<u>Prefatory Note</u>

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

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

Report to the FOMC
on Economic Conditions
and Monetary Policy

Book A

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

December 4, 2020

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

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Domestic Economic Developments and Outlook

Recent spending data have generally been better than expected and suggest that the economic recovery, through early in the fourth quarter, has slowed by less than we had projected in the October Tealbook. However, the news on the spread of the virus has been alarming, and we now think that the recent resurgence in the pandemic is increasing social distancing and will damp spending through early next year. Indeed, payroll gains slowed more abruptly in November than we had been previously expecting, and some of our high-frequency indicators have started to soften. On balance, we now project that GDP will rise at an annual rate of 5 percent in the fourth quarter, leaving GDP 2.3 percent below its year-earlier level, but we also expect spending to stall temporarily in the first quarter of next year, reflecting increased social distancing and the unwinding of earlier fiscal stimulus.

In light of recent favorable news on vaccine development, we now assume that effective COVID-19 vaccines will provide widespread immunity by the summer, a few months earlier than we had previously assumed. This assumption pulls forward some output growth into 2021, as we now expect social distancing to unwind more quickly than in the previous Tealbook. In addition, financial market conditions have become more supportive of growth, likely in reaction to the positive vaccine news and to some resolution of political uncertainty, leading us to strengthen the medium-term economic projection. As the effects of social distancing gradually fade and financial conditions continue to be supported by accommodative monetary policy, we expect GDP growth to move up to 4.3 percent next year and then to slow gradually to 2.3 percent by 2023. With GDP growth well exceeding its potential rate in the medium term, we project the unemployment rate to move down to 3.0 percent by the end of 2023.

Recent monthly inflation readings have slowed by more than we had expected in the October Tealbook. Core PCE prices rose 1.4 percent over the 12 months ended in October, 0.2 percentage point below our projection in the previous Tealbook and well below pre-pandemic rates. We expect the 12-month change in core PCE prices to move sideways through December; over the medium and longer terms, the projected gradual tightening of resource utilization pushes up core inflation to 1.9 percent by 2023 and to a little above 2 percent by 2025. Total inflation runs below core this year, reflecting the earlier declines in energy prices, but runs at a pace similar to core thereafter.

The path for the pandemic, the measures to control it, and the associated economic effects remain highly uncertain, and we continue to see the risks to our forecast as skewed notably to the downside. We view our baseline forecast as the most likely outcome, but the sharply rising COVID-19 cases in recent weeks suggest that the risk of a more adverse outcome has risen. Accordingly, the Risks and Uncertainty section of this Tealbook includes an alternative scenario, "Second Round of Severe Restrictions," in which economic activity is significantly and persistently below the baseline projection. However, the positive news on vaccine developments has greatly reduced the risk of a sharper and more prolonged downturn that we had considered in the previous Tealbook. We also present an optimistic "Early Vaccine" scenario, where generalized vaccine distribution occurs earlier than in the baseline, resulting in greater economic activity over the next year and a half than in the baseline.

The Staff's Baseline Forecast and Selected Alternative Scenarios for the Level of Real GDP
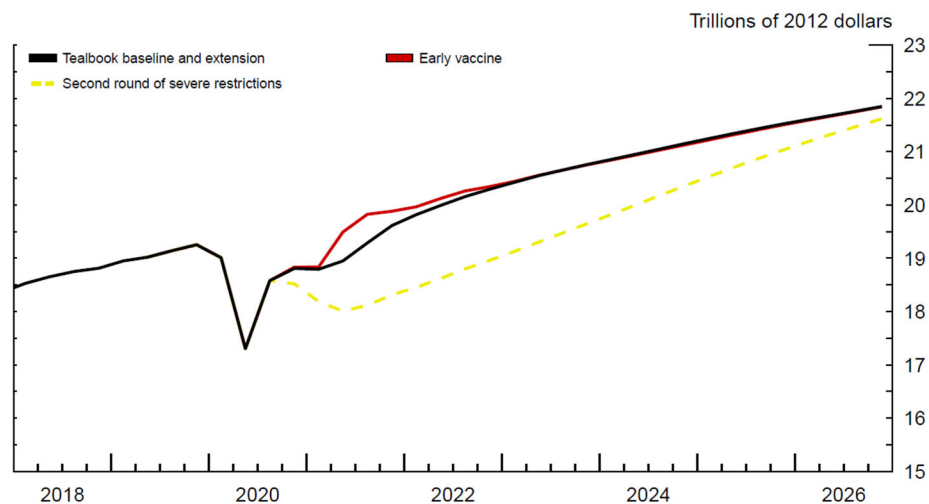
KEY BACKGROUND FACTORS

COVID-19 Pandemic and Response

In response to the recent sharp rise in reported COVID-19 cases, hospitalizations, and deaths, we now assume that some states and localities will continue to tighten business restrictions somewhat further through January and that households and firms will voluntarily reduce exposure to high-contact activities, including many consumer services. We expect many states to put in place much tighter restrictions on restaurants, bars, gyms, and other indoor services, but we assume that most states and localities will continue to avoid the types of severe economic lockdowns seen in the spring, even if that

avoidance results in more adverse health outcomes and some disruptions to health-care systems. Our new social-distancing assumptions are expected to directly reduce the rate of change in GDP by a bit more than 1 percentage point in both the fourth and first quarters.

As discussed in the box "News on COVID-19 Vaccines and Herd Immunity," the recent news on vaccine developments led us to assume that widespread immunity to the COVID-19 virus will be attained by the third quarter of 2021, one quarter earlier than in our previous projection. The earlier availability of the vaccines boosts next year's GDP growth somewhat, both here and abroad.

Fiscal Policy

We continue to estimate that enacted fiscal policies have boosted GDP growth significantly in 2020 and project that the unwinding of that stimulus will turn into a headwind for economic growth next year.[1] Importantly, we continue to assume in the baseline that no additional fiscal stimulus will be enacted. However, the future path for fiscal policy remains quite uncertain, and the upside risk of an "Additional Fiscal Support" scenario—which assumes the enactment of a $900 billion package going into effect in January—is presented in the Risks and Uncertainty section.

Effects of COVID-19 Fiscal Policies on Aggregate Demand (FI)
(Percentage point contribution to real GDP growth, annual rate)

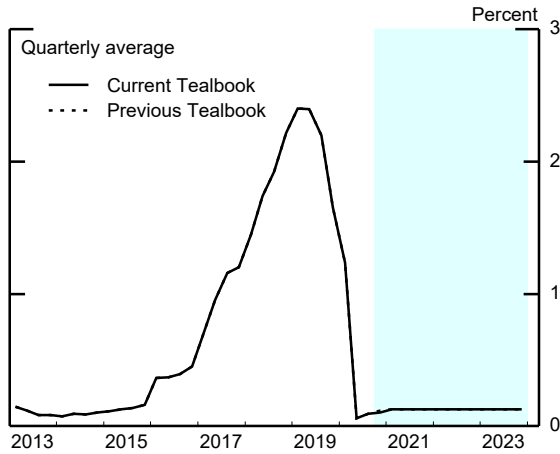|		2020				2021	Q4/Q4			
		Q1	Q2	Q3	Q4	Q1	2020	2021	2022	2023
(1)	**Total**	.0	14.5	.7	.6	-4.4	3.9	-3.2	-.3	-.2
(2)	*October TB*	*.0*	*14.4*	*1.8*	*.7*	*-4.0*	*4.1*	*-3.2*	*-.4*	*-.3*

Note: FI is fiscal impetus or the first-round direct effect, excluding multiplier effects or financial offsets, of fiscal policy on aggregate demand.

State and local government budgets remain quite strained—despite receiving around $200 billion in federal stimulus aid from the CARES Act—due to depressed tax revenues and increased spending pressures related to the COVID-19 crisis. As a result, in our baseline forecast, we anticipate that purchases by those governments will decline
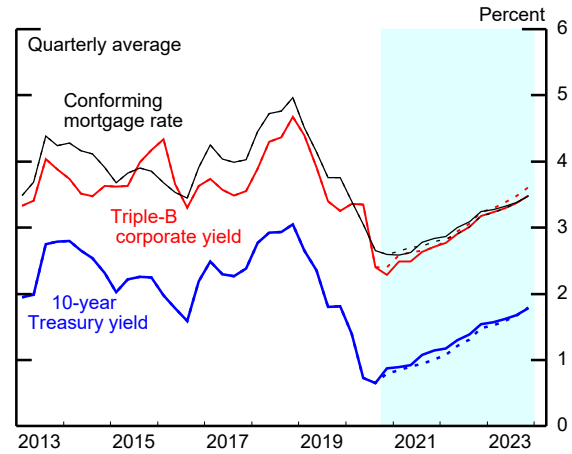
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[1] On December 11, appropriations bills that fund the federal government will expire. We assume that funding legislation will be enacted and that there will be no meaningful disruption of government operations due to a shutdown.

Domestic Econ Devel & Outlook

Key Background Factors Underlying the Baseline Staff Projection

Federal Funds Rate

Percent

Quarterly average

—— Current Tealbook
······ Previous Tealbook

2013 2015 2017 2019 2021 2023

Long-Term Interest Rates

Percent

Quarterly average

Conforming
mortgage rate

Triple-B
corporate yield

10-year
Treasury yield

2013 2015 2017 2019 2021 2023

Equity Prices

Ratio scale, 2013:Q1 = 100

Quarter-end

Dow Jones
U.S. Total Stock Market
Index

2013 2015 2017 2019 2021 2023

House Prices

4-quarter percent change

Quarterly

CoreLogic
Index

2013 2015 2017 2019 2021 2023

Oil Prices

Dollars per barrel

Quarterly average

Imported oil

2013 2015 2017 2019 2021 2023

Broad Real Dollar

2013:Q1 = 100

Quarterly average

2013 2015 2017 2019 2021 2023

3 percent this year and will rise only 1¼ percent per year, on average, over the medium term.

Monetary Policy

The federal funds rate is assumed to remain at the ELB through the first quarter of 2025, following the prescriptions of an interest rate rule that is meant to be broadly consistent with the updated Statement on Longer-Run Goals and Monetary Policy Strategy.[2] We have also maintained our assumption that SOMA purchases will continue at their current pace through 2021. Market expectations of the SOMA portfolio (both size and average maturity) currently appear to be somewhat higher than the staff's baseline, but we assume that they will come into alignment with the staff's baseline next quarter.

We continue to project that monetary policy actions taken in response to COVID-19 and the revision to the monetary policy strategy will provide substantial support to economic activity over the next few years. We estimate that the effects of changes in the federal funds rate, changes in balance sheet policies, and the introduction of corporate bond facilities since the January Tealbook (before the pandemic) on the paths of interest rates, equity prices, house prices, and the dollar will continue to boost GDP growth significantly, with the largest effect on growth in 2021.[3] We judge that the Treasury Department decision regarding the expiration of the section 13(3) credit facilities that used CARES Act funding has increased the vulnerability of the corporate sector's financing conditions, but this change is assumed to have no material effect on our baseline forecast.

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[2] According to this baseline policy rule, the federal funds rate stays at the ELB until the quarter after both the unemployment rate is below 4.1 percent *and* the four-quarter inflation rate is above 2.0 percent. Thereafter, the federal funds rate follows an inertial version of the Taylor (1999) rule, but with no response to the output gap when the gap is positive. As in the October Tealbook, we include an intercept adjustment in the rule to maintain a path for the federal funds rate that is less steep after departing from the ELB than it otherwise would be. This specification is one of many that might be considered consistent with the consensus statement. Some other simple policy rules are described in the Monetary Policy Strategies section.

[3] Because the estimates in this table cannot fully account for the effects monetary policy actions had on financial market functioning and economic uncertainty, they likely understate the total effect on real activity that is built into our projection.

Revisions since the January Tealbook to GDP Forecast due to the Effect of Monetary Policy on Financial Variables
(Percentage point contribution to Q4/Q4 growth)

	2020	2021	2022	2023	2020–23 total
Total	**1.5**	**2.1**	**1.0**	**.1**	**4.6**
Total effect due to:					
Expected path for short rates	.6	1.1	.6	.0	2.3
Balance sheet policy	.5	.9	.5	.1	2.0
Corporate bond facilities	.3	.1	- .1	- .1	.3

Note: Items may not sum to total because of rounding.

Financial Conditions

The risk appetite of financial market participants appears to have increased, on net, in recent weeks, as favorable news on effective COVID-19 vaccines and reduced political uncertainty following the U.S. election outweighed the increased spread of COVID-19. Since the October Tealbook, stock prices are notably higher, while the 10-year Treasury yield increased only slightly. Triple-B corporate bond yields and 30-year mortgage rates have declined moderately.[4] On net, the dollar depreciated by 2 percent.

Market-based financing conditions remain accommodative for corporations, municipalities, and real estate borrowers. Financing also remained generally available on attractive terms to consumers with strong credit histories. By contrast, both firms dependent on bank lending and households with relatively low credit scores continue to face tight credit availability. In particular, financing conditions for small businesses remained strained.

- Equity prices are projected to decline notably in 2021:Q1. Market participants seem to have currently priced in significant odds of further fiscal stimulus (and a bit higher than at the time of the October Tealbook), and under our baseline outlook, they will be disappointed. Thereafter, equity prices are expected to appreciate modestly through the end of 2023. Since the October Tealbook, our projection for stock prices has been revised up about 8 percent

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[4] Our October projection incorporated market prices up to Wednesday, October 21, and the discussion on market movements incorporates the changes since then. In contrast, since the FOMC meeting, market sentiment has improved more noticeably (the discussion in the Financial Market Developments section captures market movements since Wednesday, November 4).

in the near term to incorporate recent price movements but is essentially
unrevised at the end of 2023, as valuation pressures are assumed to limit the
pace of further appreciation.

- We project the 10-year Treasury rate to gradually increase from 0.9 percent in
  2020:Q4 to 1.8 percent in 2023:Q4.

  o Financial market quotes embody some likelihood of additional fiscal
    stimulus and thus imply a stronger outlook for Treasury issuance than in
    the staff's baseline. In our projection, markets are assumed to come into
    alignment with the staff's fiscal policy assumptions by the first quarter of
    2021.

  o Relative to the October Tealbook, the projected path for the 10-year
    Treasury yield is a bit higher over the next two years.

- We project that house prices will rise at a strong pace through next year,
  supported by historically low mortgage rates. Continuing the pattern of recent
  months, house price increases were much stronger than expected, on net, in
  September and October, and our projection for house prices is now noticeably
  higher than in the previous Tealbook.

RECENT DEVELOPMENTS AND NEAR-TERM OUTLOOK

Spending

With the growth of economic activity having slowed in recent months from its
sharp rebound in the late spring and early summer, we see the recovery in GDP
proceeding at a more modest pace this quarter relative to the steep gains seen in the third
quarter. Although the incoming spending data have continued to surprise us to the
upside, we expect the increased adoption of social-distancing measures—both mandatory
and voluntary—to weigh on spending through early next year. All told, we marked up
GDP growth to 5 percent in the fourth quarter, but we now expect GDP to move
sideways in the first quarter, resulting in a level that is nearly unchanged from the
October Tealbook. After the first quarter of next year, as the spread of COVID-19 is
assumed to recede and effective vaccines become widely available, we expect
social-distancing measures to ease and the recovery to pick up at a notably stronger pace
than in the previous Tealbook.

Domestic Econ Devel & Outlook

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

Measure	2020:Q3		2020:Q4		2021:Q1	
	Previous Tealbook	Current Tealbook	Previous Tealbook	Current Tealbook	Previous Tealbook	Current Tealbook
Real GDP	**31.9**	**33.0**	**3.9**	**5.0**	**1.4**	**-.3**
Private domestic final purchases	36.0	38.5	4.0	5.8	.3	-1.6
Personal consumption expenditures	39.5	40.6	2.6	3.9	-.9	-2.5
Residential investment	62.5	63.0	24.6	34.4	-2.7	-1.2
Nonres. private fixed investment	12.8	22.0	4.7	6.9	8.1	3.3
Government purchases	1.9	-4.9	-.6	-2.3	.6	.1
Contributions to change in real GDP						
Inventory investment[1]	5.2	5.8	.7	1.4	.7	.6
Net exports[1]	-4.0	-3.2	-.1	-.9	.3	.4

1. Percentage points.

Recent Nonfinancial Developments (1)

Real GDP and GDI

Source: U.S. Dept. of Commerce, Bureau of Economic Analysis.
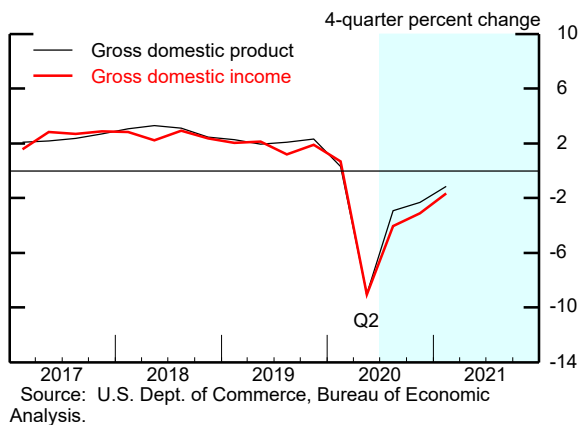
Manufacturing IP ex. Motor Vehicles and Parts

Source: Federal Reserve Board, G.17 Statistical Release, "Industrial Production and Capacity Utilization."
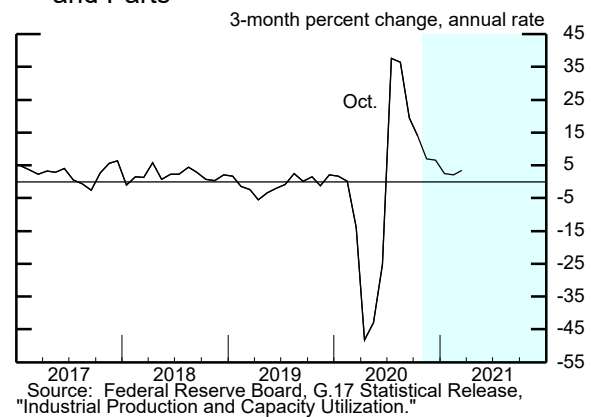
Sales and Production of Light Motor Vehicles

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

Real PCE Growth

Source: U.S. Dept. of Commerce, Bureau of Economic Analysis.
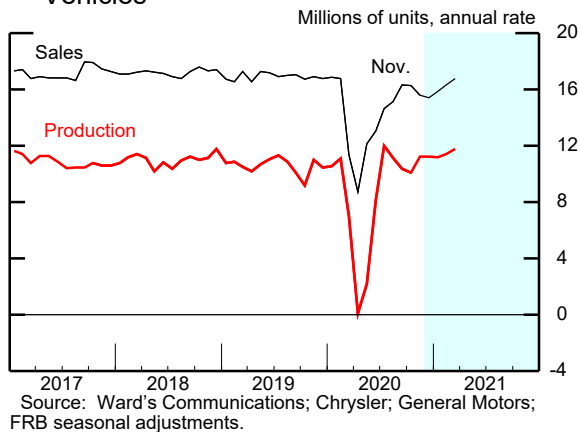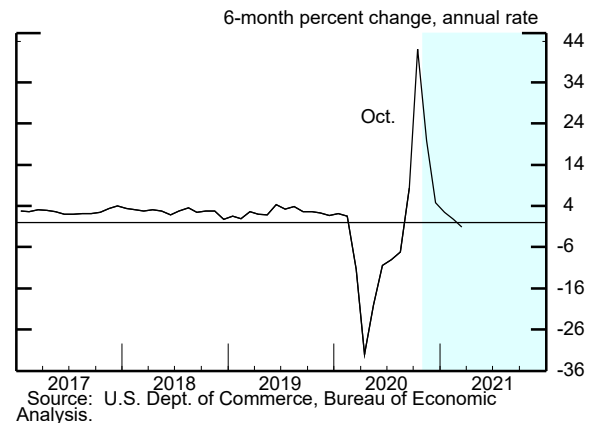
- **Consumer spending** has continued to rebound toward pre-pandemic levels. The PCE data through October came in substantially stronger than expected. However, we expect PCE to fall back in the latter part of this quarter and to remain subdued through early next year as a result of the renewed measures to contain the spread of COVID-19, the lack of additional fiscal support, and the exhaustion of excess savings among low-income households. Indeed, as seen on the "Cases and Consumer Activity" exhibit, there are signs of weakening in some of our high-frequency indicators. All told, we expect that PCE will increase 4 percent in the fourth quarter and contract 2½ percent in the first quarter, a much larger swing than in the October Tealbook.
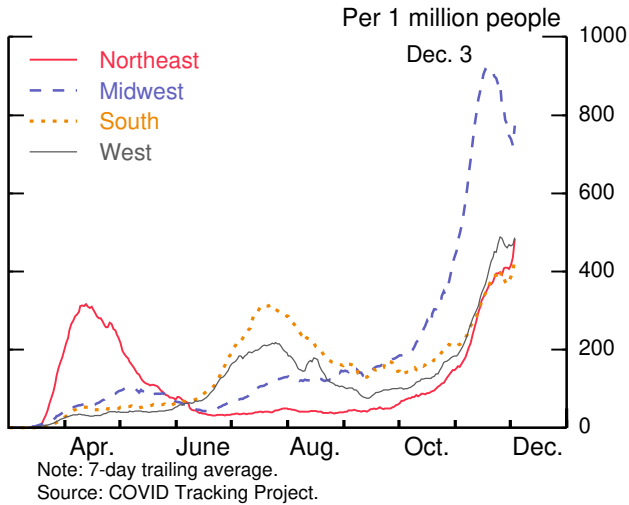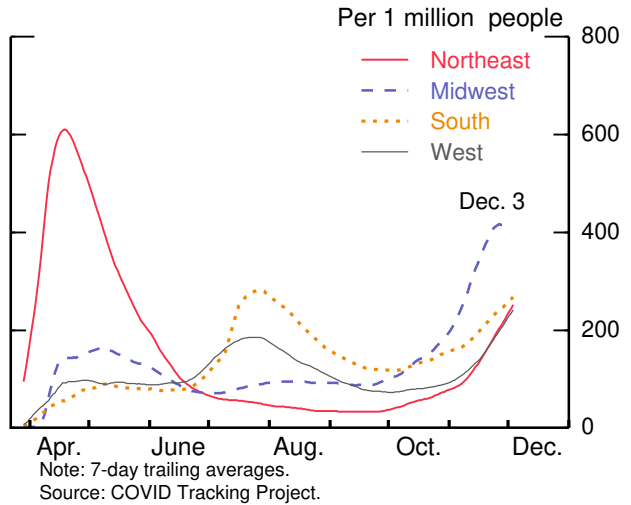
- We expect that **residential investment** will rise further above pre-pandemic levels in the fourth quarter, supported by low interest rates, the sector's ability to adjust business practices in response to social distancing, and pent-up demand from the spring shutdown. Since the October Tealbook, we revised up residential investment growth in the fourth quarter to an annual rate of 34 percent, reflecting upside surprises in existing and new home sales. However, we still forecast residential investment to level off in the first quarter, as both single-family permits and new home sales were flat and pending home sales declined again in October, suggesting that pent-up demand has largely run its course.

- **E&I investment** rebounded even more quickly in the third quarter than expected in the October Tealbook, and the October readings on orders, shipments, and imports of nondefense capital goods also surprised us to the upside. In addition, indicators of business sentiment have remained positive, and we expect the new social-distancing measures to leave only a small imprint on business equipment investment. Thus, we project that real E&I spending will increase a further 13 percent in the fourth quarter, more than fully recovering from its first-half decline.

  o The historically brisk E&I recovery likely reflects the unwinding of pandemic-related disruptions, such as factory shutdowns and some supply chain issues, and a boost to spending on medical and computer equipment, which was 15 percent above pre-pandemic levels in the third quarter because of the health crisis and the move to widespread teleworking.

Cases and Consumer Activity

Domestic Econ Devel & Outlook

New U.S. Cases of COVID-19

Per 1 million people

Dec. 3

- Northeast
- Midwest
- South
- West

Note: 7-day trailing average.
Source: COVID Tracking Project.

Current Hospitalizations for COVID-19

Per 1 million people

- Northeast
- Midwest
- South
- West

Dec. 3

Note: 7-day trailing averages.
Source: COVID Tracking Project.

Daily Credit/Debit Spending

Year-over-year percent change

Dec. 2

- Retail sales group
- Clothing stores
- Food services

Note: 7-day moving average. Retail sales group excludes non-store merchants.
Source: Fiserv, Inc.

U.S. Light Vehicle Sales

Millions of units, annual rate

Nov.

- Monthly data, Ward's
- December forecast
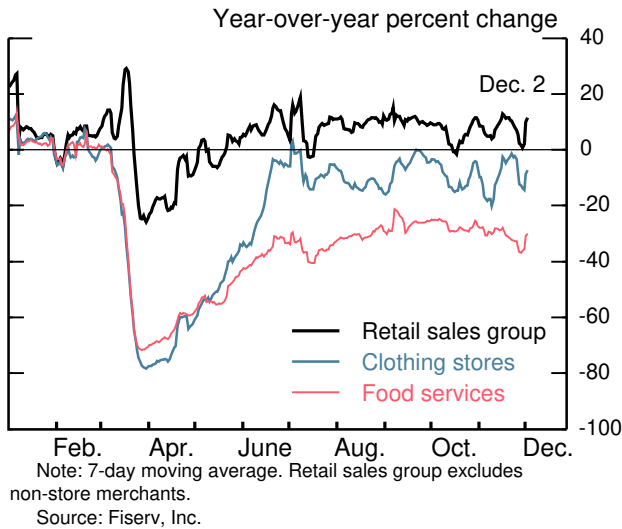
Source: Ward's Communications and J.D. Power, adjusted using FRB seasonals.
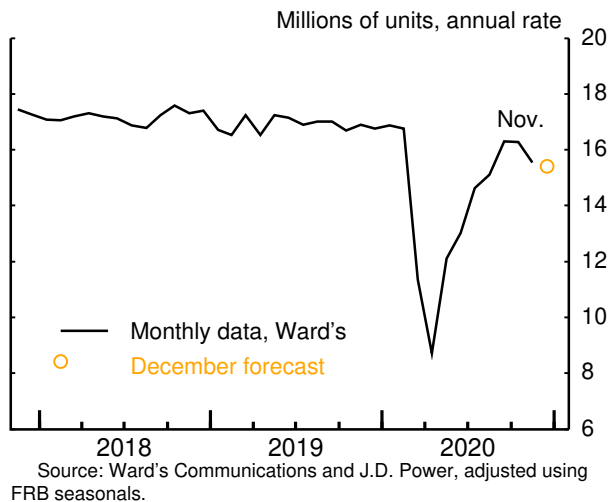
Spending on Non-food Retail Goods

Year-over-year percent change

First stimulus tranche

Nov. 28

- Total
- Brick and mortar

Source: NPD Group.
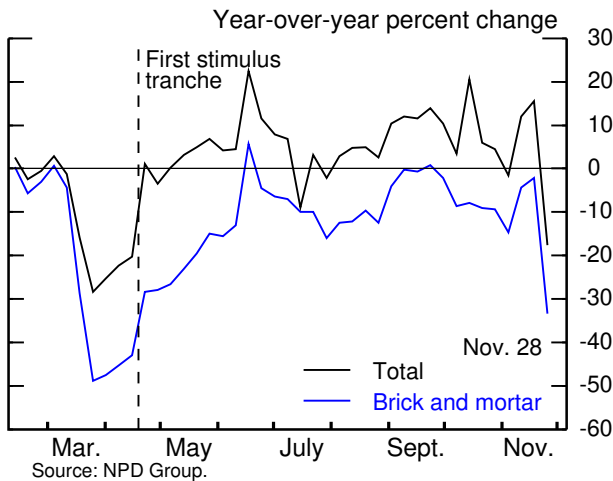
Hotel, Restaurants, and Air Travel

Year-over-year percent change

- Hotel occupancy rate
- Restaurant reservations
- Airline passengers

Nov. 28

Dec. 2

Dec. 3
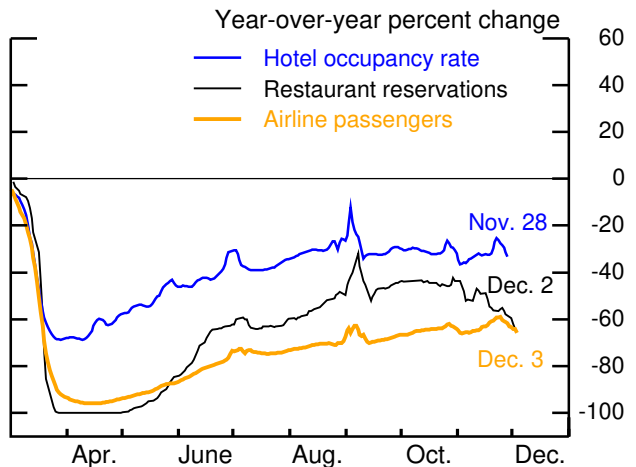
Source: OpenTable.com accessed through Haver; STR; Transportation Security Administration.

- By contrast, investment in **nonresidential structures** continued to decline in the third quarter, which we see as reflecting firms' hesitation to commit to projects with long build times amid uncertain demand. In addition, low oil prices have been substantially restraining drilling investment. We expect that structures investment will continue to recede well into next year, reflecting the depressed rate of new project starts this year.

- After recovering surprisingly rapidly to near pre-COVID levels, goods **imports** in September and October have been increasing at a pace more consistent with U.S. growth. U.S. services trade remains at a low level, held back by minimal international travel.

- Although goods **exports** recovered substantially in the third quarter, we expect their momentum to stall this quarter, in line with the sharp slowing of foreign growth. We project export growth to pick back up next year, boosted by the recovery in foreign activity and, to a much lesser extent, the lower dollar. Supply chain disruptions, which weighed on exports earlier in the year, are expected to be less of a factor going forward, as discussed in the box "Export Perspectives: Supply Chain Disruptions."

The Labor Market

The labor market recovery slowed further in October and November. The two labor market reports that we received from the BLS since the October Tealbook showed a somewhat faster decline in the unemployment rate, but a much sharper slowdown in the pace of job gains and a lower labor force participation rate in November than we had expected. We think the disappointing payrolls data last month were affected by increased social distancing, and we expect that the intensification of efforts to arrest the spread of COVID-19 will continue to slow the pace of the recovery in the labor market in the next few months.

- The BLS estimates that **private employers** added 344,000 jobs in November, considerably below the 877,000 jobs added in October. The staff's ADP-FRB measure of private payrolls also slowed considerably, but from a more rapid pace of about 1.5 million in October to about 600,000 in November. Given our new social-distancing assumptions, we expect private employment gains to slow further in December and January, after which payroll gains are

Industrial, Business, and Housing Activity

Industrial Production Index: Manufacturing

Monthly   2012 = 100

— Monthly data
○ November forecast

Source: Federal Reserve.
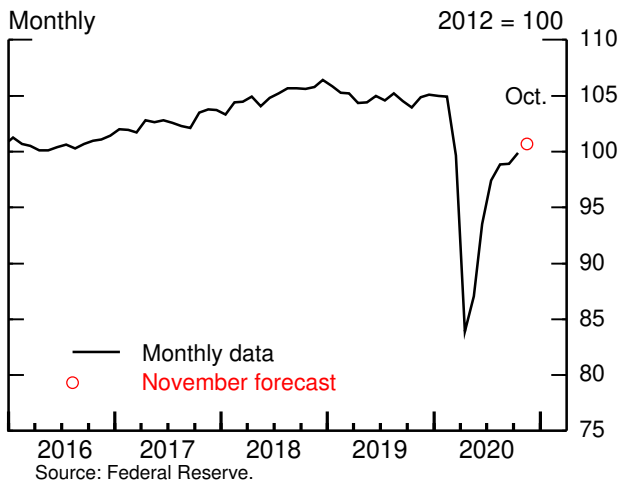
Manufacturing New Orders Indexes

Diffusion index

— Regional average
— National average
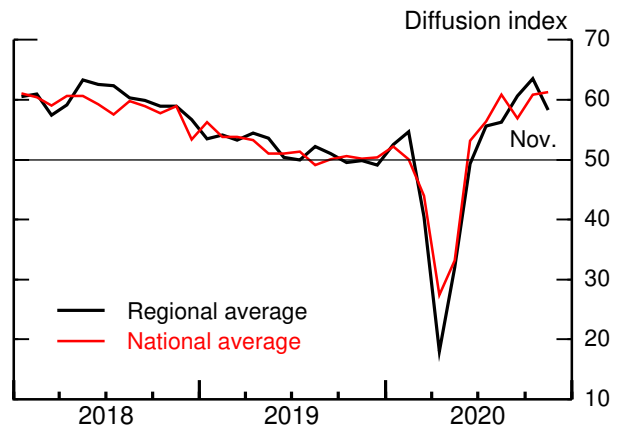
Note: The national average is composed of the ISM and Markit;
the regional average contains the orders indexes from Chicago,
Dallas, Kansas City, New York, Philadelphia, and Richmond.
Source: Federal Reserve; IHS Markit; ISM.

Oil Price and Drilling Rigs

Count   Dollars per barrel

— WTI (right)
— Oil rigs (left)

Source: Baker-Hughes (drilling rigs).
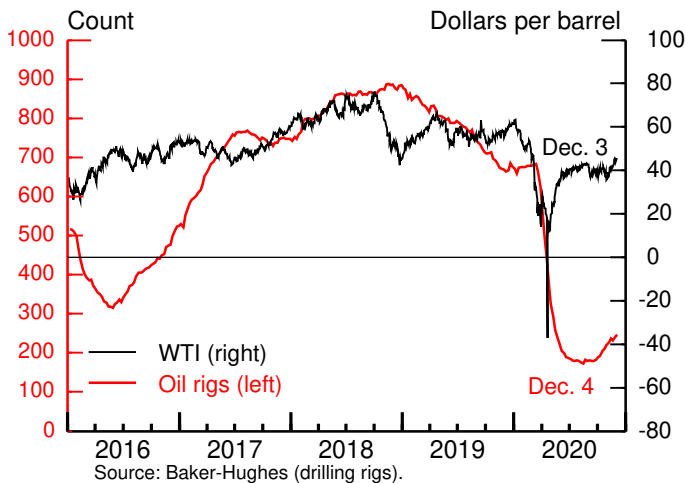
Percent of Restaurants Permanently Closed

Percent   Percent

— Cumulative for 2020 (right)
▇ Monthly rate, by month of
identified closing (left)
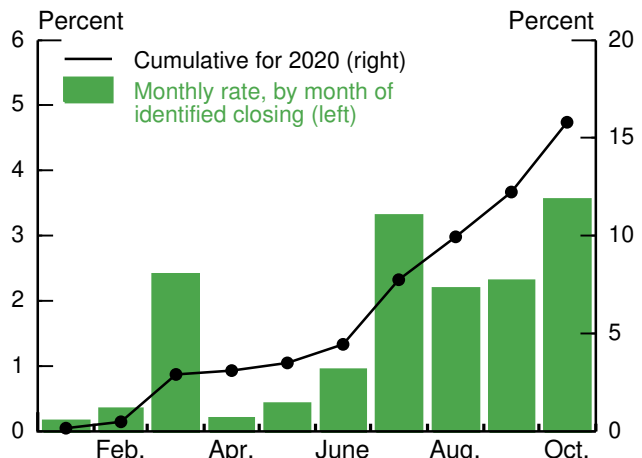
Note: Permanent closure defined as a permanent drop of 65%+ in
year-over-year visits. Last 3 months are preliminary and may revise.
Source: Staff calculations based on SafeGraph microdata.

Weekly Steel and Motor Vehicle Indicators

Thousand tons   Index, Feb. 1, 2020 = 100

— U.S. steel production (left)
— Railcar loads: motor vehicles (right)
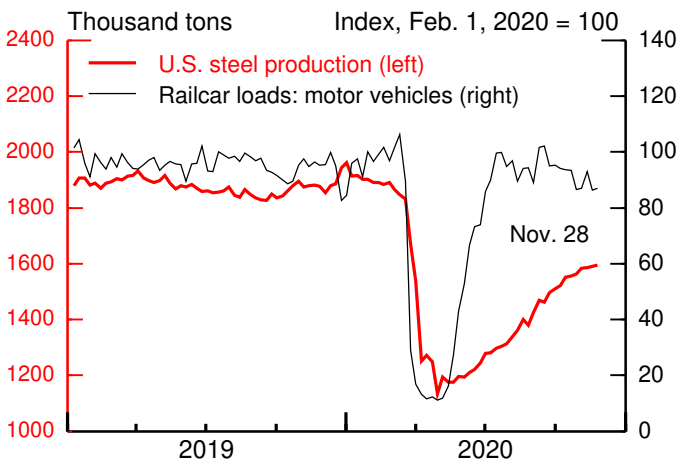
Note: Data are seasonally adjusted.
Source: American Iron and Steel Institute; staff estimates of data
from the Association of American Railroads (motor vehicles).

Pending and Existing Home Sales

52-week percent change

— Pending
— Existing
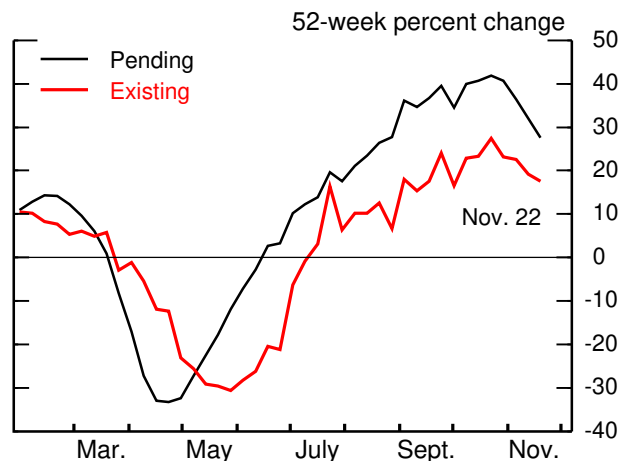
Note: Data are based on 28-day sums.
Source: Data provided by Redfin, a national real estate brokerage.

expected to pick up. That said, even beyond January, we expect private employment gains to fall short of their third-quarter pace, reflecting a diminishing boost from recall hiring of workers on temporary layoff.

| | **2020** | | | | **2021** | |
	Sept.	**Oct.**	**Nov.**	**Dec.**	**Jan.**	**Feb.**
Total payroll employment[1]	711	610	245	266	236	616
October Tealbook	*661*	*743*	*708*	*791*	*636*	*566*
Private payroll employment[1]	930	877	344	240	210	590
October Tealbook	*877*	*825*	*790*	*750*	*610*	*540*
Unemployment rate (percent)	7.9	6.9	6.7	6.6	6.6	6.6
October Tealbook	*7.9*	*7.6*	*7.3*	*6.9*	*6.7*	*6.6*
LFPR (percent)	61.4	61.7	61.5	61.7	61.7	61.7
October Tealbook	*61.4*	*61.5*	*61.7*	*61.8*	*61.8*	*61.9*
EPOP (percent)	56.6	57.4	57.3	57.6	57.6	57.6
October Tealbook	*56.6*	*56.9*	*57.2*	*57.6*	*57.7*	*57.8*

Note: LFPR is labor force participation rate; EPOP is employment-to-population ratio.

1. Monthly change, thousands.

- **Government payrolls** fell, on average, 183,000 per month in October and November, held down by layoffs of the remaining temporary federal census workers and a decline in state and local education employment—likely reflecting delayed effects from the shift to virtual learning. Looking ahead, we expect government employment to rise moderately through the first quarter of next year as these special factors holding down government employment gains in recent months fade.

- The **unemployment rate** has continued to decline steeply, falling from 7.9 percent in September to 6.7 percent in November—a considerably larger drop than we had expected.[5] The decline in the unemployment rate mainly reflects higher recall hiring and lower separations, with temporary layoffs

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[5] Due to measurement issues, the true unemployment rate was still likely higher than reported in November. However, according to the BLS, the extent of the misclassification has abated significantly, from an estimated 5 percentage points in April to at most 0.4 percentage point in November.

Labor Market

Cumulative Job Loss since February 15, 2020

Weekly, s.a.   Millions of jobs

— ADP-FRB paid employment   – – BLS CES

Nov.

Nov. 21

Note: Paid employment denotes workers who were issued a
paycheck in a given pay period.
   Source: Bureau of Labor Statistics; ADP; staff estimates.
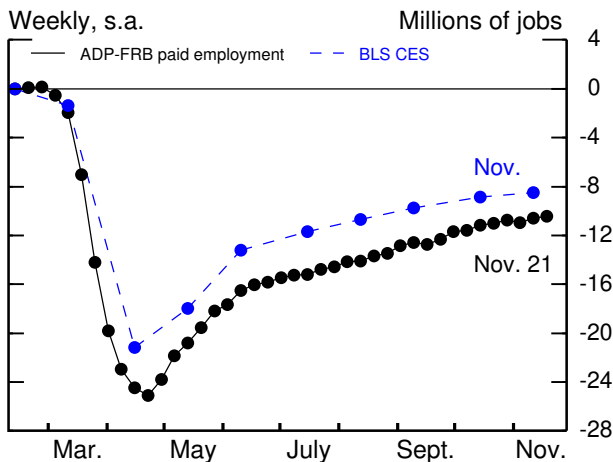
U.S. Employment at Small Businesses

Percent change since February 2020

Nov. 28

Source: Homebase.
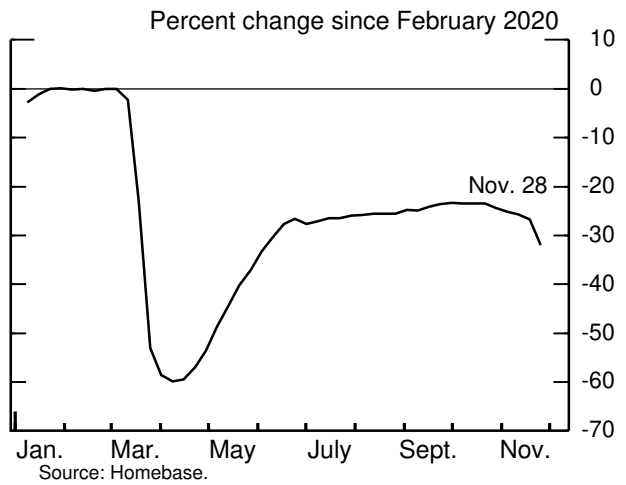
Continued Unemployment Claims

Millions

— Regular state UI
— Regular state UI, PEUC
— Regular state UI, PEUC, and EB

Nov. 14

Nov. 21

   Note: Regular claims s.a., others n.s.a. All smoothed to account for
biweekly filing.
   Source: Department of Labor ETA; staff calculations.
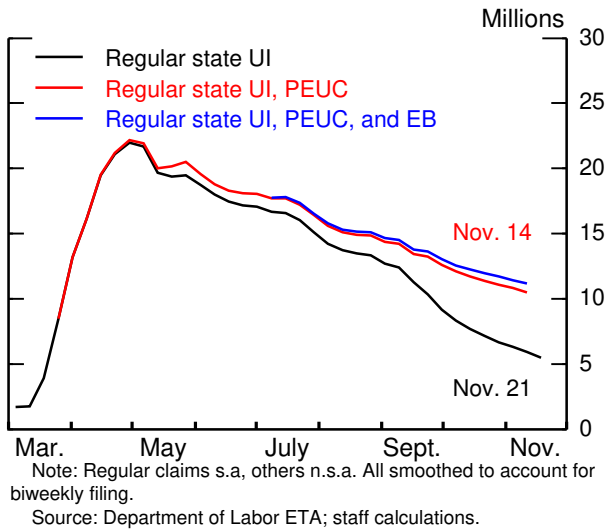
Unemployment Insurance Outlays

Billions of dollars

Dec. 3

Cumulative outlays April 1 to
December 3: $544.62 billion

   Note: Data are a moving average of the past 5 business days.
   Source: Daily Treasury Statement data.

