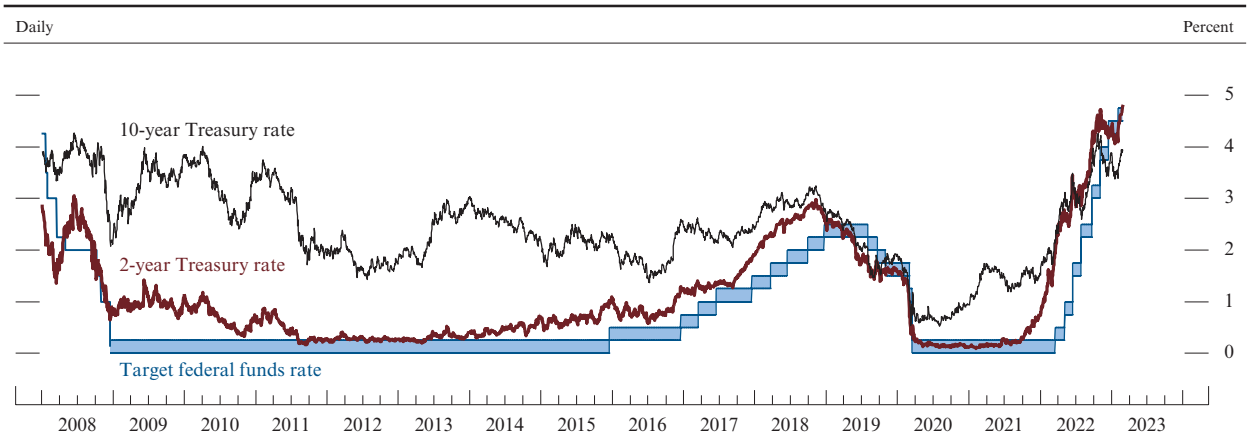
With inflation still well above the Federal Open Market Committee's (FOMC) 2 percent objective and with labor market conditions remaining tight, the Committee continued to swiftly raise the target range for the federal funds rate. Since June, the Committee raised the target range by 3 percentage points, from 1½ to 1¾ percent to 4½ to 4¾ percent (figure 47). In light of the cumulative tightening of monetary policy and the lags with which monetary policy affects economic activity and inflation, after having increased the federal funds rate by 75 basis points at its meetings in June, July, September, and November, the Committee slowed the pace of policy firming at its December and January meetings to 50 basis points and 25 basis points, respectively. The Committee indicated that it anticipates that ongoing increases in the target range will be appropriate in order to attain a stance of monetary policy that is sufficiently restrictive to return inflation to 2 percent over time.

. . . and has continued the process of significantly reducing its holdings of Treasury and agency securities

The Committee has continued to implement its plan for significantly reducing the size of the Federal Reserve's balance sheet in a predictable manner.[14] Beginning in June, principal payments from securities held in the System Open Market Account (SOMA) have been reinvested only to the extent that they exceeded monthly caps. For Treasury securities, the cap was initially set at $30 billion per month and, in September, was increased to $60 billion per month. For agency debt and agency mortgage-backed securities, the cap was initially set at $17.5 billion per month and, in September, was increased to $35 billion per month. As a result of these actions, holdings of Treasury and agency securities in the SOMA have declined

14. See the May 4, 2022, press release regarding the Plans for Reducing the Size of the Federal Reserve's Balance Sheet, available on the Board's website at https://www.federalreserve.gov/newsevents/pressreleases/monetary20220504b.htm.

47. Selected interest rates



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

by about $500 billion to around $8 trillion, or 31 percent of U.S. nominal gross domestic product, since the process to reduce securities holdings began (figure 48). Reserve balances have fallen by about $200 billion to around $3 trillion over that period. (See the box "Developments in the Federal Reserve's Balance Sheet and Money Markets.")

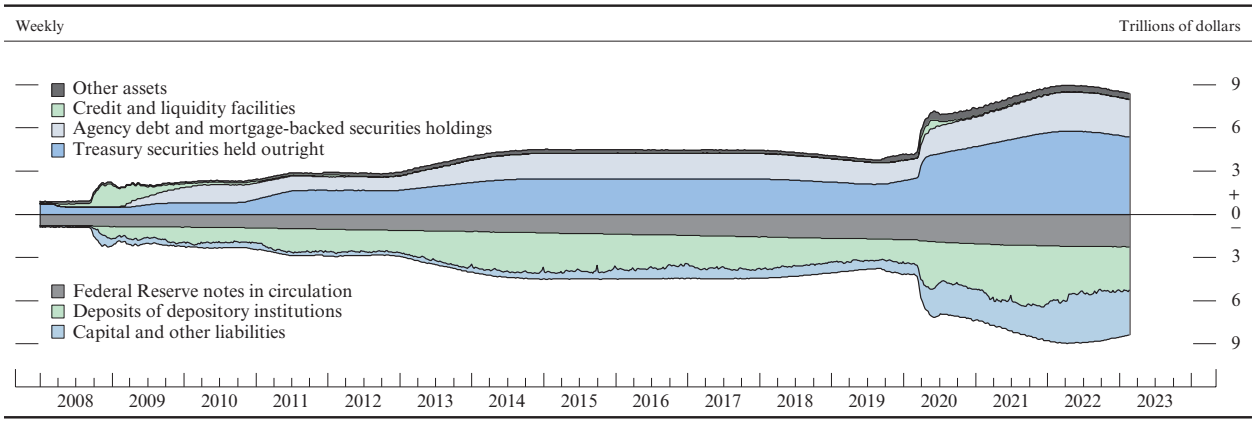
The Committee has stated that it intends to maintain securities holdings in amounts needed to implement monetary policy efficiently and effectively in its ample-reserves regime. To ensure a smooth transition, the Committee intends to slow and then stop reductions in its securities holdings when reserve balances are somewhat above the level the Committee judges to be consistent with ample reserves. Once balance sheet runoff has ceased, reserve balances will likely continue to decline at a slower pace—reflecting growth in other Federal Reserve liabilities—until the Committee judges that reserve balances are at the level required for implementing policy efficiently and effectively in its ample-reserves regime.

The FOMC will continue to monitor the implications of incoming information for the economic outlook

The FOMC is strongly committed to returning inflation to its 2 percent objective. In assessing the appropriate stance of monetary policy, the Committee will continue to monitor the implications of incoming information for the economic outlook. The Committee's assessments will take into account a wide range of information, including readings on labor market conditions, inflation pressures and inflation expectations, and financial and international developments. The Committee has noted that it is also prepared to adjust any of the details of its approach to reducing the size of the balance sheet in light of economic and financial developments.

In addition to considering a wide range of economic and financial data, the Committee gathers information from business contacts and other informed parties around the country, as summarized in the Beige Book. To hear from a broad range of stakeholders in

48. Federal Reserve assets and liabilities



NOTE: "Other assets" includes repurchase agreements, FIMA (Foreign and International Monetary Authorities) repurchase agreements, and unamortized premiums and discounts on securities held outright. "Credit and liquidity facilities" consists of primary, secondary, and seasonal credit; term auction credit; central bank liquidity swaps; support for Maiden Lane, Bear Stearns Companies, Inc., and AIG; and other credit and liquidity facilities, including the Primary Dealer Credit Facility, the Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility, the Commercial Paper Funding Facility, the Term Asset-Backed Securities Loan Facility, the Primary and Secondary Market Corporate Credit Facilities, the Paycheck Protection Program Liquidity Facility, the Municipal Liquidity Facility, and the Main Street Lending Program. "Agency debt and mortgage-backed securities holdings" includes agency residential mortgage-backed securities and agency commercial mortgage-backed securities. "Capital and other liabilities" includes reverse repurchase agreements, the U.S. Treasury General Account, and the U.S. Treasury Supplementary Financing Account. The key identifies shaded areas in order from top to bottom. The data extend through February 22, 2023.

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

the U.S. economy about how monetary policy affects people's daily lives and livelihoods, the Federal Reserve has continued to gather insights through the *Fed Listens* initiative and the Federal Reserve System's community development outreach. Policymakers also routinely consult prescriptions for the policy interest rate provided by various monetary policy rules. These rule prescriptions can provide useful benchmarks for the FOMC.

Although simple rules cannot capture all of the complexities of monetary policy, and many practical considerations make it undesirable for the FOMC to adhere strictly to the prescriptions of any specific rule, some principles of good monetary policy can be illustrated by these policy rules (see the box "Monetary Policy Rules in the Current Environment").

Developments in the Federal Reserve's Balance Sheet and Money Markets

The Federal Open Market Committee (FOMC) began to significantly reduce the size of the Federal Reserve's balance sheet in June 2022. Since that time, total assets have decreased by $550 billion, leaving the total size of the balance sheet at about $8.4 trillion (figures A and B). This discussion reviews recent developments in the Federal Reserve's balance sheet and money market conditions.

Reserve balances—the largest liability on the Federal Reserve's balance sheet—have declined by about $200 billion since June 2022 (figure C).[1] The ongoing reduction in the Federal Reserve's securities holdings would reduce the level of reserve balances one-for-one, if all other balance sheet items stayed constant.

After fluctuating around $2.2 trillion over the second half of 2022, usage at the overnight reverse repurchase agreement (ON RRP) facility increased toward year-end and reached a record high of $2.55 trillion on December 30. Since early January, ON RRP take-up has declined to about $2.1 trillion at the time of this report. Low rates on private money market instruments—reflecting still abundant liquidity in the banking system and limited Treasury bill supply—have contributed to the overall high level of take-up. In addition, uncertainty about the economic outlook—and, as a result, about the magnitude and pace of policy rate increases—continued to contribute to a preference for short-duration assets, like those provided by the ON RRP facility.

(continued)

A. Balance sheet comparison

Billions of dollars

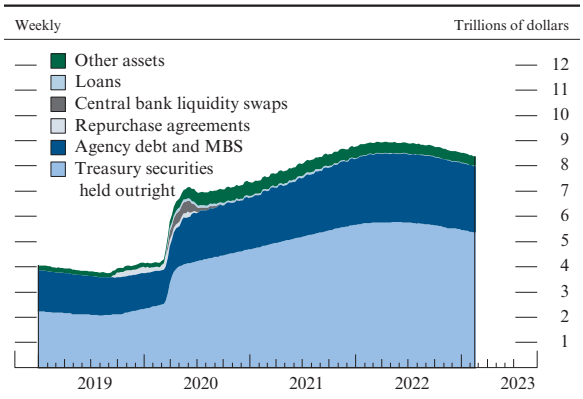
	February 22, 2023	June 15, 2022	Change
Assets			
Total securities			
Treasury securities	5,364	5,763	-399
Agency debt and MBS	2,623	2,730	-107
Net unamortized premiums	308	336	-28
Repurchase agreements	0	0	0
Loans and lending facilities			
PPPLF	11	19	-8
Other loans and lending facilities	34	38	-4
Central bank liquidity swaps	0	0	0
Other assets	41	47	-6
Total assets	**8,382**	**8,932**	**-550**
Liabilities			
Federal Reserve notes	2,252	2,227	25
Reserves held by depository institutions	2,984	3,190	-206
Reverse repurchase agreements			
Foreign official and international accounts	358	259	99
Others	2,114	2,163	-49
U.S. Treasury General Account	451	770	-319
Other deposits	193	258	-65
Other liabilities and capital	32	66	-34
Total liabilities and capital	**8,382**	**8,932**	**-550**

NOTE: MBS is mortgage-backed securities. PPPLF is Paycheck Protection Program Liquidity Facility.

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

1. Reserve balances consist of deposits held at Federal Reserve Banks by depository institutions, such as commercial banks, savings banks, credit unions, thrift institutions, and U.S. branches and agencies of foreign banks. Reserve balances allow depository institutions to facilitate daily payment flows, both in ordinary times and in stress scenarios, without borrowing funds or selling assets.

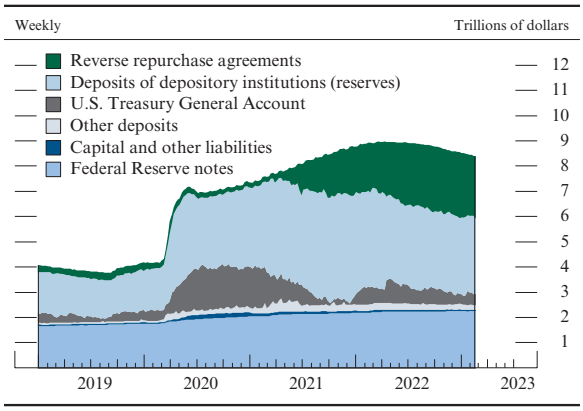
B. Federal Reserve assets



NOTE: MBS is mortgage-backed securities. The key identifies shaded areas in order from top to bottom. The data extend through February 22, 2023.

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

C. Federal Reserve liabilities



NOTE: "Capital and other liabilities" includes Treasury contributions. The key identifies shaded areas in order from top to bottom. The data extend through February 22, 2023.

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

The ON RRP facility is intended to help keep the effective federal funds rate from falling below the target range set by the FOMC, as institutions with access to the ON RRP should be unwilling to lend funds below the ON RRP's offering rate. The facility continued to serve this intended purpose, and the Federal Reserve's administered rates—interest on reserve balances and the ON RRP offering rate—were highly effective at maintaining the effective federal funds rate within the target range as the FOMC has tightened the stance of monetary policy since last March.

The Federal Reserve System had an estimated consolidated net income of about $58 billion over 2022. Given the significant increases in policy rates in response to sustained inflation pressures, the Federal Reserve's interest expenses have risen considerably, and, as a result, net income turned negative in September.[2] Because the Federal Reserve no longer has positive net income to remit to the Treasury Department, as of February 2023, the Federal Reserve's balance sheet now reports a deferred asset of about $36 billion. The deferred asset is equal to the cumulative shortfall of net income and represents the amount of future net income that will need to be realized before remittances to the Treasury resume.[3] Although remittances are suspended at the time of this report, over the past decade and a half, the Federal Reserve has remitted over $1 trillion to the Treasury. Net income is expected to again turn positive as interest expenses fall, and remittances will resume once the temporary deferred asset falls to zero.[4] Negative net income and the associated deferred asset do not affect the Federal Reserve's conduct of monetary policy or its ability to meet its financial obligations.

2. The ongoing monetary tightening also reduces the market value of the Federal Reserve's securities holdings by putting upward pressure on longer-term market interest rates. The System Open Market Account (SOMA) portfolio was in an estimated unrealized loss position of about $1.1 trillion as of September 2022. Under the current May 2022 Plans for Reducing the Size of the Federal Reserve's Balance Sheet, unrealized gains or losses will not flow through to the Federal Reserve's net income, as SOMA securities will be held until maturity. An individual security's market value converges to its face value as it approaches maturity, and, so long as the security is held until that time, any gains or losses due to interest rate fluctuations remain unrealized. Further information on the topics of the Federal Reserve's income and the SOMA portfolio's unrealized position is available in two FEDS Notes articles. For a discussion of concepts related to net income and the SOMA portfolio's unrealized position, see Alyssa Anderson, Dave Na, Bernd Schlusche, and Zeynep Senyuz (2022), "An Analysis of the Interest Rate Risk of the Federal Reserve's Balance Sheet, Part 1: Background and Historical Perspective," FEDS Notes (Washington: Board of Governors of the Federal Reserve System, July 15), https://doi.org/10.17016/2380-7172.3173; and for illustrative projections of the Federal Reserve's balance sheet and income under a wide range of potential interest rate paths, see Alyssa Anderson, Philippa Marks, Dave Na, Bernd Schlusche, and Zeynep Senyuz (2022), "An Analysis of the Interest Rate Risk of the Federal Reserve's Balance Sheet, Part 2: Projections under Alternative Interest Rate Paths," FEDS Notes (Washington: Board of Governors of the Federal Reserve System, July 15), https://doi.org/10.17016/2380-7172.3174.

3. Because of variation in the timing and magnitude of payments for expenditures, interest income, and interest expense, individual Reserve Banks may have positive earnings while Systemwide net income is negative. As net income is remitted on a weekly basis at the Reserve Bank level, individual Reserve Banks may occasionally remit small amounts of positive earnings to the Treasury while the Systemwide deferred asset grows.

4. As a result of the ongoing reduction in the size of the Federal Reserve's balance sheet, it is expected that interest expenses will fall over time as they are tied to a smaller total amount of liabilities.

Monetary Policy Rules in the Current Environment

Simple interest rate rules relate a policy interest rate, such as the federal funds rate, to a small number of other economic variables—typically including the current deviation of inflation from its target value and a measure of resource slack in the economy. Policymakers consult policy rate prescriptions derived from a variety of policy rules as part of their monetary policy deliberations without mechanically following the prescriptions of any particular rule.

Since 2021, inflation has run well above the Committee's 2 percent longer-run objective, and labor market conditions have been very tight over the past year. Reflecting these developments, the simple monetary policy rules considered in this discussion have called for levels of the federal funds rate well above those observed over the past decade. Also because of the persistently high levels of inflation, the Federal Open Market Committee (FOMC) has expeditiously raised the target range for the federal funds rate and has reduced its holdings of Treasury securities and agency debt and agency mortgage-backed securities at a historically rapid pace.

Selected Policy Rules: Descriptions

In many economic models, desirable economic outcomes can be achieved if monetary policy responds in a predictable way to changes in economic conditions. In recognition of this idea, economists have analyzed many monetary policy rules, including the well-known Taylor (1993) rule, the "balanced approach" rule, the "adjusted Taylor (1993)" rule, and the "first difference" rule.[1] Figure A shows these rules, along with a "balanced-approach (shortfalls)" rule, which represents one simple way to illustrate the Committee's focus on shortfalls from maximum employment.[2] All of these simple rules shown embody key design principles of good monetary policy, including that the policy rate should be adjusted forcefully enough over time to ensure a return of inflation to the central bank's longer-run objective and to anchor longer-term inflation expectations at levels consistent with that objective.

All five rules feature the difference between inflation and the FOMC's longer-run objective of 2 percent. The five rules use the unemployment rate gap, measured as the difference between an estimate of the rate of unemployment in the longer run (u_t^{LR}) and the current unemployment rate; the first-difference rule includes the change in the unemployment rate gap rather than its level.[3] All but the first-difference rule include an

(continued)

1. The Taylor (1993) rule was introduced 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 first-difference rule is based on a rule suggested by Athanasios Orphanides (2003), "Historical Monetary Policy Analysis and the Taylor Rule," *Journal of Monetary Economics,* vol. 50 (July), pp. 983–1022. A 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.

2. Since August 2020, the FOMC's Statement on Longer-Run Goals and Monetary Policy Strategy has referred to "shortfalls of employment" from the Committee's assessment of its maximum level rather than the "deviations of employment" used in the previous statement. The balanced-approach (shortfalls) rule reflects this change by responding asymmetrically to unemployment rates above or below their estimated longer-run value: When unemployment is above that value, the policy rates are identical to those prescribed by the balanced-approach rule, whereas when unemployment is below that value, policy rates do not rise because of further declines in the unemployment rate. As a result, the prescription of the balanced-approach (shortfalls) rule in 2022:Q4 is more accommodative than that of the balanced-approach rule.

3. Implementations of simple rules often use the output gap as a measure of resource slack in the economy. The rules described in figure A instead use the unemployment rate gap because that gap better captures the FOMC's statutory goal to promote maximum employment. Movements in these alternative measures of resource utilization tend to be highly correlated. For more information, see the note below figure A.

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	$R_t^{BA} = r_t^{LR} + \pi_t + 0.5(\pi_t - \pi^{LR}) + 2(u_t^{LR} - u_t)$
Balanced-approach (shortfalls) rule	$R_t^{BAS} = r_t^{LR} + \pi_t + 0.5(\pi_t - \pi^{LR}) + 2min\{(u_t^{LR} - u_t), 0\}$
Adjusted Taylor (1993) rule	$R_t^{T93adj} = max\{R_t^{T93} - Z_t, \text{ELB}\}$
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^{BAS}, R_t^{T93adj}, and R_t^{FD} represent the values of the nominal federal funds rate prescribed by the Taylor (1993), balanced-approach, balanced-approach (shortfalls), adjusted Taylor (1993), and first-difference rules, respectively.