Job Postings

Year-over-year percent change

Nov. 14

Source: Indeed.
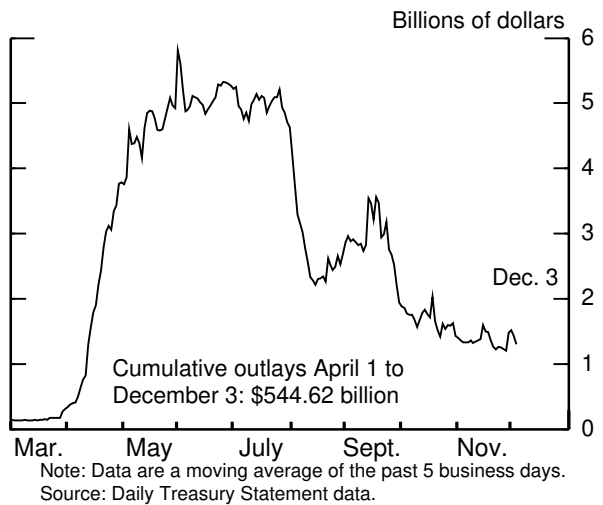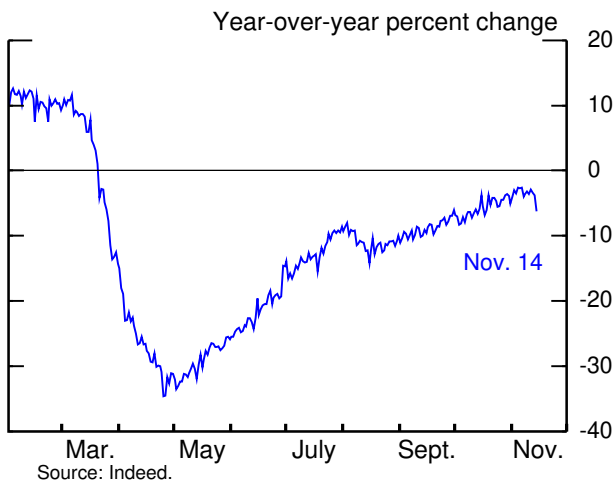
Median 12-Month Wage Growth

Percent

— Atlanta Fed Wage Growth Tracker
— ADP, hourly wage*

Oct.

* Includes tips and commissions.
   Source: Federal Reserve Bank of Atlanta; ADP; staff calculations.
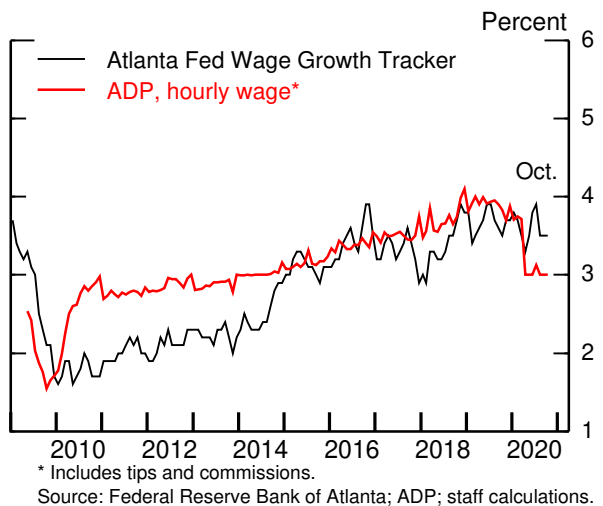
declining rapidly and permanent layoffs moving sideways after rising considerably through the summer. Consistent with the projection for a transitory slowing in payroll gains, we expect the unemployment rate to remain little changed through February and then to resume its downward movement, reaching 6.4 percent by March 2021.

- After dropping 0.3 percentage point in September, the **labor force participation rate** (LFPR) was little changed, on net, in October and November. We expect the shift to virtual learning at schools to continue to weigh on the LFPR in coming months. The **employment-to-population ratio** increased from 56.6 percent in September to 57.3 percent in November, 0.1 percentage point higher than we had expected. However, it remains more than 5 percentage points below its pre-pandemic level.

- Despite the decline in total unemployment, **long-term unemployment** continued to rise sharply in October and November, as workers laid off in the spring have now been jobless for 27 weeks or more. Many such workers exhausted regular state unemployment benefits in mid-September and are now drawing on emergency and extended benefit programs; these claimants could lose access to unemployment insurance benefits early next year as these supplemental programs phase out.[6] The box "Unemployment Insurance and Labor Supply in the COVID-19 Recession" discusses the effects of pandemic-related enhanced unemployment insurance benefits on labor supply.

Aggregate Supply

We now expect the pandemic will exert somewhat less persistent (though still severe) supply-side damage than we previously estimated. In particular, we project the level of potential output at the end of 2023 will be 0.5 percent higher relative to the September Tealbook (the last time we revised our aggregate supply assumptions), but still 0.9 percent below its projected level before the pandemic.

---

[6] In particular, the Pandemic Emergency Unemployment Compensation program, which provides an additional 13 weeks of benefits to claimants who have exhausted regular benefits, expires at the end of December. Extended benefit (EB) programs, which provide 13 to 20 weeks of additional benefits, have already triggered off in several states as their insured unemployment rates fell below statutory thresholds. Additional states will likely trigger off EB if insured unemployment continues to decline in the coming months.

- Recent indicators suggest the effects of the pandemic have boosted business exits and reduced new business start-ups by less than we had expected, implying less destruction of intangible capital and a smaller reduction in structural productivity than we previously thought. We also expect a slightly lower natural rate of unemployment and higher trend LFPR from late 2021 to early 2023, as job-finding rates of permanent job losers have held up better than we had been expecting and news on vaccine developments has been positive.

THE MEDIUM-TERM OUTLOOK FOR REAL ACTIVITY

We project that output will continue to recover over the medium term, supported by highly accommodative monetary policy and a further easing of social distancing as vaccines become widely available; these factors more than offset significant headwinds from the unwinding of fiscal stimulus and recessionary dynamics.[7] Compared with the October Tealbook, we now expect a somewhat faster recovery in output that leaves the level of GDP at the end of 2023 about ¾ percent higher. Taking into account the revisions we made to potential output described in the previous section, we project only a slightly wider output gap at the end of the medium term than in the previous Tealbook, and we expect the unemployment rate will fall to 3.0 percent, 0.1 percentage point below that in the October Tealbook.

THE OUTLOOK FOR INFLATION

Monthly changes in PCE prices continued to slow in October from the robust pace seen in the three months through August. After boosting inflation through the summer, prices for durable goods stopped increasing in September, and price increases for services have remained subdued. The readings on inflation through October were somewhat lower than we had anticipated, and we now project core PCE price inflation, on a 12-month basis, to be 1.4 percent this year, 0.1 percentage point lower than in the October Tealbook. As the pandemic-related low readings from this past spring drop out of the 12-month calculation, we forecast core inflation to move above 2 percent early in the second quarter before dropping back again. We project total PCE inflation to be just

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[7] We use the term "recessionary dynamics" to denote forces that are particularly active during recessions, including heightened pessimism, risk aversion, and reduced access to credit; they are distinct from standard macro dynamics—the usual response of household and business spending to changes in income, profits, and wealth.

1.1 percent this year on a 12-month basis, a bit below core inflation, as energy prices are expected to remain below year-ago levels. Going forward, we expect total inflation to come into line with core inflation by March of next year, as some of the earlier collapse in energy prices falls out of the 12-month window.
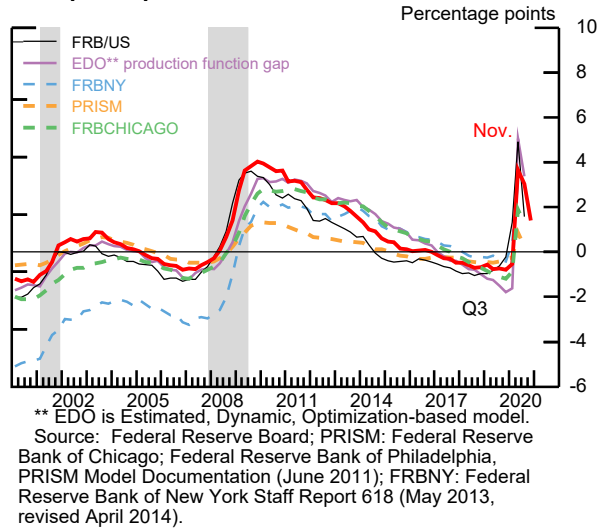
With slack diminishing over the medium term, we expect core inflation to move up to 1.8 percent in 2021 and to reach 1.9 percent by 2023. Total PCE prices rise roughly in line with core prices over the medium term, as we project only modest food and energy price inflation next year and through 2023. The box "Conditions for Achieving and Averaging 2 Percent Inflation" clarifies how inflation reaches 2 percent beyond 2023 in the staff's long-term outlook.

- **Food prices** increased 3.9 percent over the 12 months ending in October, a pace still well above that before the pandemic. We think that food inflation this year has been lifted by strong demand for food at grocery stores and by higher agricultural prices stemming from strong export demand, especially corn and soybean prices benefiting from increased Chinese purchases.

- We expect **energy prices** to move moderately higher for the next few months before stabilizing by March of next year at levels still somewhat below pre-pandemic levels.

  o The spot price of Brent crude oil has risen $6 per barrel since the time of the October Tealbook and is currently $48 per barrel. The recent reduction in oil demand from lockdowns abroad appears to have been more than offset by earlier-than-expected news of effective vaccines and prospects for stronger activity for mid-2021. Because farther-dated futures prices are unchanged, the futures curve is now flat after being upward sloping since March 2020. As a result of this flattened curve, PCE energy price inflation is higher in the near term but more subdued in the medium term.

- The effective (that is, tariff-inclusive) **price for imported core goods** has rebounded strongly thus far in the second half of the year, in part reflecting a rebound in commodity prices and the decline in the dollar. The effects of these higher commodity prices and lower dollar will also boost import prices in the first half of 2021. Consequently, we now expect an increase of
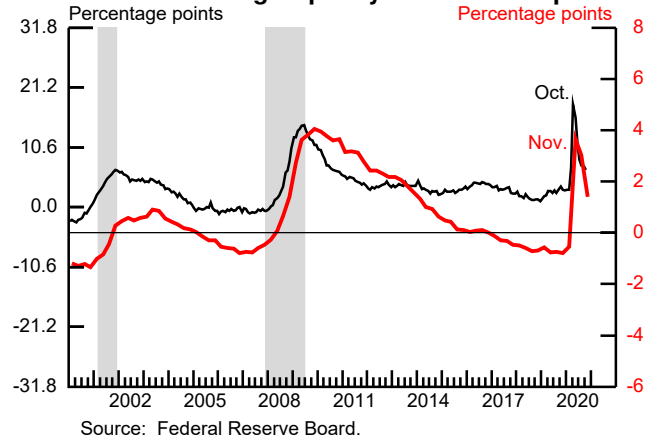
Domestic Econ Devel & Outlook

Alternative Measures of Slack

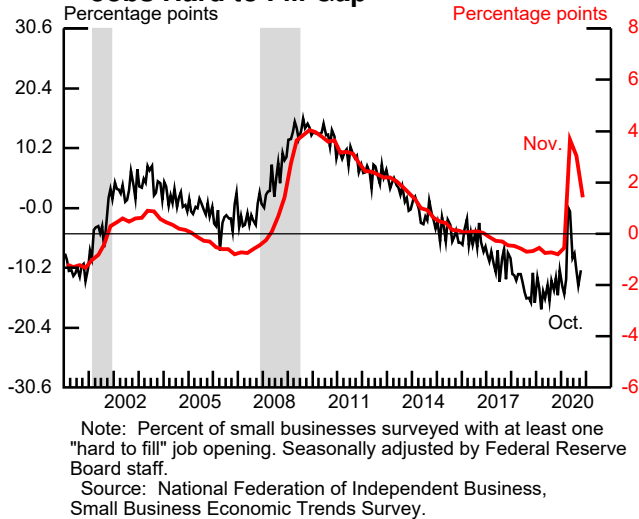The red line in each panel is the staff's measure of the unemployment rate gap (right axis).

Output Gaps

Percentage points

- FRB/US
- EDO** production function gap
- FRBNY
- PRISM
- FRBCHICAGO

Nov.

Q3

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

Manufacturing Capacity Utilization Gap*

Percentage points   Percentage points

Oct.

Nov.

 Source: Federal Reserve Board.

Jobs Hard to Fill Gap*

Percentage points   Percentage points

Nov.

Oct.

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

Private Job Openings Gap*

Percentage points   Percentage points

Nov.

Sept.

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

Job Availability Gap*

Percentage points   Percentage points

Nov.

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

Involuntary Part-Time Employment Gap

Percentage points   Percentage points

Nov.

 Note: Percent of employment.
 Source: U.S. Department of Labor, Bureau of Labor Statistics,
Current Population Survey.
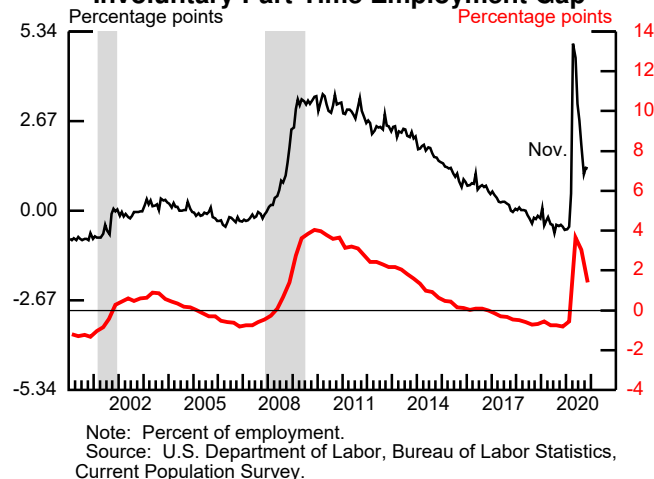
 * Plots the negative of the gap to have the same sign as the unemployment rate gap.
 Note: The shaded bars indicate a period of business recession as defined by the National Bureau of Economic Research. Output gaps are
multiplied by negative 0.52 to facilitate comparison with the unemployment rate gap. Manufacturing capacity utilization gap is constructed by
subtracting its average rate from 1972 to 2018. Other gaps were constructed by subtracting each series' average in 2004:Q4 and 2005:Q1.

1.8 percent for 2020 as a whole, and 2.4 percent in 2021. With import prices rising slightly faster than core PCE prices, we anticipate they will exert a small upward pressure on PCE inflation.

- Despite the tumultuous economic situation, measures of **longer-term inflation expectations** have remained fairly stable, on balance, this year. The staff's common inflation expectations measure, which synthesizes the information from many different measures of inflation expectations, has held steady this year, supporting our assessment that underlying inflation has remained stable.

Labor Compensation

The available indicators continue to point to downward pressure on wages from the weak labor market. Unlike some of our standard wage measures, both the ECI and the staff's ADP wage measures are relatively free from distortions caused by recent changes in the composition of the workforce.[8]

- The ECI increased 2.0 percent in the three months ending in September, the second quarterly reading that was noticeably below pre-pandemic levels.

- In addition, the staff's measure of the median of 12-month wage changes based on worker-level microdata from ADP remained near 3 percent in October, somewhat lower than the increases observed before the pandemic.

We project that the ECI will increase 2.1 percent in 2020, down from 2.7 percent last year. With slack diminishing over the next two years, we expect the pace of increases in the ECI to pick up gradually to 2.7 percent in 2023.

COMPARING THE STAFF PROJECTION WITH OUTSIDE FORECASTS

The staff forecast for GDP growth this year and next is in the middle of the range of outside forecasts (these individual projections can be seen in the table following the Blue Chip exhibit). For total and core PCE inflation, the staff's forecast is close to the median of outside projections through 2023.

---

[8] Recent movements in the BLS's measures of average hourly earnings and compensation per hour have been dominated by changes in the composition of the workforce. The enormous employment losses were largest among lower-wage workers, leading to large increases in *average* earnings and compensation. If anything, the latest data we have received on these two measures surprised us to the upside, suggesting that composition effects have been more persistent than we expected.

Domestic Econ Devel & Outlook

Tealbook Forecast Compared with Blue Chip
(Blue Chip survey released November 10, 2020)

Real GDP
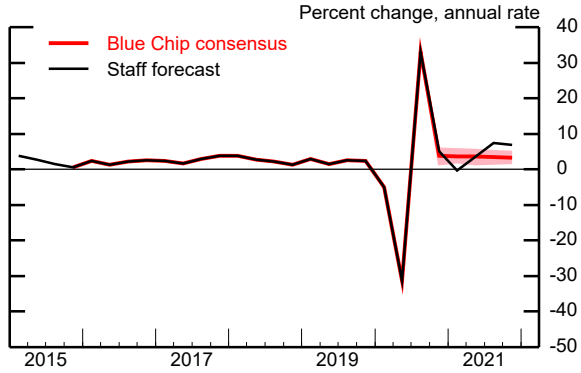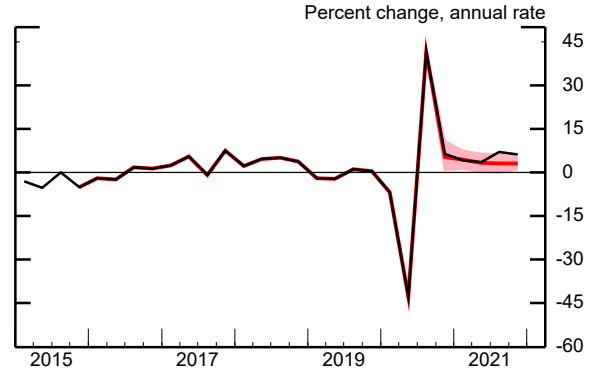
Percent change, annual rate

— Blue Chip consensus
— Staff forecast

Industrial Production

Percent change, annual rate

Unemployment Rate

Percent

Core PCE Prices

Percent change, annual rate

Treasury Bill Rate

Percent

10-Year Treasury Yield

Percent
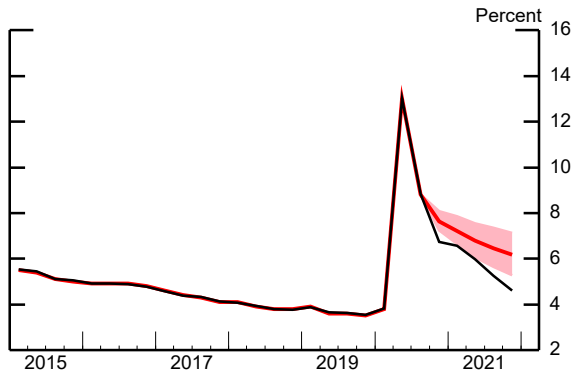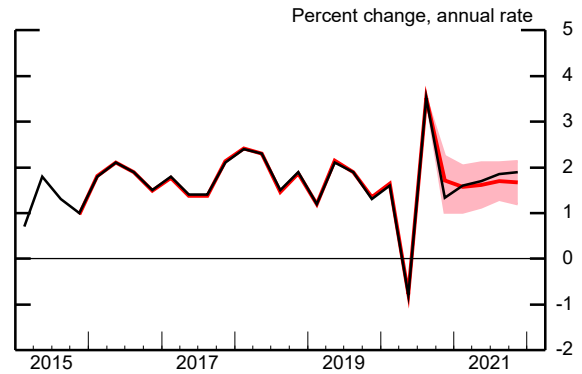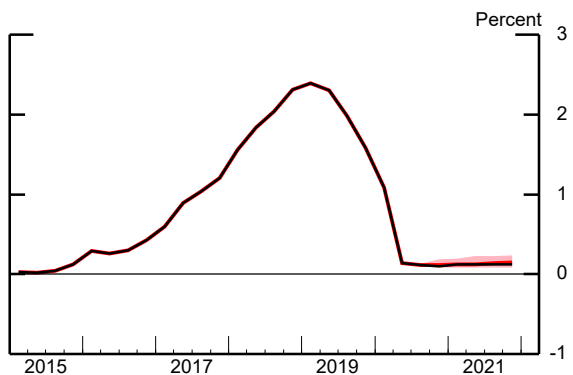
Note: The yield is for on-the-run Treasury securities. Over the forecast period, the staff's projected yield is assumed to be 3 basis points below the off-the-run yield.

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

Comparison of Staff and Outside Forecasts for Real GDP Growth

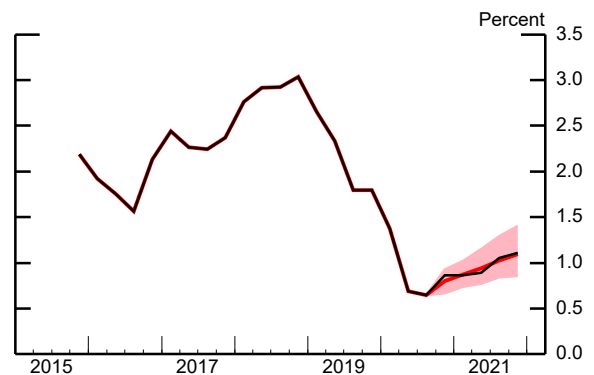| Source	Date of forecast	2020			2021	2020	2021
		Q2	Q3	Q4	Q1		
December Tealbook	**Dec. 4**	**-31.4**	**33.0**	**5.0**	**-.3**	**-2.3**	**4.3**
Median of outside forecasts		–	*33.1*	*4.2*	*2.3*	*-2.5*	*3.5*
IHS Markit[1]	Dec. 4	–	33.0	6.3	2.7	-2.0 *	1.9
Pantheon Macroeconomics	Dec. 4	–	33.1	5.0	2.0	-2.3 *	n.a.
J.P. Morgan[2]	Dec. 1	–	33.0	2.8	-1.0	-2.8 *	3.4
MacroPolicy Perspectives	Dec. 1	–	33.1	6.0	.0	-2.1	3.0
Goldman Sachs	Nov. 29	–	33.1	3.2	1.0	-2.7	5.5
Barclays	Nov. 27	–	33.1	6.0	.0	-2.1 *	3.8 *
UBS	Nov. 25	–	33.1	2.9	2.6	-2.8	3.9
Deutsche Bank	Nov. 23	–	33.1	2.3	2.6	-2.9	4.3
BMO Capital Markets	Nov. 20	–	33.1	4.0	1.5	-2.5 *	3.5 *
Citi	Nov. 20	–	33.1	5.7	5.8	-2.1 *	3.9 *
Morgan Stanley	Nov. 20	–	33.1	4.3	4.5	-2.5	6.0
Nomura	Nov. 20	–	33.1	3.5	.5	-2.7 *	2.0 *
Wells Fargo	Nov. 20	–	33.1	4.5	4.0	-2.4 *	3.2 *
Blue Chip	Nov. 10	–	33.1	3.8	3.6	-2.6	3.4

Note: Quarterly rates are annualized percent change from previous quarter. Annual rates are Q4/Q4 growth rates from previous year to current year.
1. Estimates from IHS Markit are as of December 4 (for 2020:Q3, 2020:Q4, and 2020 Q4/Q4) and November 18 (for all other periods).
2. Estimates from J.P. Morgan are as of December 1 (for 2020:Q4), November 24 (for 2021 Q4/Q4), and November 27 (for all other periods).
* Data represent staff calculation based on forecaster's quarterly forecast.
n.a. Not available.
– Staff line reflects published data from the third GDP release of 2020:Q2.
Source: For Blue Chip, monthly release; for IHS Markit, tracking update emails; for MacroPolicy Perspectives, company website; for all others, internal Board repository of bank and broker newsletters.

Outside Forecasts for Price Inflation

	Date of forecast	2020	2021	2022	2023
PCE Price Index					
December Tealbook	**Dec. 4**	**1.2**	**1.8**	**1.8**	**1.9**
Median of outside forecasts		*1.2*	*1.7*	*1.7*	*1.9*
MacroPolicy Perspectives	Dec. 1	1.2	1.0	n.a.	n.a.
Barclays†	Nov. 27	1.2	1.5	1.7	n.a.
UBS	Nov. 25	1.1	1.3	1.7	1.8
Nomura	Nov. 20	1.2	1.7	1.4	n.a.
IHS Markit	Nov. 18	1.2	2.1	2.1	1.9
Blue Chip	Nov. 10	1.3	1.7	n.a.	n.a.
Core PCE Price Index					
December Tealbook	**Dec. 4**	**1.4**	**1.8**	**1.8**	**1.9**
Median of outside forecasts		*1.4*	*1.6*	*1.7*	*1.9*
MacroPolicy Perspectives	Dec. 1	1.4	.9	n.a.	n.a.
Goldman Sachs†	Nov. 29	1.4	1.6	1.7	1.9
Barclays†	Nov. 27	1.4	1.5	1.7	n.a.
UBS	Nov. 25	1.4	1.4	1.7	1.9
J.P. Morgan	Nov. 24	1.4	1.7	n.a.	n.a.
Nomura	Nov. 20	1.4	1.6	1.4	n.a.
Citi†	Nov. 20	1.5	1.9	n.a.	n.a.
Morgan Stanley	Nov. 18	1.6	1.9	2.2	n.a.
IHS Markit	Nov. 18	1.6	2.0	2.0	1.9
Blue Chip	Nov. 10	1.5	1.6	n.a.	n.a.

Note: Rates are Q4/Q4 growth rates from previous year to current year unless otherwise noted.
n.a. Not available.
† Year-over-year percent change.
Source: For Blue Chip, monthly release; for IHS Markit, tracking update emails; for MacroPolicy Perspectives, company website; for all others, internal Board repository of bank and broker newsletters.

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Level of GDP Relative to 2019:Q4

Scaled level

- —— December Tealbook (Dec. 4)
- —— IHS Markit (Dec. 4)
- ···· Pantheon Macroeconomics (Dec. 4)
- —— J.P. Morgan (Dec. 1)
- ···· MacroPolicy Perspectives (Dec. 1)
- —— Goldman Sachs (Nov. 29)
- ···· Barclays (Nov. 27)
- —— UBS (Nov. 25)
- ···· Deutsche Bank (Nov. 23)
- —— BMO Capital Markets (Nov. 20)
- ···· Citi (Nov. 20)
- —— Morgan Stanley (Nov. 20)
- ···· Nomura (Nov. 20)
- —— Wells Fargo (Nov. 20)
- ···· Blue Chip (Nov. 10)
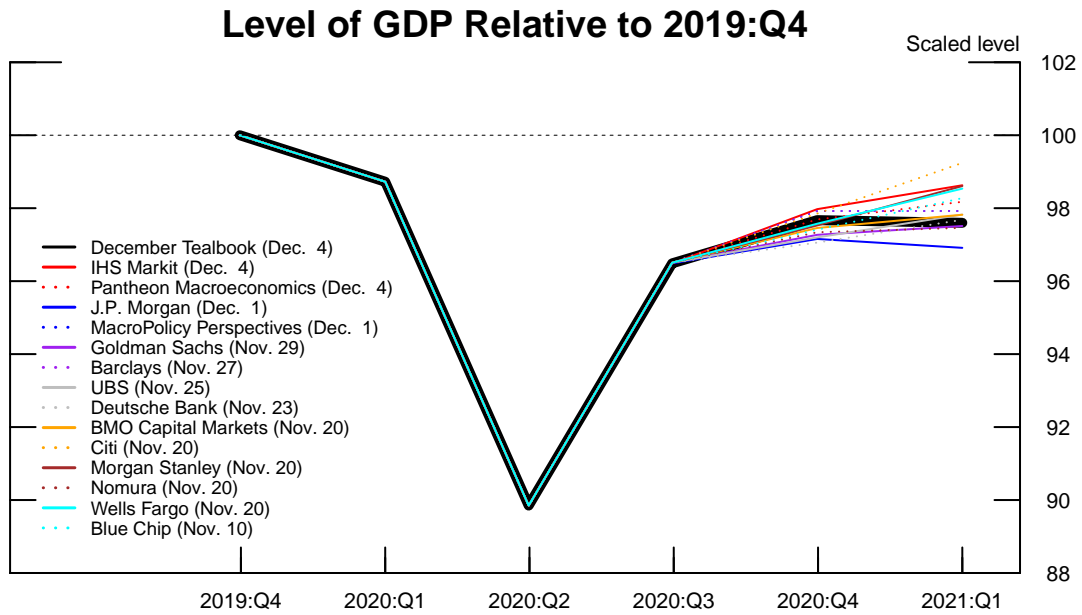
Source: For Blue Chip, monthly release; for IHS Markit, tracking update emails; for MacroPolicy Perspectives, company website; for all others, internal Board repository of bank and broker newsletters.

THE LONG-TERM OUTLOOK

- The federal funds rate remains at the ELB through 2025:Q1, the quarter in which the four-quarter change in PCE prices reaches the FOMC's 2 percent objective. The federal funds rate rises to 1.4 percent at the end of 2027 and moves up toward its long-run value of 2.5 percent thereafter.

- With monetary policy still accommodative beyond 2023, the unemployment rate falls to 2.9 percent in 2024 before rising slowly to its long-run value of 4.3 percent. GDP growth slows from 2.3 percent in 2023 to 1.5 percent in 2027, and it stays near that pace for several years before moving up to its long-run rate of 1.7 percent.

- The real long-run equilibrium federal funds rate is 0.5 percent, and the nominal yield on 10-year Treasury securities is 3.1 percent in the longer run; both values are unrevised from the previous Tealbook.

- Core PCE price inflation gradually increases from 1.9 percent at the end of the medium term to 2.1 percent in 2025. Inflation stays at about that level for a while before gradually coming back to its long-run value of 2 percent.

The Long–Term Outlook

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

Measure	2020	2021	2022	2023	2024	2025	2026	2027	Longer run
Real GDP	-2.3	4.3	3.5	2.3	1.9	1.7	1.5	1.5	1.7
Previous Tealbook	*-2.8*	*3.5*	*3.7*	*2.6*	*2.2*	*1.8*	*1.5*	*1.5*	*1.7*
Civilian unemployment rate[1]	6.7	4.6	3.4	3.0	2.9	2.9	3.0	3.1	4.3
Previous Tealbook	*7.2*	*5.2*	*3.7*	*3.1*	*2.9*	*2.8*	*2.9*	*3.0*	*4.3*
PCE prices, total	1.2	1.8	1.8	1.9	2.0	2.1	2.1	2.1	2.0
Previous Tealbook	*1.3*	*1.6*	*1.7*	*1.9*	*2.0*	*2.1*	*2.1*	*2.2*	*2.0*
Core PCE prices	1.4	1.8	1.8	1.9	2.0	2.1	2.1	2.1	2.0
Previous Tealbook	*1.6*	*1.6*	*1.8*	*1.9*	*2.0*	*2.1*	*2.1*	*2.2*	*2.0*
Federal funds rate[1]	.10	.13	.13	.13	.13	.56	1.03	1.39	2.50
Previous Tealbook	*.13*	*.13*	*.13*	*.13*	*.13*	*.44*	*.96*	*1.38*	*2.50*
10-year Treasury yield[1]	.9	1.1	1.5	1.8	2.0	2.2	2.4	2.6	3.1
Previous Tealbook	*.8*	*1.0*	*1.5*	*1.8*	*2.0*	*2.3*	*2.4*	*2.6*	*3.1*

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

Real GDP
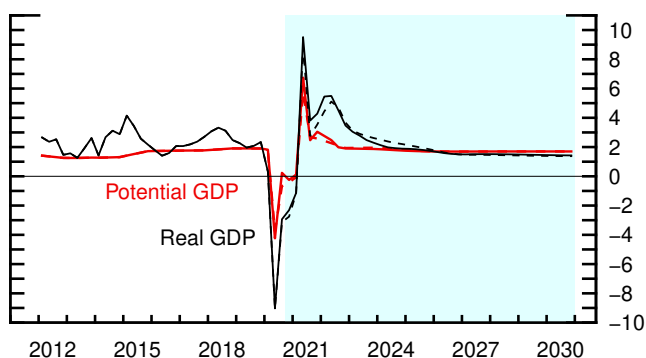
Unemployment Rate
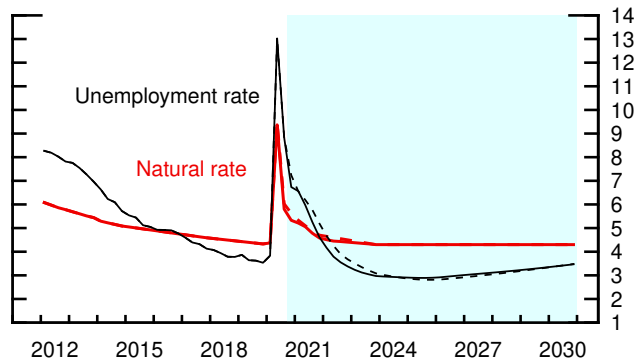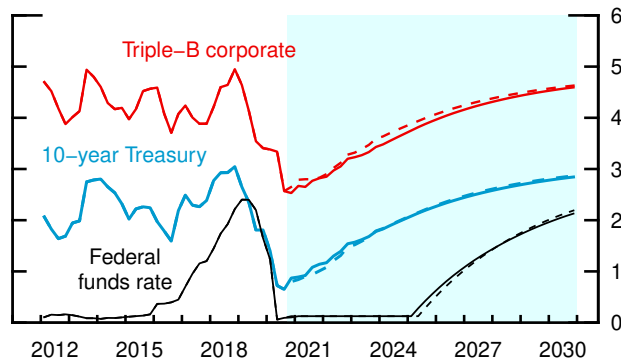

PCE Prices
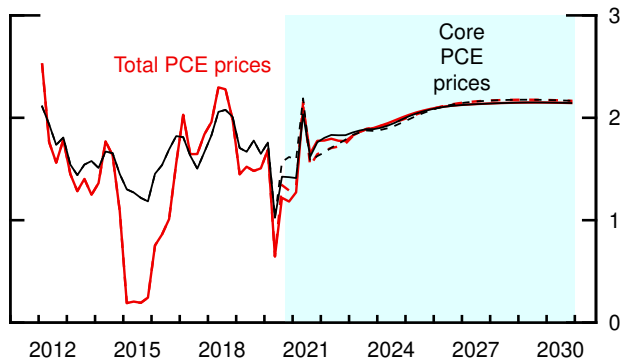
Interest Rates

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

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News on COVID-19 Vaccines and Herd Immunity

Initial phase III trial results released by Pfizer and by Moderna indicated that their experimental two-dosage vaccines have more than 90 percent efficacy at preventing COVID-19. A third two-dosage vaccine candidate, developed by AstraZeneca, showed a preliminary average efficacy of 70 percent. The efficacy of these three vaccines surpasses that for seasonal influenza vaccines. Johnson & Johnson is in the late stages of vaccine development and is expected to release preliminary results early next year.[1] Given these advances, the discussion below describes likely timelines for vaccine distribution and population immunization in the United States.

FDA Approval Process. The next stage is FDA approval. Pfizer applied to the FDA for Emergency Use Authorization (EUA)—a fast-track review for experimental products in a public health emergency—on November 20 and Moderna on November 30. AstraZeneca is expected to submit its application before the end of the year. The FDA could approve use of the Pfizer and Moderna vaccines under certain restrictions as early as mid-December.[2]

Announced Production Goals and Challenges. The first column of table 1 shows each company's announced production goals for the U.S. market if vaccines are granted EUA approval. However, as shown in the second column, we believe that a number of factors will cause production and distribution of vaccine doses to fall short of these goals. First, the global rush to produce vaccines will likely lead to shortages of specialized materials and chemicals. For example, distribution of Pfizer's vaccine requires specialized glass and dry ice, which has been in short supply recently. Second, vaccine wastage will likely be much higher than typical rates of between 1 and 5 percent because Moderna's and Pfizer's vaccines need to be kept at very cold (Moderna) or extremely cold (Pfizer) temperatures. Refrigeration lapses have been the major cause of vaccine wastage in the past. Third, we allow for a larger shortfall from Johnson & Johnson because they are not as far along in the process and more could go wrong.

Production and Distribution Timeline. Table 2 shows our assumed timelines for distribution and immunization. Distribution, shown in line 1, is expected to be quite limited this year and then ramp

Table 1: Announced Production and Assumptions

	Announced production for the United States* (through 2021)	Expected shortfall (percent)	Expected U.S. distribution (adjusted by shortfall)
Pfizer	625	35	405
Moderna	520	25	390
AstraZeneca	300	15	255
Johnson & Johnson	400	55	180
Total	**1,845**	**33**	**1,230**

Note: Announced production and expected distribution in millions of doses.

* Announced production is based on contracts signed through Operation Warp Speed and includes U.S. government options to purchase vaccines.

Source: Companies' reports; Federal Reserve Board staff estimates.

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[1] In addition, experimental vaccines from CanSino Biologics (China), the Gamaleya Research Institute of Epidemiology and Microbiology (Russia), Novavax (U.S.), Medicago (Canada), the Wuhan Institute of Virology (China), Sinopharm (China), Sinovac Biotech (China), Bharat Biotech (India), and Murdoch Children's Research Institute (Australia) are also in phase III testing, the last stage of vaccine development.

[2] The EUA approval is likely to exclude some population subgroups, such as children and pregnant women, who have been omitted from safety trials. In addition, the CDC Advisory Committee on Immunization Practices, scheduled to meet 24–48 hours after the EUA is granted, will issue further guidelines on restrictions for distribution.

up over 2021 as kinks in the production and distribution processes are worked out. In particular, we assume that production in Q1 is around one-third of levels reached at the end of the year. In addition, we assume that the unusual refrigeration requirements for the Pfizer and Moderna vaccines and the absence of full funding for state and local governments' plans to distribute and administer the vaccine will cause distribution to lag production by one month at the start of next year and by gradually smaller amounts as the year progresses.

Immunizations and Herd Immunity. The distributed doses in line 1 of the table do not translate directly into persons vaccinated because Pfizer's, Moderna's, and AstraZeneca's vaccines require two doses several weeks apart (Johnson & Johnson is testing a single course shot in addition to a two-dose regimen).[3] Line 2 of the table shows our estimate of the number of immunizations that could be achieved given the number of available doses. Although the number of doses sufficient to inoculate the entire U.S. population is projected to be available as early as midsummer, line 3 projects a slower path of immunization based on the following four assumptions: only 58 percent of Americans voluntarily vaccinate, in line with a November Gallup poll; vaccine mandates by employers and schools moderately boost vaccination rates; 10 percent of those willing to be vaccinated won't have a vaccine conveniently available to them in Q2 and will delay vaccination until Q3; children delay vaccination until the second half of the year when additional trial results are assumed to show the vaccines to be safe for them. All told, we project that vaccination will significantly slow the spread of the disease in Q2 and be close to levels consistent with herd immunity in Q3.[4] Considerable uncertainty surrounds these estimates. Moreover, how long immunity will last and whether yearly boosters will be needed remain open questions. Return to Domestic text | Return to Risks and Uncertainty text

Table 2: Timeline of Cumulative Distribution and Immunizations

	2020:Q4	2021:Q1	2021:Q2	2021:Q3	2021:Q4
1. Distribution of doses (millions of shots)	35	160	425	775	1,230
2. Possible immunizations (millions of people)	15*	100	255	330	330
3. Actual immunizations (millions of people)	15*	90	170	230	260

Note: Cumulative number of doses and of immunizations are in millions.
* Immunity from direct virus exposure.
Source: Federal Reserve Board staff estimates.

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[3] AstraZeneca is expected to amend its U.S. phase III trial to adopt a half-dose/one-dose schedule, which showed higher efficacy in early results, for all newly treated trial participants.

[4] Most models indicate that 60–70 percent of the population needs to be immune to achieve herd immunity. See, for example, Ricardo Aguas, Rodrigo M. Corder, Jessica G. King, Guilherme Gonçalves, Marcelo U. Ferreira, and M. Gabriela M. Gomes (2020), "Herd Immunity Thresholds for SARS-CoV-2 Estimated from Unfolding Epidemics," unpublished paper, medRxiv, November, https://doi.org/10.1101/2020.07.23.20160762; background information is available in Alessandro Barbarino and Travis Berge (2020), "Nowcasting the Spread and Duration of the Current COVID-19 Epidemic," informal presentation to the Federal Reserve Board, June 26. Thus, with a vaccine that is more than 90 percent effective, the United States would reach herd immunity when about 250 million people (or about 75 percent of the population) are vaccinated. However, even a 60 percent vaccination rate would likely eliminate the need for any strict social-distancing measures, according to Sarah M. Bartsch, Kelly J. O'Shea, Marie C. Ferguson, Maria Elena Bottazzi, Patrick T. Wedlock, Ulrich Strych, James A. Mckinnell, Sheryl S. Siegmund, Sarah N. Cox, Peter J. Hotez, and Bruce Y. Lee (2020), "Vaccine Efficacy Needed for a COVID-19 Coronavirus Vaccine to Prevent or Stop an Epidemic as the Sole Intervention," *American Journal of Preventative Medicine,* vol. 59 (4), pp. 493–503.

## Export Perspectives: Supply Chain Disruptions

U.S. real goods exports have only somewhat recovered from their unprecedented plunge this spring and remain about 10 percent below pre-COVID-19 levels. To date, the path for exports has largely been explained by foreign activity, as exports have tracked the decline and partial recovery in foreign GDP this year (figure 1). Exports in the second quarter, especially for autos, were also held down by supply chain disruptions, defined as reduced production due to unavailable inputs or plant closures. These disruptions, however, are likely playing only a limited role in restraining aggregate exports in the second half of 2020 despite being acute and frustrating for some U.S. firms.

Evidence for supply chain disruptions in the second quarter can be seen in supplier delivery times, which spiked in April and May (figure 2). Such spikes are particularly unusual in economic downturns, when lack of demand has often led to *shorter* delivery times. Indeed, we see the recent rise in supplier delivery times as reflecting the more typical behavior during recoveries, when supply does not expand enough to meet increased demand, rather than indicating a return to widespread supply disruptions.

In terms of specific industries, supply disruptions in the auto sector played a notable role in depressing second-quarter exports. As a result of both the stay-at-home orders and manufacturers' safety concerns, almost all U.S. auto plants closed for about two months starting in late March. This dramatic but temporary shutdown of production, combined with a large swing in demand, led autos to make a notable contribution to the decline in total U.S. real export growth in the second quarter, as shown in figure 3, even though they make up only 6 percent of exports.

Although the auto sector has complicated cross-border supply chains and experienced widespread closures, supply disruptions remained surprisingly short lived. Initially, inventory drawdowns enabled sales to decline less than production (figure 4). Despite persistent parts shortages that affected some producers, most plants reopened by the summer, allowing production to support rebounds in sales, exports, and inventories. Indeed, among major export categories, autos recovered the most in the third quarter and made a substantial contribution to overall export growth (figure 3).