R_{t-1} denotes the midpoint of the target range for the federal funds rate for quarter $t-1$, u_t is the unemployment rate in quarter t, and r_t^{LR} is the level of the neutral real federal funds rate in the longer run that is expected to be consistent with sustaining maximum employment and inflation at the FOMC's 2 percent longer-run objective, represented by π^{LR}. π_t denotes the realized four-quarter price inflation for quarter t. In addition, u_t^{LR} is the rate of unemployment expected in the longer run. Z_t is the cumulative sum of past deviations of the federal funds rate from the prescriptions of the Taylor (1993) rule when that rule prescribes setting the federal funds rate below an effective lower bound of 12.5 basis points.

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

estimate of the neutral real interest rate in the longer run (r_t^{LR}).[4]

Unlike the other simple rules featured here, the adjusted Taylor (1993) rule recognizes that the federal funds rate cannot be reduced materially below the effective lower bound. To make up for the cumulative shortfall in policy accommodation following a recession during which the federal funds rate is constrained by its effective lower bound, the adjusted Taylor (1993) rule prescribes delaying the return of the policy rate to the (positive) levels prescribed by the standard Taylor (1993) rule until after the economy begins to recover.

Policy Rules: Limitations

Simple policy rules are also subject to important limitations. One important limitation is that simple policy rules were designed and tested under very different economic conditions than those faced at present. In addition, the simple policy rules respond to only a small set of economic variables and thus necessarily abstract from many of the factors that the FOMC considers when it assesses the appropriate setting of the policy rate. Another important limitation is that most simple policy rules do not take into account the effective lower bound on interest rates, which limits the extent to which the policy rate can be lowered to support the economy. This constraint was particularly evident during the pandemic-driven recession, when the lower bound on the policy rate motivated the FOMC's other policy actions to

(continued on next page)

4. The neutral real interest rate in the longer run (r_t^{LR}) is the level of the real federal funds rate that is expected to be consistent, in the longer run, with maximum employment and stable inflation. Like u_t^{LR}, r_t^{LR} is determined largely by nonmonetary factors. The first-difference rule shown in figure A does not require an estimate of r_t^{LR}, a feature that is touted by proponents of such rules as providing an element of robustness. However, this rule has its own shortcomings. For example, research suggests that this sort of rule often results in greater volatility in employment and inflation relative to what would be obtained under the Taylor (1993) and balanced-approach rules.

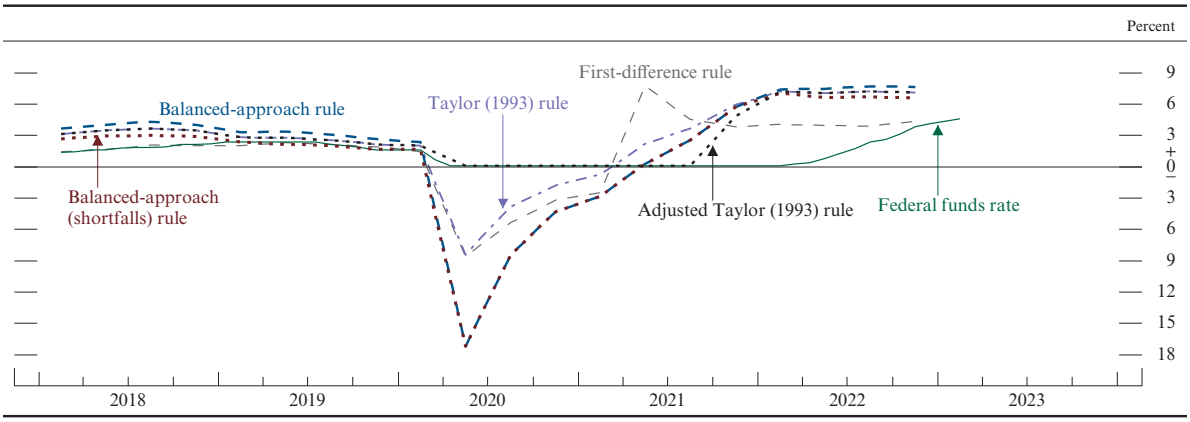
Monetary Policy Rules in the Current Environment *(continued)*

support the economy. Relatedly, another limitation is that simple policy rules do not take into account the other tools of monetary policy, such as balance sheet policies. Finally, simple policy rules generally abstract from the risk-management considerations associated with uncertainty about economic relationships and the evolution of the economy.

Selected Policy Rules: Prescriptions

Figure B shows historical prescriptions for the federal funds rate under the five simple rules considered. For each quarterly period, the figure reports the policy rates prescribed by the rules, taking as given the prevailing economic conditions and survey-based estimates of u_t^{LR} and r_t^{LR} at the time. All of the rules considered called for a highly accommodative stance for monetary policy in response to the pandemic-driven recession, followed by values above the effective lower bound as inflation picked up and labor market conditions strengthened. For most of 2022, the prescriptions for the federal funds rate were between 4 and 8 percent; these values are well above the levels observed before the pandemic and reflect, in large part, elevated inflation readings. Throughout 2021 and 2022, the target range for the federal funds rate was below the prescriptions of most of the simple rules, though that gap has narrowed considerably as the FOMC has expeditiously tightened the stance of monetary policy and inflation has begun to moderate.

B. Historical federal funds rate prescriptions from simple policy rules



NOTE: The rules use historical values of core personal consumption expenditures inflation, the unemployment rate, and, where applicable, historical values of the midpoint of the target range for the federal funds rate. Quarterly projections of longer-run values for the federal funds rate and the unemployment rate used in the computation of the rules' prescriptions are derived through interpolations of biannual projections from Blue Chip Economic Indicators. The longer-run value for inflation is set to 2 percent. The rules prescriptions are quarterly, and the federal funds rate data are the monthly average of the daily midpoint of the target range for the federal funds rate and extend through February 2023.

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

Part 3
Summary of Economic Projections

The following material was released after the conclusion of the December 13–14, 2022, meeting of the Federal Open Market Committee.

In conjunction with the Federal Open Market Committee (FOMC) meeting held on December 13–14, 2022, meeting participants submitted their projections of the most likely outcomes for real gross domestic product (GDP) growth, the unemployment rate, and inflation for each year from 2022 to 2025 and over the longer run. Each participant's projections were based on information available at the time of the meeting, together with her or his assessment of appropriate monetary policy—including a path for the federal funds rate and its longer-run value—and assumptions about other factors likely to affect economic outcomes. The longer-run projections represent each participant's assessment of the value to which each variable would be expected to converge, over time, under appropriate monetary policy and in the absence of further shocks to the economy. "Appropriate monetary policy" is defined as the future path of policy that each participant deems most likely to foster outcomes for economic activity and inflation that best satisfy his or her individual interpretation of the statutory mandate to promote maximum employment and price stability.

Table 1. Economic projections of Federal Reserve Board members and Federal Reserve Bank presidents, under their individual assumptions of projected appropriate monetary policy, December 2022

Percent

Variable	Median[1]					Central tendency[2]					Range[3]				
	2022	2023	2024	2025	Longer run	2022	2023	2024	2025	Longer run	2022	2023	2024	2025	Longer run
Change in real GDP	0.5	0.5	1.6	1.8	1.8	0.4–0.5	0.4–1.0	1.3–2.0	1.6–2.0	1.7–2.0	0.2–0.5	-0.5–1.0	0.5–2.4	1.4–2.3	1.6–2.5
September projection	0.2	1.2	1.7	1.8	1.8	0.1–0.3	0.5–1.5	1.4–2.0	1.6–2.0	1.7–2.0	0.0–0.5	-0.3–1.9	1.0–2.6	1.4–2.4	1.6–2.2
Unemployment rate	3.7	4.6	4.6	4.5	4.0	3.7	4.4–4.7	4.3–4.8	4.0–4.7	3.8–4.3	3.7–3.9	4.0–5.3	4.0–5.0	3.8–4.8	3.5–4.8
September projection	3.8	4.4	4.4	4.3	4.0	3.8–3.9	4.1–4.5	4.0–4.6	4.0–4.5	3.8–4.3	3.7–4.0	3.7–5.0	3.7–4.7	3.7–4.6	3.5–4.5
PCE inflation	5.6	3.1	2.5	2.1	2.0	5.6–5.8	2.9–3.5	2.3–2.7	2.0–2.2	2.0	5.5–5.9	2.6–4.1	2.2–3.5	2.0–3.0	2.0
September projection	5.4	2.8	2.3	2.0	2.0	5.3–5.7	2.6–3.5	2.1–2.6	2.0–2.2	2.0	5.0–6.2	2.4–4.1	2.0–3.0	2.0–2.5	2.0
Core PCE inflation[4]	4.8	3.5	2.5	2.1		4.7–4.8	3.2–3.7	2.3–2.7	2.0–2.2		4.6–5.0	3.0–3.8	2.2–3.0	2.0–3.0	
September projection	4.5	3.1	2.3	2.1		4.4–4.6	3.0–3.4	2.2–2.5	2.0–2.2		4.3–4.8	2.8–3.5	2.0–2.8	2.0–2.5	
Memo: Projected appropriate policy path															
Federal funds rate	4.4	5.1	4.1	3.1	2.5	4.4	5.1–5.4	3.9–4.9	2.6–3.9	2.3–2.5	4.4	4.9–5.6	3.1–5.6	2.4–5.6	2.3–3.3
September projection	4.4	4.6	3.9	2.9	2.5	4.1–4.4	4.4–4.9	3.4–4.4	2.4–3.4	2.3–2.5	3.9–4.6	3.9–4.9	2.6–4.6	2.4–4.6	2.3–3.0

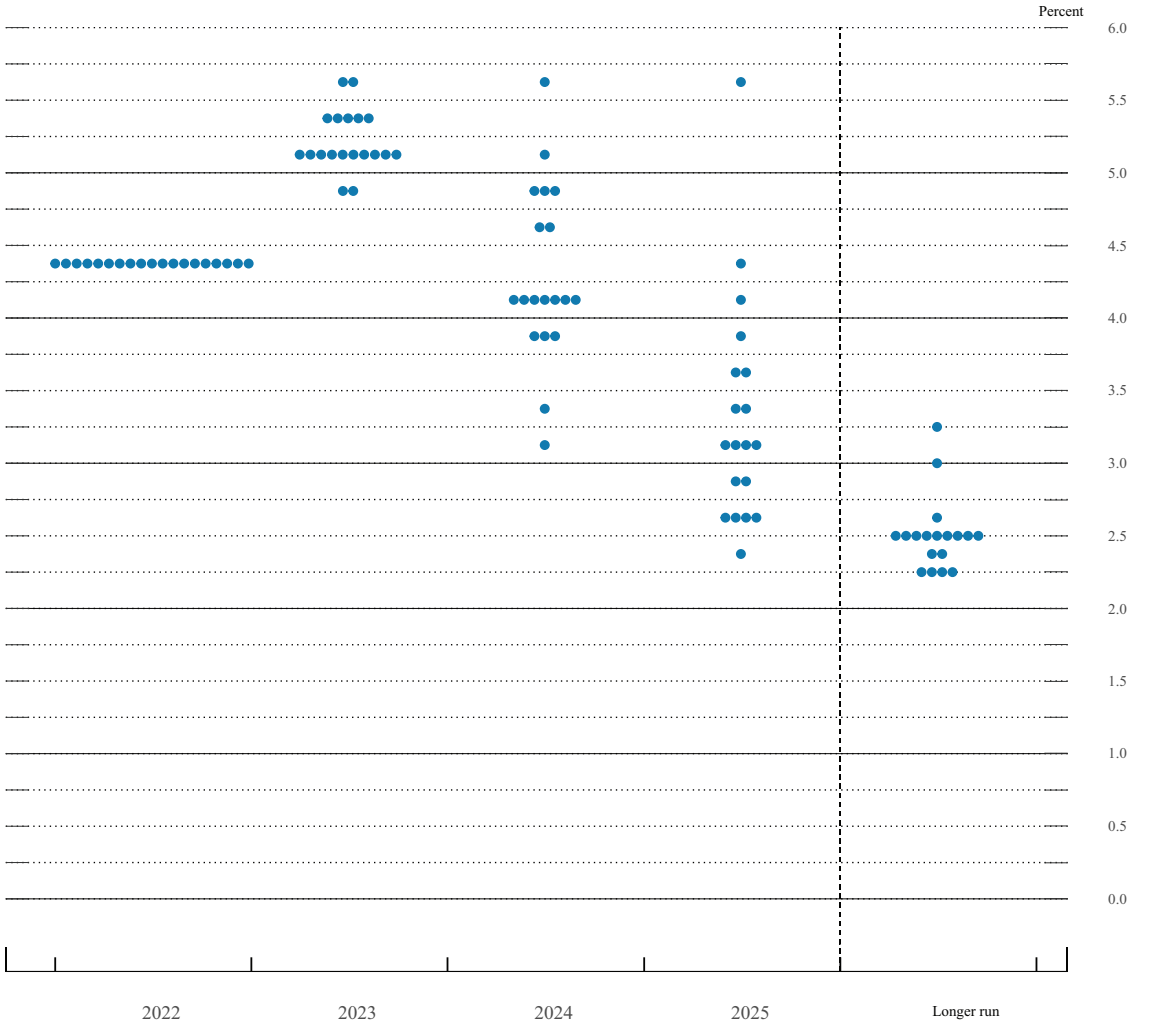
Note: Projections of change in real gross domestic product (GDP) and projections for both measures of inflation are percent changes from the fourth quarter of the previous year to the fourth quarter of the year indicated. PCE inflation and core PCE inflation are the percentage rates of change in, respectively, the price index for personal consumption expenditures (PCE) and the price index for PCE excluding food and energy. Projections for the unemployment rate are for the average civilian unemployment rate in the fourth quarter of the year indicated. Each participant's projections are based on his or her assessment of appropriate monetary policy. Longer-run projections represent each participant's assessment of the rate to which each variable would be expected to converge under appropriate monetary policy and in the absence of further shocks to the economy. The projections for the federal funds rate are the value of the midpoint of the projected appropriate target range for the federal funds rate or the projected appropriate target level for the federal funds rate at the end of the specified calendar year or over the longer run. The September projections were made in conjunction with the meeting of the Federal Open Market Committee on September 20-21, 2022. One participant did not submit longer-run projections for the change in real GDP, the unemployment rate, or the federal funds rate in conjunction with the September 20-21, 2022, meeting, and one participant did not submit such projections in conjunction with the December 13–14, 2022, 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.

Figure 1. Medians, central tendencies, and ranges of economic projections, 2022–25 and over the longer run

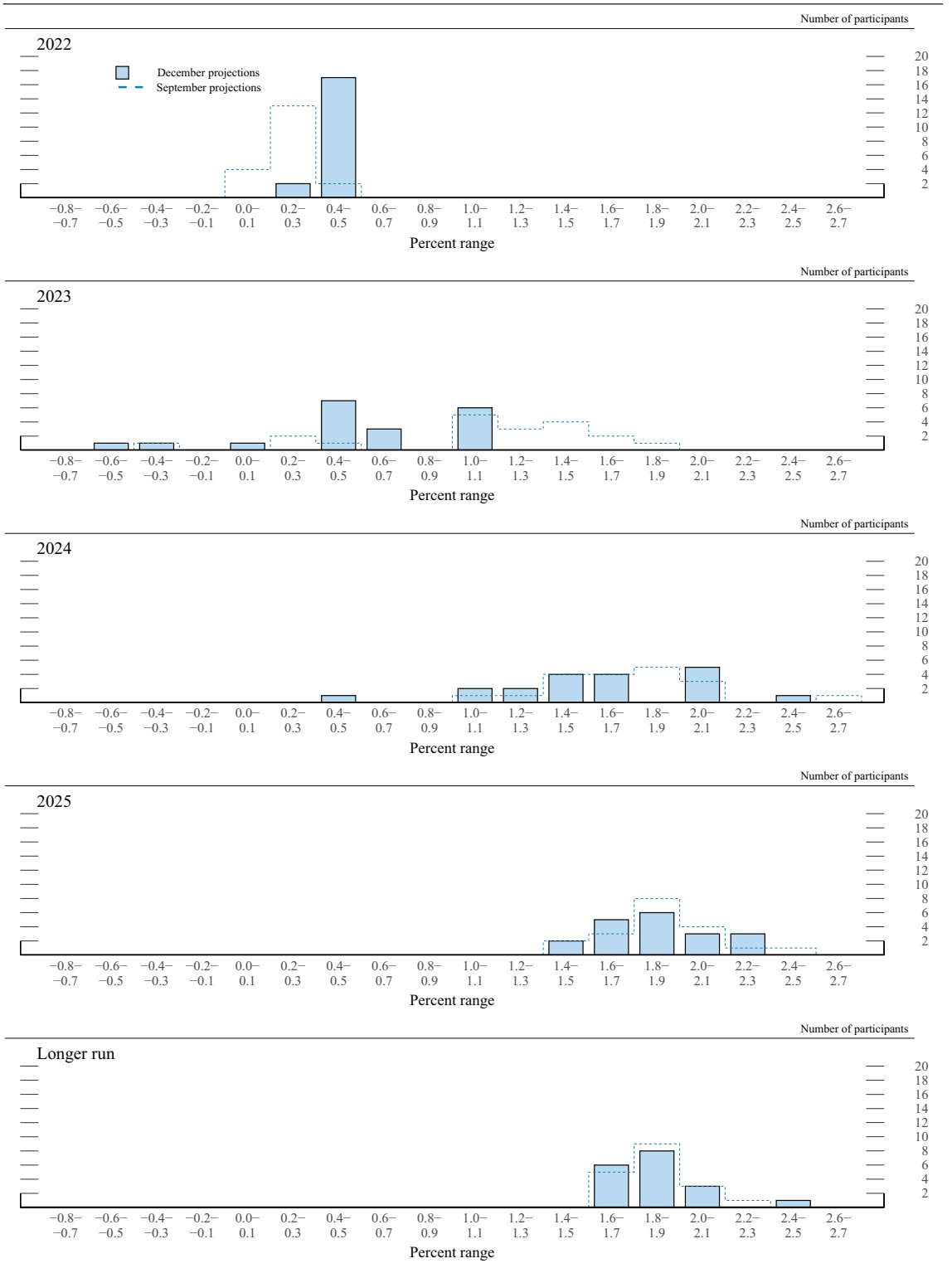
NOTE: Definitions of variables and other explanations are in the notes to table 1. The data for the actual values of the variables are annual.