Figure 1. Real Core Exports and Foreign GDP
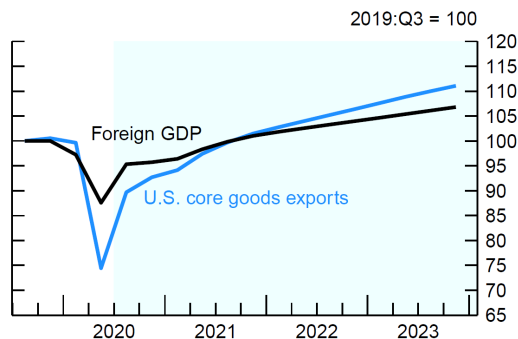
Note: GDP is gross domestic product.
Source: Staff forecast.

Figure 2. Supplier Delivery Times
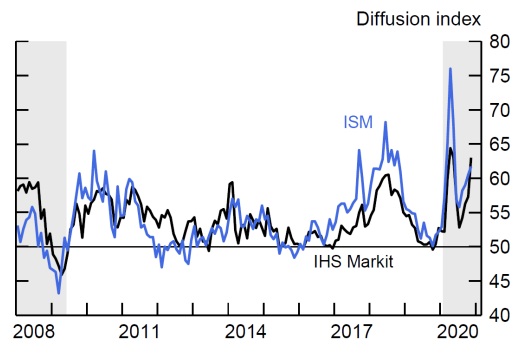
Note: More than 50 indicates longer delivery times. ISM is Institute for Supply Management. The shaded bars indicate periods of business recession as defined by the National Bureau of Economic Research (NBER). The 2020 period of recession is based on the NBER dates as of December 2.
Source: IHS Markit; ISM.

Broader evidence for the resolution of widespread supply disruptions and for the greater importance of demand factors in explaining the still-depressed level of exports comes from the movements in export prices and quantities. Figure 5 compares the change in prices of export categories (the y-axis) against their change in quantity (the x-axis) from the fourth quarter of 2019 to the third quarter of 2020. Export categories most affected by supply disruptions would be expected to have declines in quantities but increases in prices this year and would appear in the top-left quadrant of this figure. The only category that clearly satisfies these criteria is durable industrial supplies (the blue dot in the figure), which consists largely of commodities like metals and lumber. Although potentially consistent with supply disruptions, this category is only 5 percent of U.S. exports and hence does not make a large contribution to the depressed level of aggregate U.S. exports.

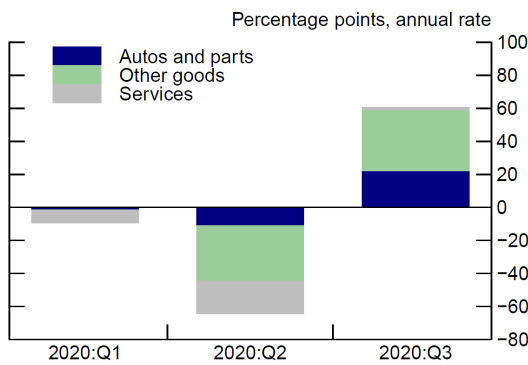In summary, supply disruptions likely were an important drag on exports in the second quarter but are playing much less of a role as economies have reopened. In addition, the prospects for additional supply disruptions appear modest. Unlike in the spring, lockdowns abroad have explicitly exempted manufacturing, and any additional U.S. lockdowns would also likely exempt manufacturing. Return to Domestic text

Figure 3. Real U.S. Exports

Percentage points, annual rate

- Autos and parts
- Other goods
- Services

Source: Bureau of Economic Analysis.

Figure 4. Total Light Vehicles

Millions of units, annual rate

Sales (right scale)

Inventories* (left scale)

Production (right scale)

Exports (right scale)
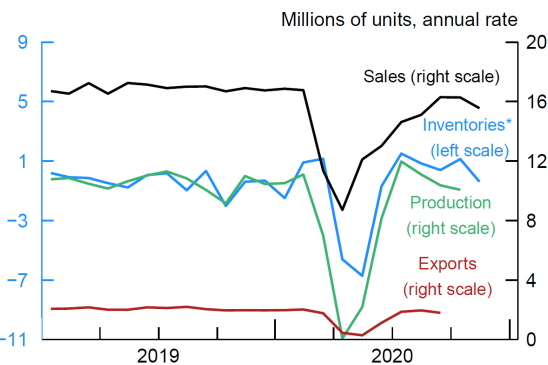
Note: Data are through November 2020 for sales and inventories, October 2020 for production, and September 2020 for exports.
* The inventories series is the monthly change at an annual rate.
Source: U.S. Census Bureau; WardsAuto.

Figure 5. U.S. Export Prices and Quantities

Percent change in price

Durable industrial supplies

Autos and parts

Aircraft

Foods

Oil

Percent change in quantity
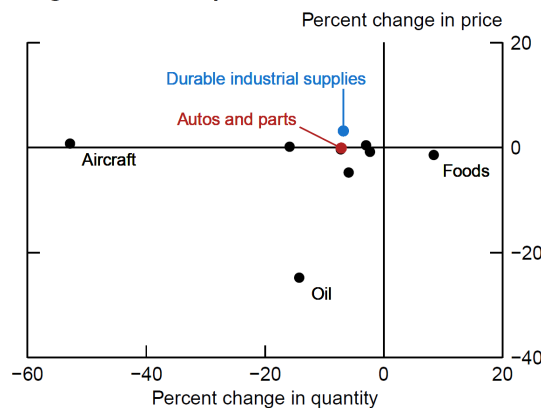
Note: Percent change is from 2019:Q4 to 2020:Q3.
Source: Bureau of Economic Analysis.

Unemployment Insurance and Labor Supply in the COVID-19 Recession

Rising virus caseloads, new business restrictions, and the looming expiration of pandemic unemployment insurance (UI) programs at the end of the year have led to calls for the renewal of enhanced UI benefits. At the same time, however, concerns have been expressed about the possibility that UI discourages labor supply. Such concerns have been especially pronounced for Federal Pandemic Unemployment Compensation (FPUC), which provided UI recipients with an extra $600 in weekly benefits from April through the end of July.[1] As a result of FPUC, most unemployed workers were receiving more each week in UI income than they previously had been receiving from employment income, and there were numerous anecdotal reports in the Beige Book and popular press of workers not returning to work because of these extra benefits.[2]

Six recent studies have examined the effects of FPUC on aggregate labor supply.[3] Each of these studies employs a similar approach, separating the labor market into units (for example, states, workers, and so on) according to their UI replacement rate—the amount of UI benefits as a percentage of previous wages—under the CARES Act. They then compare how outcomes evolved between these units before and after FPUC benefits were introduced (commonly called a difference-in-differences research design). For example, in states with relatively low wages, the $600 in extra benefits would represent a much larger increase in generosity, and a potentially larger disincentive to work, than in states with relatively high wages before the CARES Act. The studies use different sources of data, including both administrative records and surveys, to look at many labor market outcomes, including hours, employment, job search, job postings, hires, and separations.

Across all of these studies, little to no evidence emerges of the FPUC program inhibiting labor supply. For example, a recent paper finds that total hours at the state level as measured by Homebase (a time-tracking company serving mainly small businesses) evolved similarly from the

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[1] In addition to the FPUC benefits described here, the CARES Act extended benefit durations by 13 weeks (Pandemic Emergency Unemployment Compensation program) and expanded eligibility for benefits to include workers without traditional eligibility—for example, self-employed and gig workers (Pandemic Unemployment Assistance program). Moreover, the Administration also provided $300 to $400 in extra weekly benefits from August through October. These programs are not analyzed in the studies discussed here. However, recent research suggests that the effect of extended benefit durations on labor supply in previous recessions has been minimal. See Gabriel Chodorow-Reich and John M. Coglianese (2019), "Unemployment Insurance and Macroeconomic Stabilization," in Heather Boushey, Ryan Nunn, and Jay Shambaugh, eds., *Recession Ready* (Washington: The Hamilton Project and Washington Center for Equitable Growth), pp. 153–79.

[2] See Peter Ganong, Pascal J. Noel, and Joseph S. Vavra (2020), "US Unemployment Insurance Replacement Rates during the Pandemic," *Journal of Public Economics,* vol. 191 (November), 104273.

[3] See Joseph Altonji, Zara Contractor, Lucas Finamor, Ryan Haygood, Ilse Lindenlaub, Costas Meghir, Cormac O'Dea, Dana Scott, Liana Wang, and Ebonya Washington (2020), "Employment Effects of Unemployment Insurance Generosity during the Pandemic," working paper, https://tobin.yale.edu/sites/default/files/files/C-19%20Articles/CARES-UI_identification_vF(1).pdf; Alexander W. Bartik, Marianne Bertrand, Feng Ling, Jesse Rothstein, and Matthew Unrath (2020), "Measuring the Labor Market at the Onset of the COVID-19 Crisis," Brookings Papers on Economic Activity Conference Drafts, Summer, https://www.brookings.edu/wp-content/uploads/2020/06/Bartik-et-al-conference-draft.pdf; Arindrajit Dube (2020), "The Impact of the Federal Pandemic Unemployment Compensation on Employment: Evidence from the Household Pulse Survey," working paper, https://www.dropbox.com/s/q0kcoix35jxt1u4/UI_Employment_HPS.pdf; Ioana Elena Marinescu, Daphné Skandalis, and Daniel Zhao (2020), "Job Search, Job Posting and Unemployment Insurance during the COVID-19 Crisis," working paper, http://dx.doi.org/10.2139/ssrn.3664265; Nicolas Petrosky-Nadeau and Robert G. Valletta (2020), "Did the $600 Unemployment Supplement Discourage Work?" FRBSF Economic Letter 2020-28 (San Francisco: Federal Reserve Bank of San Francisco, September), https://www.frbsf.org/economic-research/publications/economic-letter/2020/september/did-600-dollar-unemployment-supplement-discourage-work; and Ernie Tedeschi (2020), "Emergency UI: Cuts Would be a Drag on 2020H2 Growth, No Evidence Yet that UI Generosity has Held Back Job Finding," Evercore International Strategy & Investment Macro Note (Washington: Evercore Partners Inc., July).

end of March through mid-July for high-replacement-rate states (the black line in the figure) and low-replacement-rate states (the red line). The other five studies show similar results for other labor market outcomes, including employment, job search, job postings, hires, and separations. None of these studies find a clear negative effect from FPUC benefits.[4]

Why was labor supply unaffected by the FPUC program? Although the extra $600 increased the value of unemployment insurance while it was in effect, this benefit was temporary, while the costs of remaining unemployed were potentially long-lasting and substantial. If a temporarily unemployed worker refused a recall offer from their employer, they would eventually need to find a new job; however, workers searching for new jobs during recessions typically take longer to find one and experience long-term earnings losses. Two recent studies suggest that these effects likely outweighed the extra $600 for the average worker from April through June 2020.[5] Both studies estimate the net present value of employment relative to unemployment for typical workers and find that only small minorities of workers, mainly low earners and workers whose occupations make them hard to replace, had an incentive to stay unemployed. These theoretical calculations corroborate the empirical evidence of little to no reduced labor supply due to the FPUC program and suggest that a renewal of enhanced UI benefits at the end of this year is unlikely to weigh on aggregate labor supply in 2021. Return to Domestic text

Hours Worked in High- and Low-Replacement-Rate States

Note: Vertical dashed line indicates implementation of CARES Act.
Source: Bartik and others (2020).

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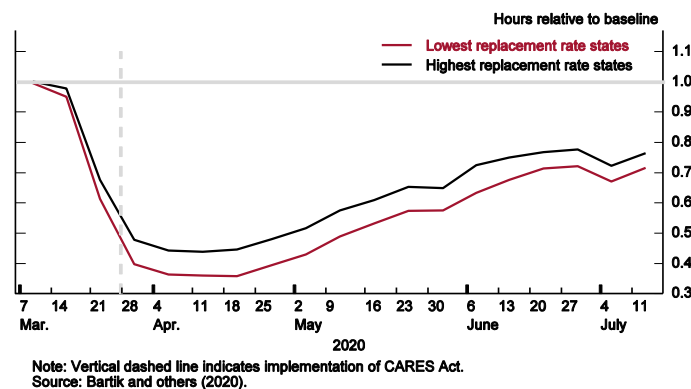
[4] One potential caveat is that these findings depend on the assumption that, in the absence of the CARES Act, employment and hours (and other outcomes) would have changed similarly over the March–July period for both high- and low-replacement-rate states (commonly referred to as the parallel trends assumption). This assumption would not be valid if, for example, states with relatively high CARES Act replacement rates would have seen relatively fast recoveries absent the FPUC. In this case, the results would understate the negative effect of FPUC on labor supply. One particular concern is that the decline in employment through April was correlated with replacement rates, as can be seen in the figure. However, the correlation between the initial employment decline and replacement rates differed across studies, with some studies—such as Bartik and others (2020)—finding a negative correlation and others—such as Altonji and others (2020)—finding a positive correlation. As a result, if there were a correlation between the initial decline and subsequent recovery (absent FPUC), it would likely impart different biases to different studies, depending on the correlation between initial employment declines and replacement rates in each study. However, all studies had similar estimation results, suggesting the absence of bias.

[5] See Corina Boar and Simon Mongey (2020), "Dynamic Trade-offs and Labor Supply under the CARES Act," NBER Working Paper Series 27727 (Cambridge, Mass.: National Bureau of Economic Research, August), https://www.nber.org/papers/w27727; and Nicolas Petrosky-Nadeau (2020), "Reservation Benefits: Assessing Job Acceptance Impacts of Increased UI Payments," Working Paper Series 2020-28 (San Francisco: Federal Reserve Bank of San Francisco, August), https://www.frbsf.org/economic-research/publications/working-papers/2020/28.

Conditions for Achieving and Averaging 2 Percent Inflation

Following the Committee's changes to its Statement on Longer-Run Goals and Monetary Policy Strategy, the staff began to assume a more accommodative policy stance that generated a projection of exceptionally low unemployment for several years beyond 2022. In the staff's framework, which includes assumptions about the slope of the Phillips curve and the evolution of inflation expectations, this persistently tight labor market leads to core PCE inflation rising above 2 percent by 2025. Of course, the Phillips curve may be flatter or steeper than we assume, and expectations might evolve differently. In this discussion, we clarify the assumptions in the staff projection that lead to inflation reaching 2 percent, and we explore just how far the unemployment rate would need to decline under alternative assumptions to achieve the Committee's inflation goals.

The attainment of 2 percent inflation in the staff projection relies on three features of our forecast. First, we see the unemployment rate falling steadily to about 3 percent in 2024. Second, we assume that the sustained period of very tight labor markets will "bend" the Phillips curve a bit, with inflation becoming more sensitive to resource utilization than is the case at less extreme levels of utilization.[1] At very high levels of resource utilization, wages and prices of inputs may need to be bid up faster in order to draw resources into production in the face of a steepening of the labor supply curve and other capacity constraints.

Third, the staff assumes that underlying inflation, which is assumed to have held steady at 1.8 percent for some time, will gradually move up to 2 percent by the end of the decade and anchor at this higher level thereafter. The increase in underlying inflation occurs as people observe actual inflation approaching and then temporarily exceeding 2 percent in an environment of tight resource utilization.[2] This rise in actual inflation is consistent with the FOMC's objective for inflation to average 2 percent, as described in the updated Statement on Longer-Run Goals and Monetary Policy Strategy. Accordingly, we do not expect underlying inflation to become unanchored but instead to settle at 2 percent.[3]

Our assumptions for the modest steepening in the slope of the Phillips curve and the evolution of expectations are highly uncertain, and different assumptions can yield quite different

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[1] The evidence for nonlinearities in the *aggregate* Phillips curve is thin, at least since the late 1980s, which may reflect the paucity of recent episodes of extremely tight labor markets. However, recent analysis of nonlinearities using state or local data, which have more variation, finds some evidence that there may be nonlinearities in the Phillips curve. See Nathan R. Babb and Alan K. Detmeister (2017), "Nonlinearities in the Phillips Curve for the United States: Evidence Using Metropolitan Data," Finance and Economic Discussion Series 2017-070 (Washington: Board of Governors of the Federal Reserve System, June), https://doi.org/10.17016/FEDS.2017.070, and Peter Hooper, Frederic S. Mishkin, and Amir Sufi (2019), "Prospects for Inflation in a High Pressure Economy: Is the Phillips Curve Dead or Is It Just Hibernating?" NBER Working Paper Series 25792 (Cambridge, Mass: National Bureau of Economic Research, May), https://doi.org/10.3386/w25792.

[2] In the past, inflation expectations appear to have moved in tandem with persistent, large changes in actual inflation, but our understanding of this apparent correlation is incomplete. Accordingly, it is unclear whether expectations will respond as projected to these modest changes in actual inflation.

[3] If expectations were to become permanently unanchored, the framework described here would no longer be appropriate.

implications. To shed light on the importance of these assumptions, this discussion uses a stylized version of the staff's Phillips curve framework:

$$\pi_t = \alpha\pi_{t-1} + (1-\alpha)\pi^* - \beta(U_t - U_t^*) + \varepsilon_t. \tag{1}$$

As shown, core inflation (π_t) is dynamically related to its value in the previous quarter, underlying inflation (π^*), and the unemployment rate gap ($U_t - U_t^*$). In this framework, core inflation will converge to its underlying rate when the unemployment rate holds steady at its natural rate; inflation could be held *above* its underlying rate by generating persistently tight resource utilization. Thus, the unemployment rate necessary for inflation to settle at 2 percent is a function of both the underlying inflation rate and the long-run sensitivity of inflation to the tightness of labor market conditions. The latter is determined by $\gamma = \frac{\beta}{1-\alpha}$, where β is the coefficient on the unemployment rate gap and α is the coefficient on lagged core inflation.

Some examples are given in the table. The unemployment rate consistent with 2 percent inflation (U_t^C) when $\gamma = 0.12$, $\pi^* = 1.8$ percent, and $U_t^* = 4.3$ percent, as in the staff projection through 2023, is 2.6 percent, the upper-left entry.[4] However, with a slightly less flat Phillips curve expected to prevail under the conditions assumed after 2023, the unemployment rate consistent with 2 percent inflation would rise to 3.2 percent, the middle-left entry. The table shows that, given this slightly less flat Phillips curve, the projected rise of underlying inflation to 1.9 percent by 2027 and 2.0 percent by the end of the decade will push the unemployment rate consistent with 2 percent inflation up further to 3.8 percent and 4.3 percent, respectively. As a result, the labor market in the baseline projection will not need to be as tight in later years in order for the Committee to meet its inflation goal.

As we have emphasized, there is considerable uncertainty about our assumptions. As illustrated in the table, if underlying inflation is higher than we assume or if the Phillips curve is much steeper than we estimate, inflation could rise more quickly and the unemployment rate would not need to fall nearly as low as the staff projects to reach the Committee's inflation goal.

Unemployment Rate Consistent with 2 Percent Inflation (Percent)

Inflation response (γ)	Underlying inflation		
	1.8	1.9	2
.12	2.6	3.5	4.3
.19	3.2	3.8	4.3
.29	3.6	4.0	4.3

Note: In these calculations, unemployment rates consistent with 2 percent inflation were calculated using combinations of inflation responses (rows) and underlying inflation rates (columns), assuming a natural rate of unemployment of 4.3 percent. The inflation responses were calculated based on a coefficient for lagged inflation of 0.3 and contemporaneous coefficients on the unemployment rate gap of 0.08, 0.13, and 0.20.

Source: Federal Reserve staff calculations.

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[4] We calculated the unemployment rate consistent with 2 percent core inflation as $U_t^C = U_t^* - [\frac{2-\pi_t^*}{\gamma}]$. This calculation assumes that core import prices and energy prices will increase in line with core PCE prices. However, if core import prices continue to rise more slowly than core PCE prices, as they have in recent years, the unemployment rate consistent with 2 percent core PCE inflation will be lower than the formula would suggest.

Revisions to the Staff Projection since the Previous SEP

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

The recovery in activity in the second half of this year has been stronger than we had anticipated in September. In particular, data on housing activity, E&I investment, and PCE have all exceeded our expectations. Our forecast for GDP growth in 2021 and 2022 has also been revised up somewhat. The positive effect of recent vaccine developments on financial conditions and foreign demand, our less dire assessment of state and local government budgets, and our judgment that household balance sheets—bolstered by this year's fiscal stimulus—will be more supportive of consumer spending all boosted our projection relative to September. These positive developments more than offset the removal of another fiscal package from our baseline projection and our assessment that some of the strength in the recovery this year pulled forward growth that we had previously anticipated to occur later. Data on the unemployment rate have come in much lower than we expected in September, and, with the level of output revised up throughout the medium term, the projected path for the unemployment rate is also lower. In response to both incoming data and our projection of tighter resource utilization, core PCE inflation has been revised up a bit this year and next.

As in September, the federal funds rate is assumed to be at the effective lower bound throughout the medium term.

Comparison of December and September Tealbook Projections

Variable	2020 H1	2020 H2	2020	2021	2022	2023	Longer run
Real GDP[1]	-19.2	18.2	-2.3	4.3	3.5	2.3	1.7
September Tealbook	*-19.5*	*16.4*	*-3.2*	*4.2*	*3.2*	*2.8*	*1.7*
Unemployment rate[2]	13.0	6.7	6.7	4.6	3.4	3.0	4.3
September Tealbook	*13.0*	*7.4*	*7.4*	*4.9*	*3.8*	*3.2*	*4.3*
PCE inflation[1]	-.2	2.6	1.2	1.8	1.8	1.9	2.0
September Tealbook	*-.3*	*2.4*	*1.1*	*1.7*	*1.8*	*1.9*	*2.0*
Core PCE inflation[1]	.4	2.4	1.4	1.8	1.8	1.9	n.a.
September Tealbook	*.3*	*2.4*	*1.3*	*1.7*	*1.8*	*1.9*	*n.a.*
Federal funds rate[2]	.06	.10	.10	.13	.13	.13	2.50
September Tealbook	*.07*	*.13*	*.13*	*.13*	*.13*	*.13*	*2.50*
Memo: Federal funds rate, end of period	.06	.09	.09	.13	.13	.13	2.50
September Tealbook	*.06*	*.13*	*.13*	*.13*	*.13*	*.13*	*2.50*
Output gap[2,3]	-3.8	-.6	-.6	.6	2.1	2.6	n.a.
September Tealbook	*-4.5*	*-1.3*	*-1.3*	*.3*	*1.5*	*2.3*	*n.a.*

1. Percent change from final quarter of preceding period to final quarter of period indicated.
2. Percent, final quarter of period indicated.
3. Percent difference between actual and potential. A negative number indicates that the economy is operating below potential.
n.a. Not available.

Domestic Econ Devel & Outlook

Projections of Real GDP and Related Components

(Percent change at annual rate from final quarter
of preceding period except as noted)

Measure	2019	2020 H1	2020 H2	2020	2021	2022	2023
Real GDP	**2.3**	**-19.2**	**18.2**	**-2.3**	**4.3**	**3.5**	**2.3**
Previous Tealbook	*2.3*	*-19.2*	*17.1*	*-2.8*	*3.5*	*3.7*	*2.6*
Final sales	2.8	-16.8	14.0	-2.6	4.1	3.5	2.2
Previous Tealbook	*2.8*	*-16.8*	*13.7*	*-2.7*	*3.1*	*3.7*	*2.5*
Personal consumption expenditures	2.5	-21.1	20.9	-2.3	3.7	3.8	3.1
Previous Tealbook	*2.5*	*-21.1*	*19.7*	*-2.8*	*3.0*	*4.5*	*3.1*
Residential investment	1.6	-12.4	48.0	13.8	13.9	6.0	-7.7
Previous Tealbook	*1.6*	*-12.4*	*42.3*	*11.6*	*6.9*	*5.3*	*-1.6*
Nonresidential structures	1.9	-20.0	-15.9	-18.0	.4	7.5	4.6
Previous Tealbook	*1.9*	*-20.0*	*-15.7*	*-17.9*	*.2*	*4.7*	*7.9*
Equipment and intangibles	1.3	-16.8	23.6	1.4	6.3	4.6	2.7
Previous Tealbook	*1.3*	*-16.8*	*16.1*	*-1.7*	*6.5*	*6.7*	*4.7*
Federal purchases	4.8	8.7	-3.2	2.6	.6	.6	.8
Previous Tealbook	*4.8*	*8.7*	*7.0*	*7.9*	*.7*	*-2.0*	*-2.0*
State and local purchases	1.9	-2.2	-3.8	-3.0	1.6	1.1	1.1
Previous Tealbook	*1.9*	*-2.2*	*-3.4*	*-2.8*	*1.1*	*1.0*	*1.0*
Exports	.4	-43.2	32.2	-13.4	14.6	5.3	4.6
Previous Tealbook	*.4*	*-43.2*	*35.3*	*-12.4*	*10.8*	*4.8*	*4.5*
Imports	-1.9	-37.5	48.3	-3.8	9.9	5.8	4.2
Previous Tealbook	*-1.9*	*-37.5*	*46.1*	*-4.5*	*8.9*	*6.2*	*4.6*
Contributions to change in real GDP (percentage points)							
Inventory change	-.4	-2.3	4.0	.3	.2	.0	.1
Previous Tealbook	*-.4*	*-2.5*	*3.2*	*.0*	*.5*	*.0*	*.1*
Net exports	.3	.3	-2.5	-1.0	.1	-.3	-.1
Previous Tealbook	*.3*	*.3*	*-2.1*	*-.8*	*-.1*	*-.4*	*-.2*

Real GDP

Note: The gray shaded bars indicate a period of business recession as defined by the National Bureau of Economic Research.
Source: U.S. Department of Commerce, Bureau of Economic Analysis.

Domestic Econ Devel & Outlook

The Outlook for the Labor Market

Measure	2019	2020 H1	2020 H2	2020	2021	2022	2023
Nonfarm payroll employment[1]	178	-2,365	848	-759	626	317	252
Previous Tealbook	*178*	*-2,365*	*1,026*	*-670*	*467*	*362*	*271*
Private employment[1]	162	-2,138	824	-657	574	278	215
Previous Tealbook	*162*	*-2,138*	*965*	*-586*	*427*	*323*	*234*
Labor force participation rate[2]	63.2	60.8	61.6	61.6	62.6	62.8	62.9
Previous Tealbook	*63.2*	*60.8*	*61.7*	*61.7*	*62.3*	*62.7*	*62.9*
Civilian unemployment rate[2]	3.5	13.0	6.7	6.7	4.6	3.4	3.0
Previous Tealbook	*3.5*	*13.0*	*7.2*	*7.2*	*5.2*	*3.7*	*3.1*
Employment-to-population ratio[2]	61.0	52.9	57.4	57.4	59.7	60.6	61.0
Previous Tealbook	*61.0*	*52.9*	*57.2*	*57.2*	*59.1*	*60.4*	*60.9*

1. Thousands, average monthly changes.
2. Percent, average for the final quarter in the period.
Source: U.S. Department of Labor, Bureau of Labor Statistics; staff assumptions.

Inflation Projections

Measure	2019	2020 H1	2020 H2	2020	2021	2022	2023
Percent change at annual rate from final quarter of preceding period							
PCE chain-weighted price index	1.5	-.2	2.6	1.2	1.8	1.8	1.9
Previous Tealbook	*1.5*	*-.2*	*2.8*	*1.3*	*1.6*	*1.7*	*1.9*
Food and beverages	.9	9.1	-1.0	3.9	1.7	1.4	2.3
Previous Tealbook	*.9*	*9.1*	*-1.2*	*3.8*	*1.6*	*1.4*	*2.3*
Energy	-.6	-29.5	15.4	-9.8	2.4	1.3	1.3
Previous Tealbook	*-.6*	*-29.5*	*12.0*	*-11.2*	*2.2*	*1.6*	*1.8*
Excluding food and energy	1.6	.4	2.4	1.4	1.8	1.8	1.9
Previous Tealbook	*1.6*	*.4*	*2.8*	*1.6*	*1.6*	*1.8*	*1.9*
Prices of core goods imports[1]	-1.4	-.6	5.0	2.1	2.4	.9	1.0
Previous Tealbook	*-1.4*	*-.6*	*4.6*	*2.0*	*1.7*	*.9*	*.9*

	Sept. 2020	Oct. 2020	Nov. 2020[2]	Dec. 2020[2]	Jan. 2021[2]	Feb. 2021[2]	Mar. 2021[2]
12-month percent change							
PCE chain-weighted price index	1.4	1.2	1.2	1.1	1.1	1.1	1.6
Previous Tealbook	*1.5*	*1.4*	*1.3*	*1.2*	*1.2*	*1.2*	*1.6*
Excluding food and energy	1.6	1.4	1.5	1.4	1.3	1.3	1.6
Previous Tealbook	*1.7*	*1.6*	*1.7*	*1.5*	*1.5*	*1.5*	*1.8*

1. Core goods imports exclude computers, semiconductors, oil, and natural gas.
2. Staff forecast.
Source: U.S. Department of Commerce, Bureau of Economic Analysis.

Recent Nonfinancial Developments (2)

Domestic Econ Devel & Outlook

Single-Family Housing Starts and Permits

Millions of units
(annual rate)

— Adjusted permits
— Starts

Oct.

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

Home Sales

Millions of units
(annual rate)

Millions of units
(annual rate)

Existing homes
(left scale)

New single-family
homes (right scale)

Oct.

Source: For existing, National Association of Realtors; for new, U.S. Census Bureau.
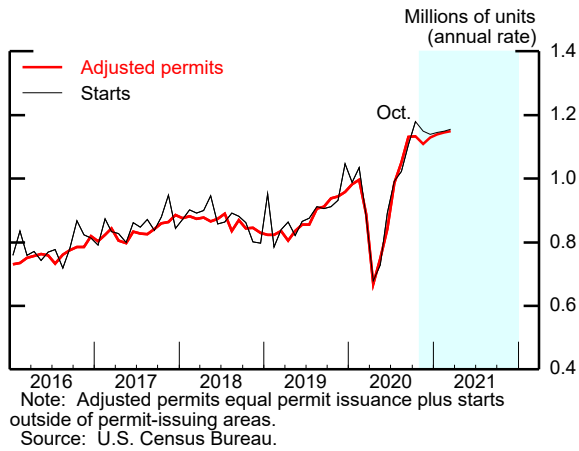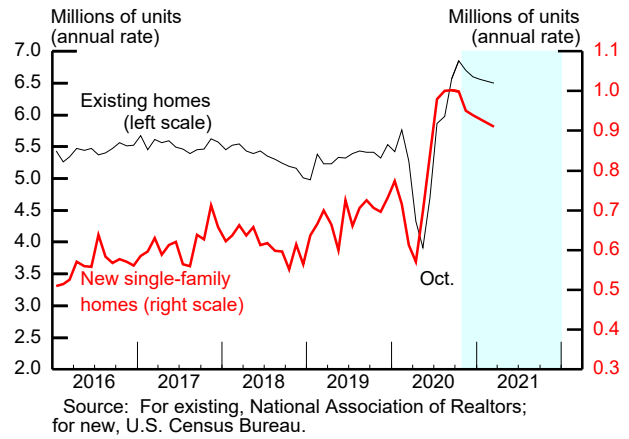
Nondefense Capital Goods ex. Aircraft

Billions of dollars

Shipments

Orders

Oct.

Note: Data are 3-month moving averages.
Source: U.S. Census Bureau.
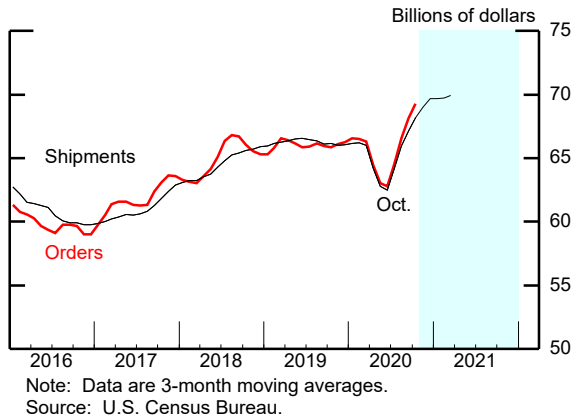
Nonresidential Construction Put in Place

Billions of chained (2012) dollars

Oct.

Note: Nominal CPIP deflated by BEA prices through 2020:Q2 and by the staff's estimated deflator thereafter.
Source: U.S. Census Bureau.

Inventory Ratios

Months

Oct.

Staff flow-of-goods system

Census book-value data

Sept.

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

Exports and Non-oil Imports

Billions of dollars

Non-oil imports

Exports

Sept.

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

Domestic Econ Devel & Outlook
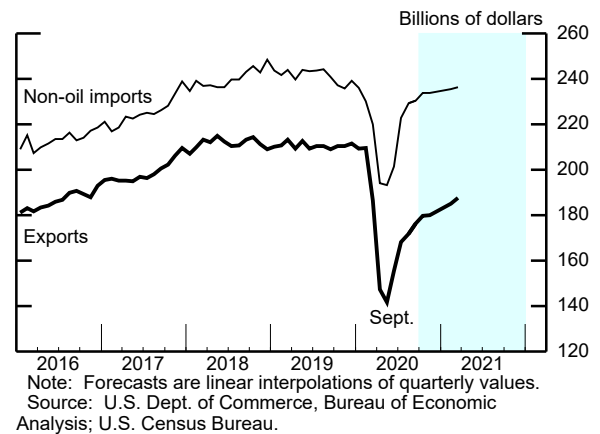
Components of Final Demand

Personal Consumption Expenditures
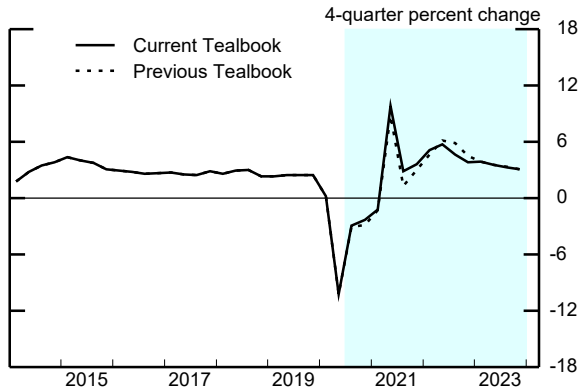
Residential Investment
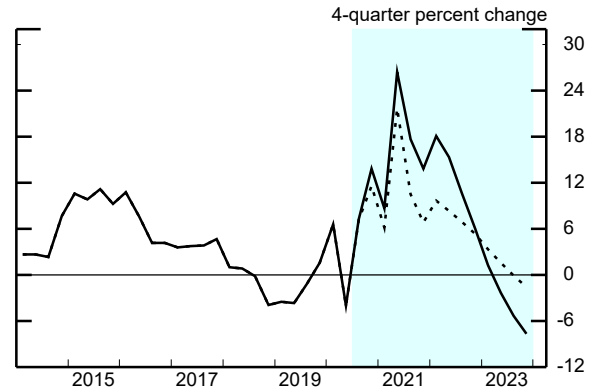
Equipment and Intangibles
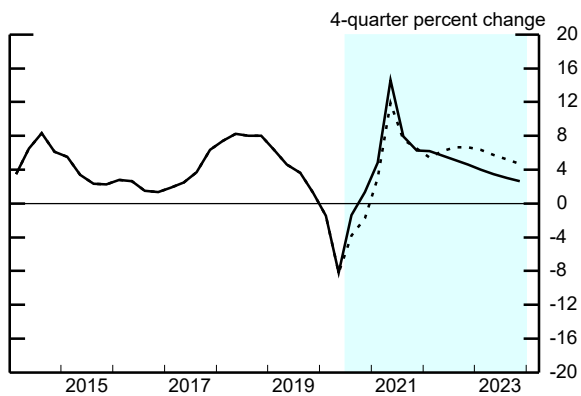
Nonresidential Structures
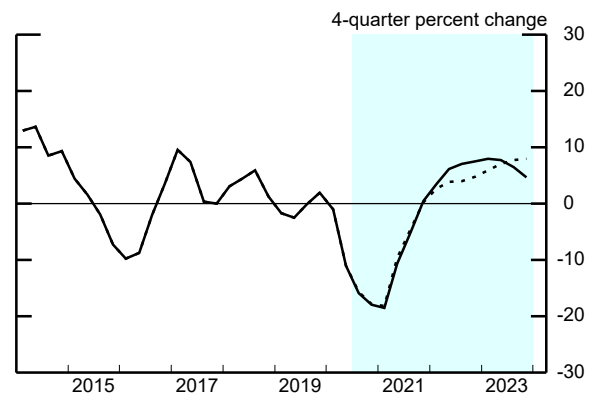
Government Consumption and Investment
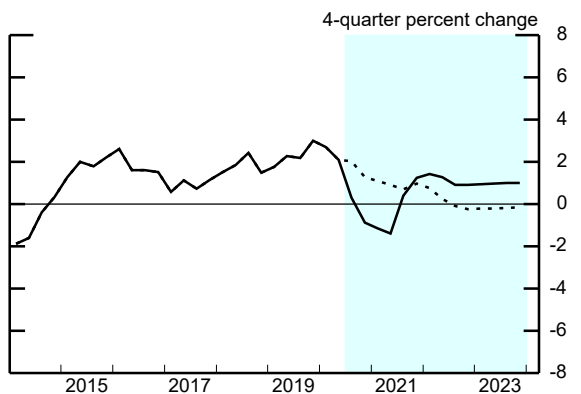
Exports and Imports
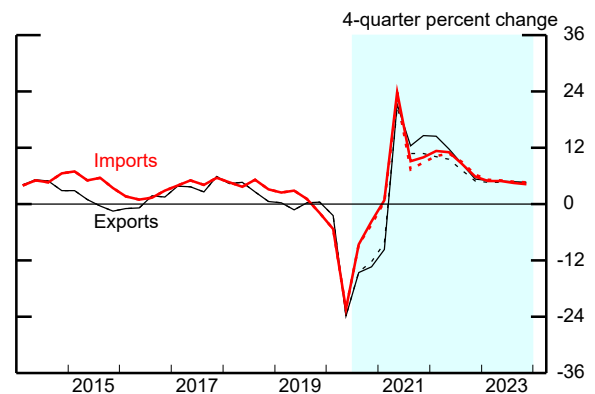
Source: U.S. Department of Commerce, Bureau of Economic Analysis.

Aspects of the Medium-Term Projection

Personal Saving Rate

Percent

- Current Tealbook
- ⋯⋯ Previous Tealbook
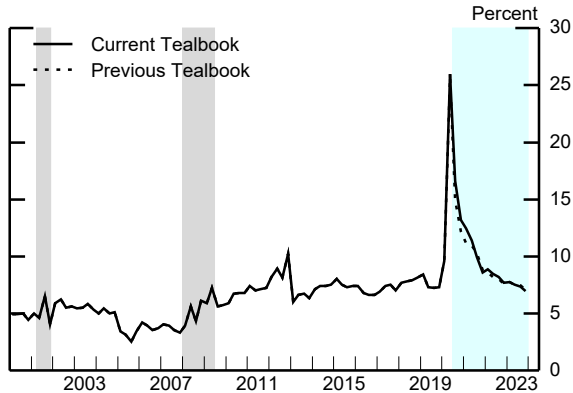
Source: U.S. Dept. of Commerce, Bureau of Economic Analysis.

Wealth-to-Income Ratio
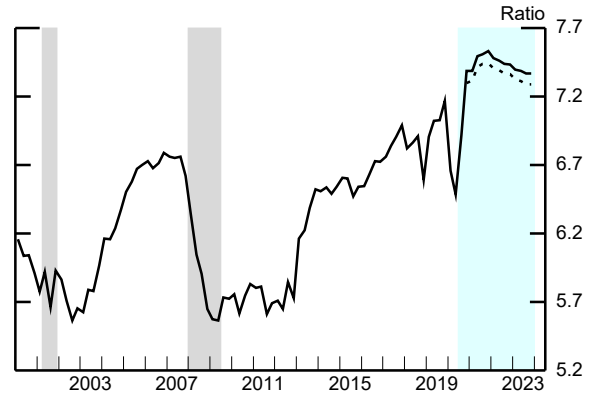
Ratio

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

Single-Family Housing Starts

Millions of units
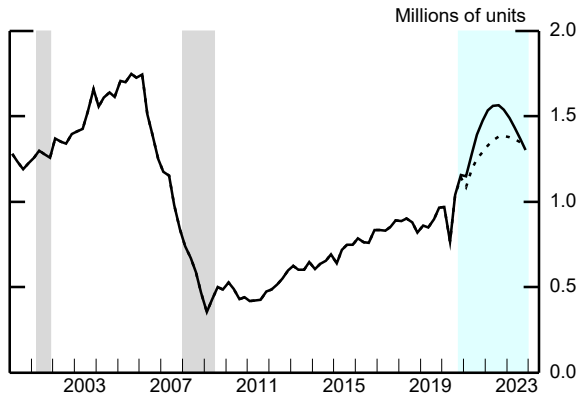
Source: U.S. Census Bureau.

Equipment and Intangibles Spending

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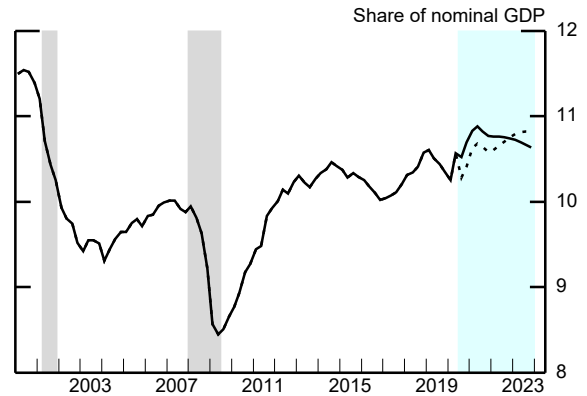
Source: U.S. Dept. of Commerce, Bureau of Economic Analysis.

Federal Surplus/Deficit

Share of nominal GDP
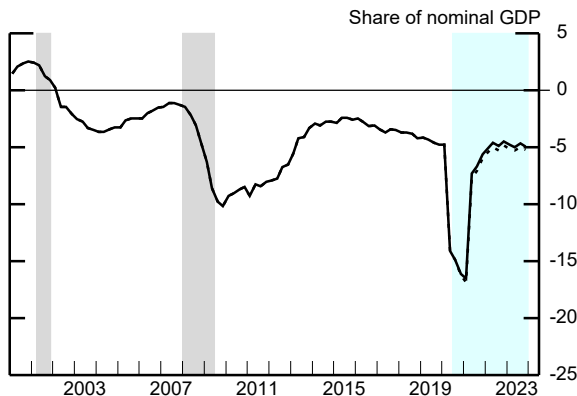
Note: 4-quarter moving average.
Source: Monthly Treasury Statement.