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



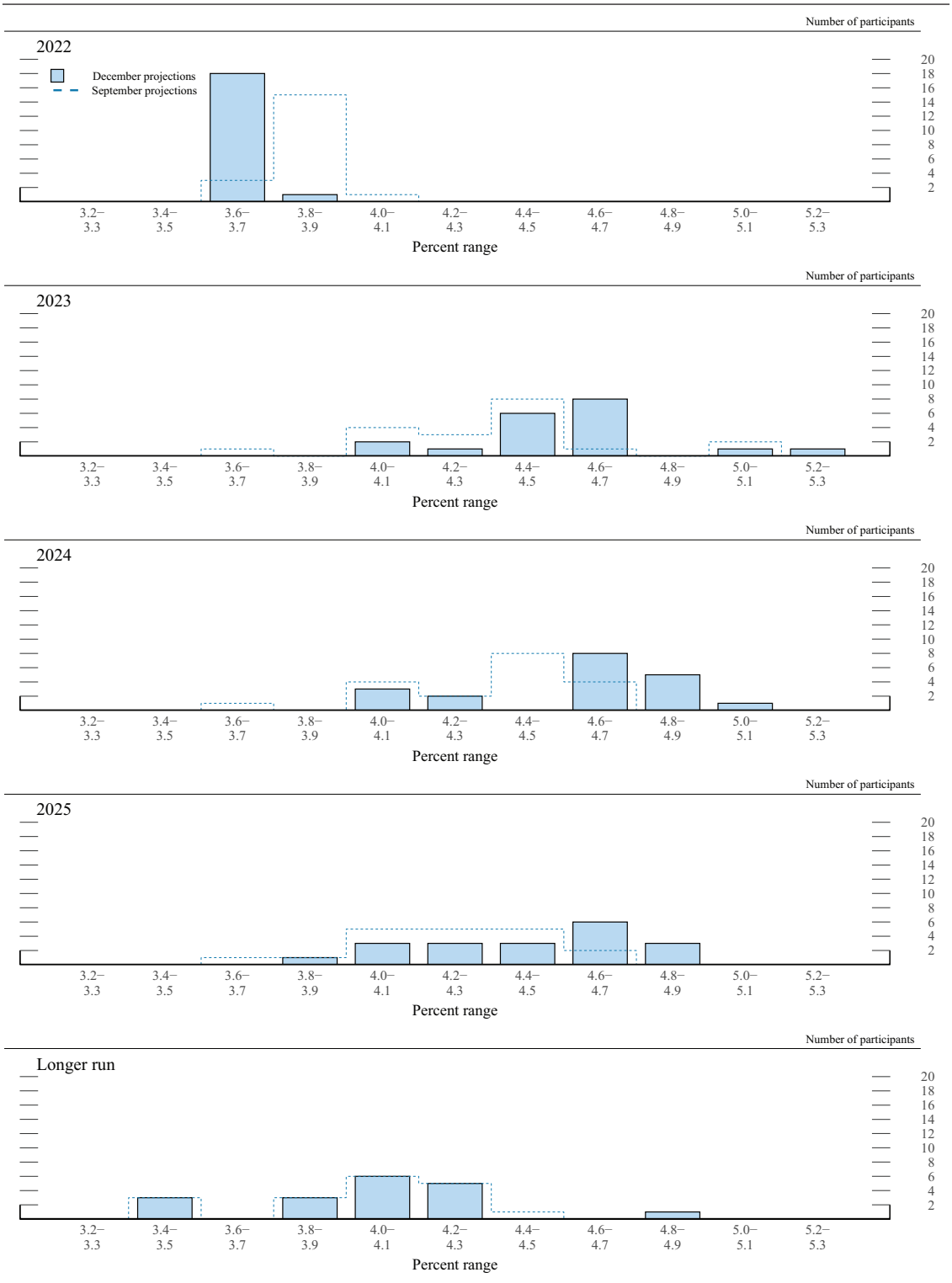
NOTE: Each shaded circle indicates the value (rounded to the nearest 1/8 percentage point) of an individual participant's judgment of the midpoint of the appropriate target range for the federal funds rate or the appropriate target level for the federal funds rate at the end of the specified calendar year or over the longer run. One participant did not submit longer-run projections for the federal funds rate.

Figure 3.A. Distribution of participants' projections for the change in real GDP, 2022–25 and over the longer run



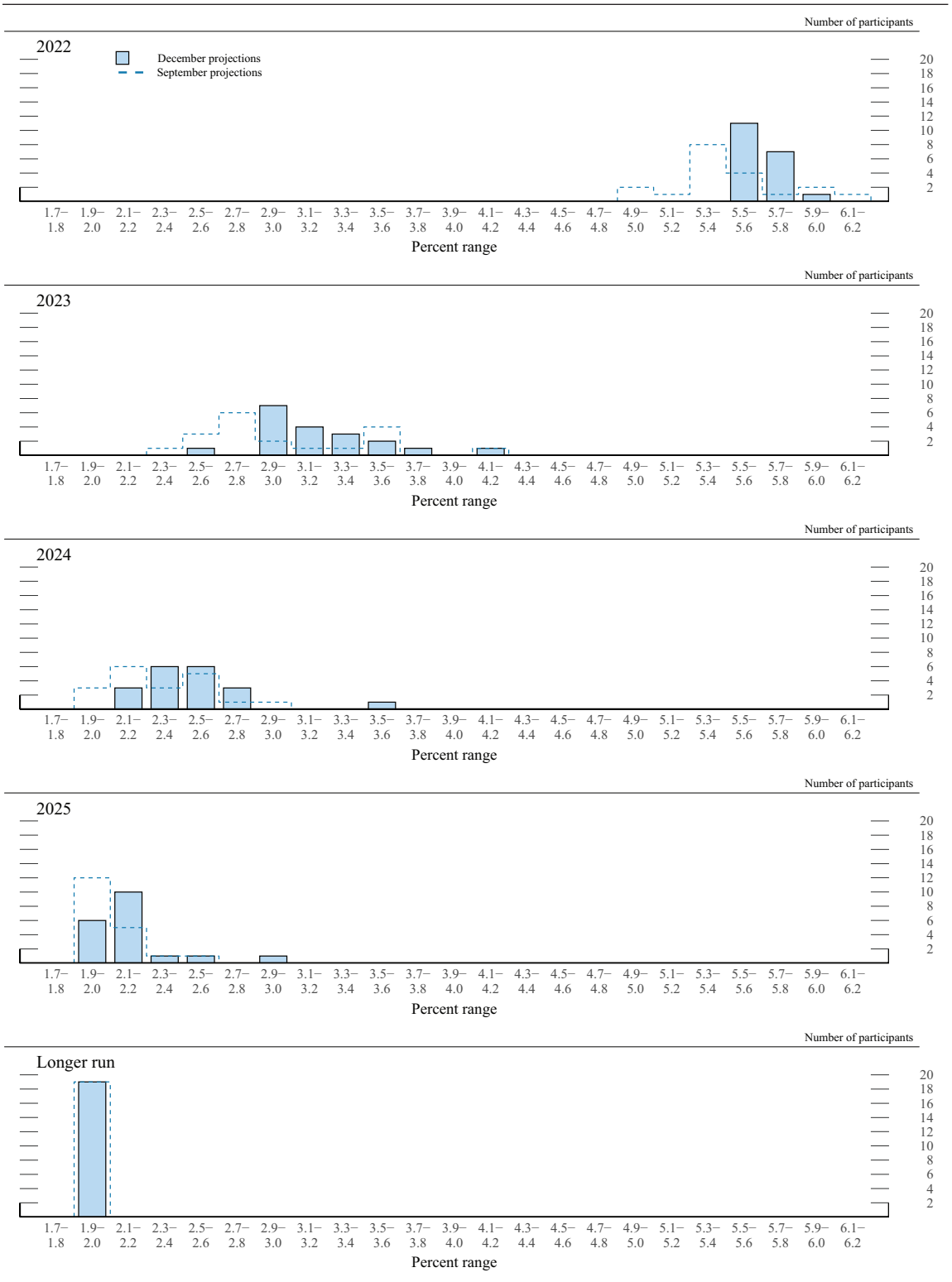
NOTE: Definitions of variables and other explanations are in the notes to table 1.

Figure 3.B. Distribution of participants' projections for the unemployment rate, 2022–25 and over the longer run



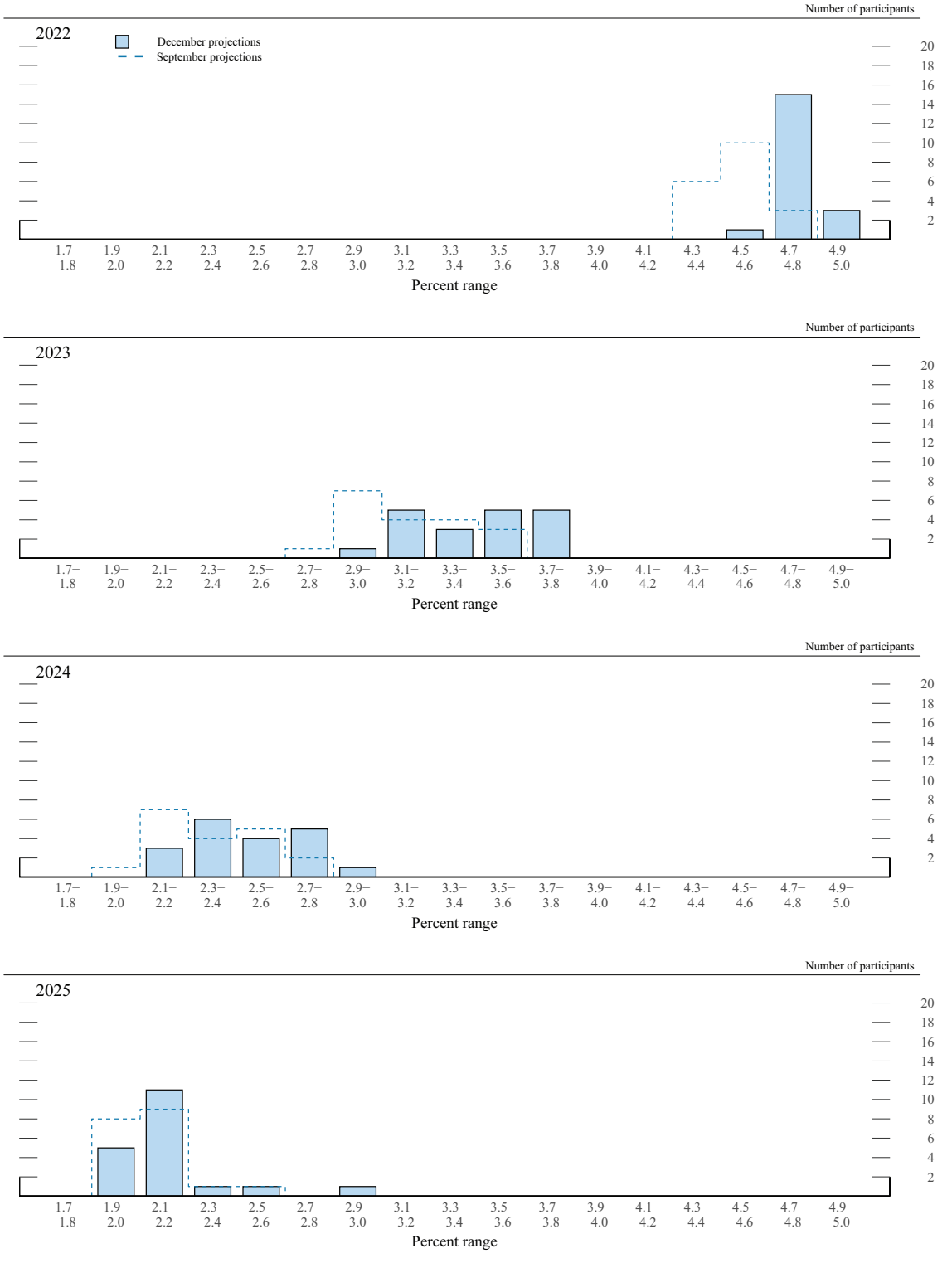
NOTE: Definitions of variables and other explanations are in the notes to table 1.

Figure 3.C. Distribution of participants' projections for PCE inflation, 2022–25 and over the longer run



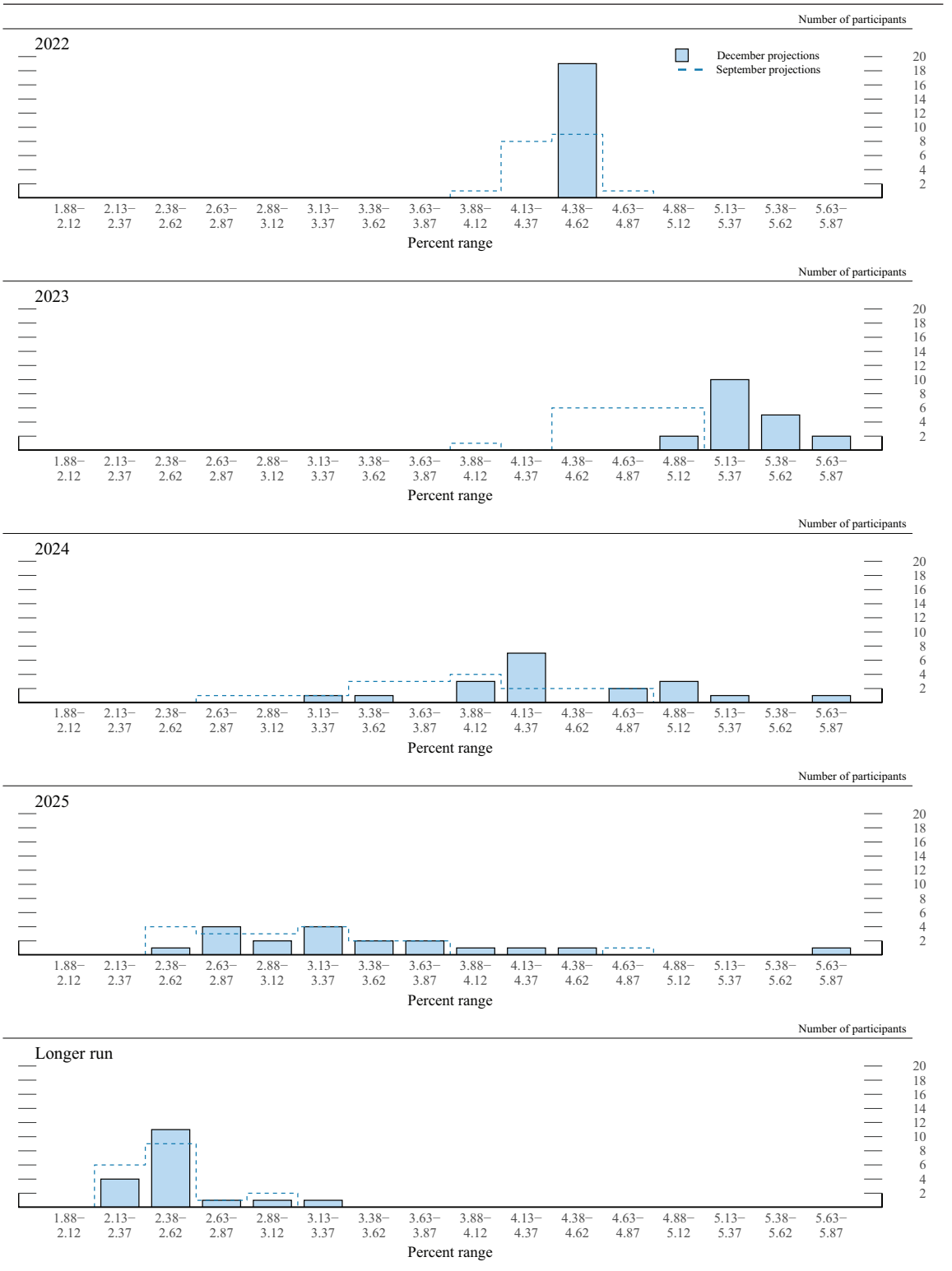
NOTE: Definitions of variables and other explanations are in the notes to table 1.

Figure 3.D. Distribution of participants' projections for core PCE inflation, 2022–25



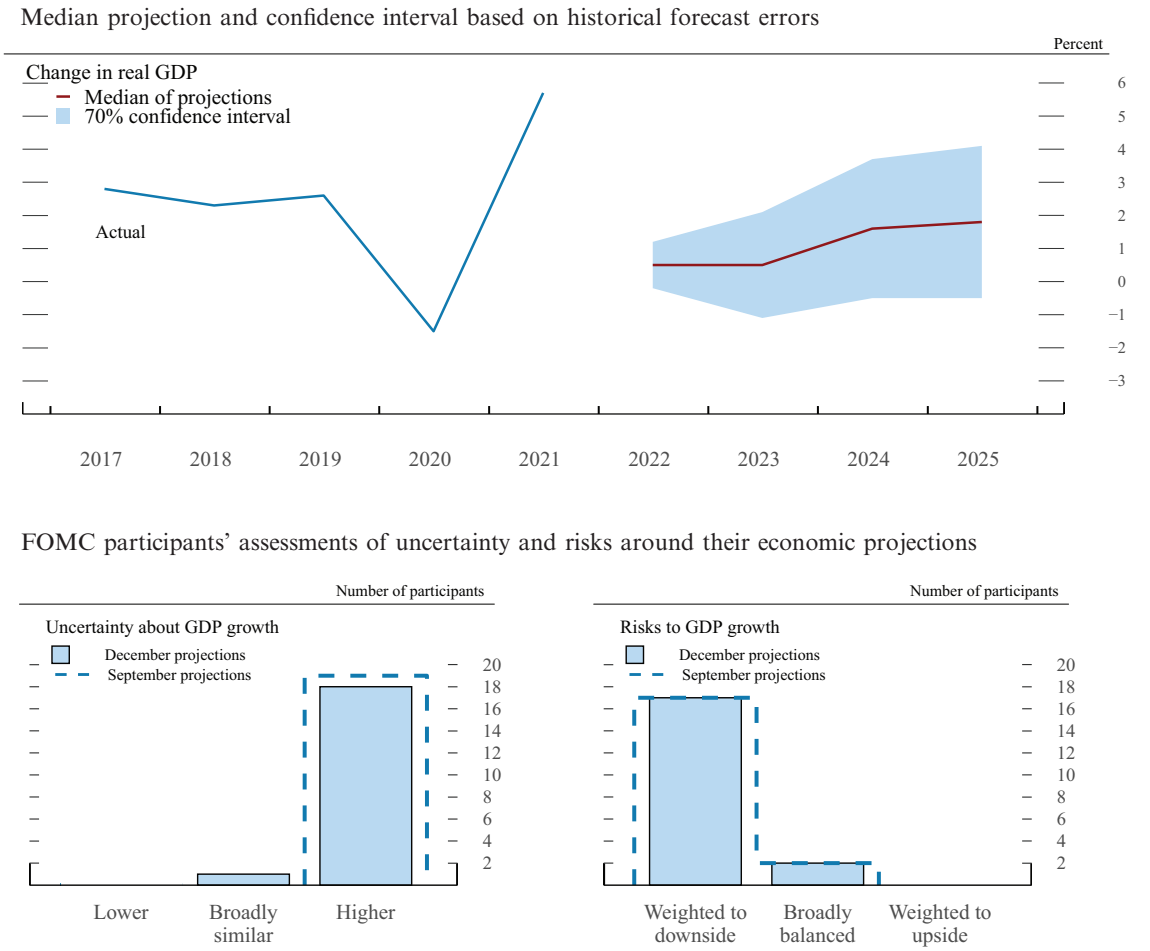
NOTE: Definitions of variables and other explanations are in the notes to table 1.