Current Account Surplus/Deficit
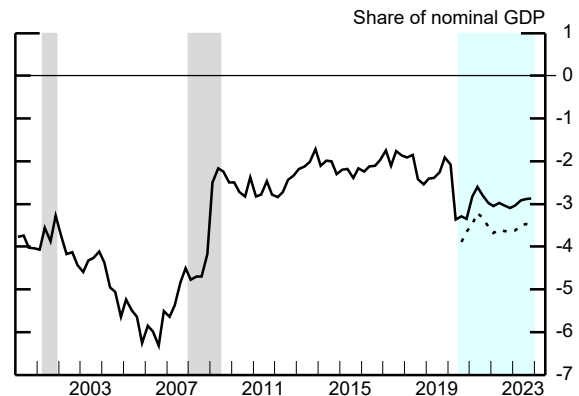
Share of nominal GDP

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

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

Domestic Econ Devel & Outlook

Cyclical Position of the U.S. Economy: Near-Term Perspective
(Percent change at annual rate from final quarter
of preceding period except as noted)

Measure	2019	2020	2020 Q2	2020 Q3	2020 Q4
Output gap[1]	**1.5**	**-.6**	**-3.8**	**-1.8**	**-.6**
Previous Tealbook	*1.5*	*-.9*	*-4.3*	*-1.1*	*-.9*
Real GDP	2.3	-2.3	-31.4	33.0	5.0
Previous Tealbook	*2.3*	*-2.8*	*-31.4*	*31.9*	*3.9*
Measurement error in GDP	.2	.0	.0	.0	.0
Previous Tealbook	*.2*	*.0*	*.0*	*.0*	*.0*
Potential output	1.9	-.2	-20.3	22.3	.0
Previous Tealbook	*1.9*	*-.4*	*-18.3*	*15.5*	*3.0*

Note: The output gap is the percent difference between actual and potential output; a negative number indicates that the economy is operating below potential. The change in the output gap is equal to real GDP growth less the contribution of measurement error less the growth rate of potential output. For quarterly figures, the growth rates are at an annual rate, and this calculation needs to be multiplied by 1/4 to obtain the quarterly change in the output gap.

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

Judgmental Output Gap
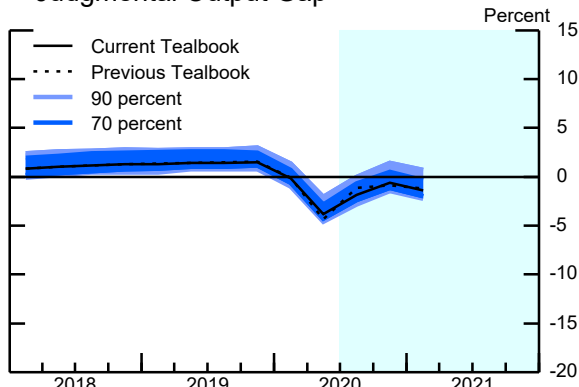
Note: Shaded regions show the distribution of historical revisions to the staff's estimates of the output gap.
Source: Various macroeconomic data; staff assumptions.

Model-Based Output Gap
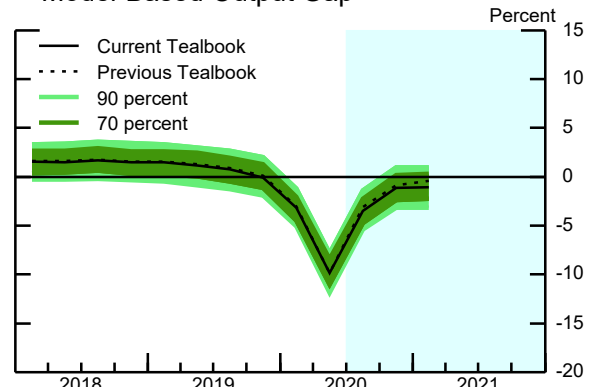
Note: Shaded regions denote model-computed uncertainty bands.
Source: Various macroeconomic data; staff assumptions.
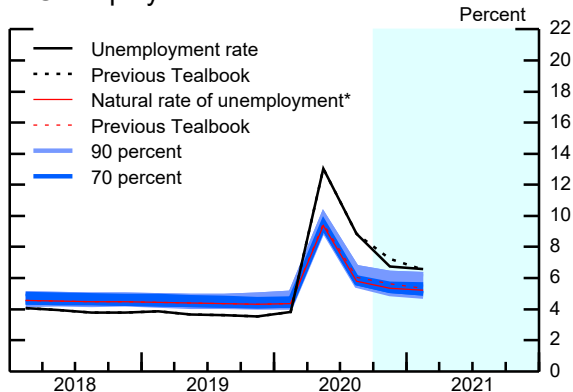
Unemployment Rate

Note: Shaded regions show the distribution of historical revisions to the staff's estimates of the natural rate.
*Staff estimate including the effect of extended and emergency unemployment insurance benefits.
Source: U.S. Department of Labor, Bureau of Labor Statistics; staff assumptions.

Core PCE Price Inflation
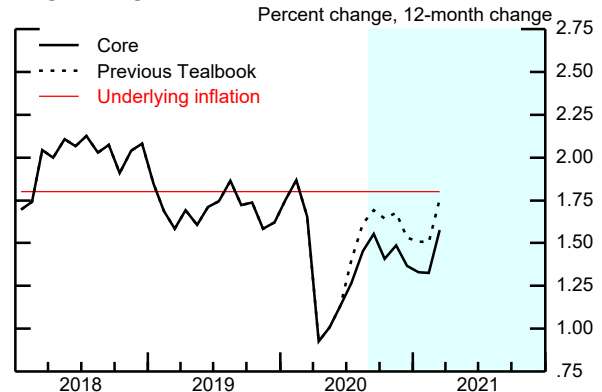
Source: U.S. Department of Commerce, Bureau of Economic Analysis; staff assumptions.

Cyclical Position of the U.S. Economy: Longer-Term Perspective

Output Gap

Note: Shaded regions show the 70 percent and 90 percent confidence intervals of the distribution of historical revisions to the staff's estimates of the output gap.
Source: Various macroeconomic data; staff assumptions.

Unemployment Rate

Note: Shaded regions show the 70 percent and 90 percent confidence intervals of the distribution of historical revisions to the staff's estimates of the natural rate.
*Staff estimate including the effect of extended and emergency unemployment insurance benefits.
Source: Various macroeconomic data; staff assumptions.

Manufacturing Capacity Utilization Rate

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

Labor Productivity
(Business Sector)

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

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

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

Measure	1975-96	1997-2001	2002-08	2009-11	2012-18	2019	2020	2021	2022	2023
Potential output	3.1	3.6	2.5	1.7	1.6	1.9	-.2	3.0	1.9	1.9
Previous Tealbook	*3.1*	*3.6*	*2.5*	*1.7*	*1.6*	*1.9*	*-.4*	*2.6*	*1.9*	*2.0*
Selected contributions:[1]										
Structural labor productivity[2]	1.7	3.2	2.4	1.6	1.3	1.3	1.7	.8	1.3	1.4
Previous Tealbook	*1.7*	*3.2*	*2.4*	*1.6*	*1.3*	*1.3*	*1.5*	*.6*	*1.2*	*1.2*
Capital deepening	.7	1.5	1.0	.4	.8	.7	1.5	-.3	.5	.6
Multifactor productivity	.8	1.3	1.2	1.0	.2	.4	.0	.9	.6	.6
Structural hours	1.5	1.2	.7	.7	.4	.8	-2.2	2.9	.9	.6
Previous Tealbook	*1.5*	*1.2*	*.7*	*.7*	*.4*	*.8*	*-2.1*	*2.4*	*1.0*	*.9*
Labor force participation	.4	-.1	-.2	-.5	-.4	.0	-1.8	1.3	.0	-.2
Previous Tealbook	*.4*	*-.1*	*-.2*	*-.5*	*-.4*	*.0*	*-1.4*	*.7*	*.1*	*.0*
Memo:										
Output gap[3]	-.4	-.8	-4.2	-4.6	1.3	1.5	-.6	.6	2.1	2.6
Previous Tealbook	*-.4*	*-.8*	*-4.2*	*-4.6*	*1.3*	*1.5*	*-.9*	*.0*	*1.7*	*2.4*

Note: For multiyear periods, the percent change is the annual average from Q4 of the year preceding the first year shown to Q4 of the last year shown.
1. Percentage points.
2. Total business sector.
3. Percent difference between actual and potential output in the final quarter of the period indicated. A negative number indicates that the economy is operating below potential.

Labor Market Developments and Outlook (1)

Domestic Econ Devel & Outlook

Measures of Labor Underutilization

Percent

- U-5*
- Unemployment rate
- Part time for economic reasons**

Nov.

2006 2008 2010 2012 2014 2016 2018 2020

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

Unemployment Rate

Percent

- Unemployment rate
- Previous Tealbook
- Natural unemployment rate
- Previous Tealbook

2017 2019 2021 2023

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

Employment-to-Population Ratio

Percent

- Total (current Tealbook)
- Total (previous Tealbook)
- EPOP trend

Nov.

2007 2009 2011 2013 2015 2017 2019 2021 2023

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

Unemployed Workers on Temporary and Permanent Layoff
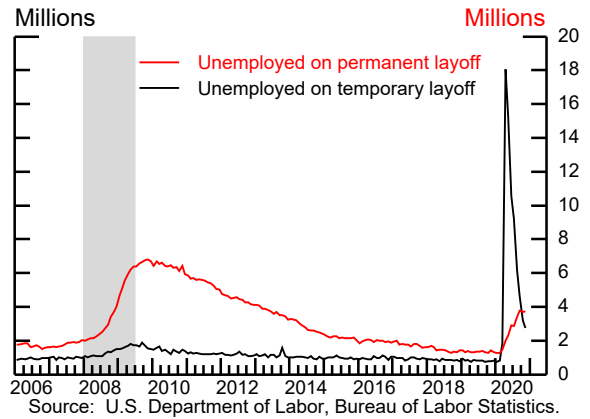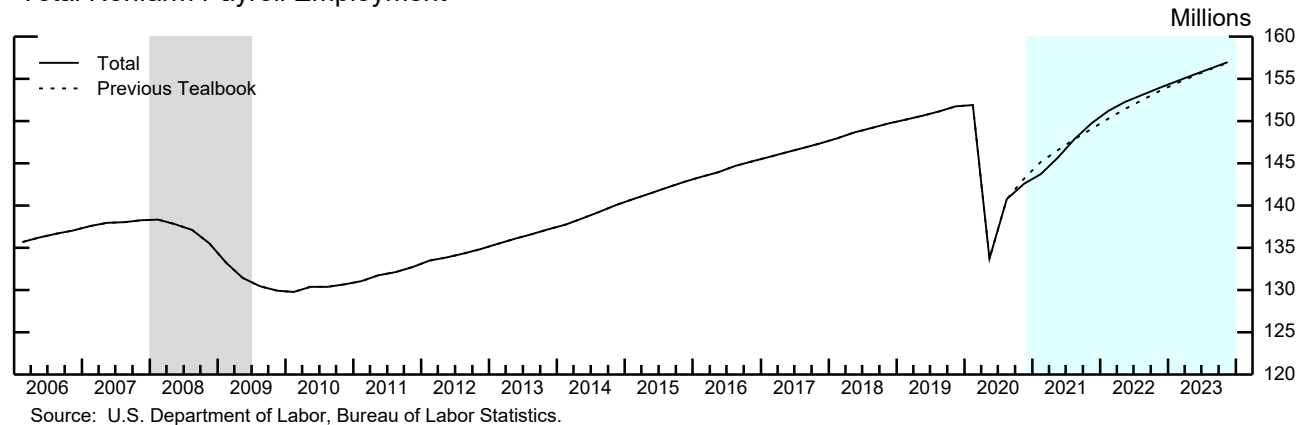
Millions   Millions

- Unemployed on permanent layoff
- Unemployed on temporary layoff

2006 2008 2010 2012 2014 2016 2018 2020

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

Total Nonfarm Payroll Employment

Millions

- Total
- Previous Tealbook

2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023

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

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

Labor Market Developments and Outlook (2)

Labor Force Participation Rate

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

Initial Unemployment Insurance Claims

Note: 4-week moving average. Series plots values that are not seasonally adjusted.
Source: U.S. Department of Labor, Employment and Training Administration.

Hires, Quits, and Job Openings

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

Unemployment Rate by Racial/Ethnic Group

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

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

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

Measures of Longer-Term Inflation Expectations

Domestic Econ Devel & Outlook

Index of Common Inflation Expectations

Percent

Q4ᵖ

CIE Index, scaled by SPF, 10-year PCE inflation
Alternative index, scaled by Michigan, next 5-10 years

Note: Index of 21 inflation expectations indicators.
p Preliminary estimate based on data available to date.
Source: Staff calculations.

Next 10 Years

Percent

Q4
June
Q4

SPF median, CPI
Livingston Survey median, CPI
SPF median, PCE

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

CPI Forward Expectations

Percent

Oct.
Q4
Oct.
Nov.

SPF median, 6 to 10 years ahead
Blue Chip mean, 7 to 11 years ahead
Primary dealers median, 5 to 10 years ahead
5-to-10-year-ahead TIPS infl. compensation

Source: Federal Reserve Bank of Philadelphia; Blue Chip
Economic Indicators; Federal Reserve Bank of New York;
Federal Reserve Board staff calculations.

PCE Forward Expectations

Percent

SPF median, 6 to 10 years ahead

Q4

Primary Dealers long run   Nov.

Source: Federal Reserve Bank of Philadelphia; Federal
Reserve Bank of New York.

Surveys of Consumers

Percent

Oct.

Nov.ᵖ

Michigan median increase in prices, next 5 to 10 years
FRBNY median increase in prices, 3 years ahead

Note: Federal Reserve Bank of New York (FRBNY) Survey
of Consumer Expectations reports expected 12-month inflation
rate 3 years from the current survey date. FRBNY data begin
in June 2013.
p Preliminary estimate based on data available to date.
Source: University of Michigan Surveys of Consumers;
Federal Reserve Bank of New York Survey of Consumer
Expectations.

Survey of Business Inflation Expectations

Percent

Mean increase in unit costs, next 5 to 10 years

Q3

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

Inflation Developments and Outlook (1)
(Percent change from year-earlier period)

Headline Consumer Price Inflation

Source: For CPI, U.S. Department of Labor, Bureau of Labor Statistics; for PCE, U.S. Department of Commerce, Bureau of Economic Analysis.
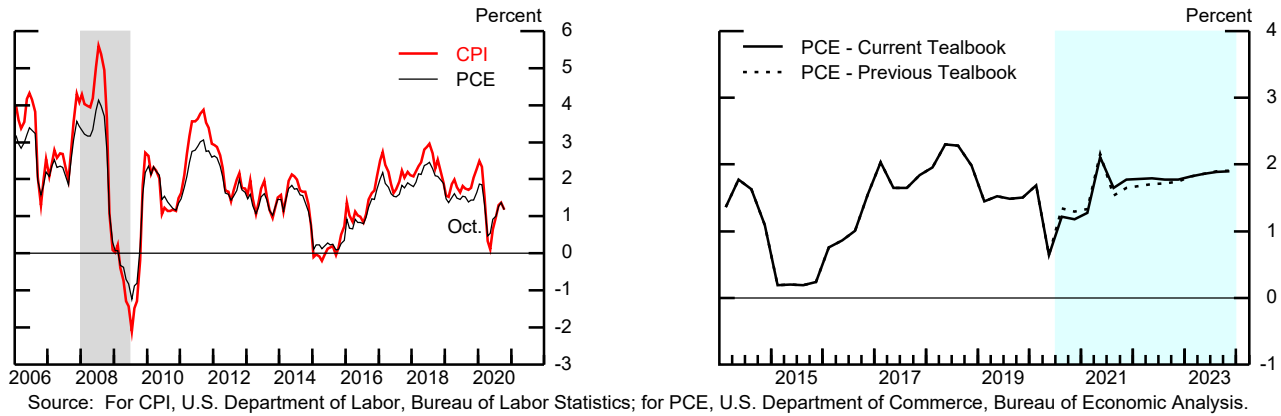
Measures of Core PCE Price Inflation
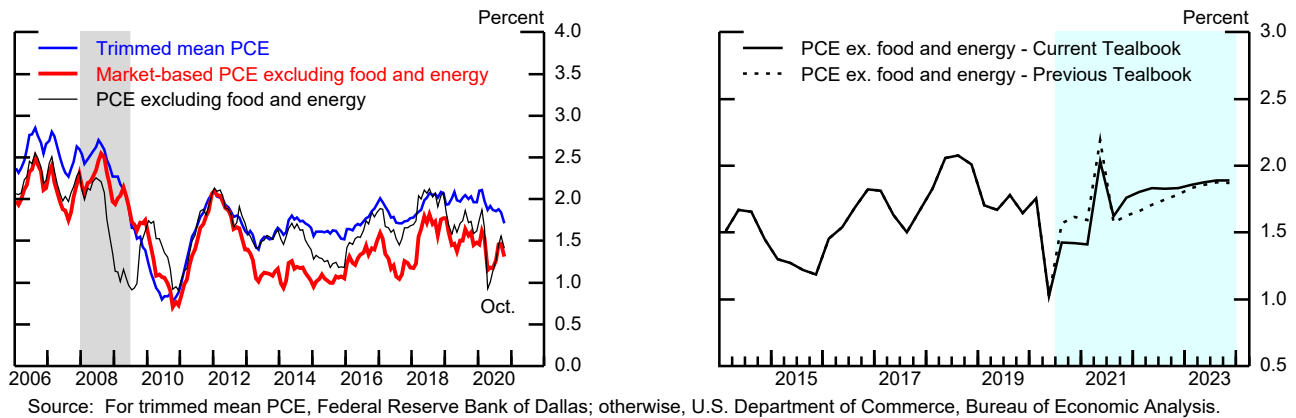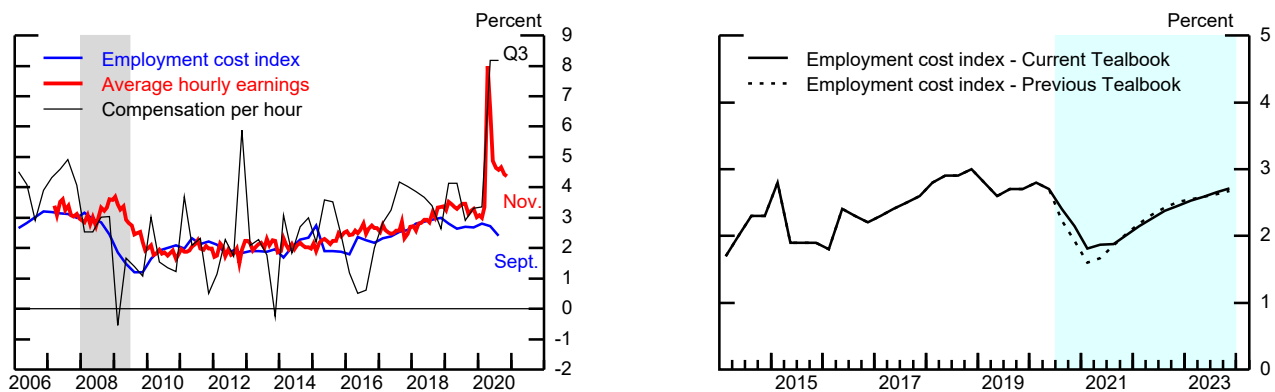
Source: For trimmed mean PCE, Federal Reserve Bank of Dallas; otherwise, U.S. Department of Commerce, Bureau of Economic Analysis.

Labor Cost Growth

Note: Compensation per hour is for the business sector. Average hourly earnings are for the private nonfarm sector. The employment cost index is for the private sector.
Source: U.S. Department of Labor, Bureau of Labor Statistics.

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

Inflation Developments and Outlook (2)
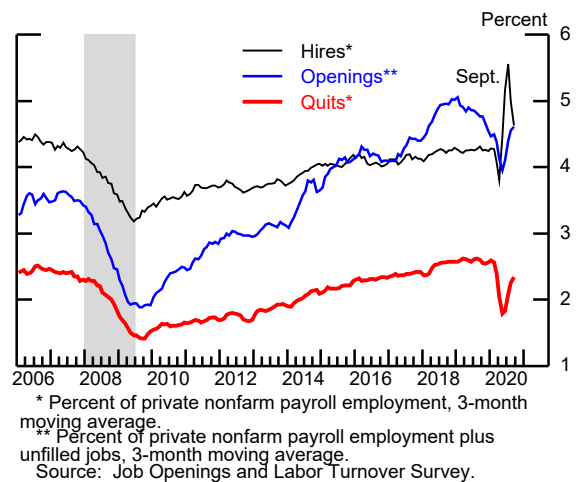(Percent change from year-earlier period, except as noted)

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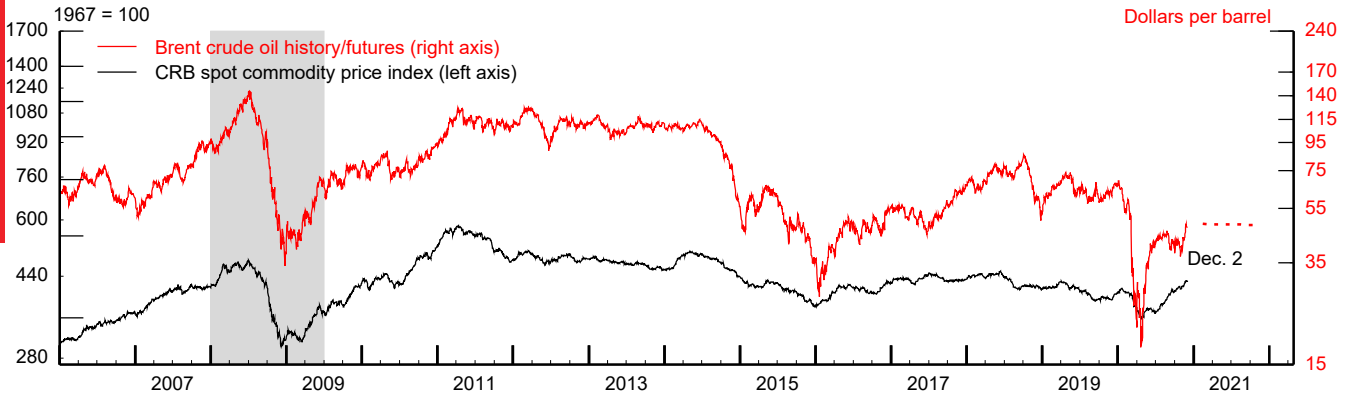
Note: Futures prices (dotted lines) are the latest observations on monthly futures contracts.
Source: For oil prices, U.S. Department of Energy, Energy Information Agency; for commodity prices, Commodity Research Bureau (CRB).

Energy and Import Price Inflation
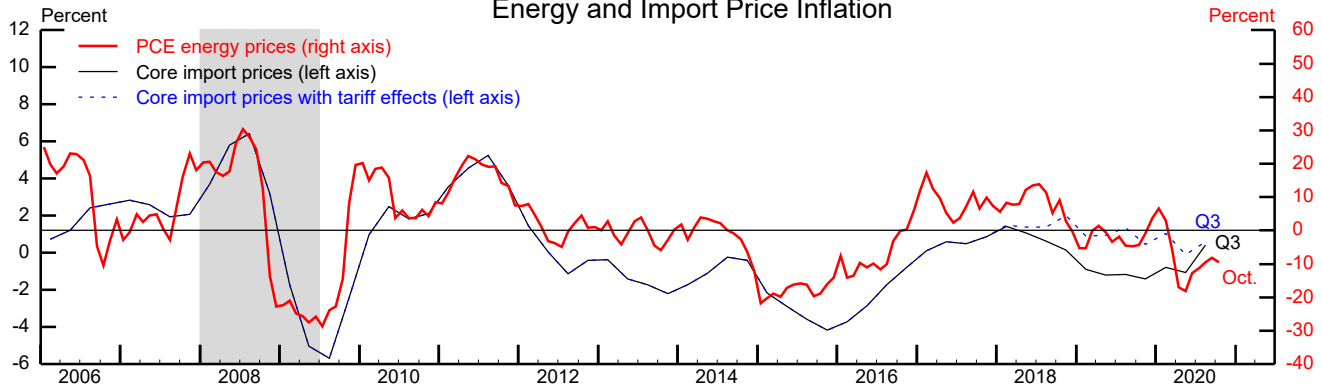
Source: For core import prices and for PCE, U.S. Dept. of Commerce, Bureau of Economic Analysis; for core import prices with a tariff effect, Federal Reserve Board staff calculations.

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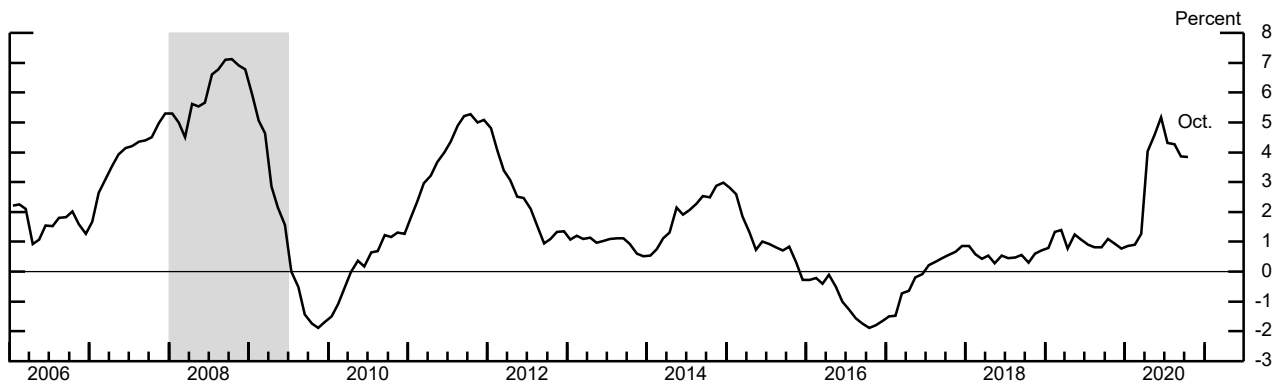
Source: U.S. Dept. of Commerce, Bureau of Economic Analysis.

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

Federal Reserve System Nowcasts of 2020:Q4 Real GDP Growth
(Percent change at annual rate from previous quarter)

Federal Reserve entity	Type of model	Nowcast as of Dec. 2, 2020
Federal Reserve Bank		
Boston	• Mixed-frequency Bayesian vector autoregression (BVAR)	7.8
New York	• Dynamic factor model	2.5
Cleveland	• Bayesian regressions with stochastic volatility • Tracking model	2.4 2.8
Atlanta	• Tracking model combined with BVARs, dynamic factor models, and factor-augmented autoregressions (known as GDPNow)	10.9
Chicago	• Dynamic factor model • Large mixed-frequency BVAR	7.4 6.5
St. Louis	• Dynamic factor model • News index model • Let-the-data-decide regressions	3.4 4.2 3.5
Kansas City	• Accounting-based tracking estimate	6.3
Board of Governors	• Staff judgmental estimate • Mixed-frequency dynamic factor model (DFM-BM) • Mixed-frequency dynamic factor model with small information set (DFM-SM) • Markov-switching dynamic factor model (MS-DFM)	5.0 8.4 6.1 6.4
Memo: Median of Federal Reserve System nowcasts		6.1

Domestic Econ Devel & Outlook

Evolution of the Staff Forecast

Change in Real GDP

Percent, Q4/Q4

Tealbook publication date

Unemployment Rate

Percent, fourth quarter
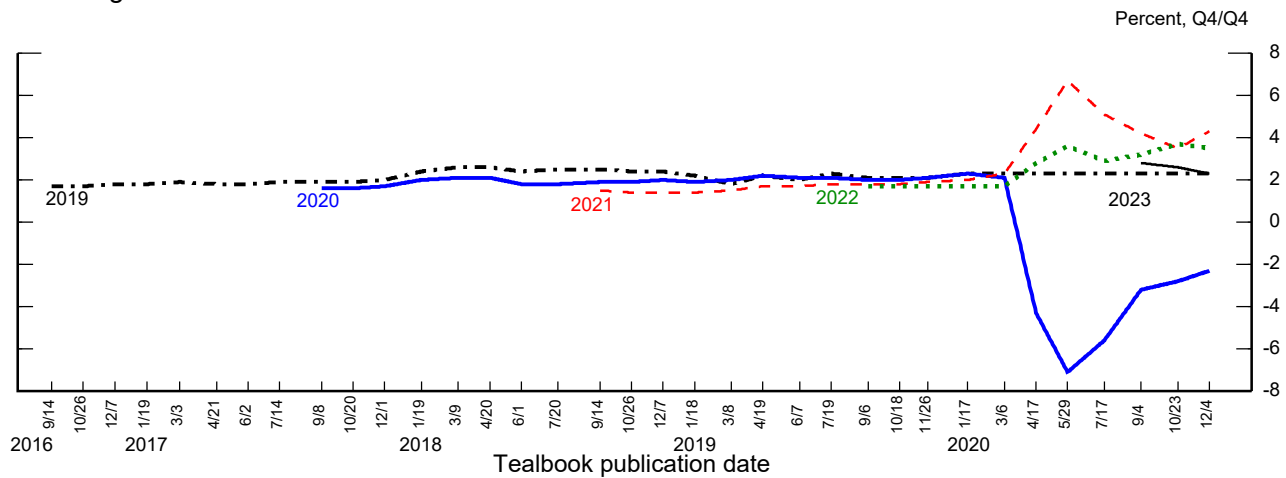
Tealbook publication date
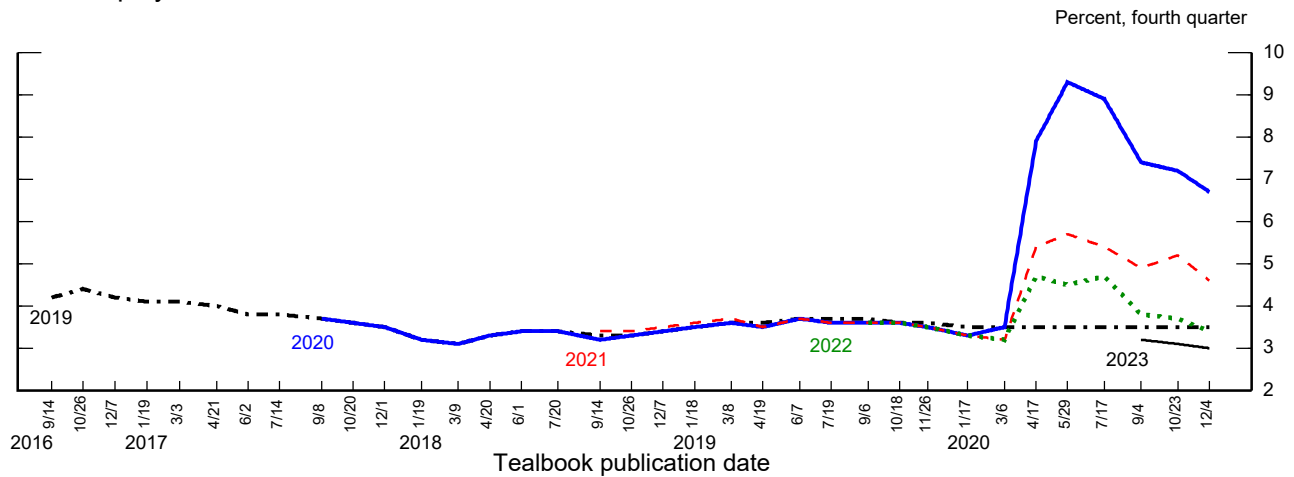
Change in PCE Prices excluding Food and Energy

Percent, Q4/Q4

Tealbook publication date
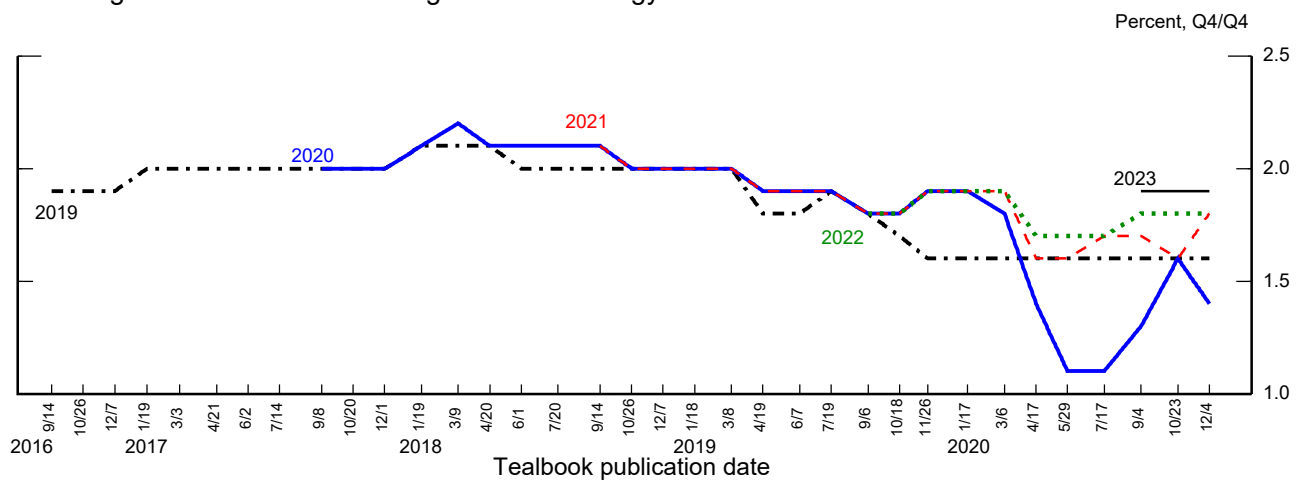
International Economic Developments and Outlook

After a stronger-than-expected rebound in the third quarter, many foreign economies face a harsh winter

Following its precipitous drop in the first half of the year, foreign GDP snapped back in the third quarter even more sharply than we had estimated in the October Tealbook. Going forward, we are balancing two developments related to the coronavirus (COVID-19). On the downside, the recent surge of infections in Europe and Canada has taken the wind out of the sails of the near-term recovery, as governments in many advanced foreign economies (AFEs) impose new restrictions on activity. Accordingly, we have lowered our expectations for growth this quarter and the next, as shown in figure 1, but not to the degree we experienced earlier this year, given that the restrictions are less stringent than those imposed in the spring. On the upside, progress on vaccine development makes us more hopeful about the subsequent strength of the recovery, and we have marked up foreign growth starting later next year. (For country details, see the box "Regional Developments and Outlook." For a review of the staff's outlook compared with those of the International Monetary Fund and private forecasters, see the box "Comparing the Staff International Growth Outlook with Other Forecasts.")

Figure 1. GDP Forecast

Total Foreign — Percent change, annual rate. Source: Staff forecast.

Advanced Foreign Economies — Percent change, annual rate. Source: Staff forecast.

Emerging Market Economies — Percent change, annual rate. Source: Staff forecast.

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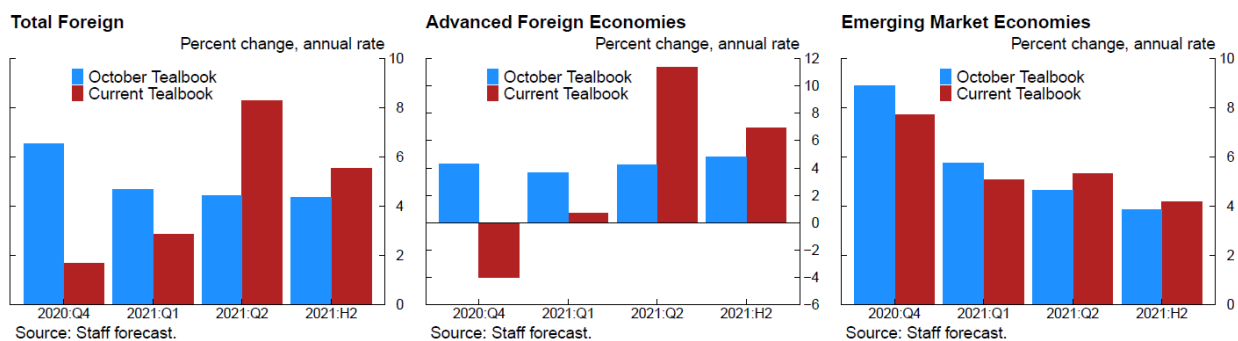
Virus resurgence in the advanced foreign economies has led to the reimposition of targeted restrictions

The virus resurgence in the AFEs, especially in Europe, has led to strains on health-care systems. In major European countries and Canadian provinces, authorities have imposed temporary lockdown measures. Figure 2 shows that these measures seem to have inhibited the spread of the virus in Europe, as evidenced by a recent decline in new cases, yet figure 3 indicates that death rates are still elevated.

Although the lockdowns are set to expire, we project that tight restrictions will likely stay in place over coming months to try to keep the pandemic under control. As shown by the plus signs in table 1, the restrictions are more stringent this quarter and next than we had assumed in the October Tealbook.

Compared with the spring, current restrictions are more limited and focused on socially intensive sectors. Nonessential businesses such as bars and restaurants have been closed (though takeout is usually permitted) and social movement has been restricted, but schools and factories remain open. As discussed in the box "Measuring the Effects of the Pandemic in Europe," the tradeoff between population health and economic activity has improved somewhat, in line with more effective virus treatments and better business practices. At the same time, the political and fiscal costs of closing down the economy are rising. Governments are also cognizant of long-term consequences of lockdowns in terms of rising unemployment and reduced business dynamism.

Figure 2. New COVID-19 Cases in AFEs
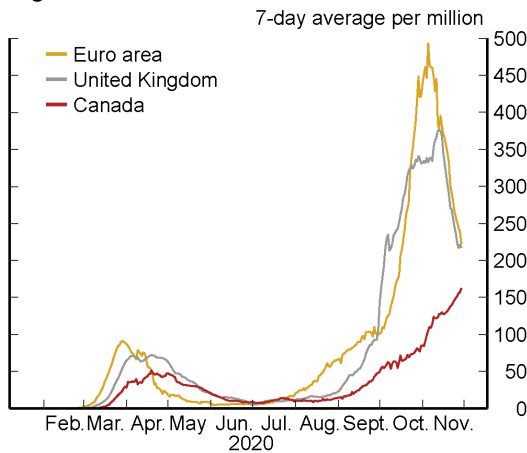
7-day average per million

Note: AFE is advanced foreign economy. The euro area includes France, Germany, Italy, and Spain.
Source: Johns Hopkins University.

Figure 3. New COVID-19 Deaths in AFEs
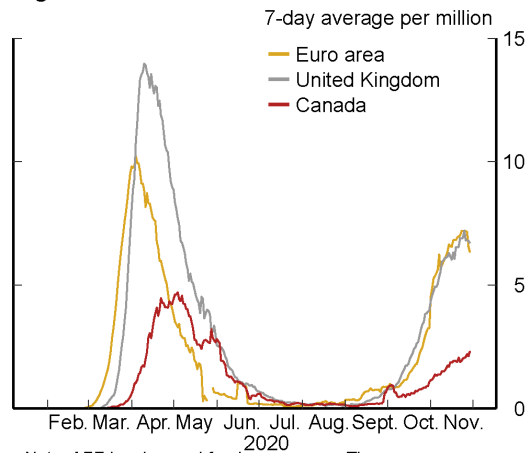
7-day average per million

Note: AFE is advanced foreign economy. The euro area includes France, Germany, Italy, and Spain. Missing values for euro-area series are attributed to miscoded data.
Source: Johns Hopkins University.

Table 1. Stringency of Restrictions due to COVID-19

	Euro area	United Kingdom	Canada	Japan
2020:Q1				
2020:Q2				
2020:Q3				
2020:Q4	+	+	+	
2021:Q1	+	+	+	
2021:Q2	−	−		
2021:Q3				
2021:Q4	−	−	−	−
2022				

None	No restrictions
Low	Some restrictions on social interaction
Moderate	Some nonessential activity shut down
Notable	Sizable portion of nonessential activity shut down; limited movement
Elevated	Shelter in place; most activity shut down

Note: Plus and minus signs denote a notch increase and decrease, respectively, from the November Federal Open Market Committee.
Source: Federal Reserve Board staff calculations from University of Oxford's Stringency Index through October and staff forecasts thereafter.

Restrictions are depressing near-term activity in the advanced foreign economies, with indicators signaling a strong hit to services; manufacturing is holding up better

In Europe, targeted (yet tight) restrictions and social distancing are leading to a steep fall in retail and recreational mobility, as shown in figure 4, and a smaller decline in mobility related to essential activities such as grocery shopping, using public transport, and going to workplaces (figure 5). Similarly, PMIs indicate a notable drop in services

activity even as manufacturing is holding up (figure 6). European confidence indicators, seen in figure 7, show consumer confidence well below pre-COVID levels and turning back down, and business plans for future production, after recovering close to pre-COVID levels, weakened in November. On balance, we project that GDP in the euro area and the United Kingdom will contract at a 10 percent annual rate this quarter and increase only about 1 percent next quarter, while the more limited virus spread and restrictions in Canada imply a contraction of about 1 percent this quarter and the next.

Figure 4. Retail and Recreation Mobility
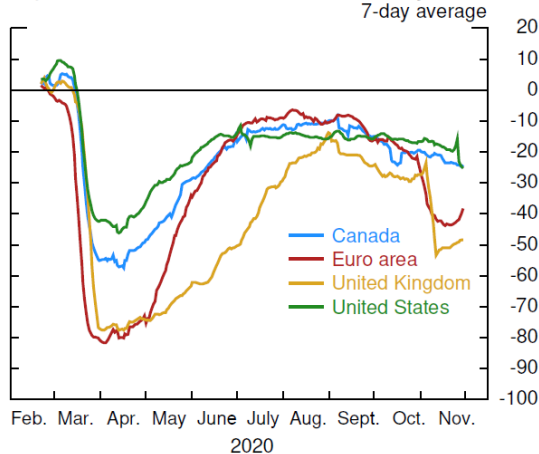
7-day average

Note: The euro area includes France, Germany, Italy, and Spain.
Source: Google Community Mobility Reports.

Figure 5. Grocery, Transit, and Workplace Mobility
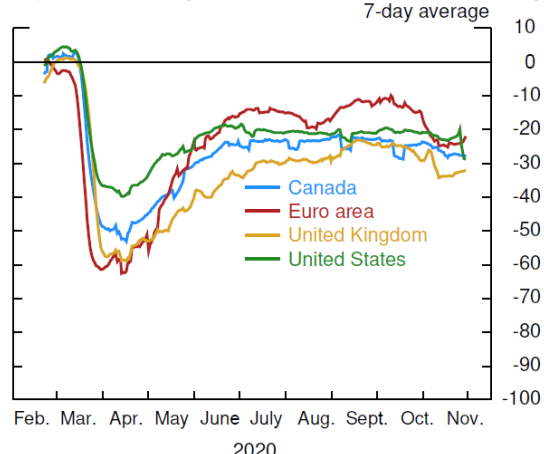
7-day average

Note: The euro area includes France, Germany, Italy, and Spain.
Source: Google Community Mobility Reports.

Figure 6. European Purchasing Managers Indexes
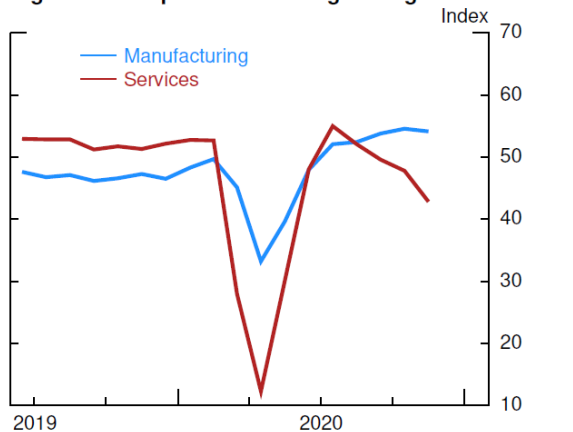
Index

Note: The index is a weighted average of surveys (seasonally adjusted).
Greater than 50 indicates expansion, and less than 50 contraction, in the sector.
Europe includes the euro area and the United Kingdom.
Source: Haver Analytics.