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, 2022–25 and over the longer run



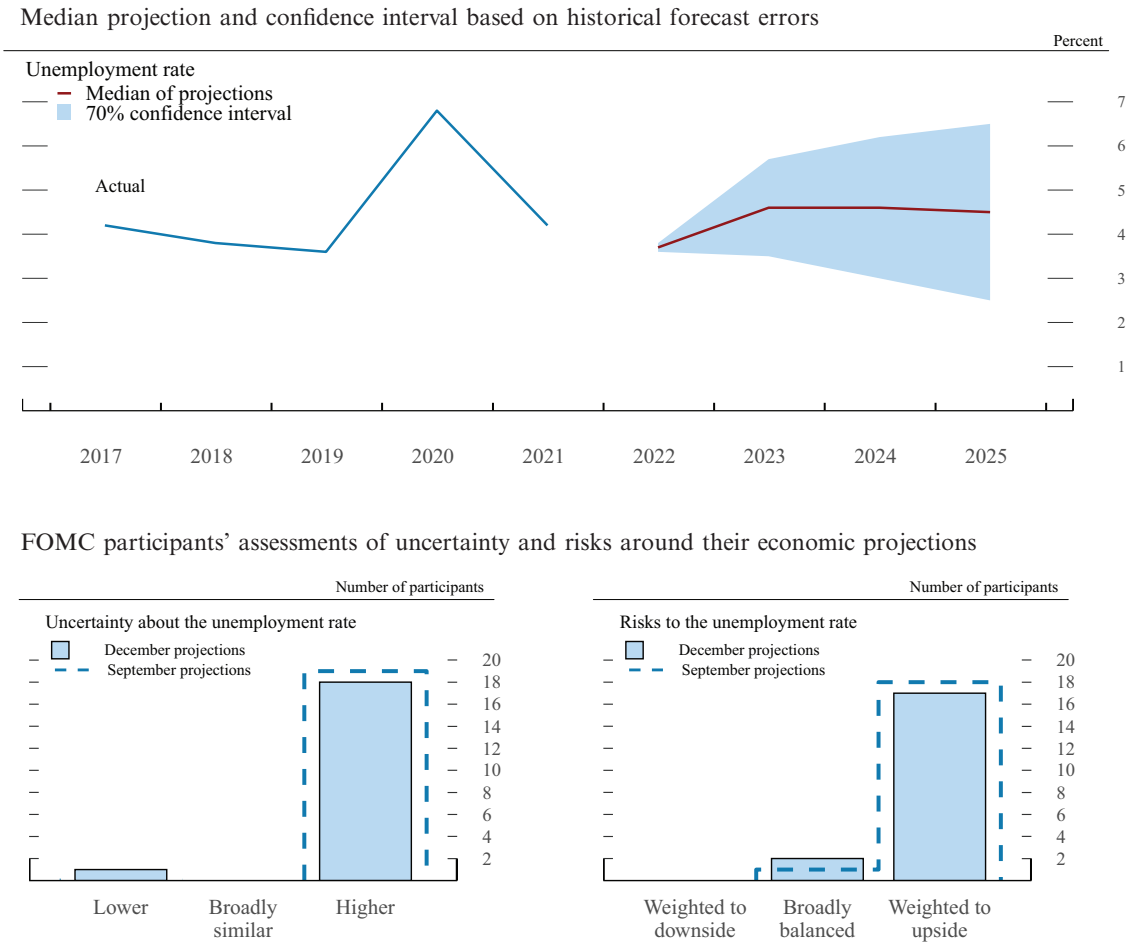
NOTE: Definitions of variables and other explanations are in the notes to table 1.

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



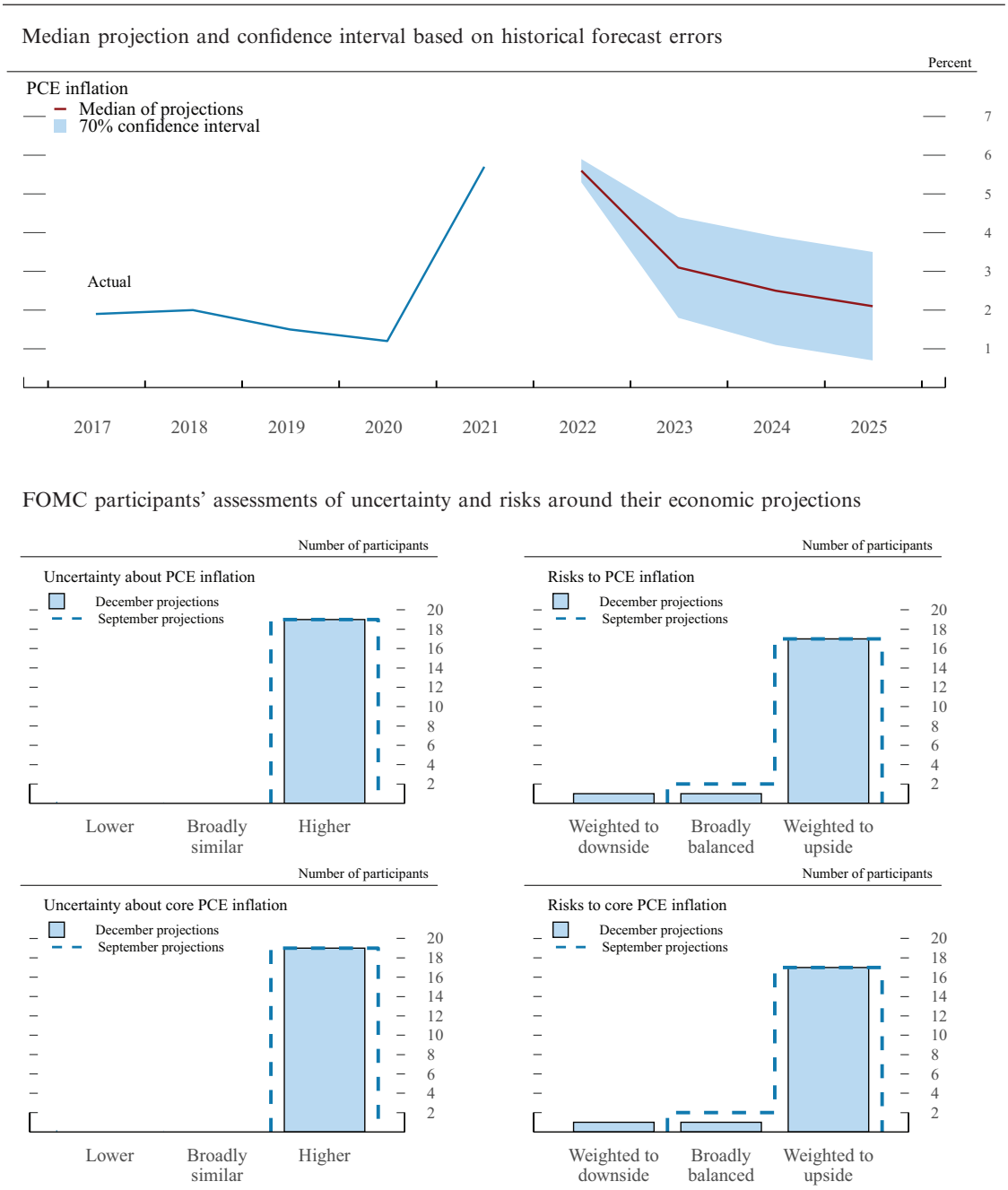
NOTE: The blue and red lines in the top panel show actual values and median projected values, respectively, of the percent change in real gross domestic product (GDP) from the fourth quarter of the previous year to the fourth quarter of the year indicated. The confidence interval around the median projected values is assumed to be symmetric and is based on root mean squared errors of various private and government forecasts made over the previous 20 years; more information about these data is available in table 2. Because current conditions may 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



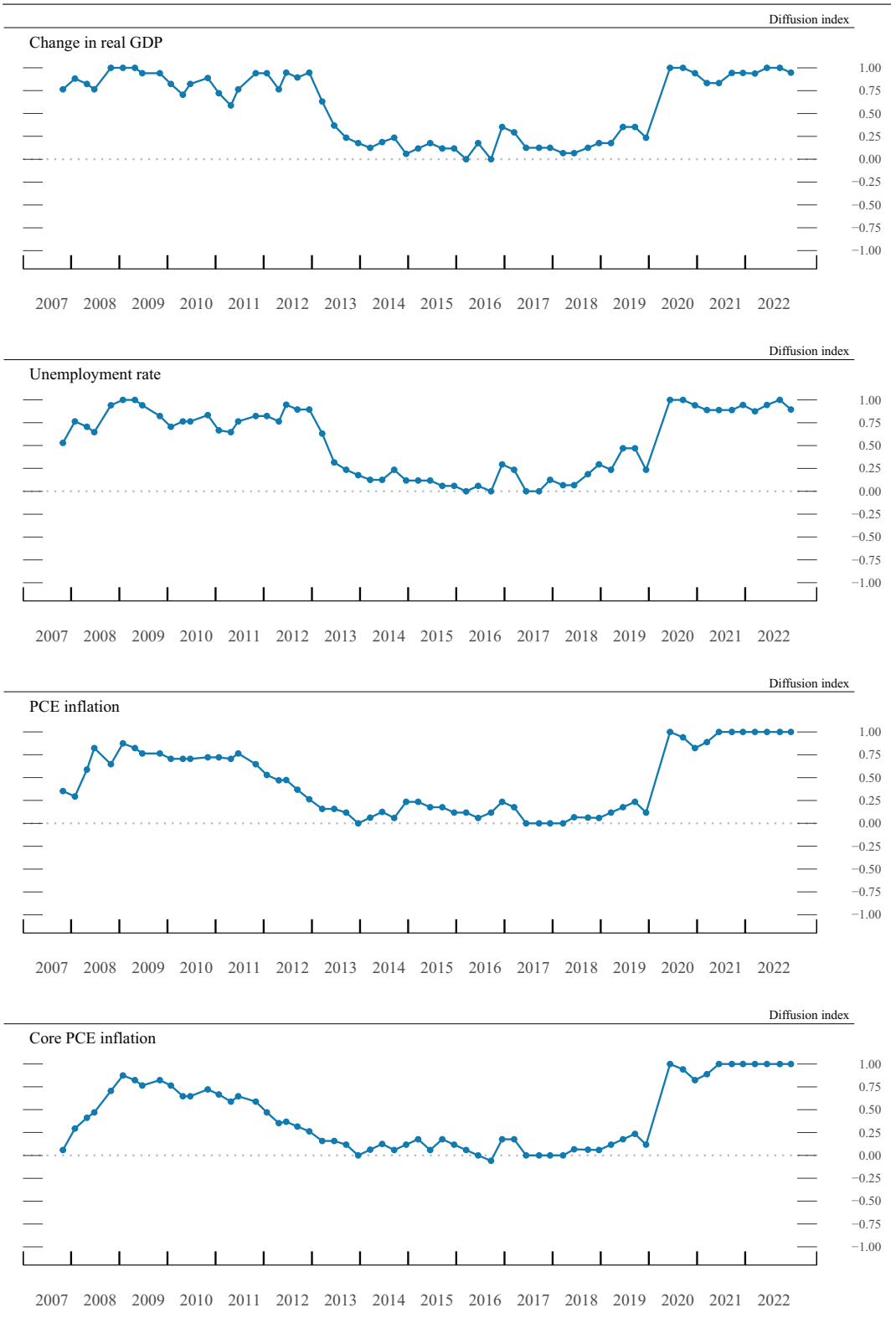
NOTE: The blue and red lines in the top panel show actual values and median projected values, respectively, of the average civilian unemployment rate in the fourth quarter of the year indicated. The confidence interval around the median projected values is assumed to be symmetric and is based on root 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