Figure 7. European Confidence Indicators

Percent balance
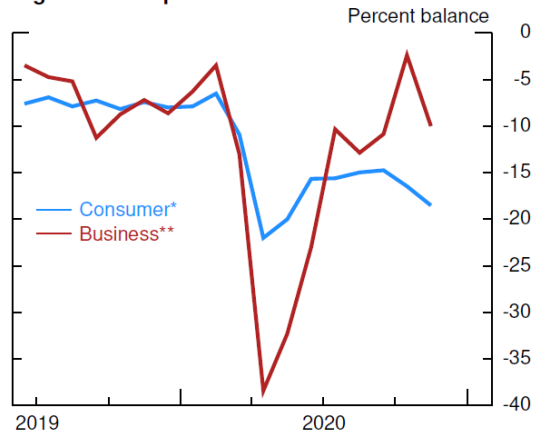
Note: Europe includes the euro area and the United Kingdom.
* Average of consumers' expectations of their financial situation, general economic situation, unemployment, and savings over the next 12 months.
** Balance of firms planning to increase production in next 4 months.
Source: Haver Analytics.

While the virus is under control in Asian emerging economies, the situation in Latin America is more challenging

In several higher-income Asian economies, virus cases and deaths remain low thanks to rigorous monitoring and testing policies, with relatively few social restrictions (figures 8 and 9). In Latin America, new cases and deaths have stabilized somewhat but continue at a relatively high level given inadequate tracking and social distancing as well as poor health-care systems.

Figure 8. New COVID-19 Cases in EMEs
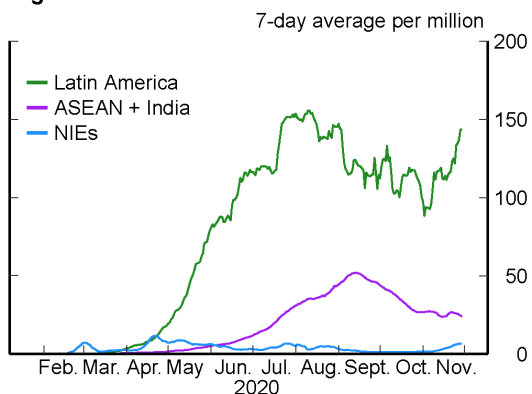
7-day average per million

Note: EME is emerging market economy. The Association of Southeast Asian Nations (ASEAN) includes Indonesia, Malaysia, the Philippines, Thailand, and Vietnam. Latin America includes Argentina, Brazil, Chile, Colombia, and Mexico. Newly industrialized economies (NIEs) include Hong Kong, Singapore, South Korea, and Taiwan.
Source: Johns Hopkins University.

Figure 9. New COVID-19 Deaths in EMEs
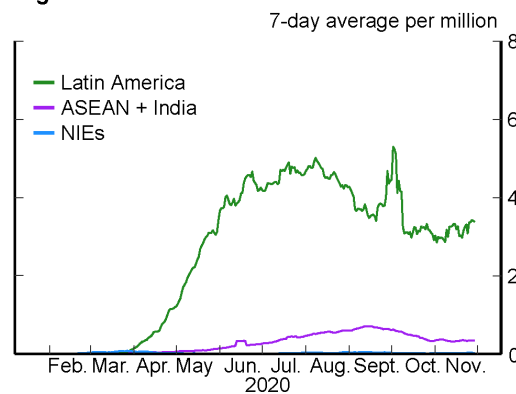
7-day average per million

Note: EME is emerging market economy. The Association of Southeast Asian Nations (ASEAN) includes Indonesia, Malaysia, the Philippines, Thailand, and Vietnam. Latin America includes Argentina, Brazil, Chile, Colombia, and Mexico. Newly industrialized economies (NIEs) include Hong Kong, Singapore, South Korea, and Taiwan.
Source: Johns Hopkins University.

Emerging economies will face reduced external demand from advanced economies in the near term

Although the recovery in the emerging market economies (EMEs) has been supported by strong exports, as shown in figure 10, we are seeing signs that external demand from advanced economies is softening and believe this reduced demand will prove a near-term headwind. Accordingly, we revised down aggregate EME growth 1 percentage point to 6.4 percent, on average, in the current quarter and the next. In China and some other Asian economies, the drag on exports through lower overall external demand should be mitigated by continued demand for COVID-19-related products, such as high-tech goods and medical supplies (figure 11).

Figure 10. Nominal Merchandise Exports

Dec. 2019 = 100

China
Asia ex. China
Latin America

Dec. Jan. Feb. Mar. Apr. May Jun. Jul. Aug. Sept. Oct.
2019   2020
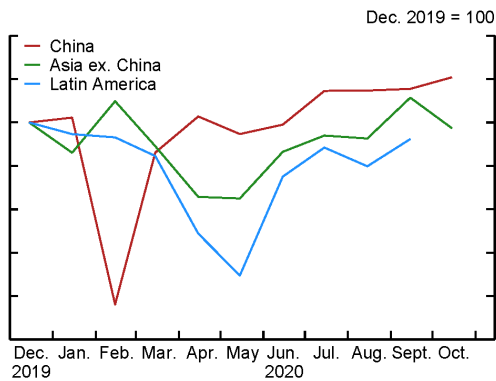
Note: Asia ex. China aggregate includes Hong Kong, India, Indonesia, South Korea, Taiwan, Thailand, and Vietnam. Latin America aggregate includes Argentina, Brazil, Chile, and Colombia. The data for Asia ex. China and China extend through October, while the data for Latin America extend through September.
Source: Haver Analytics.

Figure 11. Contribution to Export Growth: Emerging Asia, Dec. 2019 to Oct. 2020

Percent

COVID-19 related   Other
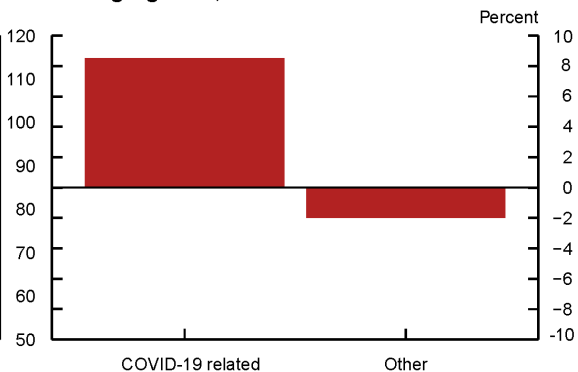
Note: COVID-related products include chemicals, electrical, furniture, machinery, metallic products, pharmaceuticals, and plastics. Emerging Asia includes China, South Korea, and Taiwan.
Source: Haver Analytics.

Policies will remain supportive in advanced foreign economies, while some emerging market economies struggle with lack of policy space

Recent restrictions in Europe have been accompanied by further fiscal stimulus (including the extension of wage subsidy programs and loans for affected businesses). Thus, we project a lesser drag from fiscal policy in 2021 than assumed in the October Tealbook. In contrast, the fiscal drag next year will be greater for the EMEs, where some major economies—notably, Brazil, Mexico, and India—struggle with lack of policy space to offset reduced external demand or any domestic resurgence of the virus.

Monetary policy across the foreign economies is set to remain highly accommodative. The Bank of England increased the target stock of its asset purchases in November, and we assume that the European Central Bank will also boost its asset purchases at its meeting on December 10. AFE central banks are also maintaining their support for market functioning and the flow of credit, as discussed in the box "Status of Support Programs at Major Foreign Central Banks."

Foreign economic activity should bounce back next spring as the spread of the virus wanes, vaccines are distributed, and restrictions are loosened

After the harsh winter, we project that foreign GDP growth will be a robust 5.5 percent next year, 1 percentage point higher than assumed in the October Tealbook. The recent announcements about vaccine progress are promising for the advanced

economies, which have signed significant commitments with companies producing the vaccines that currently appear to be the most viable (figure 12). Accordingly, we have moved forward our assumption of a full lifting of restrictions in the AFEs by one quarter, to the end of 2021. The recovery should also be supported by improved business and consumer confidence and highly accommodative fiscal and monetary policies.

The positive news about vaccines does not materially alter the EME outlook. In several higher-income Asian economies that managed to keep the virus under control, the outlook depends less on the timing of vaccine distribution. In addition, most countries in Latin America and parts of South Asia are currently scheduled to receive the vast majority of their vaccines from China and Russia, about which there is relatively little news regarding success rates and likely timing of rollouts (figure 13). Even if enough of the new vaccines could be developed to supply most EMEs' needs, the logistical challenges of distributing them are such that our previous assumption of a gradual vaccine rollout for these economies over the course of 2021 still seems reasonable. That said, EMEs should benefit indirectly from stronger foreign growth and the risk-on tone in financial markets.

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Figure 12. Advanced Economies: Procured Vaccines

Per capita doses
- Pfizer and Moderna
- AstraZeneca
- Other
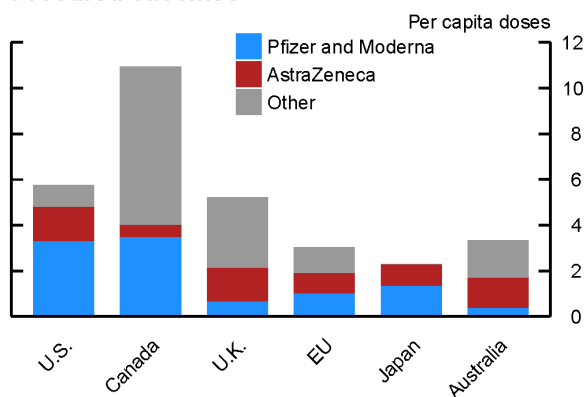
Note: EU is European Union. Pfizer and Moderna aggregate includes option contracts that allow countries to purchase more doses. "Other" aggregate includes CanSino Biologics, COVAX, CureVac, G42 Healthcare, Gamaleya, Johnson & Johnson, Medicago, Novavax, Sanofi−GlaxoSmithKline, Sinovac, and Valneva.
Source: Duke Global Health Innovation Center; Goldman Sachs; Deutsche Bank; Bloomberg.

Figure 13. Emerging Market Economies: Procured Vaccines

Per capita doses
- Pfizer and Moderna
- AstraZeneca
- Other
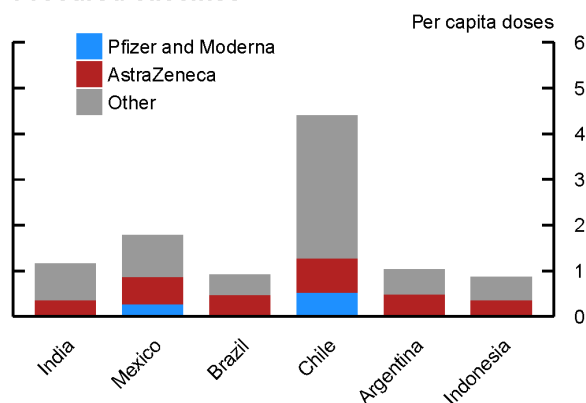
Note: "Other" aggregate includes CanSino Biologics, COVAX, CureVac, G42 Healthcare, Gamaleya, Johnson & Johnson, Medicago, Novavax, Sanofi−GlaxoSmithKline, Sinovac, and Valneva. COVAX is an association created by the World Health Organization to redistribute vaccines to developing countries.
Source: Duke Global Health Innovation Center; Goldman Sachs; Deutsche Bank.

Recovery in foreign economies faces significant headwinds

With the notable exception of China, we project that GDP in the majority of foreign economies will return to pre-pandemic levels only slowly (figure 14). For countries still struggling to control the virus, we assume recessionary dynamics will further impede the recovery. The outlook is especially fragile for Latin America, which suffered a strong contraction in the spring, and the GDP level is projected to recover to its pre-pandemic level only in 2023. For this region, we see impaired balance sheets and high debt as constraining investment long after the pandemic has been contained.

In the AFEs, the extension of wage subsidy schemes should continue to contain increases in unemployment in the near term but will also delay the structural reallocation of workers. Accordingly, our projection assumes persistently higher unemployment rates in Europe, as wage subsidy schemes are terminated but institutional rigidities delay the reemployment of workers (figure 15). Similarly, the resurgence of the virus and associated restrictions are further stressing balance sheets of firms, especially small and medium-sized enterprises. In many countries, new business registrations plunged in the spring and, so far, have rebounded only partially (figure 16). Governments have extended further support to firms in the form of income transfers and, in some cases, loan guarantees, payment moratoriums, and the suspension of insolvency notifications. Such support prevented widespread business failures but will also extend the life of nonviable firms, weighing on business dynamism and productivity.

Figure 14. Foreign Level of Real GDP

Note: Data are weighted by bilateral shares in U.S. merchandise exports.
Source: Staff forecasts.
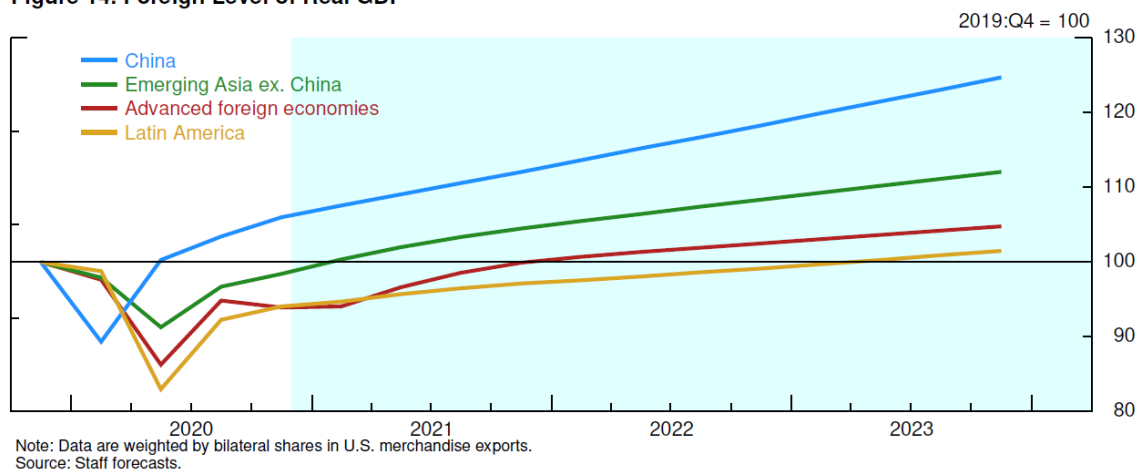
Figure 15. Unemployment Rate in Selected Advanced Economies

Percent of labor force

* Forecast from Board of Governors of the Federal Reserve System, Division of Research and Statistics.
Source: Haver Analytics; staff forecast.
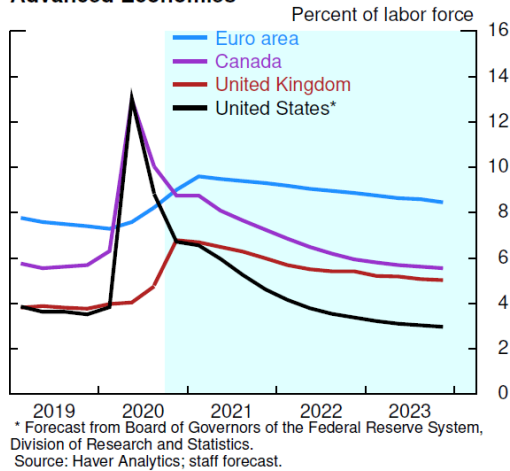
Figure 16. New Business Registrations

Percent change from year earlier
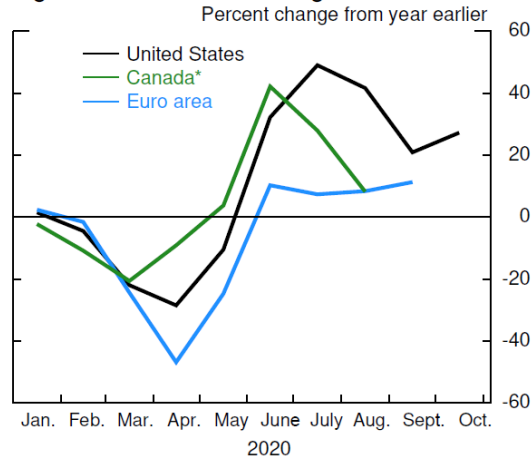
Note: The euro area includes Italy, Spain, France, and Germany. The data for Canada extend through August 2020.
* Business openings are defined as businesses with employment in the current month and no employment in the previous month.
Source: U.S. Census Bureau; Federal Statistical Office of Germany; Insituto Nacional de Estadistica; Statistics Canada; Bank of Italy; National Institute of Statistics and Economic Studies; Sara Formai, Francesca Lotti, Francesco Manaresi, and Filippo Scoccianti (2020), "Entrepreneurial Lockdown," unpublished working paper.

Risks to the baseline forecast are now more balanced than in the spring as vaccine news further reduces extreme downside risks and raises possible upside risks

The availability of several highly effective vaccines reduces the likelihood of extreme downside scenarios and raises the possibility that an effective vaccine could be widely administered earlier than assumed in the baseline. We explore this upside possibility in the "Early Vaccine" scenario in the Risks and Uncertainty section (the red line in figure 17). Earlier widespread vaccine administration may result in a more buoyant recovery in consumer and business confidence, boosting economic activity and reducing, potentially considerably, the significant scarring effects present in our baseline outlook.

Figure 17. Foreign GDP: Baseline and Scenarios

Source: Staff calculations.
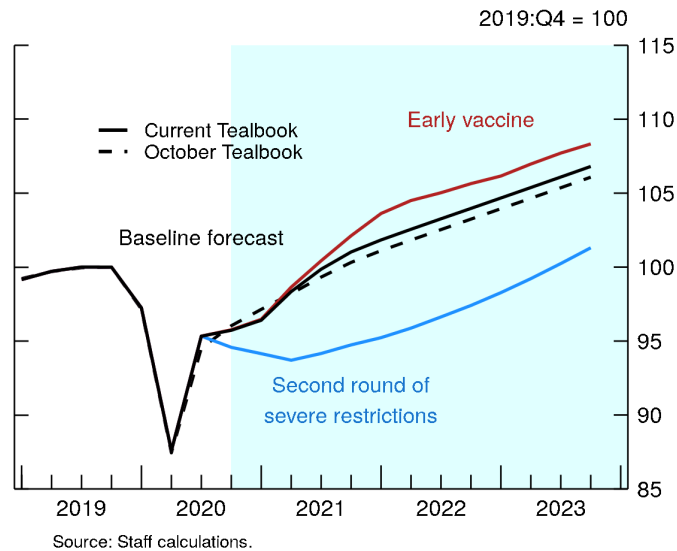
Significant downside risks remain, nonetheless

On the downside, the current surge in infections in the United States and abroad may prove more tenacious, making extensive and economically costly restrictions unavoidable, with greater scarring effects on employment and productivity that could be amplified by a lack of monetary and fiscal policy space. This outcome could roil global financial markets and severely stress vulnerable economies. We explore such an outcome in the "Second Round of Severe Restrictions" scenario in the Risks and Uncertainty section (the blue line in figure 17).

In addition to scenario analysis, we also assess risks using a model that extracts information about the likely range of future output growth based on incoming economic and financial indicators.[1] As seen in figure 18, the distribution of possible one-year-ahead GDP realizations has narrowed considerably since March thanks to continued resilience in economic indicators and favorable financial conditions. That said, risk remains tilted to the downside, and outcomes such as those envisioned in the "Second Round of Severe Restrictions" scenario are still in the tail of possible adverse events.

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[1] See the "Model-Based Assessment of Risk" discussed in the Risks and Uncertainty section for additional details about the Markov-switching model, a comparison with an alternative "growth at risk" approach based on quantile regressions, and estimates for the United States.

**Figure 18. Conditional Distributions of 1-Year-Ahead GDP Growth
for the Foreign Economy Aggregate**
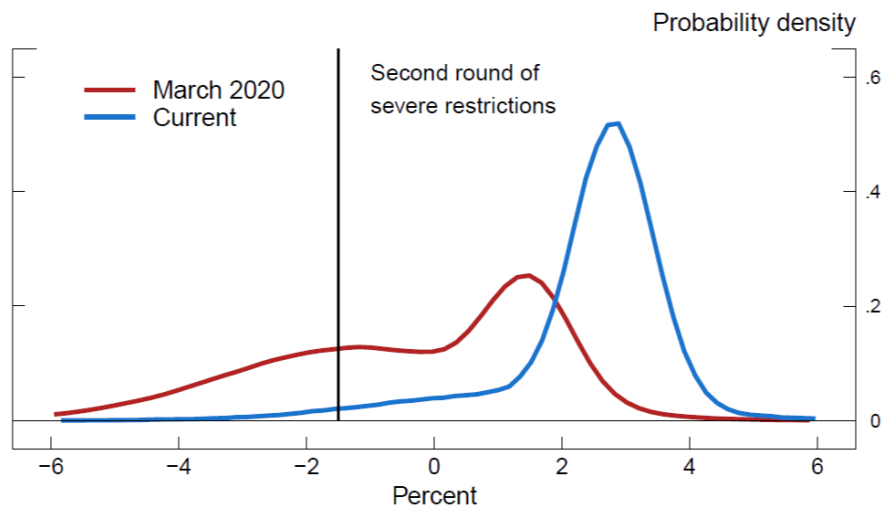
Note: The exhibit shows estimates of the conditional distribution of GDP growth for the foreign economy aggregate
1 year ahead. The distributions are estimated using a 2-state Markov-switching model. The estimates are conditioned
on foreign indicators of macroeconomic conditions and global indicators of financial conditions. Data are current as of
October 2020.
Source: Staff calculations.

Even without an amplification of the current outbreak and more severe
restrictions, recessionary dynamics and scarring may prove more persistent and delay a
return to pre-COVID levels of activity, especially in countries experiencing pronounced
virus resurgence. In addition, vaccine distribution and take-up may not occur in time to
prevent widespread business failures and, especially in some EMEs, a destabilizing rise
in government debt that, in turn, could jeopardize financial stability.

Finally, a "no deal" Brexit remains a significant downside risk to the U.K. outlook
and, to a lesser extent, the global economy, given the continued lack of progress in
negotiations. Although we still assume that a trade deal between the United Kingdom
and the European Union will be reached by year-end, this outcome is not assured.

Regional Developments and Outlook

ADVANCED FOREIGN ECONOMIES

- *Euro Area.* After a strong but partial rebound in the third quarter, euro-area GDP is set to contract 10 percent at an annual rate this quarter and to expand a meager 1 percent next quarter. The contraction results largely from tighter COVID-19 restrictions. Indicators through November, including mobility and PMIs, are indeed consistent with a sizable economic hit focused in hospitality and other socially intensive service sectors including entertainment and recreation. Some of the most stringent restrictions are explicitly temporary. The still-high number of hospitalizations, however, leads us to anticipate only a gradual easing of these measures, which should return to their October levels only at the end of January. We expect GDP to bounce back 7.4 percent in 2021, about 2.5 percentage points more than in the October Tealbook, on the assumption that positive vaccine developments and waning public support for lockdown measures will result in a quicker unwinding of restrictions. The European Union (EU) finalized significant commitments with several vaccine manufacturers—including Pfizer, Moderna, and AstraZeneca—and is expected to vaccinate most of its population by end-2021.

  Fiscal and monetary policy should also bolster the recovery. Short-term work schemes continue to support employment in affected industries, and governments have put in place additional fiscal measures for businesses closed due to lockdowns. In addition, disbursements from the EU Recovery Fund, notwithstanding recent setbacks in negotiations, are expected to begin in the second half of next year. We continue to assume that, at its December meeting, the ECB will announce a €500 billion expansion of asset purchases under its Pandemic Emergency Purchase Programme, bringing the total amount of assets to be purchased since the onset of the pandemic to €1.85 trillion (about 16 percent of GDP). We also assume that the ECB will unveil more attractive conditions on targeted longer-term refinancing operations (TLTRO III). Even with this policy support, 12-month headline inflation is projected to recover only gradually from its current pace of just below zero, reaching a meager 1.2 percent at the end of the forecast period.

- *United Kingdom.* After surging 78 percent at an annual rate in the third quarter, we see U.K. GDP contracting 10 percent this quarter given restrictions imposed to tame the resurgence of infections, leaving GDP still more than 10 percent below its pre-pandemic level. Recent PMIs and mobility readings point already to a considerable slowdown in economic activity, though of a smaller magnitude than observed in the spring. This time around, the U.K. government introduced less stringent measures focused on socially intensive sectors while leaving schools and factories open. In addition, the government extended its furlough program and loans to businesses in need. We project that stringent measures to limit social contacts will prevail through next quarter. Nonetheless, we expect GDP to grow more than 11 percent next year, as the virus spread wanes, the vaccine is rolled out, and restrictions ease. The U.K. health authorities have been the first ones to approve usage of the Pfizer vaccine, and the first vaccine doses should be administered in the United Kingdom in coming weeks. The government also has a number of other vaccine deals and thus should be able to vaccinate quickly most of its

population. Although the positive vaccine news has brightened the outlook for next year, the possibility of a "no trade deal" Brexit remains an important downside risk.

On November 5, the Bank of England (BOE) increased the target stock of its asset purchases by an additional £150 billion of government bonds (bringing the total of purchases since the pandemic started to £450 billion, around 20 percent of GDP), which are to be completed by the end of next year. The BOE also stated that it is ready "to take whatever additional action is necessary to achieve its remit" and it reiterated its forward guidance of not tightening monetary policy "at least until there is clear evidence that significant progress is being made in eliminating spare capacity and achieving the 2% inflation target sustainably."[1]

- *Canada*. GDP rebounded 40.5 percent at an annual rate in the third quarter, but since then, the near-term outlook has deteriorated. New COVID-19 cases have steadily increased since mid-August, prompting local authorities to tighten social-distancing measures in most affected areas. Mobility and credit card spending data through November suggest that these restrictions have already taken a toll. Accordingly, we expect GDP to decline this quarter and the next quarter by about 1 percent, on average. The medium-term outlook for the Canadian economy, however, is somewhat brighter thanks to promising vaccine news. Since the beginning of the pandemic, the Canadian government has secured a large number of vaccine doses (around 10 doses per person), including major contracts with Pfizer, Moderna, and AstraZeneca. With restrictions assumed to be lifted somewhat earlier than in the October Tealbook, we see GDP reaching its pre-COVID level by the end of 2021.

   At its October meeting, the Bank of Canada (BOC) added a specific time reference to its forward guidance. The BOC stated that, based on its current projection for economic slack and inflation, the policy rate likely will be held at its effective lower bound of ¼ percent until 2023. The BOC also announced a recalibration of its quantitative easing (QE) program, shifting purchases toward longer-term bonds while gradually reducing the pace of purchases to C$4 billion a week from C$5 billion. The BOC stated that it sees these QE adjustments as "providing at least as much monetary stimulus as before."[2] In line with this communication and our growth outlook, we expect the BOC to wait until 2023 before raising its policy rate.

- *Japan.* The third-quarter bounceback in GDP of 21.4 percent at an annual rate was faster than estimated in the October Tealbook, as net exports and private consumption recovered sharply. In addition, despite recent upticks, new COVID-19 cases and deaths remain very low compared with most advanced economies. Hence, notwithstanding a weak external environment, we expect relatively robust GDP growth in the current and next quarters, averaging a bit below 4 percent. With limited long-term scarring from the virus and positive vaccine developments in many trading partners, we see Japanese GDP returning to its pre-COVID level by late next year, somewhat earlier than in the October Tealbook.

[1] Monetary Policy Committee (2020), "Bank Rate Held at 0.1% and Asset Purchases Increased by £150bn—November 2020," monetary policy summary and minutes of the Monetary Policy Committee meeting (London: Bank of England, November 5), https://www.bankofengland.co.uk/monetary-policy-summary-and-minutes/2020/november-2020.

[2] Bank of Canada (2020), "Bank of Canada Will Maintain Current Level of Policy Rate until Inflation Objective Is Achieved, Recalibrates Its Quantitative Easing Program," press release, October 28, https://www.bankofcanada.ca/2020/10/fad-press-release-2020-10-28.

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The inflation outlook remains bleak, however. On a 12-month basis, inflation turned negative in October, reflecting declines in energy and core prices. We see inflation near zero over the next three quarters before gradually edging up to a bit below 1 percent by the end of 2023. Accordingly, we expect the BOJ to keep its current highly accommodative monetary stance over the forecast period. We assume that the policy rate will remain at negative 0.1 percent and that the BOJ will purchase Japanese government bonds to keep 10-year yields around zero percent.

EMERGING MARKET ECONOMIES

- *China.* Recent indicators show continued momentum for the Chinese economy in the fourth quarter, following two quarters of robust recovery. Much of this momentum is attributable to strong export growth; despite slowing activity in advanced economies, China remains a major exporter of goods (electronics and medical products) for which demand has been exceptionally strong during the pandemic. Domestic demand, which has been lagging the recovery, is also starting to catch up, reflecting both policy stimulus and China's success in containing the virus. The strength in Chinese activity is, in turn, providing a boost to other countries in the region and to commodity-exporting EMEs for which China is a major source of demand. All told, we expect the economy to grow at a solid 10 percent pace in the fourth quarter, which would bring GDP above the level we projected before the pandemic. As the recovery matures, we expect Chinese authorities to gradually dial back policy stimulus and refocus attention on financial stability risks, with GDP growth slowing over the forecast period to 5.4 percent in 2023.

- *Asia ex. China.* After surging at a stronger-than-anticipated 25.9 percent in the third quarter, growth in the region is set to moderate sharply to 7.4 percent in the current quarter, about 3 percentage points lower than in the October Tealbook. This revision reflects, in part, a pulling-forward of growth into the third quarter. In addition, we expect some near-term weakness in exports as growth falters in the advanced economies, which is only partially offset by continued strong demand from these economies for high-tech goods and medical supplies.

  Recent indicators suggest domestic demand remains relatively resilient in emerging Asia, particularly in countries that have the virus under control. By the same token, recent vaccine developments have not greatly changed our view on the outlook. The more developed economies in the region are already managing to live with the virus with relatively few social restrictions, and the region's less developed economies face considerable distribution challenges that will significantly constrain the rollout of any vaccine. All told, we see activity normalizing gradually over the next several quarters, approaching the pre-COVID level by the middle of next year.

  The recent signing of the Regional Comprehensive Economic Partnership, a new trade agreement, could boost regional integration and growth in the long run. Given that tariffs between signatory countries are already low, however, the agreement is not expected to have much effect over the forecast period.

- *Mexico.* After a massive contraction in the second quarter, the Mexican economy partially rebounded at a 58 percent annual rate in the third quarter, boosted by very strong external demand, especially for autos. Domestic demand, in contrast, remained weak, reflecting the

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paucity of policy support as well as a difficult virus situation. We expect the near-term outlook to remain challenging, as external demand—and in particular demand for inputs to U.S. manufacturing production—moderates. Although the availability of several promising vaccines offers welcome light at the end of the tunnel for Mexico, the distributional challenges involved have led us to assume a slow rollout. All told, we expect the Mexican economy to contract 6.4 percent this year and to expand only 3.3 percent in 2021. We continue to see significant headwinds persisting long after the virus itself has been contained, exacerbated by low policy support and a lack of structural reforms.

- *Brazil.* The solid recovery in Brazil's activity led to a third-quarter rebound in GDP of 34.6 percent, leaving GDP about 4 percent below its pre-pandemic level—a markedly better performance than Mexico, where GDP is still down 8 percent. Brazil's outperformance in the region has been fueled by the government's emergency aid payments to households and relatively lenient social restrictions. Virus containment continues to be challenging, however, with the number of new daily cases rising in recent weeks. In addition, we anticipate a significant drag on economic activity as emergency fiscal support programs are ended. With public debt around 100 percent of GDP, we expect concerns about fiscal sustainability and reform prospects, together with monetary tightening, to be reflected in tight financial conditions. All told, we expect the economy to expand 5 percent this quarter and a meager 1.7 percent next year. Return to International text

Int'l Econ Devel & Outlook

Measuring the Effects of the Pandemic in Europe

Europe is experiencing a resurgence of coronavirus (COVID-19) infections and fatalities, with the majority of countries registering a record number of cases and almost as many deaths as in the spring (left panel of figure 1). Consequently, governments have tightened restrictions on activity (middle panel), and social distancing has increased, leading to a decline in mobility (right panel). That said, our forecast assumes that the economic effect of the resurgence of the virus will be less damaging than before, as recent restrictions are less severe than in the spring and health-care systems as well as businesses and households appear to be better at handling the virus. This discussion presents empirical evidence in support of this assessment.

To quantify how the severity of the pandemic and the restrictions imposed to control it affect economic activity, we estimate a time-varying panel vector autoregressive model (VAR). The model allows for the interactions between these variables to vary over time, making it possible to investigate whether the connections between the pandemic, governments' restrictions, and activity have changed since the beginning of the pandemic. The model uses daily data from 10 European countries on three variables: COVID-19 deaths, a proxy for the overall intensity of the pandemic; the Oxford stringency index, a measure of policy restrictions; and the Google mobility index, a widely used high-frequency proxy of economic activity.[1] We allow the model coefficients to vary between the first half and second half of the year.

Our estimates indicate that the ongoing virus resurgence should prove less damaging to economic activity than in the spring. While an increase in the number of COVID-19-related deaths prompts a rise in the stringency of restrictions and a sharp decline in mobility in both periods, this effect is substantially smaller in the second half of the sample.[2] Additionally, we find evidence that stringency measures have become more effective over time in curbing deaths for a given change in mobility, pointing to an improved tradeoff between population health and economic activity. Lastly, the severity of the virus resurgence—as measured by the size of the estimated shock to deaths—is also smaller than in the spring.

Figure 1: Number of COVID-19 Deaths, Oxford Stringency Index, and Google Mobility in Europe
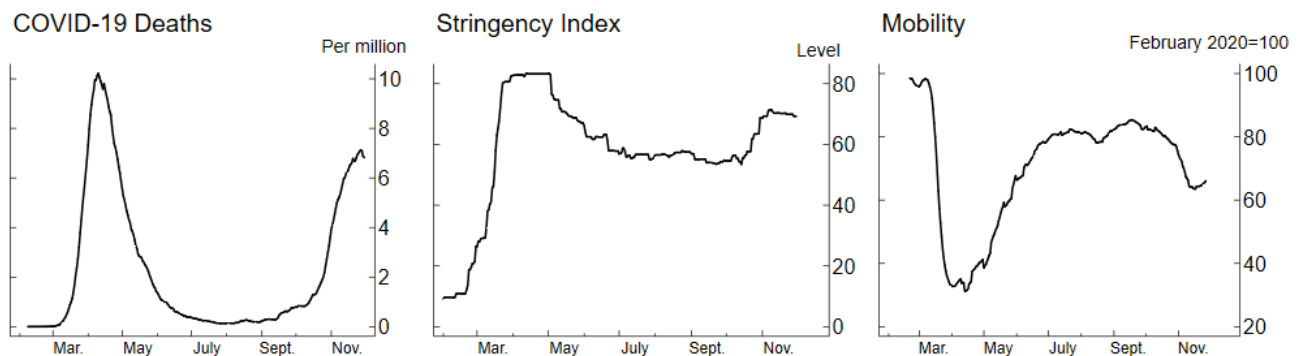
Source: Staff calculations.

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[1] The number of deaths per capita 20 days ahead—the average time between infection and death—proxies for the state of the pandemic. Mobility is the average of Google work and retail mobility. The sample runs from February 1 through November 30, 2020, and includes Belgium, France, Germany, Greece, Italy, Netherlands, Portugal, Spain, Sweden, and the United Kingdom.

[2] Our identification strategy assumes a recursive structure, often seen in VAR models, in which causality runs from the state of the pandemic (deaths) to stringency to mobility. That is, stringency responds to current deaths, and mobility responds to the current state of both deaths and stringency. All three variables can affect each other with a one-period lag or more.

To illustrate these points, we use the model to trace out what would have happened in Europe if the current rise in deaths had taken place in the environment of six months ago. Figure 2 compares the recent data for stringency, mobility, and deaths (black lines) with the counterfactual of how the variables would have behaved if the shocks that account for the resurgence in the virus since October had been applied to the estimated model economy from the 2020:H1 period (red lines). As the figure shows, we would have observed tighter restrictions and a larger drop in mobility, together with a slightly lower death toll.

To quantify how the effects of the pandemic on economic activity have changed over time, we make use of an auxiliary regression that links changes in mobility to changes in GDP.[3] This calculation suggests that, had the economy responded to the recent virus resurgence as in the first half of the year, we would have penciled in a decline in euro-area GDP in the current quarter of 17 percent at an annual rate, about 7 percentage points more than in our baseline.[4]

Our model estimates also suggest that both a less-aggressive policy response and, to a lesser extent, increased resilience of households and firms, account for the reduced economic damage from the virus resurgence. This evidence is consistent with the fact that governments are now focusing on more-targeted restrictions—largely concentrated in nonessential activities, such as the hospitality industry and other socially intensive service sectors—rather than widespread lockdowns, as they did in the first half of the year. Indeed, schools, factories, and many nonessential businesses outside of the hospitality sector have generally remained open. The less-stringent policy responses may also reflect concerns about social unrest in response to restrictions, especially in places with limited fiscal space to provide additional support. The increased resilience is likely to reflect better handling of the virus by the public in terms of safer business practices and social distancing (use of masks, contact tracing, and reduced interactions with the elderly).

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Int'l Econ Devel & Outlook

Figure 2: Data since the Resurgence in Deaths and Counterfactual Responses

Source: Staff calculations.

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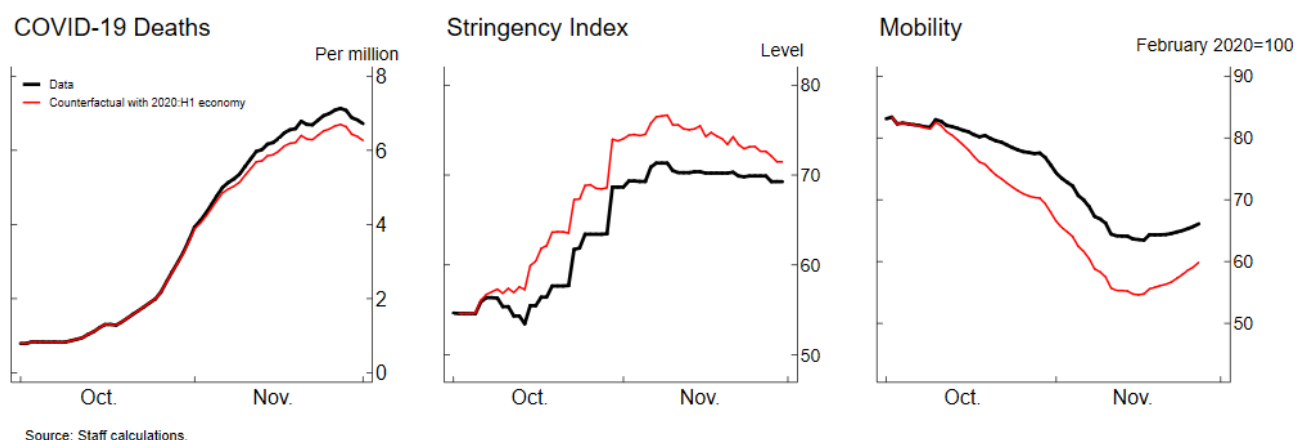
[3] Specifically, we compute how much of the gap between the staff's pre-pandemic path and the staff's current path of GDP can be associated with the decline in mobility since the start of the pandemic.

[4] This calculation assumes that the difference in mobility between the counterfactual and the data persists through year-end.

Status of Support Programs at Major Foreign Central Banks

Our outlook for the advanced foreign economies (AFEs) has a rebound in economic growth next year that is underpinned by continued accommodative monetary policy, with policy rates near or below zero and large-scale purchases of sovereign bonds. In addition to this general stimulus, AFE central banks also have ongoing support programs aimed at particular markets or sectors of the economy. Although these support programs differ some from the Federal Reserve's facilities, they serve much the same purpose: to address market dysfunction and to ensure that credit flows to borrowers and thus supports economic activity.

The table provides a brief overview of the support programs initiated or expanded in the spring of 2020 at several major foreign central banks: the European Central Bank (ECB), the Bank of England (BOE), the Bank of Canada (BOC), the Bank of Japan, and the Reserve Bank of Australia (RBA). We divide the programs into three groups: (1) asset purchase programs, (2) short-term financing facilities, and (3) bank term funding facilities.

These central banks have programs to purchase central government debt, but several also buy other forms of government debt. The BOC and RBA have programs that buy provincial or state debt in order to improve borrowing conditions for those subnational entities. The ECB's Pandemic Emergency Purchase Programme also can buy debt of regional and local governments within the euro area, but, more importantly, it provides flexibility to buy relatively more bonds of euro-area national governments (such as Italy) that have faced relatively unfavorable financing conditions during the pandemic.

Most of these central banks also buy corporate debt or other private assets, such as shares of exchange-traded equity funds. They also have short-term financing facilities to ensure liquidity in key financial markets that came under pressure during the spring. And their bank term funding facilities ensure the flow of credit to firms and households by providing medium-term financing (typically of three to four years) to banks, sometimes with incentives for expanding net lending (especially to small and medium-sized enterprises). This credit is channeled through banks rather than through financial markets, given the generally bank-centric financial systems in AFEs.

Most of the support programs remain in effect through next spring or are open-ended. In particular, these central banks have maintained asset purchase programs that buy corporate and subnational bonds, and they have extended—and made more attractive—their bank term funding facilities in order to facilitate the flow of credit to firms and households.

At the same time, these central banks have cut back some of their short-term financing programs as liquidity has returned to financial markets. (The four programs that have been discontinued are shown in red in the table.) The BOC ended its programs to buy bankers' acceptances (a key source of financing for small and medium-sized corporate borrowers) and provincial money market securities, though it noted that "any discontinued facilities can be restarted if necessary."[1] Similarly, the BOE ended its pandemic-related contingent term repo facility. Both the BOC and BOE

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[1] See Bank of Canada (2020), "Bank of Canada Announces Changes to Programs that Support Key Financial Markets," market notice (Ottawa: BOC, October 15), https://www.bankofcanada.ca/2020/10/bank-canada-announces-changes-programs-support-key-financial-markets.

cited significant declines in usage as reasons for ending those programs. The BOC also discontinued its purchases of mortgage bonds for the same reason.

In addition to these central bank programs, some AFE governments have set up programs outside the central banks that provide direct loans or loan guarantees for businesses. For instance, the BOE's COVID Corporate Financing Facility, a joint facility with the U.K. Treasury, is designed to support liquidity among larger firms. The U.K. government also has several other programs for loans to firms, including small businesses. The application deadlines for those loan programs were extended in recent months from September 30, 2020, to January 31, 2021. Other European governments also have sizable ongoing programs of loan guarantees or credit support to large and small businesses.
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Support Programs at Major Foreign Central Banks

Central bank	Program	National government	Subnational government	Corporate or other private	End date
Asset purchase programs					
ECB	Pandemic Emergency Purchase Programme	X*	X*	X	June 2021
BOE	COVID Corporate Financing Facility			X	Mar. 2021
BOC	Provincial Bond Purchase Program		X		May 2021
	Corporate Bond Purchase Program			X	May 2021
	Canada Mortgage Bond Purchase Program			X	Oct. 2020
BOJ	Outright Purchases of CP and Corporate Bonds			X	Open-ended
	Purchases of ETFs and J-REITs			X	Open-ended
RBA	Long-dated government bond and semi-government bond purchases	X	X		Mid-2021
Short-term financing facilities					
BOE	Contingent Term Repo Facility	Repo			June 2020
BOC	Standing Term Liquidity Facility	Repo			Open-ended
	Contingent Term Repo Facility	Repo			Apr. 2021
	Bankers' Acceptance Purchase Facility			X	Oct. 2020
	Provincial Money Market Purchase Program		X		Nov. 2020
	Commercial Paper Purchase Program			X	Apr. 2021
Bank term funding facilities					
ECB	Pandemic Emergency Longer-Term Refinancing Operations (PELTROs)				Dec. 2020
	Targeted Longer-Term Refinancing Operations (TLTRO III)				June 2021
BOE	Term Funding Scheme with additional incentives for SMEs (TFSME)				Apr. 2021
BOJ	Special funds-supplying operations to support financing mainly of SMEs				Mar. 2021
RBA	Term Funding Facility				June 2021

Note: ECB is European Central Bank; BOE is Bank of England; BOC is Bank of Canada; BOJ is Bank of Japan; RBA is Reserve Bank of Australia; CP is commercial paper; ETF is exchange-traded fund; J-REIT is Japanese real estate investment trust; SME is small and medium-sized enterprise.
    * Public-sector purchases are primarily of national governments but also of agencies, regional and local governments, international organizations, and multilateral development banks located in the euro area.

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Comparing the Staff International Growth Outlook with Other Forecasts

Following a deep recession in the first half of this year and a stronger-than-expected rebound in the third quarter, the Board's staff and outside forecasters anticipate the foreign economic recovery to lose momentum in the near term before picking up next year. As shown in the first row of the table, the staff sees total foreign output in 2020 contracting at a similar pace to the rate estimated by Consensus Economics but less than projected by the International Monetary Fund (IMF). The IMF forecast was published in October, before the release of third-quarter GDP reports. For 2021, the Board's staff is more optimistic than other forecasters and anticipates a stronger recovery abroad, especially in China and other emerging market economies. The Organisation for Economic Co-operation and Development trimmed its estimate of growth for next year in its latest update, released December 1, and now anticipates a slower recovery in 2021 in both advanced and emerging economies than projected by the staff and other forecasters.

Despite a resurgence of COVID-19 in some parts of the world, the staff's 2020 forecast for the aggregate foreign economy and that of Consensus Economics are little changed, on net, since the October Tealbook (shown in panel A on the next page). Regarding the outlook for next year, while the near-term outlook has deteriorated, especially in advanced economies, both outside forecasters and the staff anticipate growth to pick up as economies recover from their deep holes. The staff has marked down the 2021 outlook somewhat relative to midyear, but its estimate of growth remains more optimistic than those of other forecasters (panel B). Professional forecasters and international organizations continue to highlight the uncertainty in the economic outlook for next year. For instance, the forecasts collected by Consensus Economics range from 2.7 to 7.4 percent for the euro area and from 5.5 to 9.5 percent for China.

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Comparison of Foreign Real GDP Forecasts

| | Year-over-year percent change | | | | | | | |
| | 2020 | | | | 2021 | | | |
	FRB	IMF	Consensus	OECD	FRB	IMF	Consensus	OECD
1. Total foreign	-5.6	-6.2	-5.8	n.a.	4.9	4.6	4.5	n.a.
2. Advanced foreign economies	-6.6	-7.4	-6.5	-6.5	4.4	4.8	4.4	3.4
3. Canada	-5.8	-7.1	-5.7	-5.4	4.0	5.2	4.8	3.5
4. Euro area	-7.3	-8.3	-7.3	-7.5	5.1	5.2	4.7	3.6
5. Japan	-5.3	-5.3	-5.5	-5.3	3.1	2.3	2.5	2.3
6. United Kingdom	-11.3	-9.8	-11.0	-11.2	5.9	5.9	4.7	4.2
7. Emerging market economies	-4.7	-5.3	-5.2	n.a.	5.6	4.6	4.7	n.a.
8. China	1.9	1.9	2.0	1.8	10.1	8.2	7.9	8.0
9. Emerging Asia ex. China	-2.7	-4.0	-3.5	n.a.	5.5	4.3	4.6	n.a.
10. Mexico	-9.0	-9.0	-9.4	-9.2	4.3	3.5	3.6	3.6
11. Brazil	-5.0	-5.8	-4.9	-6.0	3.1	2.8	3.2	2.6
Memo								
Emerging market economies ex. China	-6.1	-6.8	-6.7	n.a.	4.7	3.8	4.0	n.a.
India	-8.0	-10.3	-9.4	-9.9	15.5	8.8	10.2	7.9
United States	-3.5	-4.3	-3.7	-3.7	4.0	3.1	3.8	3.2

Note: Gross domestic product (GDP) aggregates are weighted by shares of U.S. nonagricultural exports. India is excluded from all year-over-year forecast aggregates, as Consensus Economics reports Indian growth on a fiscal year basis. Federal Reserve Board (FRB) forecasts are from the current Tealbook. International Monetary Fund (IMF) forecasts are from the October 2020 *World Economic Outlook*. Consensus Economics' forecasts were published on November 12 for advanced economies and Asian countries, November 18 for Latin American countries, and November 19 for Russia. Organisation for Economic Co-operation and Development (OECD) forecasts are from the December 2020 preliminary *Economic Outlook* for most countries and from the May 2020 *Economic Outlook* for Sweden and Switzerland.

   n.a. Not available.

   Source: Federal Reserve Board Tealbook forecasts; International Monetary Fund; Consensus Economics; Organisation for Economic Co-operation and Development.

Evolution of Foreign Growth Forecasts

A. Forecasts of 2020 Real GDP

Year-over-year percent change

- Consensus Economics
- International Monetary Fund
- Federal Reserve Board
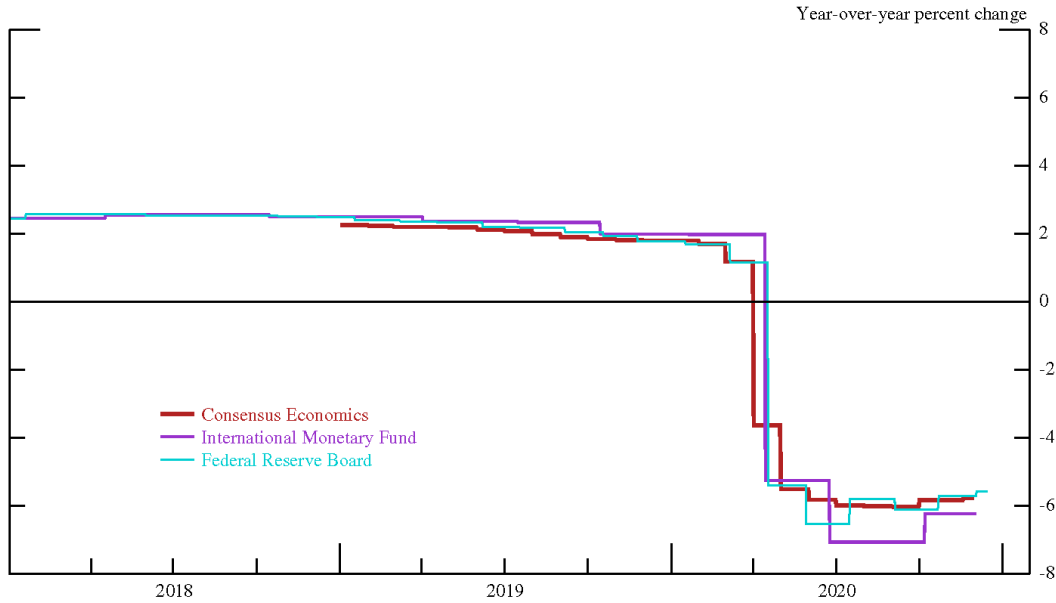
B. Forecasts of 2021 Real GDP
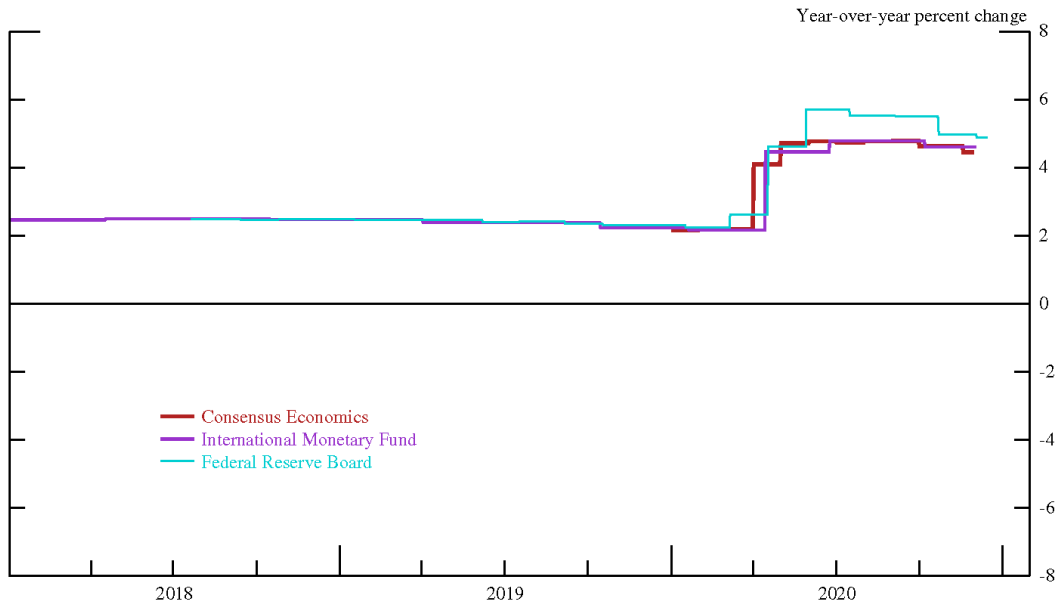
Year-over-year percent change

- Consensus Economics
- International Monetary Fund
- Federal Reserve Board

Note: Gross domestic product (GDP) aggregates are weighted by shares of U.S. nonagricultural exports. India is excluded from all year-over-year forecast aggregates, as Consensus Economics reports Indian growth on a fiscal year basis. Federal Reserve Board (FRB) forecasts are from the current Tealbook. International Monetary Fund (IMF) forecasts for almost all individual countries are from the October 2020 *World Economic Outlook*. Consensus Economics' forecasts were published on November 12 for advanced economies and Asian countries, November 18 for Latin American countries, and November 19 for Russia. Consensus Economics began forecasting 2020 only in 2019 and 2021 only in 2020. The FRB and IMF began forecasting 2020 and 2021 earlier.
Source: Federal Reserve Board Tealbook forecasts; International Monetary Fund; Consensus Economics.

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The Foreign GDP Outlook

Real GDP*

Percent change, annual rate**

	2019	2020				2021	2022	2023
		Q1	Q2	Q3	Q4			
1. Total foreign	1.3	-10.6	-34.2	40.4	1.7	5.5	2.9	2.7
Previous Tealbook	*1.3*	*-10.9*	*-34.4*	*36.5*	*6.5*	*4.5*	*2.9*	*2.8*
2. Advanced foreign economies	1.2	-9.0	-39.0	45.9	-4.0	6.4	2.6	2.2
Previous Tealbook	*1.1*	*-9.4*	*-39.1*	*42.6*	*4.3*	*4.4*	*2.5*	*2.2*
3. Canada	1.7	-7.3	-38.1	40.5	-.5	5.7	2.8	2.5
4. Euro area	1.0	-14.1	-39.5	60.5	-10.2	7.4	2.5	2.2
5. Japan	-.7	-2.3	-28.8	21.4	4.3	3.3	1.3	1.1
6. United Kingdom	1.0	-9.7	-58.7	78.0	-10.2	11.4	3.1	1.5
7. Emerging market economies	1.5	-12.1	-29.1	35.0	7.7	4.7	3.2	3.3
Previous Tealbook	*1.4*	*-12.4*	*-29.2*	*30.7*	*8.9*	*4.5*	*3.4*	*3.3*
8. China	5.9	-36.3	59.1	13.1	10.2	5.7	5.5	5.4
9. Emerging Asia ex. China	1.7	-8.1	-24.4	25.9	7.4	6.2	3.7	3.5
10. Mexico	-.7	-4.9	-52.4	58.0	7.1	3.3	1.9	2.2
11. Brazil	1.5	-6.0	-33.2	34.6	5.0	1.7	2.8	2.6
Memo								
Emerging market economies ex. China	.6	-6.1	-40.0	40.1	7.2	4.5	2.8	2.8

* GDP aggregates weighted by shares of U.S. merchandise exports.
** Annual data are Q4 over Q4.

Total Foreign GDP
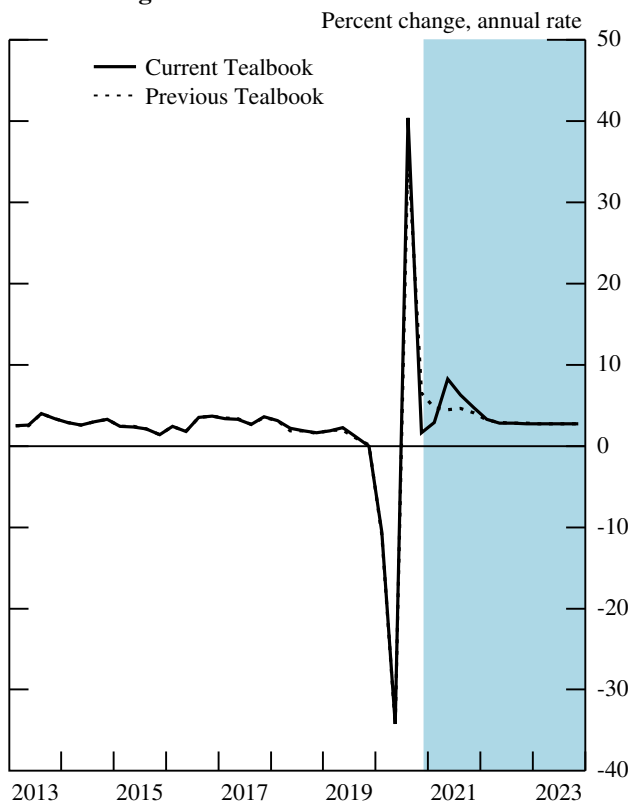
Foreign GDP
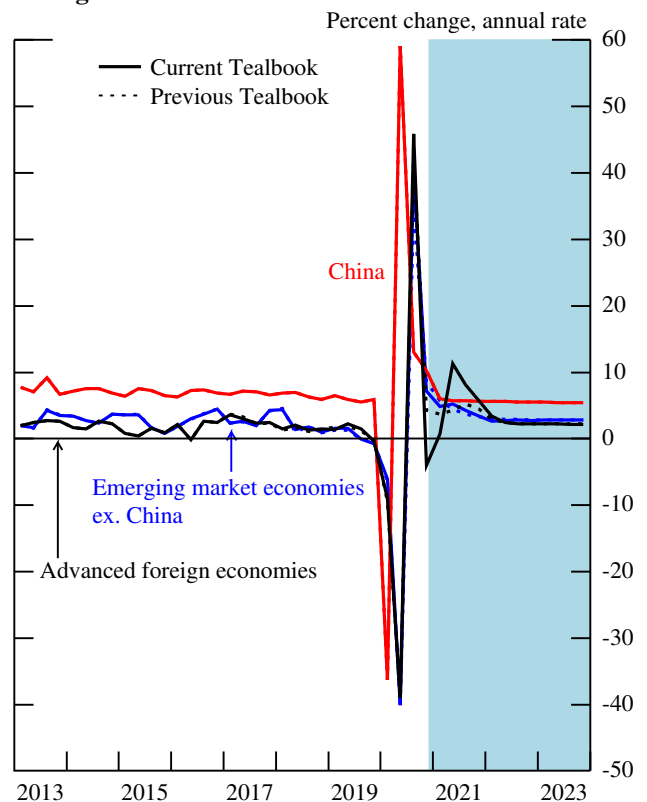
The Foreign Inflation Outlook

Consumer Prices*   Percent change, annual rate**

	2019	2020 Q1	Q2	Q3	Q4	2021	2022	2023
1. Total foreign	2.4	2.3	-2.1	2.7	1.2	2.1	2.2	2.3
Previous Tealbook	*2.4*	*2.3*	*-2.2*	*2.7*	*1.8*	*2.1*	*2.2*	*2.3*
2. Advanced foreign economies	1.2	.6	-2.0	1.0	.8	1.1	1.2	1.4
Previous Tealbook	*1.2*	*.6*	*-2.0*	*1.0*	*1.1*	*1.1*	*1.3*	*1.4*
3. Canada	2.1	.5	-3.3	3.0	2.3	1.5	1.9	2.0
4. Euro area	1.0	.7	-1.4	-.4	.8	1.0	1.0	1.2
5. Japan	.5	.3	-1.0	.7	-2.1	.4	.6	.8
6. United Kingdom	1.4	2.0	-1.5	1.5	1.3	2.1	1.7	1.9
7. Emerging market economies	3.3	3.5	-2.2	3.9	1.5	2.8	2.8	2.9
Previous Tealbook	*3.3*	*3.6*	*-2.2*	*3.9*	*2.2*	*2.8*	*2.8*	*2.9*
8. China	4.2	4.2	-4.3	2.3	-1.0	2.5	2.5	2.5
9. Emerging Asia ex. China	1.9	2.5	-3.5	3.5	2.1	2.5	2.6	3.0
10. Mexico	2.9	3.3	2.0	7.1	3.8	3.2	3.2	3.2
11. Brazil	3.4	4.9	-1.6	3.9	7.1	3.7	3.5	3.5
Memo								
Emerging market economies ex. China	2.6	3.0	-.7	5.1	3.2	3.0	3.1	3.2

* CPI aggregates weighted by shares of U.S. non-oil imports.
** Annual data are Q4 over Q4.

Foreign Monetary Policy
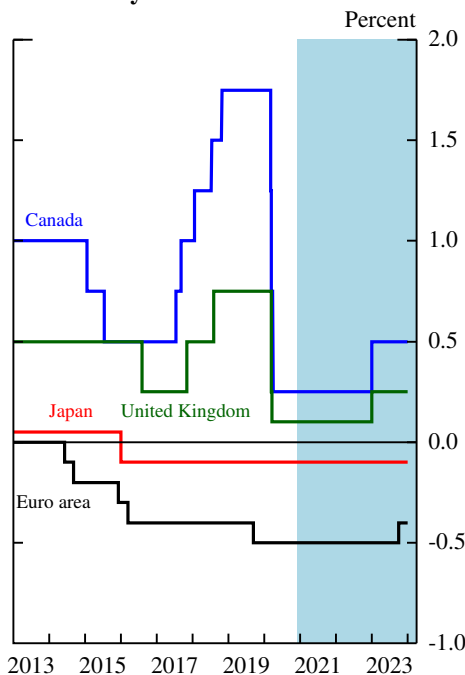
AFE Policy Rates   **AFE Central Bank Balance Sheets**   **EME Policy Rates**
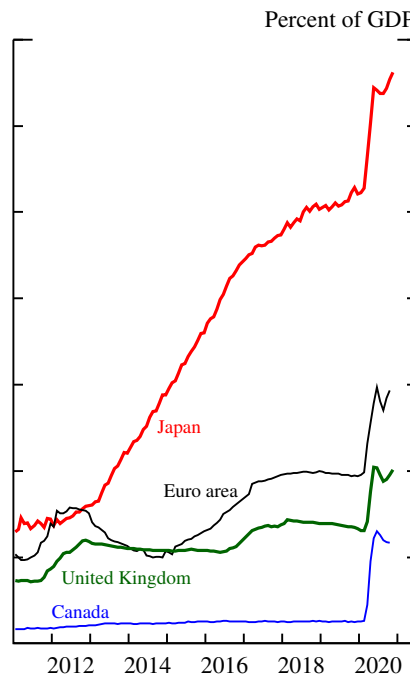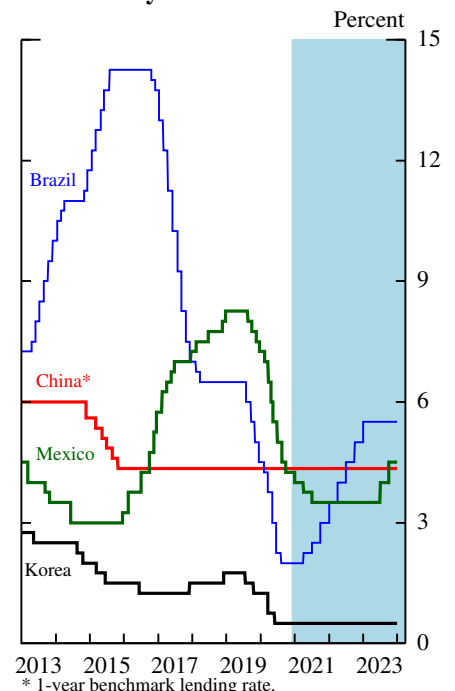
* 1-year benchmark lending rate.

Recent Foreign Indicators

Nominal Exports

Jan. 2011 = 100

Foreign
AFE*
EME**

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

Industrial Production

Jan. 2011 = 100

Foreign
AFE*
EME**

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

Retail Sales

12-month percent change

Foreign
AFE*
EME**

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

Manufacturing PMI

Diffusion index

Foreign
AFE*
EME**

* Includes Australia, Canada, euro area, Japan, Sweden, Switzerland, U.K.
** Includes Brazil, China, India, Indonesia, Israel, Korea, Mexico, Russia, Singapore, Taiwan, Turkey.

Consumer Prices: Advanced Foreign Economies

12-month percent change

Headline*
Core**

* Includes Canada, euro area, Japan, U.K.
** Excludes all food and energy; staff calculation.
Source: Haver Analytics.
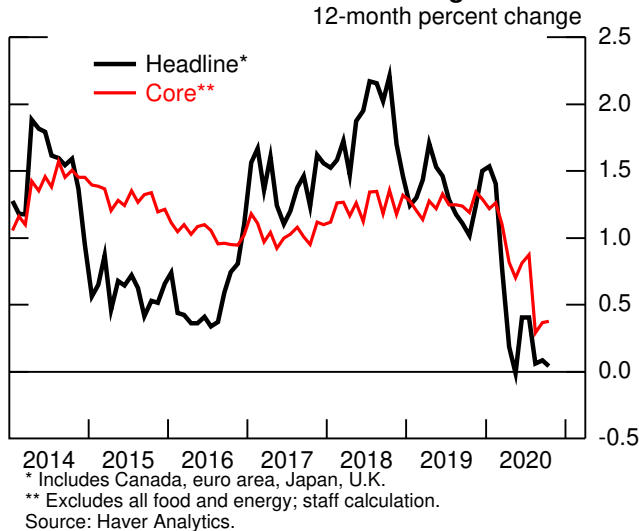
Consumer Prices: Emerging Market Economies

12-month percent change

Headline*
Ex. food--emerging Asia**
Ex. food--Latin America**

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

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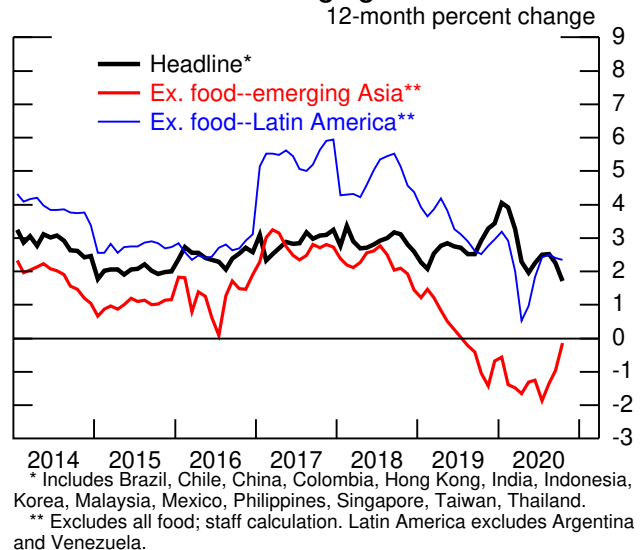
Note: Individual economies' data series may have more recent months than shown here.

Evolution of Staff's International Forecast

Total Foreign GDP
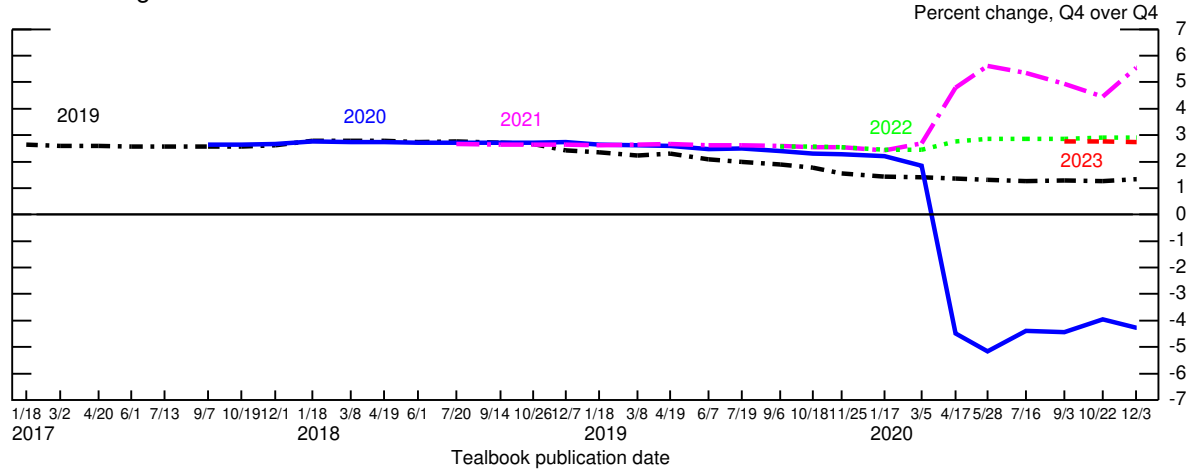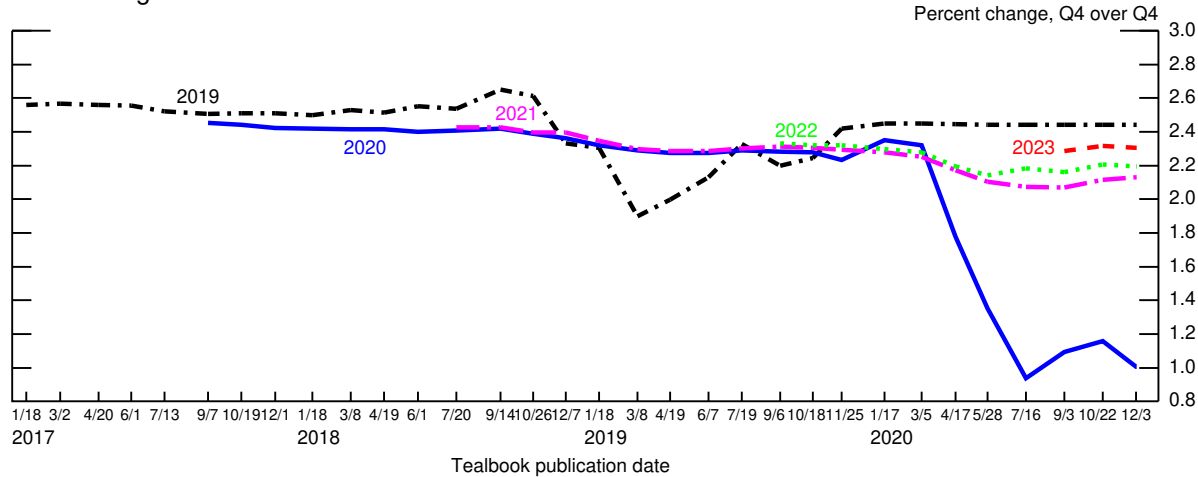
Percent change, Q4 over Q4

Tealbook publication date

Total Foreign CPI

Percent change, Q4 over Q4

Tealbook publication date

U.S. Current Account Balance

Percent of GDP

Tealbook publication date

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Int'l Econ Devel & Outlook
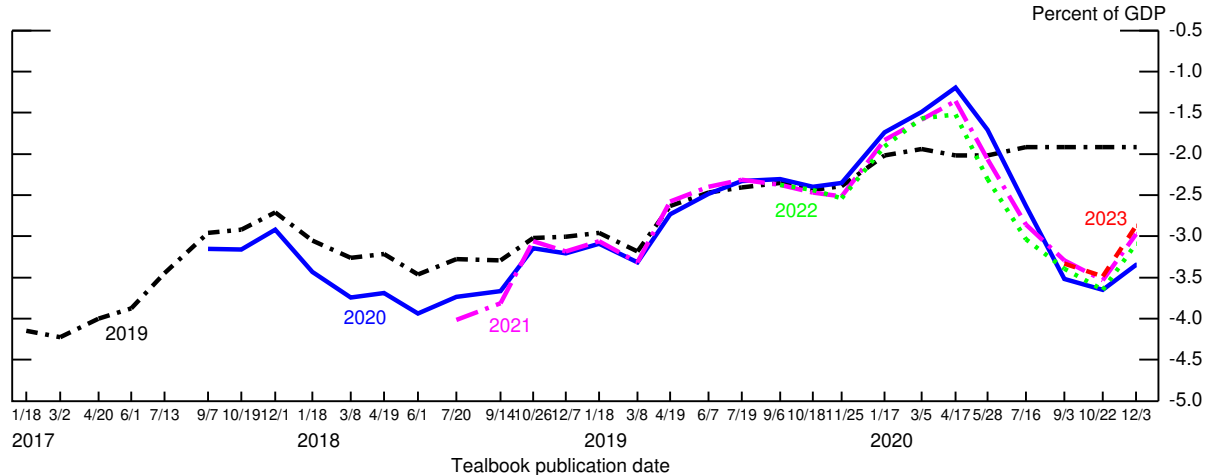
Financial Market Developments

News of the imminent arrival of multiple highly effective COVID-19 vaccines, as well as reduced political uncertainty following the U.S. election, boosted financial market sentiment over the intermeeting period. The boost from those developments far outweighed concerns regarding the continued dramatic rise in COVID-19 cases and the potential effects of ensuing restrictions on economic activities in the months ahead. Consequently, risk spreads narrowed while U.S. and foreign stock prices rose considerably, with outsized gains for companies in industries that have suffered the most from the pandemic. The Treasury yield curve steepened, inflation compensation increased, and the dollar depreciated, mainly on the COVID-19 vaccine news and renewed prospects for another fiscal stimulus package. Finally, market participants largely shrugged off the news of the year-end termination of section 13(3) credit facilities that use CARES Act funding.[1]

- Broad U.S. equity price indexes increased 6.5 percent, on net, with more dramatic gains logged by stocks of energy, banking, and smaller firms. One-month implied volatility on the S&P 500 index (the VIX) declined markedly to 21 percentage points.

- Spreads on investment- and speculative-grade corporate bonds narrowed 30 basis points and 69 basis points, respectively, and currently stand below the midpoints of their historical ranges.

- On net, the 2-year nominal Treasury yield was little changed, while 10- and 30-year nominal Treasury yields increased 14 basis points and 12 basis points, respectively.

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[1] This document describes financial market developments through December 3. On the morning of December 4, the November Employment Situation report was released. Headline payroll numbers were considerably weaker than expected, while the unemployment rate ticked down in line with forecasts. The initial response across markets was limited, but yields subsequently rose, particularly for longer-dated nominal Treasury and TIPS securities, with the 10-year nominal yield rising 5 basis points by 10:30 a.m. Some market commentary attributed the increase in yields to greater prospects for additional fiscal stimulus.

Treasury Yields and Policy Expectations

Intraday Treasury Yields

Percent   Percent

Nov. FOMC statement
Oct. employment report
Pfizer vaccine news
Moderna vaccine news
Treasury 13(3) announcement
AstraZeneca vaccine news
GSA transition funds released
Nov. FOMC minutes
Fiscal package talk revived

10–year (right scale)

2–year (left scale)

Dec. 3

Nov. 5   Nov. 10   Nov. 16   Nov. 19   Nov. 24   Nov. 30   Dec. 3

2020
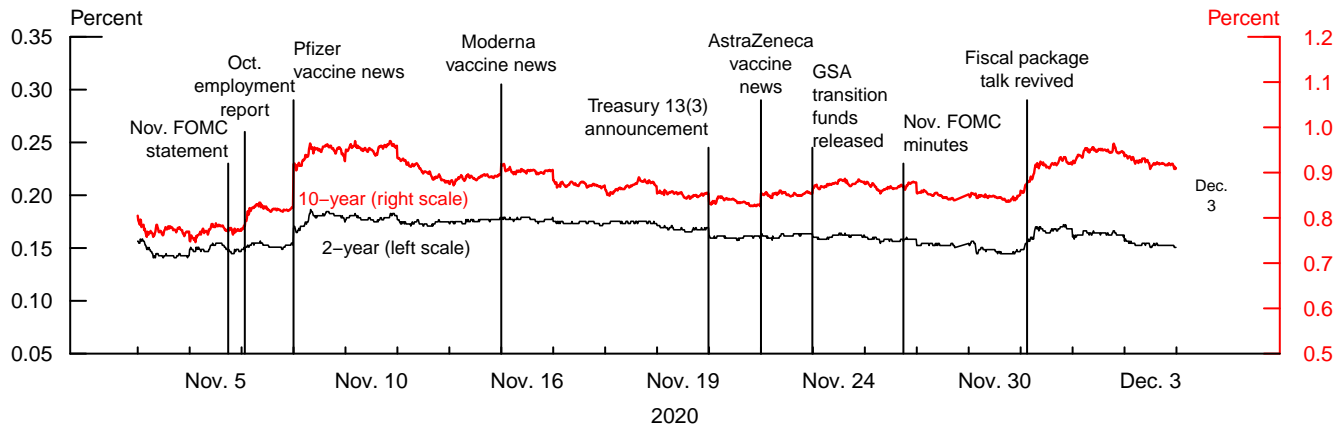
Note: Data are spaced at 5–minute intervals from 8:00 a.m. to 4:00 p.m.
Source: Bloomberg.

Treasury Yield Curve

Percent

— Most recent: December 3, 2020
--- Previous FOMC: November 4, 2020

2   5   10   20   30

Maturity in years
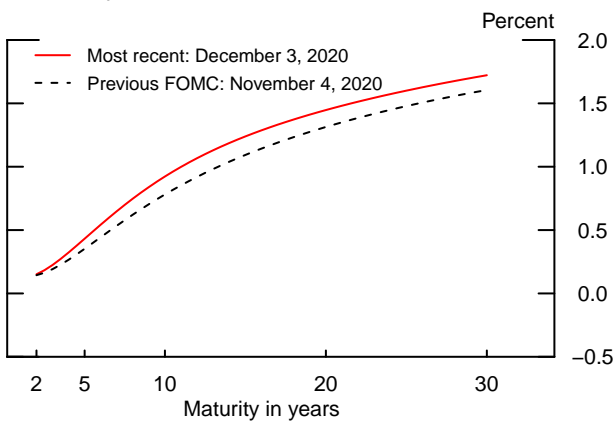
Note: Smoothed yield curve estimated from off–the–run Treasury coupon
securities. Yields shown are those on notional par Treasury securities with
semiannual coupons.
    Source: Federal Reserve Bank of New York; Board staff calculations.

Measure of Implied Volatility of 10–Year Treasury

Basis points

Daily   Nov. FOMC

— 1 month ahead
— 3 months ahead
— 1 year ahead

Dec. 3

2018   2019   2020
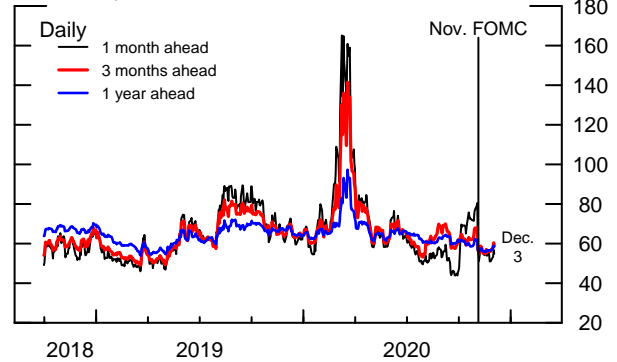
Note: Implied volatility is derived from 10–year swaptions.
Source: Barclays.

TIPS–Based Inflation Compensation

Percent

Daily   Nov. FOMC

5 to 10 years ahead

Dec. 3

Next 5 years*

2018   2019   2020
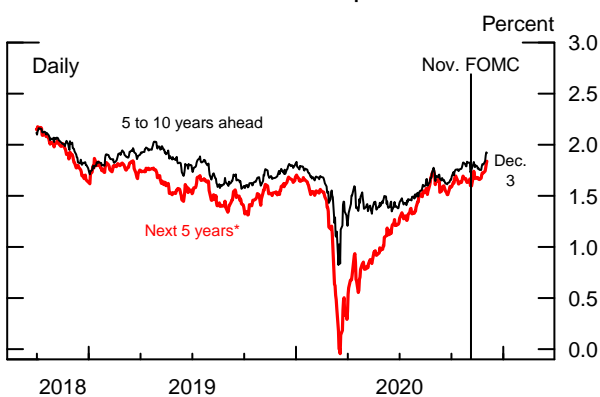
Note: Estimates based on smoothed nominal and inflation–indexed
Treasury yield curves.
    * Adjusted for lagged indexation of Treasury Inflation–Protected Securities
(TIPS) (carry effect).
    Source: Federal Reserve Bank of New York; Board staff calculations.

Implied Federal Funds Rate

Percent

— Most recent: December 3, 2020
--- Previous FOMC: November 4, 2020
◇ Blue Chip Financial Forecasts survey

With model–based
term premium

Macro–finance model

With zero
term premium

2020   2021   2022   2023   2024
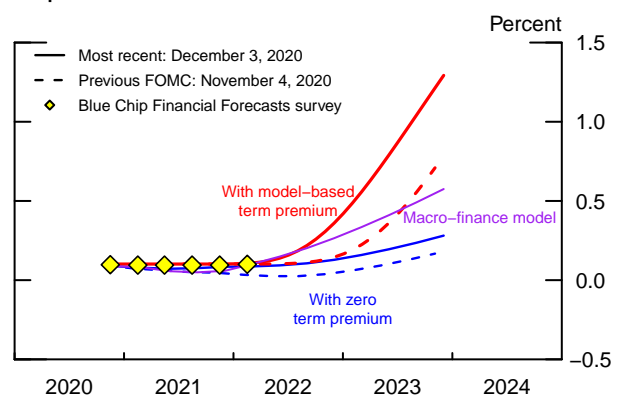
Note: Zero term premium path is estimated using overnight index swap
quotes with a spline approach and a term premium of 0 basis points.
Model–based term premium path is estimated using a term structure model
maintained by Board staff and corrects for term premiums. Macro–finance
model path is estimated using regressions of survey–OIS gaps on the
covariances between real and nominal variables. The Blue Chip path is the
average of respondents' expectations for the federal funds rate in the survey
published on December 1.
    Source: Bloomberg; Board staff calculations.

Financial Markets

- TIPS-based inflation compensation at the 5-year and the 5-to-10-year horizons increased 24 basis points and 19 basis points, respectively, to 1.84 percent and 1.92 percent.

- The expected federal funds rate based on a straight read of OIS quotes did not change materially and remains near the effective lower bound (ELB) until the second half of 2023.

- Municipal bond spreads to comparable-maturity Treasury yields declined notably but generally remained above pre-pandemic levels.

- Liquidity conditions in most secondary markets improved a bit and moved closer to pre-pandemic levels.

- Risky asset prices abroad increased notably, as news of vaccine progress also boosted sentiment in hard-hit foreign economies. Emerging market (EM) asset prices gained the most, supported by record capital flows into EM-dedicated mutual funds. In line with the boost to investor sentiment, the broad dollar index fell 2.7 percent.

- To date, market quotes indicate relatively muted pressures in short-term and dollar funding markets around year-end.

DOMESTIC DEVELOPMENTS

The Treasury yield curve steepened moderately since the November FOMC meeting. The yield on 2-year nominal Treasury securities, now at 0.15 percent, was little changed, on net, while 10- and 30-year yields rose, on net, about 14 basis points and 12 basis points, to 0.92 percent and 1.72 percent, respectively. Early in the period, longer-term yields jumped up following news about the successful COVID-19 vaccine trial by Pfizer and, to a lesser extent, a stronger-than-expected Employment Situation report for October. Since then, downward pressure on longer-term yields from concerns about intensifying near-term pandemic effects was offset by upward pressure from news about two more successful vaccine trials and, more significantly, renewed talk of another fiscal stimulus package. FOMC communications were reportedly viewed as broadly in line with expectations and did not elicit material market reactions. Near-term measures of implied volatility for 10-year interest rates declined to historical lows, retracing a small increase that occurred ahead of the U.S. election.

Financial Markets

Corporate Markets

Intraday S&P 500 Futures and 10-Year Treasury Yield
November 05, 2020 = 100

Percent

Presidential election

Oct. employment report

Nov. FOMC statement

Pfizer vaccine news

Moderna vaccine news

Treasury 13(3) announcement

AstraZeneca vaccine news

GSA transition funds released

Fiscal package talk revived

Dec. 3

S&P 500 (left scale)

U.S. 10-year Treasury yield (right scale)

Nov. 3   Nov. 6   Nov. 11   Nov. 16   Nov. 19   Nov. 24   Nov. 27   Dec. 2

2020

Note: Data are spaced at 5-minute intervals from 8:00 a.m. to 4:00 p.m.
Source: Bloomberg.

Select Stock Price Indexes

— S&P 500
— S&P 500 Airlines
— S&P 500 Banks
— COVID-19 portfolio

Nov. FOMC

Dec. 3

Apr.   Aug.   Dec.

2020

Note: Value-weighted COVID-19 portfolio shows the return to a value-weighted portfolio of Citrix, TelaDoc, Blue Apron, AIM Immunotech, ZOOM, Peloton, and Vapotherm.
Source: Bloomberg.
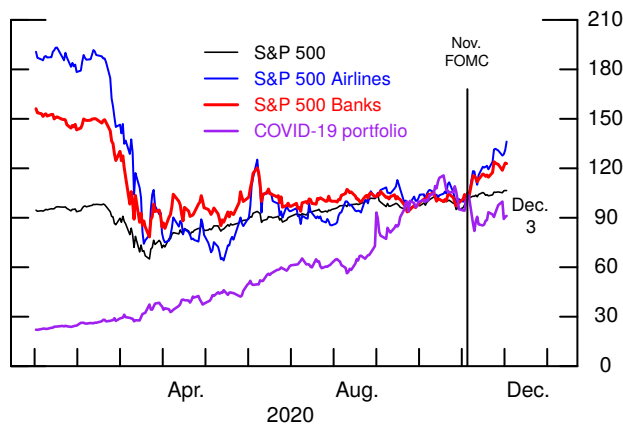
Implied Volatility on S&P 500 (VIX)

Percent

Daily

Nov. FOMC

Dec. 3

2018   2019   2020

Source: Chicago Board Options Exchange.

VIX Futures Curves

Percent

Monthly

— Nov. 3, 2020
— Nov. 5, 2020
— Dec. 3, 2020

Nov.   Dec.   Jan.   Feb.   Mar.   Apr.   May   June
2020   2021

Contract expiration date

Source: Bloomberg.