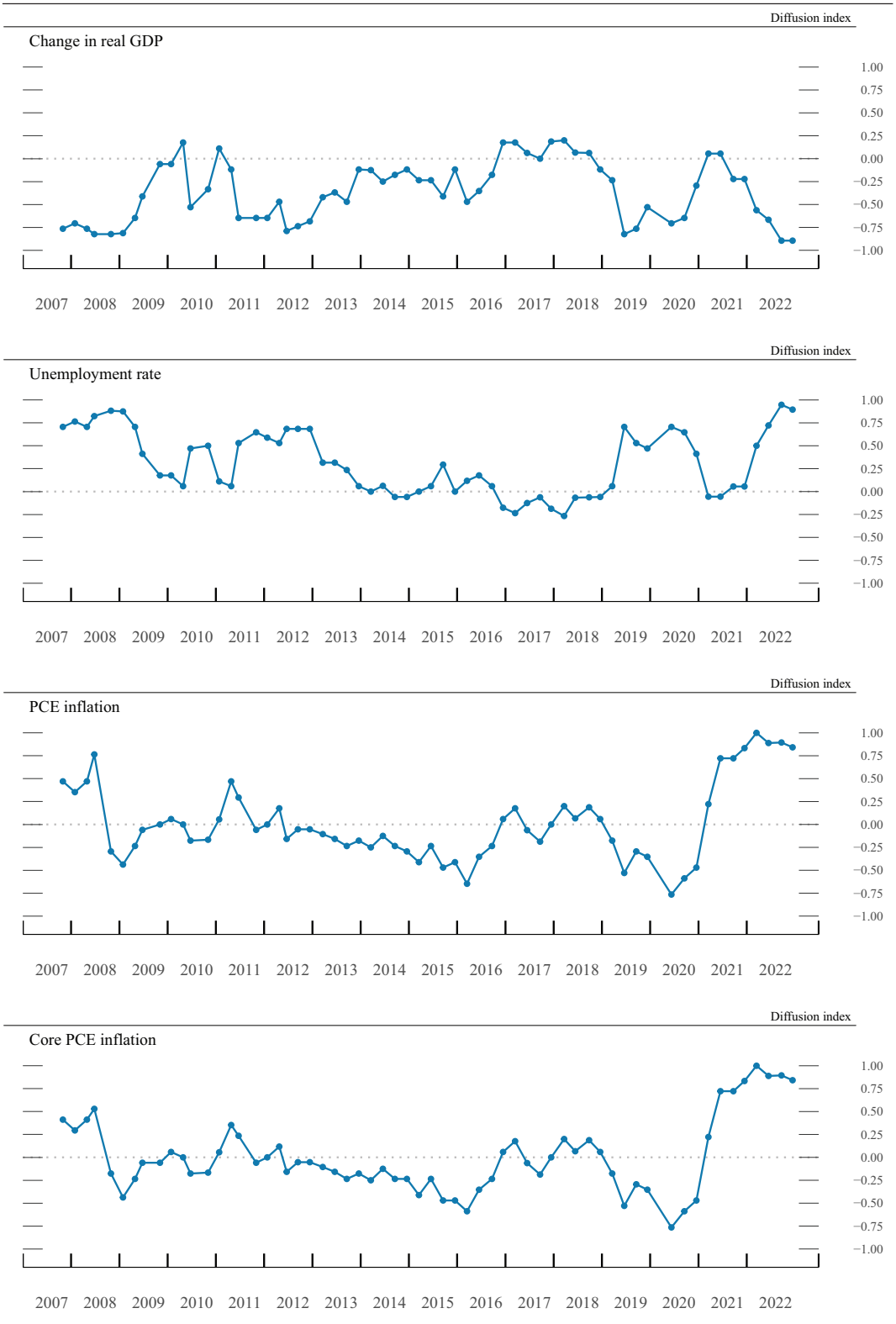
NOTE: The blue and red lines in the top panel show actual values and median projected values, respectively, of the percent change in the price index for personal consumption expenditures (PCE) from the fourth quarter of the previous year to the fourth quarter of the year indicated. The confidence interval 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 4.D. Diffusion indexes of participants' uncertainty assessments



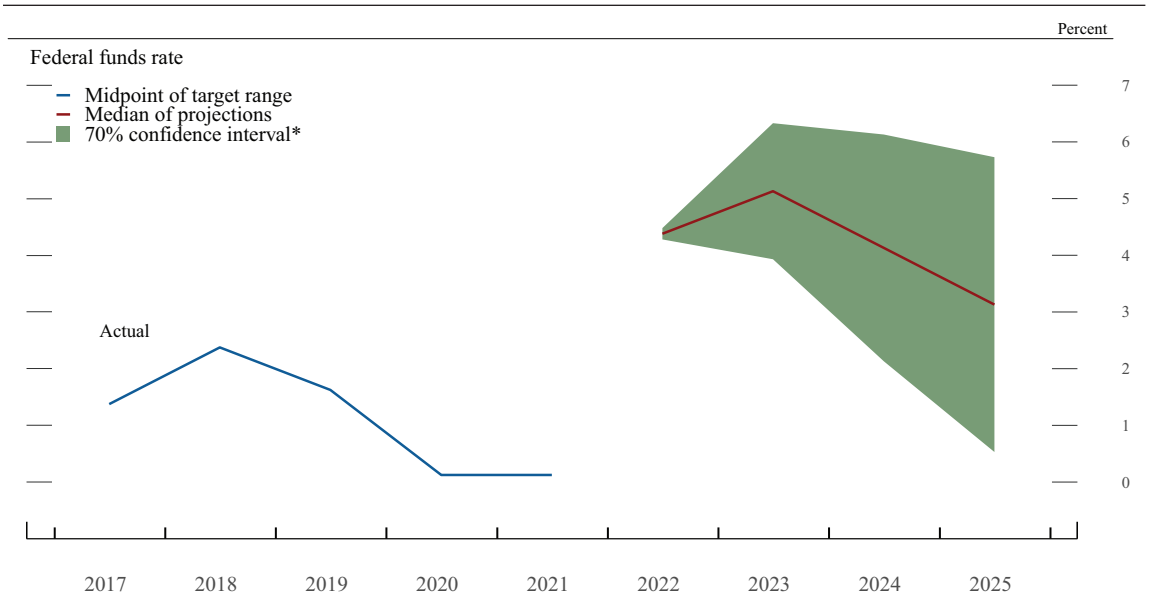
NOTE: For each SEP, participants provided responses to the question "Please indicate your judgment of the uncertainty attached to your projections relative to the levels of uncertainty over the past 20 years." Each point in the diffusion indexes represents the number of participants who responded "Higher" minus the number who responded "Lower," divided by the total number of participants. Figure excludes March 2020 when no projections were submitted.

Figure 4.E. Diffusion indexes of participants' risk weightings



NOTE: For each SEP, participants provided responses to the question "Please indicate your judgment of the risk weighting around your projections." Each point in the diffusion indexes represents the number of participants who responded "Weighted to the Upside" minus the number who responded "Weighted to the Downside," divided by the total number of participants. Figure excludes March 2020 when no projections were submitted.

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



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

Table 2. Average historical projection error ranges
Percentage points

Variable	2022	2023	2024	2025
Change in real GDP[1]	± 0.7	± 1.6	± 2.1	± 2.3
Unemployment rate[1]	± 0.1	± 1.1	± 1.6	± 2.0
Total consumer prices[2]	± 0.3	± 1.3	± 1.4	± 1.4
Short-term interest rates[3]	± 0.1	± 1.2	± 2.0	± 2.6

NOTE: Error ranges shown are measured as plus or minus the root mean squared error of projections for 2002 through 2021 that were released in the winter by various private and government forecasters. As described in the box "Forecast Uncertainty," under certain assumptions, there is about a 70 percent probability that actual outcomes for real GDP, unemployment, consumer prices, and the federal funds rate will be in ranges implied by the average size of projection errors made in the past. For more information, see David Reifschneider and Peter Tulip (2017), "Gauging the Uncertainty of the Economic Outlook Using Historical Forecasting Errors: The Federal Reserve's Approach," Finance and Economics Discussion Series 2017-020 (Washington: Board of Governors of the Federal Reserve System, February), https://dx.doi.org/10.17016/FEDS.2017.020.

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

Forecast Uncertainty

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

Table 2 summarizes the average historical accuracy of a range of forecasts, including those reported in past *Monetary Policy Report*s and those prepared by the Federal Reserve Board's staff in advance of meetings of the Federal Open Market Committee (FOMC). The projection error ranges shown in the table illustrate the considerable uncertainty associated with economic forecasts. For example, suppose a participant projects that real gross domestic product (GDP) and total consumer prices will rise steadily at annual rates of, respectively, 3 percent and 2 percent. If the uncertainty attending those projections is similar to that experienced in the past and the risks around the projections are broadly balanced, the numbers reported in table 2 would imply a probability of about 70 percent that actual GDP would expand within a range of 2.3 to 3.7 percent in the current year, 1.4 to 4.6 percent in the second year, 0.9 to 5.1 percent in the third year, and 0.7 to 5.3 percent in the fourth year. The corresponding 70 percent confidence intervals for overall inflation would be 1.7 to 2.3 percent in the current year, 0.7 to 3.3 percent in the second year, and 0.6 to 3.4 percent in the third and fourth 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

(continued)

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
AUM	assets under management
COVID-19	coronavirus disease 2019
EME	emerging market economy
FOMC	Federal Open Market Committee; also, the Committee
GDP	gross domestic product
MBS	mortgage-backed securities
MMF	money market fund
ON RRP	overnight reverse repurchase agreement
PCE	personal consumption expenditures
SOMA	System Open Market Account
S&P	Standard & Poor's
VIX	implied volatility for the S&P 500 index