Corporate Bond Spreads

Basis points   Basis points

Daily

— High-yield (right scale)
— Triple-B (left scale)

Nov. FOMC

Dec. 3

2016   2017   2018   2019   2020

Note: Series are option-adjusted spreads. The ICE triple-B index has a weighted-average maturity of 11.5 years, and the ICE high-yield index has a weighted-average maturity of 6.4 years.
Source: Intercontinental Exchange (ICE) Indices.

Financial Markets

TIPS-based measures of inflation compensation moved up, on net, initially on the Pfizer vaccine news and again on talk of a fiscal stimulus package. The 5-year measure increased 24 basis points, on net, to 1.84 percent, while the 5-to-10-year measure rose 19 basis points and currently stands at 1.92 percent. Both of these measures are now back at or a bit above their pre-pandemic levels.

Since the November FOMC meeting, the expected path for the federal funds rate over the next few years, as implied by OIS quotes under the assumption of zero term premiums, edged up marginally, on net, but remains below 0.25 percent until the second half of 2023. The average respondent to the December Blue Chip Financial Forecasts surveys expects a flat path near the ELB until at least the end of 2022. The staff's model-based measures that adjust for term premiums put the expected policy rate path near the ELB until at least the middle of 2022.

Broad stock price indexes increased considerably over the intermeeting period as news about surprisingly successful vaccines arriving within months and the resolution of election uncertainty dwarfed concerns about the worsening pandemic that brought on new restrictions. Indeed, despite the rise of COVID-19 cases, the prospect of an economic recovery next year aided by effective vaccines led to outsized stock price gains in cyclical sectors, such as the energy and industrials sectors, including airlines. Of note, bank equity prices climbed 23 percent, on net, since the November FOMC meeting given the prospect of lower loan losses and stronger loan demand. And stock prices of small firms far outperformed large-cap indexes. Meanwhile, stock prices of firms whose business activities benefit from the pandemic, such as those supporting stay-at-home activities, declined.

The VIX declined considerably, reaching levels not seen since February. Prices of near-term VIX futures declined much more than those of far-term VIX futures, returning the term structure VIX futures to its usual upward-sloping shape following its recent inversion, which was driven in part by election uncertainty.

Consistent with the optimism driving stock prices, risk spreads of investment- and speculative-grade corporate bond yields over comparable-maturity Treasury yields narrowed markedly. The risk spreads currently stand below the midpoints of their historical ranges and are essentially back to their pre-pandemic levels. The drop in risk pricing was most evident for the riskiest companies, as spreads on corporate bonds rated triple-C and below continued to plunge and now stand below the median of their

Liquidity Conditions in Domestic Markets

10-Year Indicative Bid-Ask Spreads for Treasury Securities

Cents per $100

Source: Federal Reserve Bank of New York.

Treasury Market Depth

Millions of dollars

Millions of dollars

Note: Market depth is defined as the average top 3 bid and ask quote sizes for on-the-run Treasury securities. The tick size of the 2-year is one-fourth of the tick size of the 10-year security.
Source: Repo Inter Dealer Broker community.
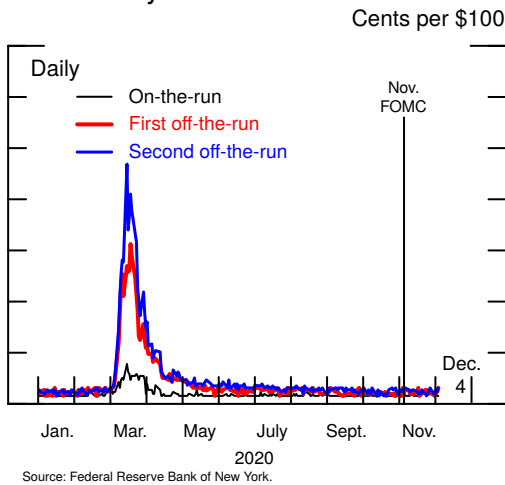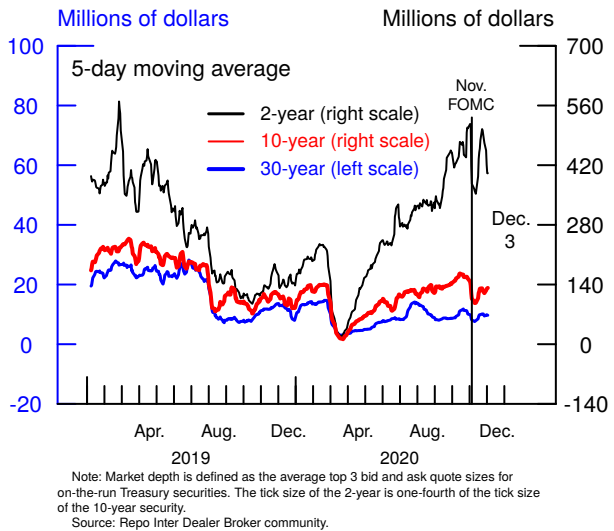
On-the-Run Treasury Liquidity Premium

5-day moving average

Note: Premium is calculated as spread between regular yields and predicted yields using off-the-run Svensson coefficients.
Source: Federal Reserve Bank of New York; Board staff calculations.
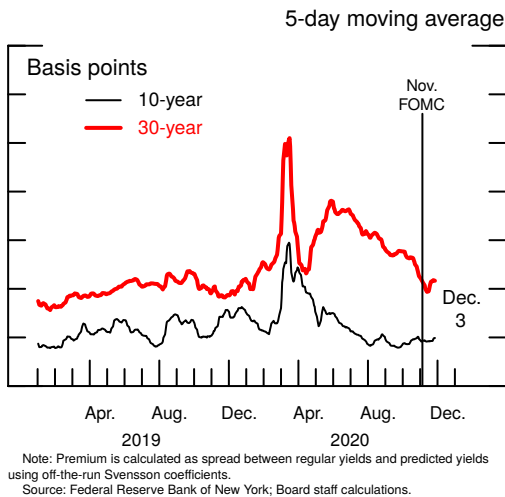
Top-of-the-Book Depth: Equity Index Futures

November 4, 2020 = 100

Note: Figure is based on the E-mini S&P 500. Average depth: (Avg. bid size + avg. ask size) / 2.
Source: Tick History.
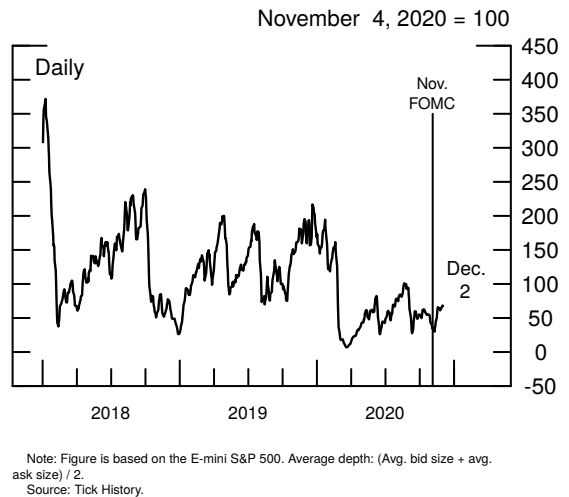
Bid-Ask Spreads for Corporate Bonds

Percent

Source: FINRA; Board staff calculations.
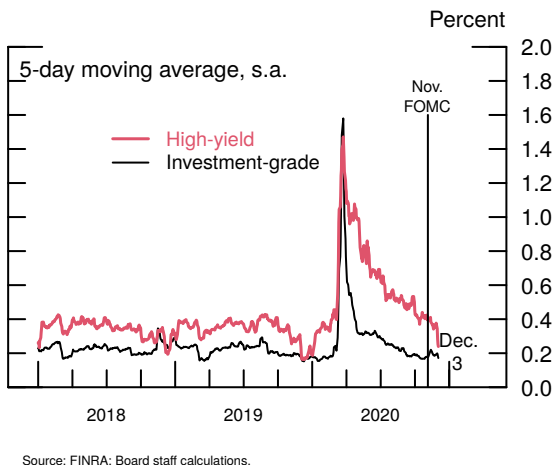
Round-Trip Transaction Costs for Large Municipal Bond Trades (Par Value >= 500K)

Percent

Note: Round-trip transactions are pairs of trades that start with a dealer-buy from a customer and are immediately followed by a dealer-sell to the customer in trades of the same par value. Round-trip transaction cost is the percentage change from dealer-sell price to dealer-buy price. Only fixed-coupon bonds that are at least 90 days after issuance and traded between the hours of 8:00 a.m. and 6:00 p.m. on weekdays are included.
Source: Municipal Securities Rulemaking Board; Board staff calculations.

Financial Markets

historical distribution. The declines in spreads pushed corporate bond yields down to the very bottom of their historical distribution.

In the municipal bond market, secondary market yields on triple-A-rated and triple-B-rated benchmark indexes, as well as spreads over comparable-maturity Treasury yields, declined notably. The end of new purchases under the corporate credit facilities and the Municipal Liquidity Facility by December 31 produced little reaction in corporate and municipal markets. Although the facilities were generally regarded as an important backstop, the muted reaction was consistent with the facilities' low take-up and the possibility that these facilities could be reinstated in the future if market conditions deteriorate.

LIQUIDITY CONDITIONS IN DOMESTIC MARKETS

Treasury market liquidity, as measured by bid-ask spreads and market depth, rebounded from a small dip around the time of the U.S. election and is largely back to pre-election levels. Unlike short-dated Treasury securities, liquidity for the longest-dated Treasury securities and in some portions of the mortgage-backed securities (MBS) market—notably for those securities excluded from Federal Reserve open market purchases—remained somewhat below pre-pandemic levels.

Liquidity conditions in equity markets continued to improve over the intermeeting period and are significantly better than conditions in the spring. Even so, the top-of-the-book measure of futures market depth suggests that liquidity conditions remain somewhat strained compared with those observed before the pandemic. Liquidity conditions in the corporate bond market also improved a bit. Bid-ask spreads on speculative-grade bonds continued their decline over the intermeeting period and have essentially returned to their pre-pandemic levels. Bid-ask spreads on investment-grade corporate bonds were roughly unchanged in recent weeks and have remained close to their pre-pandemic levels. Liquidity conditions in the municipal bond market are close to pre-pandemic levels, although round-trip transaction costs on the largest trades ticked up a bit.

FOREIGN DEVELOPMENTS

Positive COVID-19 vaccine developments and the resolution of uncertainty regarding the U.S. election were also the primary drivers of asset price moves abroad over the intermeeting period. The boost to risk sentiment outweighed concerns about

Financial Markets

Foreign Developments

Global Equity Indexes

Daily   Nov. 4, 2020 = 100

- EURO STOXX 50
- EURO STOXX Banks
- Korea KOSPI
- Mexico MEXBOL

Note: Indexes denominated in local currency.
Source: Bloomberg.
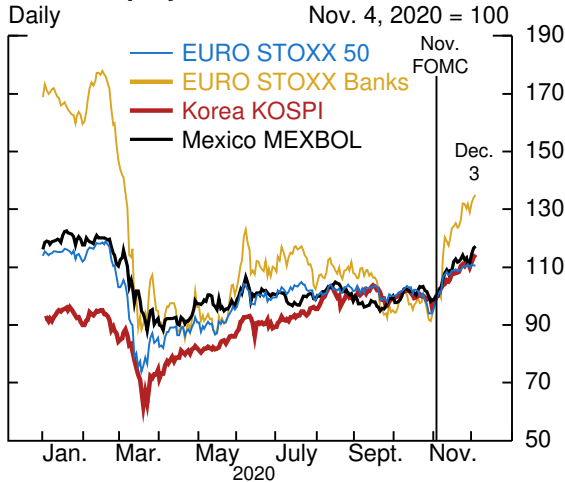
Emerging Market Flows and Spreads

Billions of dollars   Basis points

- Weekly bond flows (left scale)
- Weekly equity flows (left scale)
- EMBI+ (right scale)

Note: EMBI+ refers to emerging market bond spreads to Treasury
securities. Excludes intra-China flows.
Source: Emerging Portfolio Fund Research.

Exchange Rate Indexes

Daily   Nov. 4, 2020 = 100

- Broad
- AFE
- EME

Dollar appreciation

Source: Bloomberg; Federal Reserve Bank of New York;
Board staff calculations.

Selected Exchange Rates

Daily   Nov. 4, 2020 = 100

Dollar appreciation

- Mexican peso
- Brazilian *real*
- British pound
- Chinese renminbi

Source: Bloomberg.
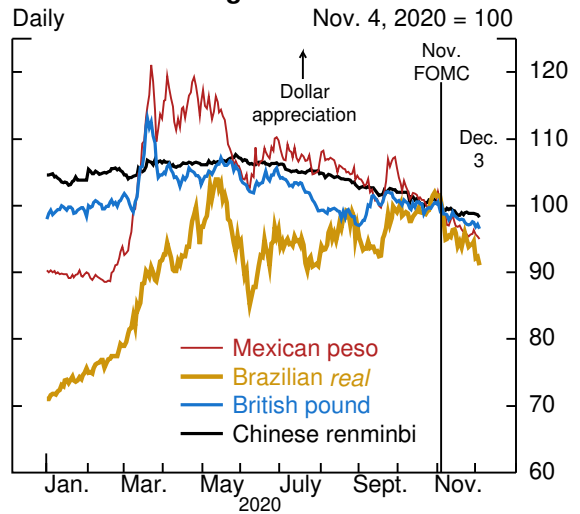
10-Year Sovereign Yields

Daily   Percent

- United Kingdom
- Germany
- Canada

Source: Bloomberg.
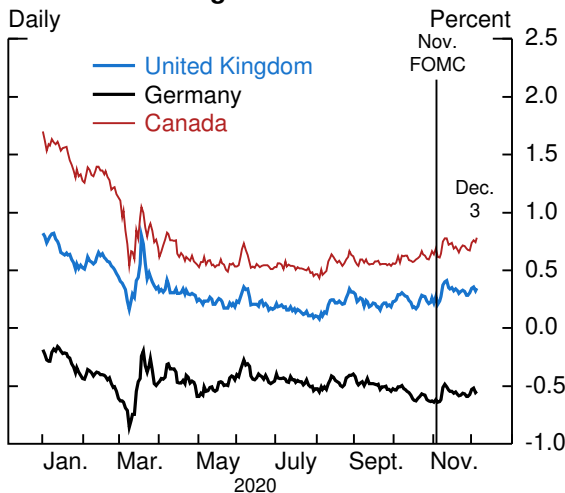
Euro-area Inflation Compensation

Daily   Percent

- 5-year
- 5-to-10 year

Source: Bloomberg.
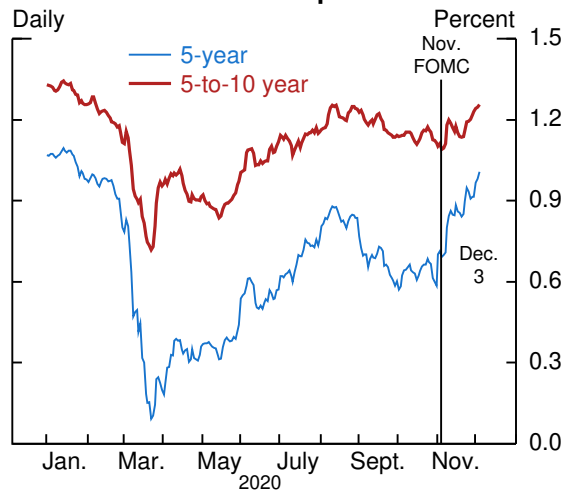
continuing high case counts in many countries and ongoing significant restrictions to slow the spread. As in the United States, the prices of risky assets abroad increased notably, particularly in the EMs; measures of implied volatility dropped sharply; most advanced foreign economy (AFE) sovereign yields rose; and the dollar depreciated against most currencies.

Equity markets abroad reacted strongly to the prospect of a global vaccine-led recovery. Prices of foreign stocks in the bank, energy, and industrial sectors recorded the largest gains, similar to what was observed in U.S. equity markets. European equity indexes increased about 11 percent, including a 35 percent rise in bank stock prices. The VDAX measure of implied volatility declined about 7 percentage points to 23 percentage points, near the median of its historical distribution but still above its pre-pandemic level. Many EM equity indexes rose even more, including 14 percent in Korea and 17 percent in Mexico, amid record capital inflows into EM-dedicated mutual funds. These capital flows also contributed to a notable narrowing of EM sovereign and corporate spreads. Some market participants point to the prospect of a more stable trade policy environment under a new U.S. Administration as an additional factor supporting EM asset prices.

Improved risk sentiment also weighed on the dollar and prices of AFE sovereign bonds. On net, the EME dollar index fell 2.9 percent, and the AFE index fell 2.6 percent. Among EME currencies, notable moves were seen for the Brazilian *real* and the Mexican peso, which appreciated 9 percent and 5 percent, respectively. The Chinese renminbi also appreciated around 1.7 percent over the intermeeting period and is up 8 percent since June, supported by China's strong economic recovery. Among AFE currencies, the U.K. pound is about 3.5 percent higher, having moved up on the announcement of additional fiscal actions and on days when there was news of progress toward a trade agreement with the European Union. Long-term sovereign yields are 8 to 12 basis points higher, on net, in the United Kingdom, Canada, and Germany. In the euro area, 5-year and 5-to-10-year inflation compensation measures rose 29 basis points and 16 basis points, respectively, and approached their pre-pandemic levels. Staff models attribute most of the moves to rising inflation expectations.

The rise in AFE yields occurred despite actions by policymakers in several countries aimed at maintaining accommodative financial conditions. The Bank of England (BOE) announced an above-expectations increase in its asset purchase program of £150 billion, though the purchases will be at a slower pace. However, some investors

Short-Term Funding Markets and Federal Reserve Liquidity and Credit Facilities

Short-Term Funding Market Spreads (Longer Tenor)

Basis points

Daily

- 1-month NCD
- 3-month NCD
- 1-month AA Nonfinancial CP
- 1-month A2P2 Nonfinancial CP

Nov. FOMC

Dec. 3
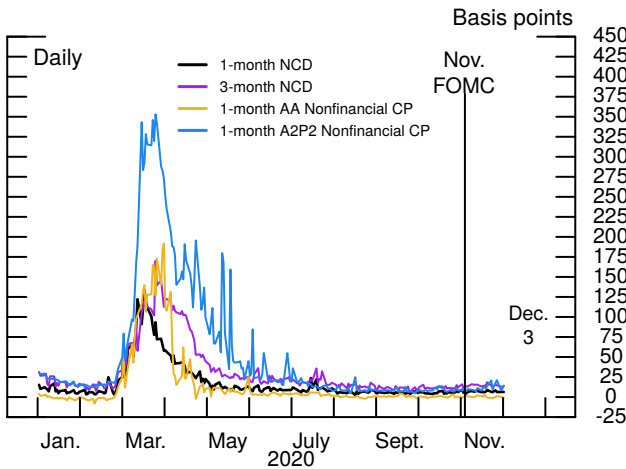
Note: CP is commercial paper; NCD is negotiable certificate of deposit. All spreads are to OIS of the same tenor.
Source: Depository Trust & Clearing Corporation.

Outstanding Levels of CDs and Unsecured CP

Billions of Dollars

Daily

- CDs
- Financial CP
- Nonfinancial CP
- Asset-backed CP

Nov. FOMC

Dec. 3
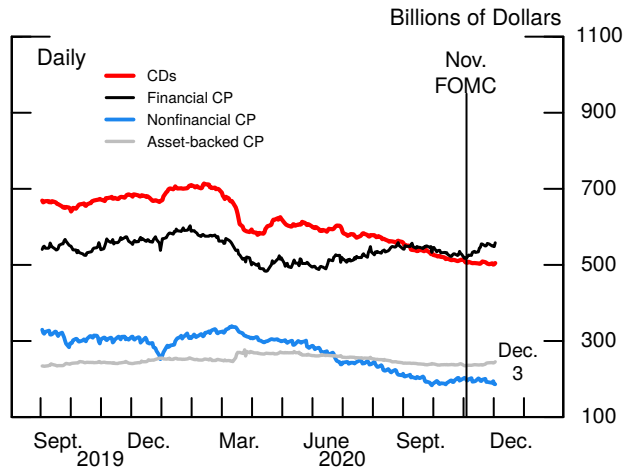
Note: Levels are not seasonally adjusted. The series include both foreign and domestic issuers, with CDs maturing in one year or less.
Source: Depository Trust & Clearing Corporation.

Usage of Liquidity and Credit Facilities

Billions of dollars

Daily

Nov. FOMC

Dec. 3

- PPPLF
- MMLF
- Primary credit
- PDCF
- CPFF
- SMCCF
- MLF
- PMCCF
- Main Street
- TALF
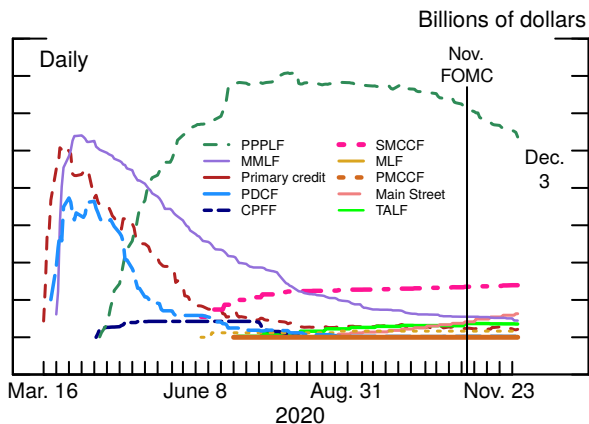
Note: The values shown are outstanding amounts. PPPLF is Paycheck Protection Program Liquidity Facility; MMLF is Money Market Mutual Fund Liquidity Facility; PDCF is the Primary Dealer Credit Facility; CPFF is Commercial Paper Funding Facility; SMCCF is Secondary Market Corporate Credit Facility; MLF is Municipal Liquidity Facility; PMCCF is Primary Market Corporate Credit Facility; TALF is Term Asset-Backed Securities Loan Facility.
Source: Federal Reserve Board.

MMF Weighted-Average Maturity

Days

Weekly

- Prime
- Government

Nov. FOMC

Dec. 1
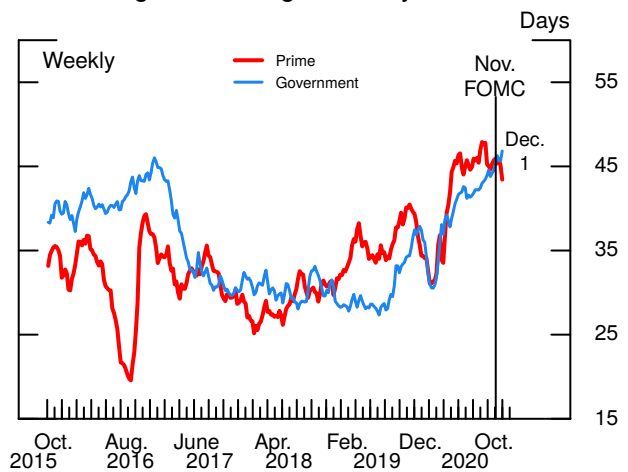
Note: All statistics are computed on an asset-weighted basis.
Source: iMoneyNet.

Overnight Funding Rates

Basis points

Daily

- SOFR
- EFFR

Nov. FOMC

Dec. 3
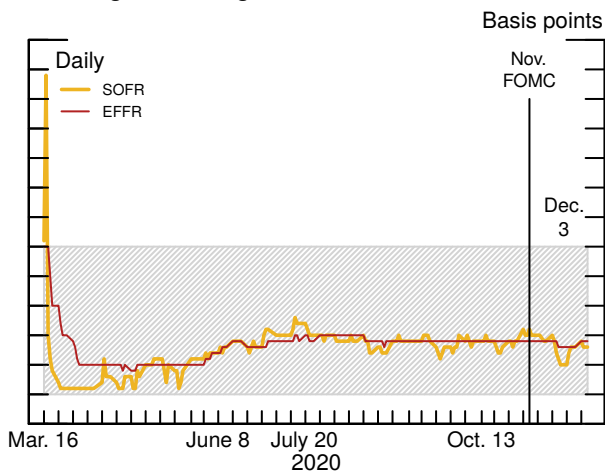
Note: Shaded area is the target range for the federal funds rate. EFFR is effective federal funds rate. SOFR is Secured Overnight Financing Rate.
Source: Federal Reserve Bank of New York; Federal Reserve Board.

Outright Security Purchases

Billions of dollars   Billions of dollars

Daily

- Treasury purchases (left scale)
- MBS purchases (left scale)
- Cumulative purchases (right scale)

Nov. FOMC

Dec. 3
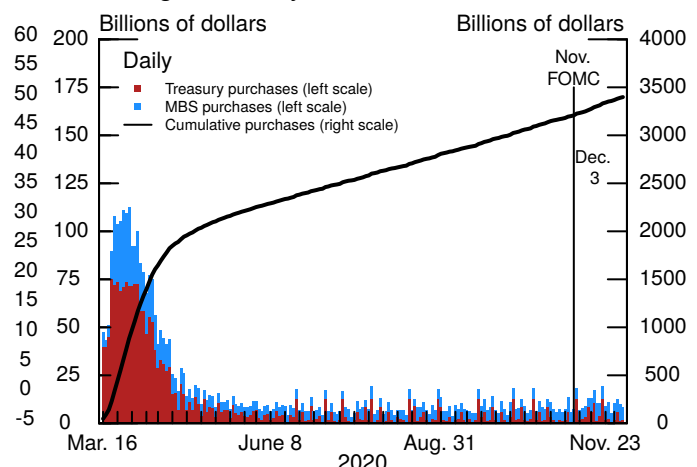
Note: Cumulative purchases are from March 16. MBS is mortgage-backed securities. MBS purchases include reinvestments.
Source: Federal Reserve Bank of New York.

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were surprised that the BOE did not discuss a move into negative policy rates, which contributed to the 12 basis point rise in 10-year U.K. gilt yields during the period. The Reserve Bank of New Zealand also announced additional stimulus in the form of a funding-for-lending program, but policymakers indicated that they were no longer considering negative policy rates as an option. This news prompted a strong reaction in asset prices, which contributed to the 32 basis point rise in long-term sovereign yields and 5.4 percent appreciation of the New Zealand dollar over the period. In Sweden, the Riksbank announced an expansion of its asset purchasing program by 200 billion Swedish krona and an extension of the period for purchases by six months to the end of December 2021 in response to the second wave of coronavirus infections. The Swedish krona is around 3.9 percent higher over the intermeeting period.

In contrast to recent years, the cost of obtaining dollar funding over the upcoming year-end has remained fairly stable. The subdued pressure is likely the result of the expansion of the central bank swap lines and the FIMA Repo Facility, as well as the abundance of reserves and regulatory relief, which reduce bank balance sheet constraints (see the box "Year-End Conditions in Offshore Dollar Funding Markets Appear Benign").

SHORT-TERM FUNDING MARKETS AND FEDERAL RESERVE OPERATIONS

Conditions in unsecured short-term funding markets have remained stable over the intermeeting period. Since the previous FOMC meeting, despite continued moderate outflows from prime money market funds (MMFs), spreads on commercial paper (CP) and negotiable certificates of deposit (NCDs) have changed little across tenors, remaining at historically low levels and showing no signs of year-end pressures. CP and NCD issuance was also robust across the different tenors, and the fraction of overnight CP in total CP issuance remained within its normal (pre-pandemic) range. Amid stable market conditions, there was no take-up at the Money Market Liquidity Facility or the Commercial Paper Funding Facility over the intermeeting period.

Over the intermeeting period, assets under management (AUM) of prime MMFs declined moderately, likely driven by their compressed yields relative to those of government MMFs. While the AUM of government MMFs changed little, the weighted-average maturity of their holdings increased to a level not seen since 2016, possibly reflecting the funds' effort to maintain positive net yields without further reductions in

Financial Markets

the fees they charge to investors. The net yields of both prime and government MMFs remained at near historically low levels.

The effective federal funds rate averaged 9 basis points, unchanged from the previous period. Federal funds volumes averaged about $60 billion per day, little changed from the previous period. Overnight repo markets were calm, with the Secured Overnight Financing Rate (SOFR) averaging 8 basis points, close to the previous period's average.

Repo market quotes and commentary are consistent with an expectation of muted year-end funding pressure in this market, given the ample liquidity, the backstop of the Fed's repo operations, and the reduction in balance sheet pressures stemming from regulatory actions taken in the spring. The overnight reverse repo facility take-up averaged well below $1 billion per day, and there was no participation in the Desk's repo operations.

Over the intermeeting period, the Federal Reserve's balance sheet expanded about $65 billion, mainly due to increases in the SOMA holdings of Treasury securities and agency MBS. The Desk plans to increase the SOMA holdings of Treasury securities by about $80 billion and agency MBS by about $40 billion in the current monthly period ending December 11.

Financial Markets

Year-End Conditions in Offshore Dollar Funding Markets Appear Benign

Rates in offshore dollar funding markets and other money market segments typically increase and exhibit volatility at the end of the year. These year-end dynamics have the potential to affect market functioning and credit provision. Historically, year-end effects have reflected a combination of factors, including balance sheet management ("window dressing") for financial and regulatory reporting, the potential for severe reductions in liquidity in these markets during the holidays, and special factors that vary from year to year. In contrast to recent years, the FX swap basis, a measure of implied dollar funding cost relative to interbank funding costs, for the year-end turn has been subdued so far, as shown in the figure. Repo quotes similarly indicate muted year-end pressures.

Several actions taken by the Federal Reserve at the onset of the COVID-19 pandemic are contributing to the relatively subdued funding conditions during this year-end period. These actions include the changes to the cost and auction frequency of the central bank dollar liquidity swap lines and the temporary expansion of swap line counterparties, which ensure there is ample liquidity in dollar funding markets abroad. The FIMA Repo Facility and the Fed's overnight repo operations, as well as 13(3) facilities, are also viewed by investors as important liquidity backstops. Market participants also cite the abundance of reserves as contributing to softness in funding costs. On the regulatory front, the temporary exemption of U.S. Treasury securities and reserves from the supplementary leverage ratio calculation has reduced balance sheet constraints of firms that provide liquidity in these markets.

Additionally, bank balance sheet management is likely to be less severe this year-end, as communications from large U.S. banks have indicated a willingness to operate with higher G-SIB surcharges or that G-SIB constraints are less binding than in previous years. This shift in balance sheet management reduces the likelihood that banks will aggressively shrink their FX swap lending in order to reduce their G-SIB scores near the year-end assessment date. Return to Financial Markets Text

Financial Markets

LIBOR-Based FX Swap Basis at Recent Year-Ends

EUR 1−Month FX Swap Basis
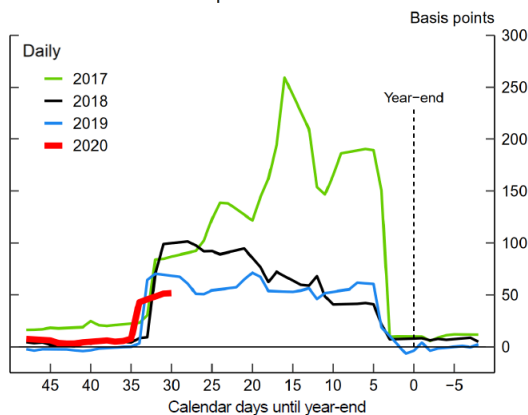
JPY 1−Month FX Swap Basis

Source: Bloomberg and staff calculations.

Source: Bloomberg and staff calculations.

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Financial Markets
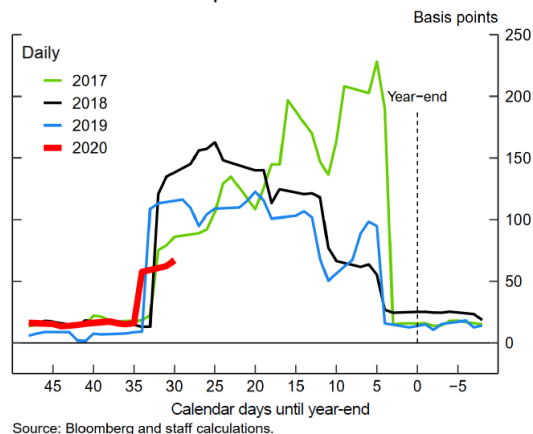
Financing Conditions for Businesses and Households

Market-based financing conditions remained accommodative, having eased a bit further in some sectors in recent weeks. Meanwhile, bank lending conditions appear to have remained relatively tight. As a result, financing conditions remained accommodative for large firms, municipalities, and real estate borrowers that access financing through markets, while financing conditions for firms and households that rely on bank lending or alternative mortgage products appear to have remained tight. The implied end of several pandemic-related section 13(3) credit facilities, after the Federal Reserve agreed to return to the Treasury Department the unused CARES Act funding that collateralizes these facilities, did not have a discernible effect on financing conditions.

- Gross issuance of investment- and speculative-grade corporate bonds remained at solid levels, as corporate bond yields declined further. Gross equity issuance through seasoned offerings and initial public offerings (IPOs) was robust in the intermeeting period.

- The decline in C&I loans outstanding at banks accelerated in September and October, primarily because of continued paydowns of loan balances and the start of Paycheck Protection Program (PPP) loan forgiveness activity.

- Although short-term delinquency on small business loans moved down in September and October, business owners' expectations of permanent closures remain elevated.

- Commercial real estate (CRE) loan growth on banks' books slowed over the intermeeting period. Spreads on non-agency commercial mortgage-backed securities (CMBS) ticked down slightly, while issuance increased in October.

- Residential mortgage originations continued to be strong, with elevated home-purchase and refinance activity evidently supported by low interest rates.

- Developments in credit card financing conditions were mixed, with loan volumes continuing to contract while solicitations rebounded. Auto loan balances continued to increase solidly for prime and near-prime borrowers, in part reflecting low interest rates. Overall consumer credit conditions still appear tight for subprime borrowers.

Financing Conditions

Business Finance

Gross Issuance of Nonfinancial Corporate Bonds

Billions of dollars

Monthly rate

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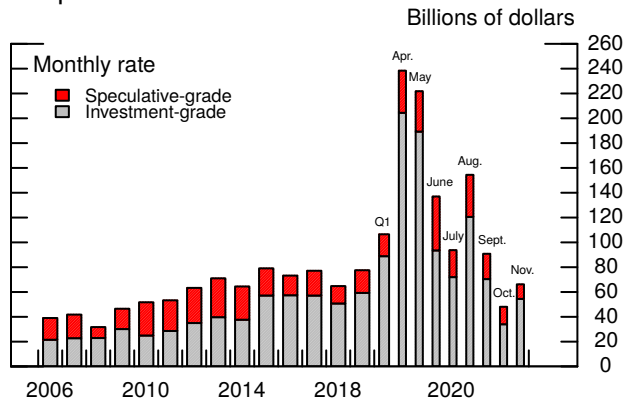
Note: Bonds are categorized by Moody's, Standard & Poor's, and Fitch.
Source: Mergent Fixed Income Securities Database.

Institutional Leveraged Loan Issuance, by Purpose

Billions of dollars

Monthly rate

- New money
- Refinancings
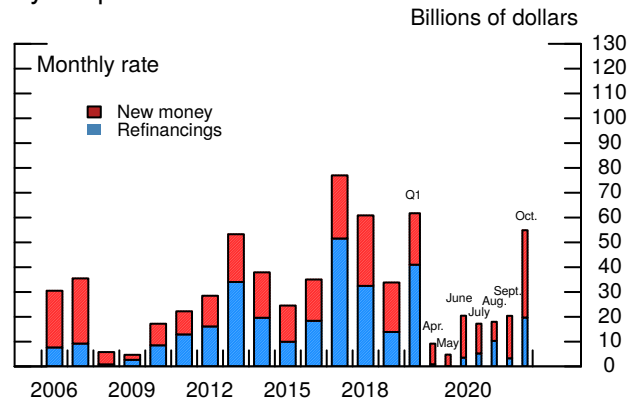
Source: Thomson Reuters LPC LoanConnector.

Nonfinancial Ratings Changes, by Sector

Percent of outstanding

Annual rate

Upgrades
- Energy
- Ex. energy

Downgrades
- Ex. energy
- Energy
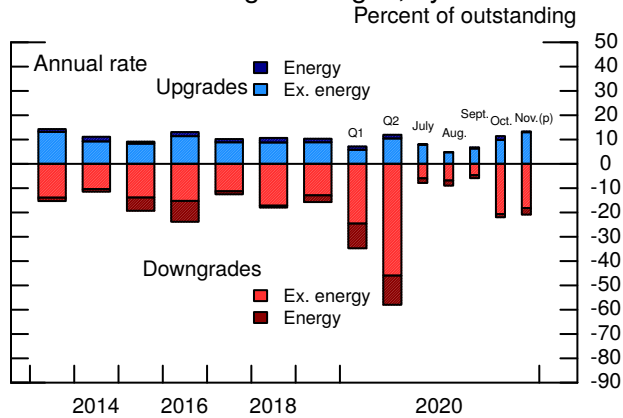
Note: Computed as a percent of nonfinancial bonds outstanding.
(p) Preliminary.
Source: Board staff calculations using composite ratings from Mergent Fixed Income Securities Database.

Realized and Expected Nonfinancial Bond Default Rates

Percent

Monthly
- Nonfinancial bond default rate
- KMV expected default rate
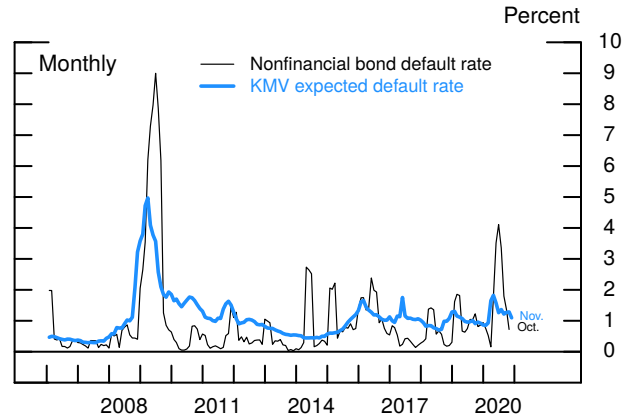
Note: For realized default rate, 3-month trailing defaults divided by beginning-of-period outstanding, at an annual rate. For expected default rate, firm-level estimates of default weighted by firm liabilities as a percent of total liabilities, excluding defaulted firms.
Source: For realized default rate, Moody's Investors Service; for expected default rate, calculated using firm-level data from Moody's KMV.

Bias-Adjusted Wall Street Analyst Forecasts of S&P 500 Earnings per Share

2020:Q2 = 100

Quarterly
- Actual S&P 500 EPS
- Current forecast
- Forecast at November FOMC
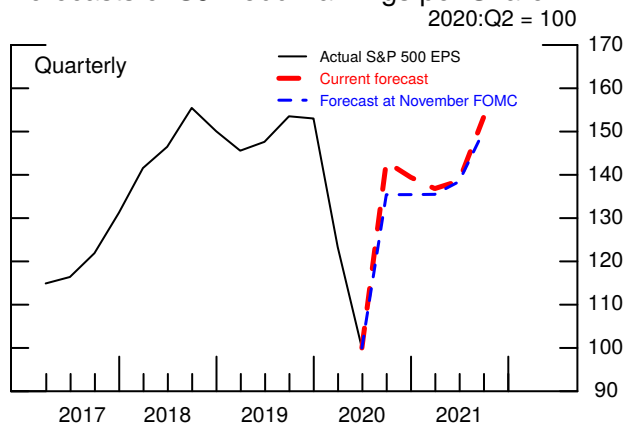
Note: Bias-adjustments control for the "earnings guidance game" (Richardson, Teoh, and Wysocki, 2004). Observations are quarterly and adjusted for seasonality. EPS is earnings per share.
Source: Thomson Reuters Financial.

Changes in C&I Loans at Banks

Billions of dollars

Monthly rate, s.a.

- Large banks
- Other banks
- Foreign banks
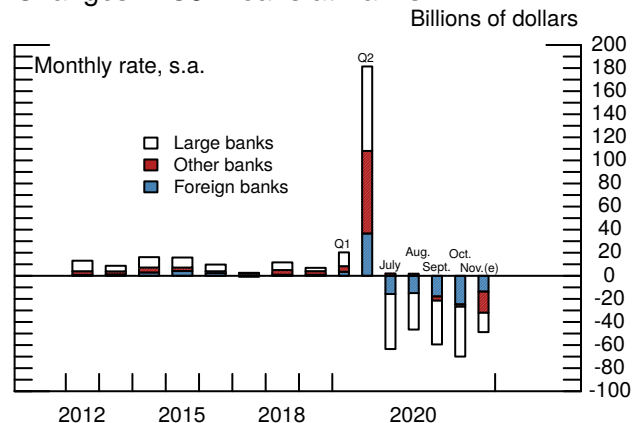
Note: Large banks are defined as the largest 25 banks by assets. C&I is commercial and industrial.
e (Estimated).
Source: Federal Reserve Board (FRB) staff calculations, FRB, Form FR 2644, Weekly Report of Selected Assets and Liabilities of Domestically Chartered Commercial Banks and U.S. Branches and Agencies of Foreign Banks.

Financing Conditions

BUSINESS FINANCING CONDITIONS

Nonfinancial Business

Financing conditions in capital markets continued to be broadly accommodative, supported by low interest rates and high equity valuations. Conditions eased a bit over the intermeeting period, as corporate bond yields declined even further from their historically low levels. Gross issuance of both investment- and speculative-grade corporate bonds was solid over the intermeeting period, although the pace of issuance has stepped down in October and in November relative to the summer. Recent issuance was mostly used to refinance existing debt, especially for speculative-grade firms.

Gross issuance of institutional leveraged loans increased notably in October for both new-money issuance and refinancing, with new money issuance substantially higher than the issuance volume observed during the same period last year. Issuance of these loans for LBO, M&A, and dividend-recapitalization purposes made up roughly equal portions of the total $35 billion in new-money institutional issuance.[1] Investor demand for leveraged loans has been high, with strong CLO issuance in October.

Bank lending conditions appear to have generally remained tight. C&I loans outstanding contracted in October and November with continued paydowns of loan balances and the start of PPP loan forgiveness activity. Spreads on bilateral C&I loans ticked up in October, while spreads on triple-B-rated syndicated loans remained elevated through mid-November. Bank supervisors and market contacts indicate that underwriting standards have stayed relatively tight in recent months.

Gross equity issuance through seasoned offerings was similar in October and November to the typical volumes observed in previous years. Some firms that have been disproportionately hurt by the pandemic raised funds through seasoned equity offerings, reflecting recent improvements in investor sentiment. Equity raised by nonfinancial corporations through IPOs declined somewhat from a strong September but remained solid overall. Many of the recent IPOs continued to be in the biotechnology and information technology industries. The December IPO calendar appears to be strong, with a few large IPOs expected in the coming weeks.

The credit quality of nonfinancial corporations continued to show signs of stabilization. Although the volume of nonfinancial corporate bond downgrades somewhat outpaced upgrades in October and November, nonfinancial corporate bond defaults continued to decline. In addition, the default rate on leveraged loans was largely

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[1] "Dividend recapitalization" refers to a firm borrowing in order to pay a "special" dividend to shareholders.

Small Business Financing

Small Business Loan Originations

January 2005 = 100

Monthly

Oct.
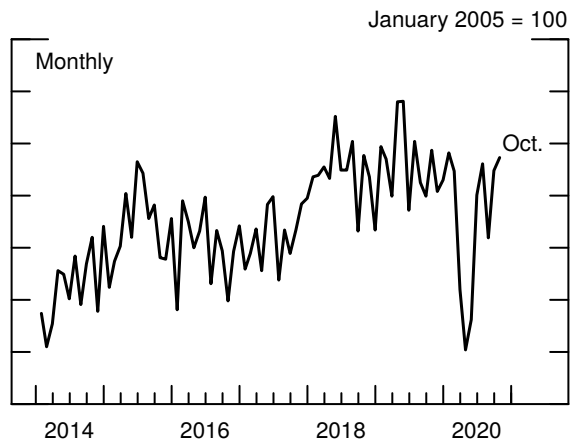
Source: Paynet.

Delinquency Rates of Small Business Loans

Percent

Monthly

— 30-day delinquency rate
— 90-day delinquency rate

Oct.
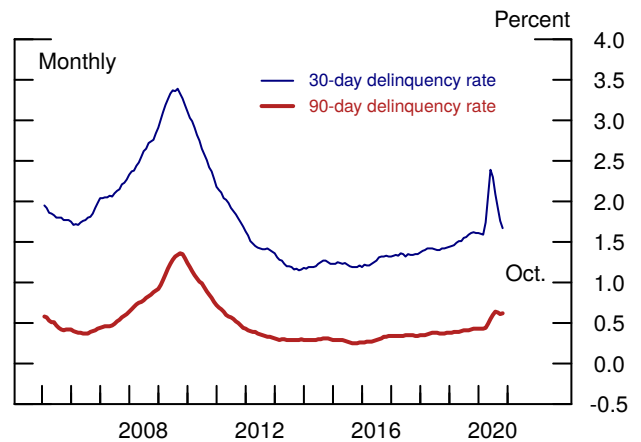
Source: Paynet.

Commercial Real Estate

Changes in CRE Loans at Banks

Billions of dollars

Monthly rate, s.a.
- ■ Construction and land development
- ■ Multifamily
- ■ Nonfarm nonresidential

H2 Q1 Q2
H1
Q3   Nov.(e)
Oct.
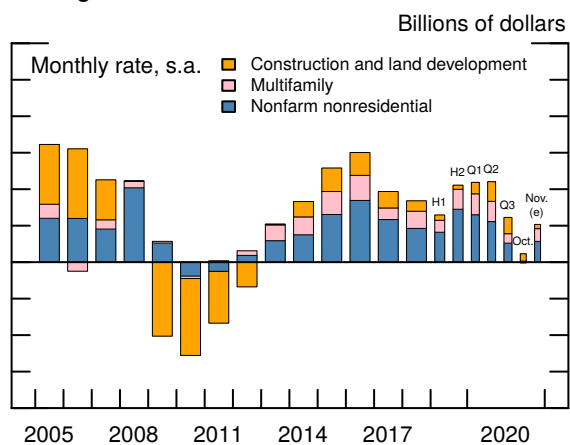
Note: Yearly rates are Q4 to Q4; half-years are based on Q4 and Q2 average levels; quarterly and monthly annual rates use corresponding average levels. Large banks are defined as the largest 25 banks by assets. CRE is commercial real estate.
  (e) Estimated.
  Source: Federal Reserve Board, Form FR 2644, Weekly Report of Selected Assets and Liabilities of Domestically Chartered Commercial Banks and U.S. Branches and Agencies of Foreign Banks.

Non-agency CMBS Spreads over Swaps

Basis points   Basis points

Weekly   Weekly

Triple-A 10-year   Triple-B 10-year
senior (left scale)   (right scale)

Nov.
27
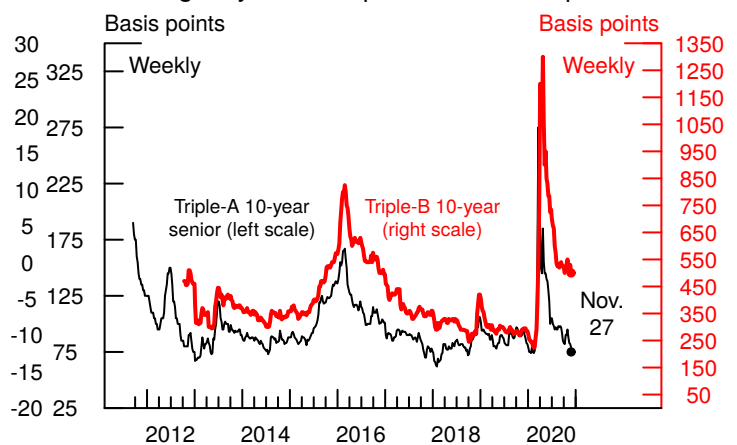
Note: CMBS is commercial mortgage-backed securities.
Source: J.P. Morgan.

Financing Conditions

unchanged in October, albeit at somewhat elevated levels. Market indicators of future default expectations declined slightly, even though they remained above their pre-pandemic levels.

The third-quarter earnings season ended with firms largely having reported better-than-expected earnings even after adjusting for analyst bias. Earnings for S&P 500 firms rose an outstanding 43 percent from the second quarter to the third quarter. However, they were still 7 percent below their levels during the same quarter last year. In November, private-sector analysts' expectations of long-term earnings were revised sharply higher and stood near pre-pandemic levels.

Small Businesses

Financing conditions for small businesses remained tight. Data from the Federal Reserve Small Business Lending Survey indicate tightening lending standards for small businesses, on net, over the third quarter, consistent with responses to the most recent SLOOS.[2] According to the PayNet Small Business Lending Index, small business loan originations ticked up in October, and the October level was similar to that seen a year earlier. However, the rebound in lending in recent months appears to be due in large part to the refinancing of existing loans. In addition, balances on bilateral C&I loans, which are often used by small businesses, contracted in October.

Small business balance sheets have shown some signs of stabilization. The Census Small Business Pulse Survey data suggest that, on average, across all firms, there was little change in cash on hand relative to expenses from June to mid-November. However, the credit quality of firms in the accommodation and food services industry has deteriorated somewhat, with the percent reporting less than a week of cash relative to expenses having risen from about 10 percent in June to 16 percent in mid-November.

Small business loan performance showed hints of improvement in October, on balance, across sectors. Thirty-day delinquency rates on small business loans edged down in October, while 90-day delinquency rates and default rates were stable. Delinquencies and defaults remain elevated relative to the range observed over the past several years but are significantly below the levels observed following the Great Financial Crisis. Loan performance in the accommodation and food services sector, however, has continued to worsen, with the default rate increasing in October to levels last observed in 2010.

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[2] The Federal Reserve Small Business Lending Survey data will be publicly released on December 18, 2020.

The potential for further deterioration in loan performance remains high. Data from Homebase and Womply suggest that employment and revenue at small businesses declined further in November. In addition, the Census Small Business Pulse Survey shows that expectations of business owners about the risk of permanent closures remain elevated relative to historical measures of business exits in most sectors.

Commercial Real Estate

The securitization market for CRE borrowing remained accommodative over the intermeeting period. Spreads on agency CMBS remained narrow, and issuance continued to be strong in October. Spreads on non-agency CMBS ticked down in October and November. Although spreads on triple-B-rated non-agency CMBS have come down substantially from their highs in the spring, they continued to be elevated relative to pre-pandemic levels. Non-agency CMBS issuance picked up in October, nearing pre-pandemic levels. Growth of CRE loans on banks' books remained weak in October and November, consistent with tight bank lending standards.

State and Local Government Financing Conditions

Financing conditions in the municipal bond market remained accommodative over the intermeeting period. In October, issuance of state and local government debt continued to be robust and reached all-time high levels, reportedly because of municipalities pulling forward issuance ahead of the election. Taxable issuance was strong in October, as was new capital and refinancing issuance. High-yield municipal bond issuance in October was similar to average levels observed last year, while unrated issuance was below the average levels observed last year. November issuance was muted.

Indicators of the credit quality of municipal debt weakened somewhat further in October, with the number of credit-rating downgrades exceeding the number of upgrades by a moderate amount. Meanwhile, state CDS spreads were little changed on net. The Municipal Liquidity Facility (MLF) did not see any new take-up over the intermeeting period, although Illinois has reportedly indicated its intention to tap the MLF ahead of the program's expiration at the end of the year.

HOUSEHOLD FINANCING CONDITIONS

Residential Real Estate

Financing conditions in the residential mortgage market remained highly accommodative for borrowers accessing government- and agency-backed loans. Mortgage rates for most borrowers ticked down slightly since the November FOMC, remaining near historical lows. In aggregate, home-purchase and refinance originations continued to be robust. However, mortgage credit remained tight for borrowers with lower credit scores and for jumbo loans and other products ineligible for government and agency credit guarantees.

The fraction of mortgages in forbearance held fairly steady in November after having trended down from June through October. The rate of transition into mortgage delinquency remained at pre-pandemic levels through October after briefly having spiked in April and May.

Consumer Credit

Financing conditions in consumer credit markets were largely stable during the intermeeting period, remaining generally accommodative for borrowers with relatively strong credit scores. Developments in credit card financing were mixed, whereas signals for auto lending were positive on balance.

Credit card balances continued to contract at a moderate pace, on net, for both prime and nonprime borrowers. Average credit limits on existing credit card accounts declined for all types of borrowers, and financing conditions in this market remained tight for nonprime borrowers. However, there were some signs of easing, as the volume of mail solicitations continued to rebound through October.

Auto loan balances increased solidly in October for prime and near-prime borrowers but declined for subprime borrowers. Auto loan interest rates remain well below pre-pandemic levels, even as most of financing incentives from the spring are gone, and continued to be cited as a favorable factor in auto-purchase decisions. In addition, captive finance companies have financed a growing share of new car loans.

Consumer ABS market conditions remained stable over the intermeeting period, with tight spreads on triple-A rated securities and, on balance, robust issuance. The announced expiration of TALF did not appear to leave a significant imprint in the market.

Financing Conditions

Household Finance

Mortgage Rate and MBS Yield

Rate

Daily

30-year conforming fixed-rate mortgage

MBS current-coupon yield

Dec. 2

10-year Treasury yield

July   Aug.   Sept.   Oct.   Nov.   Dec.
2020
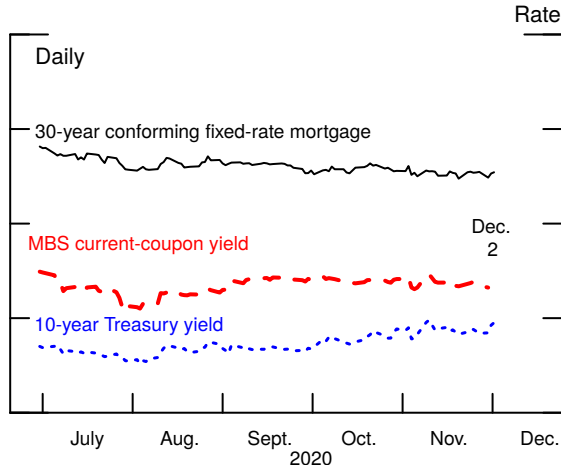
Note: The mortgage-backed securities (MBS) yield is from Fannie Mae through May 31, 2019, and from uniform mortgage-backed securities thereafter.
Source: For mortgage rates, Optimal Blue; for MBS yield, J.P. Morgan.

Purchase and Refinance Originations

Thousands   Thousands

Monthly

Home purchase (left scale)

Oct.

Refinance (right scale)

2002   2005   2008   2011   2014   2017   2020
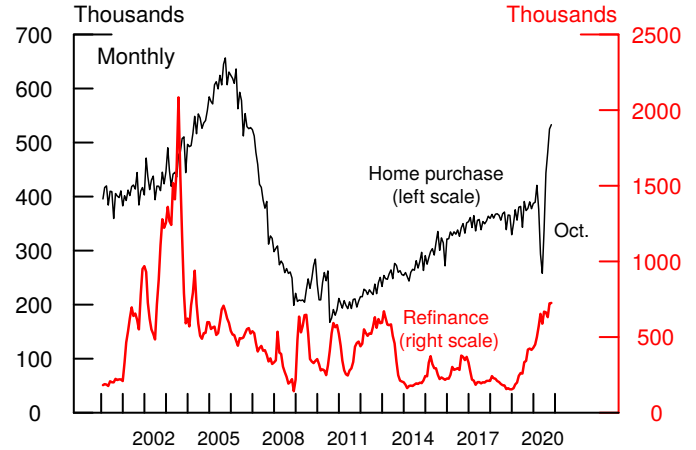
Note: The data are seasonally adjusted by Federal Reserve Board staff.
Source: For values before 2020, data reported under the Home Mortgage Disclosure Act of 1975; for values in 2020, Federal Reserve Board staff estimates.

Delinquencies on Conventional Mortgages

Percent of loans   Percent of loans

Monthly

Transition rate (left scale)
Delinquency rate (right scale)

Oct.

2002   2005   2008   2011   2014   2017   2020
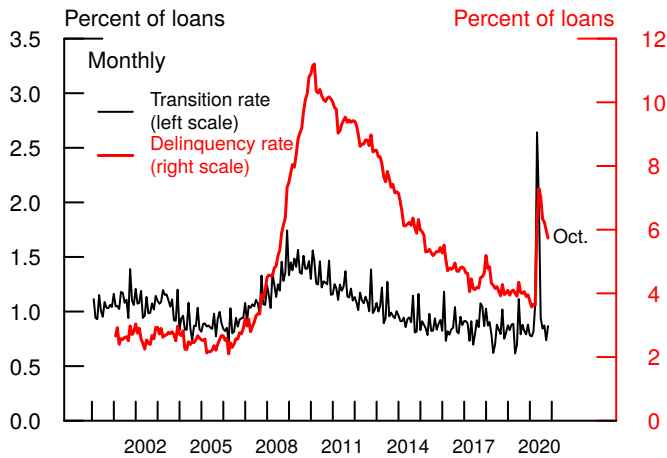
Note: For delinquency rate, percent of loans 30 or more days past due or in foreclosure. For transition rate, percent of previously current mortgages that transition to being at least 30 days delinquent each month.
Source: LPS Applied Analytics/Black Knight.

Consumer Credit Flows

Billions of dollars (real)

Monthly rate

Q1   June   July   Sept. Oct.

Apr.   Aug.
May

Credit cards
Auto loans
Student loans

2012   2016   2020
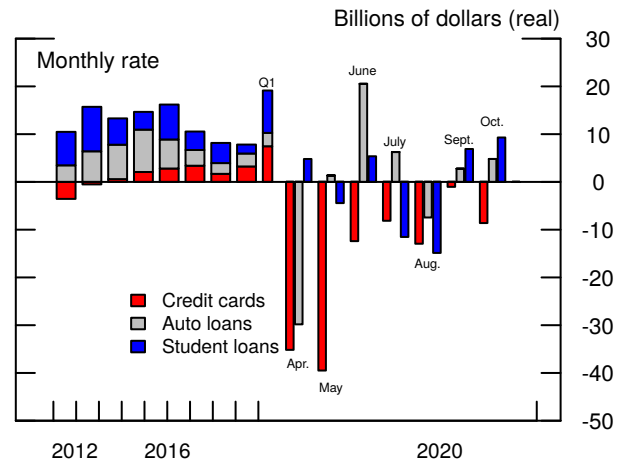
Note: The data are seasonally adjusted by Federal Reserve Board staff.
Source: Federal Reserve Bank of New York Consumer Credit Panel/Equifax.

Buying Conditions and Interest Rates for Vehicles

Percent of consumers   Percent

Monthly   Weekly

Interest rates as a positive reason for buying a vehicle (left scale)

Oct.

Rate for new auto loans (right scale)

Nov.

2016   2017   2018   2019   2020
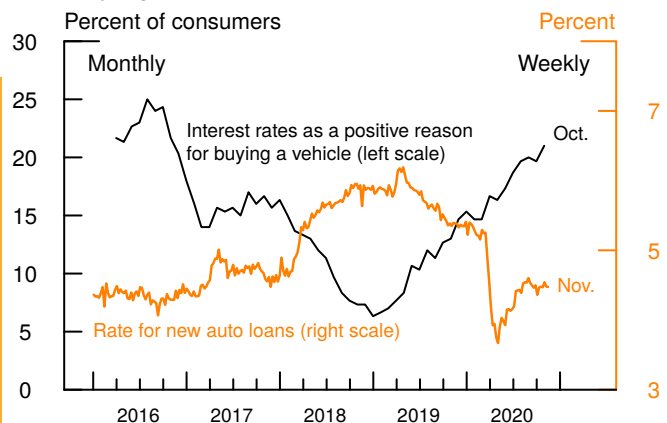
Note: Percent of consumers reporting it is a good time to buy a car due to low interest rates minus the percent of consumers reporting it is a bad time to buy a car due to high interest rates. Data are a 3-month moving average. Auto loans data are reported weekly and seasonally adjusted.
Source: University of Michigan Surveys of Consumers; J.D. Power.

Average Credit Limit on Existing Credit Card Accounts

Thousands of dollars

Monthly

Sept.

2014   2015   2016   2017   2018   2019   2020
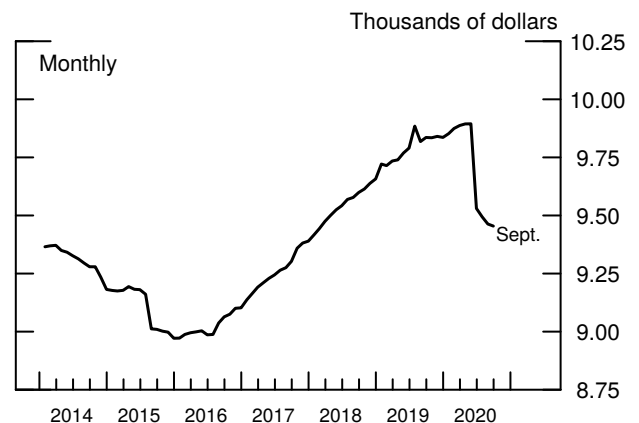
Source: Federal Reserve Board, Form FR Y-14M, Capital Assessments and Stress Testing.

Financing Conditions

FINANCING AND FINANCIAL CONDITIONS INDEXES

A staff index that provides a measure of financing conditions for nonfinancial corporations indicates those conditions eased somewhat over the intermeeting period, reflecting stronger stock market performance of speculative-grade firms relative to investment-grade firms. The average reading of publicly available financial conditions indexes, which are largely based on a range of market prices, also indicate a further easing of financial conditions. On balance, these indexes suggest that financing conditions are about as accommodative as before the onset of the COVID-19 pandemic in the United States.

Financing Conditions

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Financing Conditions

Appendix

Technical Note on Financial Conditions Indexes

The table "Overview of Selected FCIs" provides a summary of various financial conditions indexes (FCIs) that have been developed at the Federal Reserve Board and elsewhere. The historical evolution of these indexes is reported in the exhibit "Selected Financial Conditions Indexes."

Overview of Selected FCIs

Index	Frequency	Sample start	Methodology	Components
Staff FCI for nonfinancial corporations	Daily	1973	Difference in equity returns between two portfolios of firms with credit ratings above and just below investment grade	Nonfinancial firms' stock returns and credit ratings; five Fama-French factors, plus momentum and quality minus junk factors
SLOOS Bank Lending Standards Index	Quarterly	1991	Weighted average of the net percentage of domestic banks tightening standards for 11 loan categories, with weights given by the size of each loan category on banks' balance sheets	Lending standards for 11 loan categories
Goldman Sachs Financial Conditions Index	Daily	1990	Weighted average of financial variables with weights pinned down by the contribution of each financial variable on real GDP growth over the following year using a VAR model	5 financial variables: the federal funds rate, the 10-year Treasury yield, the triple-B yield spreads to Treasury, the S&P price-to-earnings ratio, and the broad value of the U.S. dollar
Chicago Fed National Financial Conditions Index	Weekly	1971	Dynamic factor model	100 financial variables related to money markets (28 indicators), debt and equity markets (27 indicators), and the banking system (45 indicators)
St. Louis Fed Financial Stress Index	Weekly	1993	Principal component analysis	18 variables, including short- and long-term Treasury yields, corporate yields, money market and corporate bond spreads, bond and stock market volatility indicators, breakeven inflation rate, and the S&P 500 index
Kansas City Fed Financial Stress Index	Monthly	1990	Principal component analysis	11 financial variables, including short- and long-term interest rates, corporate and consumer yield spreads, the VIX, and the volatility of bank stock prices

Source: CRSP; Yahoo Finance; Moody's Bond Ratings; Ken French website; AQR Capital Management website; Federal Reserve Board, Senior Loan Officer Opinion Survey on Bank Lending Practices; Bloomberg; Federal Reserve Banks of Chicago, St. Louis, and Kansas City.

Financing Conditions

The first index in the table, the staff FCI for nonfinancial corporations, measures financing conditions for nonfinancial corporations.[1] This index is constructed as the difference in equity returns between two portfolios of firms with credit ratings above and just below investment grade. To the extent that speculative-grade firms are more sensitive to changes in financing conditions than investment-grade firms but have similar exposure to other shocks, movements in this index provide a measure of changes in financing conditions for nonfinancial corporations.

The second index in the table measures the net share of domestic banks reporting tighter lending standards across all core loan categories in the Senior Loan Officer Opinion Survey on Bank Lending Practices. Banks' responses for a given loan category are weighted by banks' holdings of those loans on their balance sheets.[2]

The other FCIs are constructed by aggregating a large set of financial variables into a summary series using various statistical methods. While these indexes provide a useful summary of broad financial market developments, the movements in these indexes may reflect both changes in financing conditions and other shocks to the economy.

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[1] This index was first discussed in the box "Financial Conditions Indexes" in the Financing Conditions for Businesses and Households section of the September 2018 Tealbook A.

[2] This index is an updated version of the index developed in William F. Bassett, Mary Beth Chosak, John C. Driscoll, and Egon Zakrajsek (2014), "Changes in Bank Lending Standards and the Macroeconomy," *Journal of Monetary Economics,* vol. 62 (March), pp. 23–40. The current index uses a new weighting approach for each loan category.

Selected Financial Conditions Indexes

Staff FCI for Nonfinancial Corporations
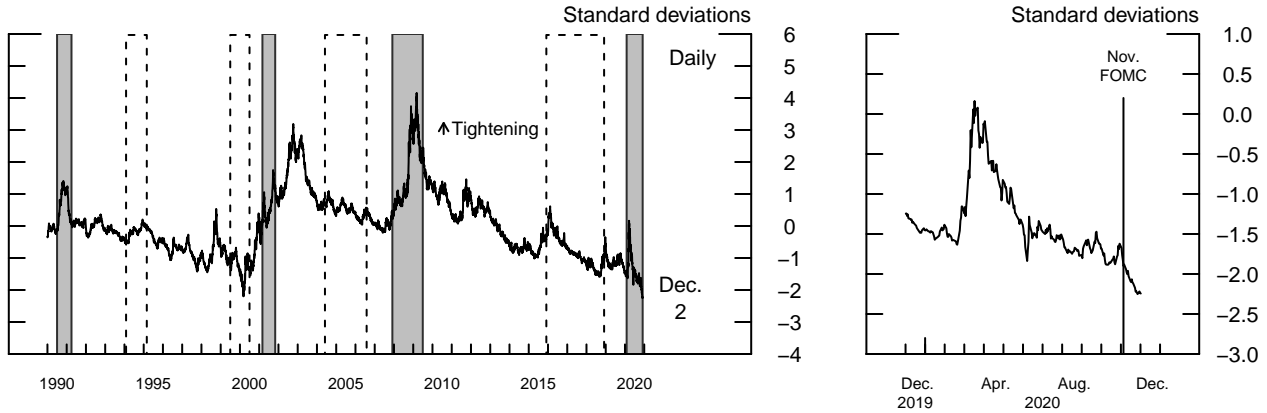
Note: The financial conditions index (FCI) is the deviation from the long–run relation between the systematic components of the cumulative log returns of 2 portfolios of firms with credit ratings above and just below investment grade. The systematic components are derived from the 5–factor Fama–French asset pricing model, augmented with the momentum and quality minus junk factors.
Source: CRSP; Yahoo Finance; Moody's Bond Ratings; Ken French website; AQR Capital Management website.

SLOOS Bank Lending Standards Index
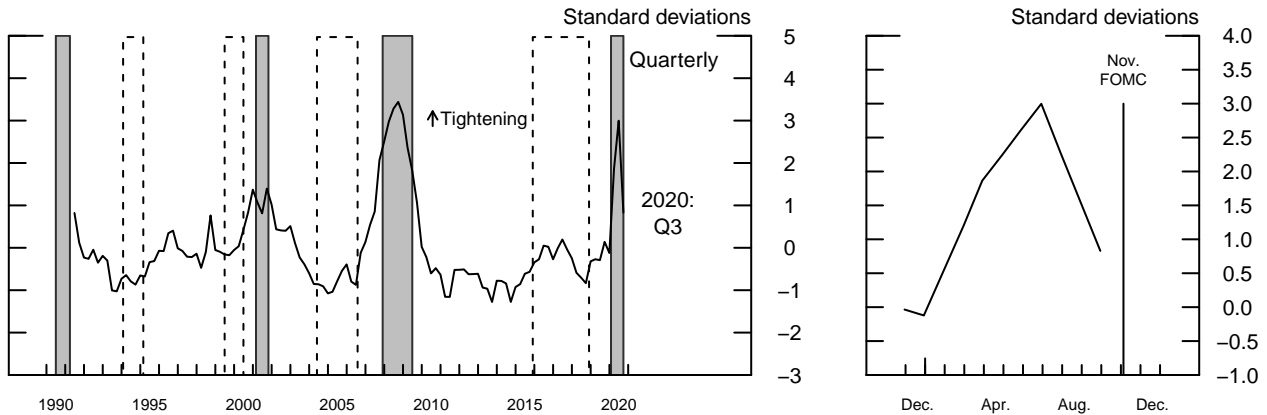
Note: The index is a weighted average of the net percentage of domestic banks tightening standards for 11 loan categories, with weights given by the size of each loan category on banks' balance sheets.
Source: Federal Reserve Board, Senior Loan Officer Opinion Survey on Bank Lending Practices.

Mean and Range of External FCIs
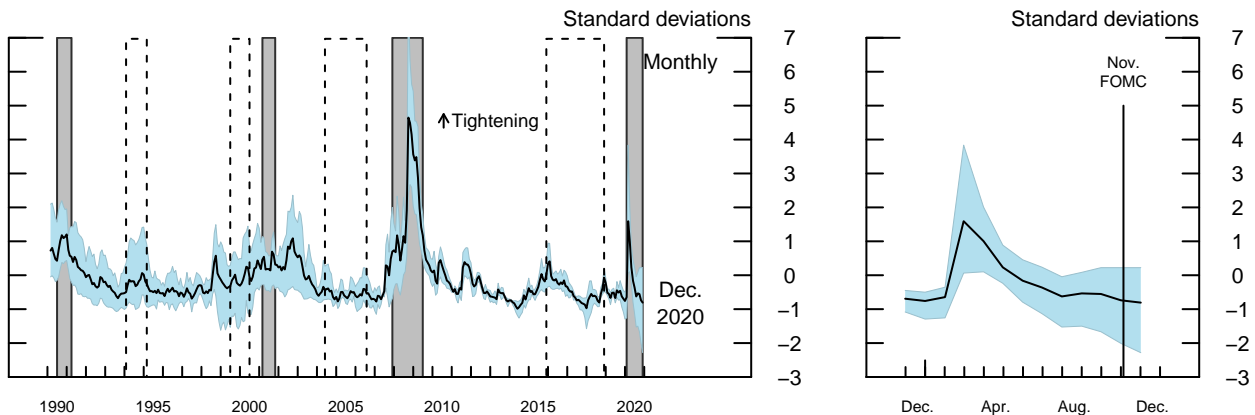
Note: Mean FCI represents the mean of FCIs developed by Goldman Sachs and the Federal Reserve Banks of Chicago, St. Louis, and Kansas City. The blue shaded region represents the range of these 4 standardized FCIs.
Source: Bloomberg; Federal Reserve Banks of Chicago, St. Louis, and Kansas City.

For all panels: Indexes are standardized. Values above (below) zero represent tighter (easier) than average financial conditions. The shaded bars indicate periods of business recession as defined by the National Bureau of Economic Research. The dashed boxes denote monetary policy tightening cycles.

Financing Conditions

Selected Financial Conditions Indexes (continued)

Goldman Sachs FCI

Standard deviations   Standard deviations
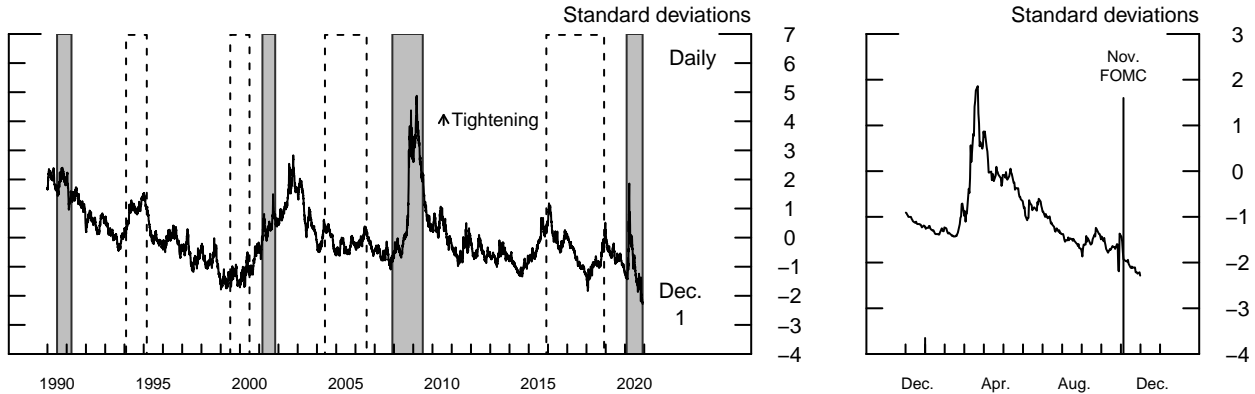
Note: The index is a weighted average of 5 financial variables: the federal funds rate, the 10–year Treasury yield, the triple–B yield spreads to Treasury, the S&P price–to–earnings ratio, and the broad value of the U.S. dollar. Weights are pinned down by the contribution of each financial variable on real gross domestic product growth over the following year using a vector autoregression model.
Source: Bloomberg.

Chicago Fed NFCI

Standard deviations   Standard deviations
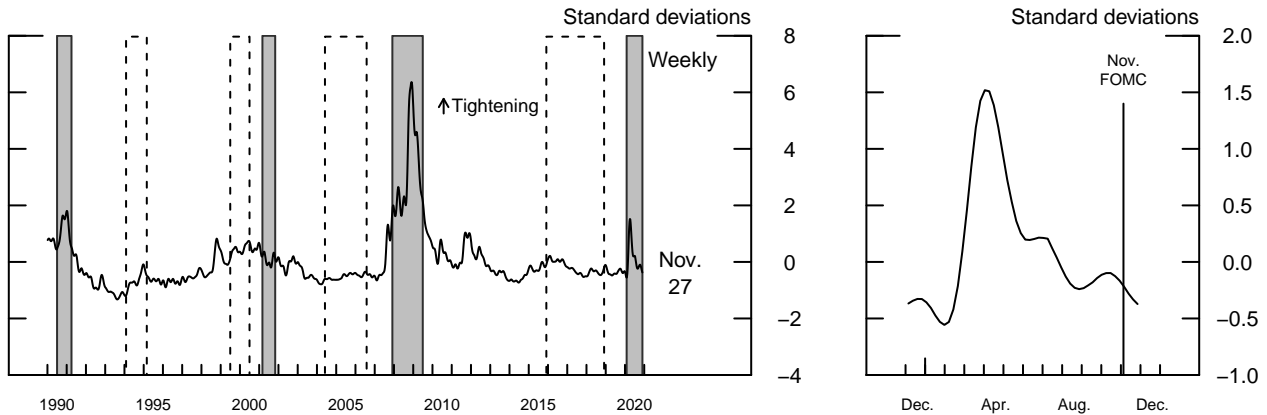
Note: The index is based on 100 financial variables related to money markets (28 indicators), debt and equity markets (27 indicators), and the banking system (45 indicators). The index is weekly and is derived using a dynamic factor model.
Source: Federal Reserve Bank of Chicago.

St. Louis Fed Financial Stress Index

Standard deviations   Standard deviations
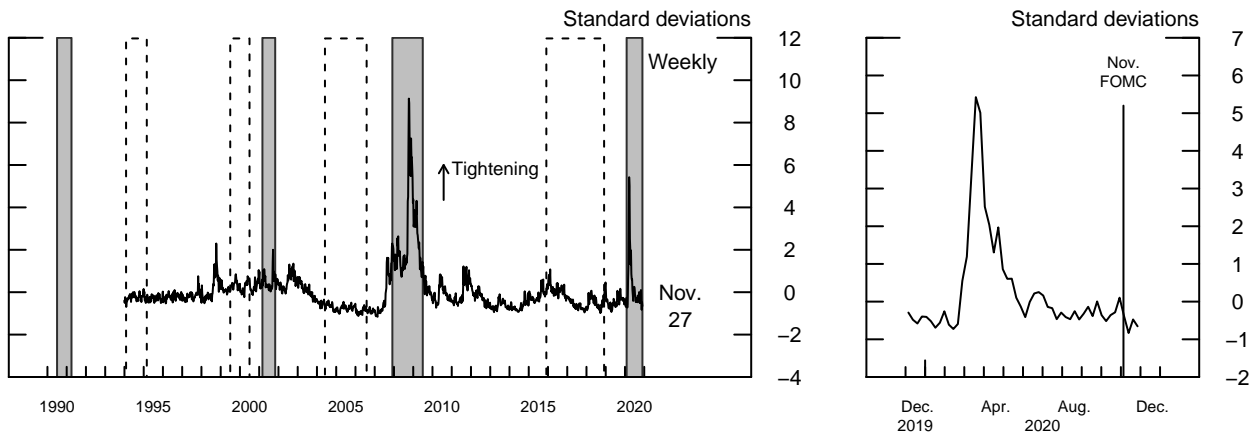
Note: The index is the principal component of 18 variables, including short– and long–term Treasury yields, corporate yields, money market and corporate bond spreads, bond and stock market volatility indicators, breakeven inflation rate, and the S&P 500 index.
Source: Federal Reserve Bank of St. Louis.

For all panels: Indexes are standardized. Values above (below) zero represent tighter (easier) than average financial conditions. The shaded bars indicate periods of business recession as defined by the National Bureau of Economic Research. The dashed boxes denote monetary policy tightening cycles.

Selected Financial Conditions Indexes (continued)

Kansas City Fed Financial Stress Index

Standard deviations   Standard deviations

Monthly

↑Tightening   Nov.
                                             FOMC

Oct.
2020

1990   1995   2000   2005   2010   2015   2020   Dec.   Apr.   Aug.   Dec.
                                                             2019   2020
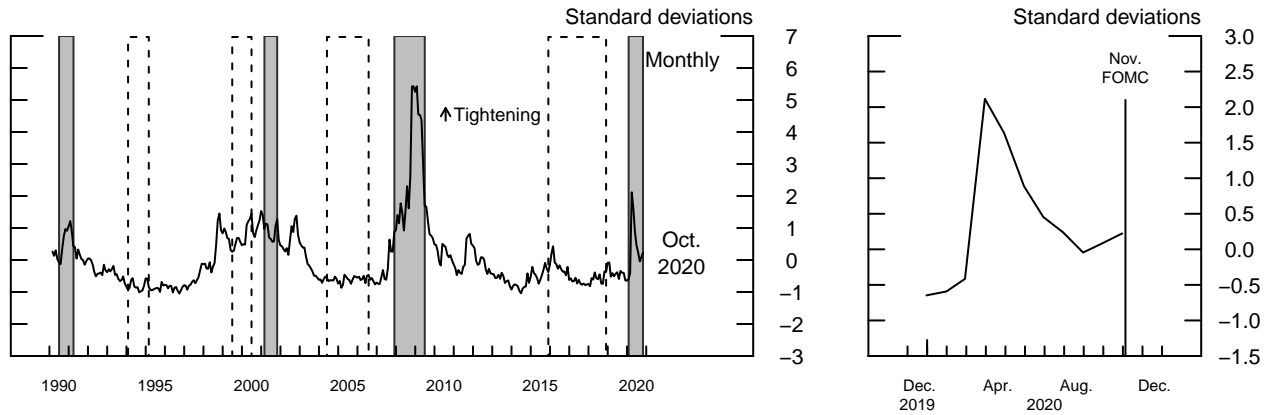
Note: The index is the principal component of 11 financial variables, including short– and long–term interest rates, corporate and consumer yield spreads, the VIX, and the volatility of bank stock prices.

Source: Federal Reserve Bank of Kansas City.

Financing Conditions

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Financing Conditions

Risks and Uncertainty

ASSESSMENT OF RISKS

Resurgence of the virus both in the United States and abroad has increased the near-term downside risks to economic activity. At the same time, positive vaccine developments have diminished adverse tail risks over the medium term.

The pandemic has worsened dramatically in recent weeks. The level of COVID-19-related hospitalizations in the United States far exceeds the previous peaks reached in the spring and summer, and daily deaths have recently touched levels not seen since the peak last spring, leading some states and localities to reimpose targeted restrictions on large gatherings and certain business activities. In the baseline projection, we assume that more states put in place such restrictions. These measures, along with increased voluntary social distancing, are assumed to be sufficient to prevent health-care systems from being overwhelmed for extended periods in the United States. Although we expect these actions will leave a noticeable imprint on economic activity, we anticipate a hit that is far smaller than the collapse we saw in the spring. Abroad, we have already seen the imposition of significant targeted lockdown measures in major European countries and parts of Canada, which we expect to stay in place over the coming months. However, the virus may prove to be more difficult to control than we assume in the baseline. It is therefore possible that more-severe restrictions will be needed both in the United States and abroad—with all the attendant stresses on financial markets and business and household confidence. We explore this possibility in the "Second Round of Severe Restrictions" scenario.

The recent good news on vaccines greatly reduces the risk that there will be a long wait for an effective vaccine. In the staff baseline, we have moved up the date at which herd immunity will be achieved by one quarter and now assume that all effects of social-distancing measures on economic activity will be behind us by the end of next year. There is, however, a great deal of uncertainty about the ability of drug companies to produce, and of the health-care system to distribute, vaccines at the scale and speed assumed in the baseline. As one element of our "Second Round of Severe Restrictions" scenario, we assume that delays in the availability of the vaccine increase the duration of economic weakness. We also consider an upside scenario ("Early Vaccine") in which the vaccine is produced as rapidly as the manufacturers say is possible, most people are willing to get inoculated as soon as possible, and herd immunity is

achieved at a threshold that is at the more optimistic end of the range estimated by epidemiologists.

The on-again, off-again negotiations over an additional fiscal stimulus package highlight the upside risk that, contrary to our baseline assumption, the Congress may enact a substantial additional tranche of stimulus, a possibility we explore in the "Additional Fiscal Stimulus" scenario.

We also consider two scenarios associated with inflation risks. Under "Inflationary Pressures," supply chain disruptions, higher costs associated with COVID-19 mitigation measures, and reduced labor supply put more upward pressure on inflation than assumed in the staff baseline. By contrast, in the "Lower Inflation Expectations" scenario, we assume that underlying inflation is now, and has been for some time, lower than assumed in the staff baseline.

ALTERNATIVE SCENARIOS

This section provides details on the alternative scenarios introduced in the preceding section. The scenarios are simulated using the FRB/US and SIGMA models as well as a recently developed staff model—NK/SIR—that couples a small-scale New Keynesian model with a SIR (susceptible, infected, recovered) model of viral propagation to capture the endogenous response of consumption and production to the progression of the pandemic.[1] In all scenarios, the federal funds rate follows the policy rule used for the baseline projection.[2]

Second Round of Severe Restrictions (FRB/US, SIGMA)

Given the deteriorating pandemic situation, the baseline projection assumes that social-distancing measures will lower economic activity through the first quarter of 2021—both in the United States and, especially, in advanced foreign economies (AFEs)—but that social distancing will have been relaxed somewhat by the start of the second quarter of 2021. However, the number of infections could rise sharply during the winter, perhaps because the current high level of new cases erodes the effectiveness of existing pandemic control measures or because indoor social activities during the winter raise the risk of infection. Such a surge in infections could

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[1] For a description of the NK/SIR model and its properties, see Antoine Lepetit and Cristina Fuentes-Albero (2020), "The Limited Power of Monetary Policy in a Pandemic," unpublished paper, Board of Governors of the Federal Reserve System, Division of Research and Statistics, September, dx.doi.org/10.2139/ssrn.3699708.

[2] Unless otherwise stated, all scenarios assume that federal fiscal policy and the Federal Reserve's balance sheet policies are the same as in the baseline.

lead state and local governments in the United States to impose more-severe and widespread restrictions, while foreign governments might need to prolong and intensify restrictions already in place. In addition, although large-scale vaccinations are likely to begin in the first half of 2021, challenges related to vaccine distribution and take-up, especially in emerging market economies (EMEs), could delay the recovery. The contraction in economic activity caused by the new wave of restrictions could be amplified if firms' and households' access to financing becomes increasingly impaired and financial conditions tighten more broadly.[3] Furthermore, in many countries, limited policy space for additional fiscal support and recessionary dynamics (including private-sector debt overhangs) may cause those economies to weaken sharply. Moreover, the supply side of the economy could suffer more than in the baseline because of greater permanent job loss, a spike in firm exits, and reduced investment.[4]

In this scenario, a continued surge in new cases in many U.S. states and in foreign economies leads to a widespread and persistent increase in stringent social-distancing measures starting before the end of the year. Additionally, delays in vaccine distribution and take-up postpone the achievement of herd immunity in the advanced economies until the fourth quarter of 2021 (one quarter later than in the baseline). Because we believe governments and private agents have learned how to better deal with these disruptions, the social-distancing measures are less damaging to both the United States and foreign economies than earlier this year. Abroad, GDP stops growing in 2021 and remains more than 6 percent below the baseline throughout 2021 and 2022, with a more protracted slump in Latin American economies. Corporate borrowing spreads increase 150 basis points in advanced economies (including the United States) and 250 basis points in emerging foreign economies in the first half of 2021. Flight-to-safety flows to the United States lead to a 5 percent appreciation of the dollar in early 2021.

At home, the broad reinstatement of social distancing along with the deterioration in financial conditions and in consumer and business confidence causes consumption and investment to weaken, and the slump in foreign demand, together with the appreciation of the dollar, leads to lower exports. Disruptions associated with renewed social distancing drive up the unemployment rate, which hits 8.4 percent in the middle of 2021 and remains elevated for the

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[3] As in the baseline, we assume that support programs for financial markets are not reestablished in the United States, thereby worsening the amplification of the downturn through financial channels.

[4] This scenario assumes that, over much of the next year, the natural rate of unemployment averages 0.6 percentage point above the baseline, consistent with the staff's estimates of the effects that increased mandatory social distancing and associated impairments in labor market functioning would have on the natural rate of unemployment. In addition, the labor force participation rate averages 0.8 percentage point below the baseline over this period. Both the natural rate of unemployment and the participation rate converge to the baseline thereafter.

Alternative Scenarios

Risks & Uncertainty

■ Tealbook baseline and extension	■ Early vaccine	■ Inflationary pressures
■ Second round of severe restrictions	■ Additional fiscal support	■ Lower inflation expectations

Real GDP
4–quarter percent change
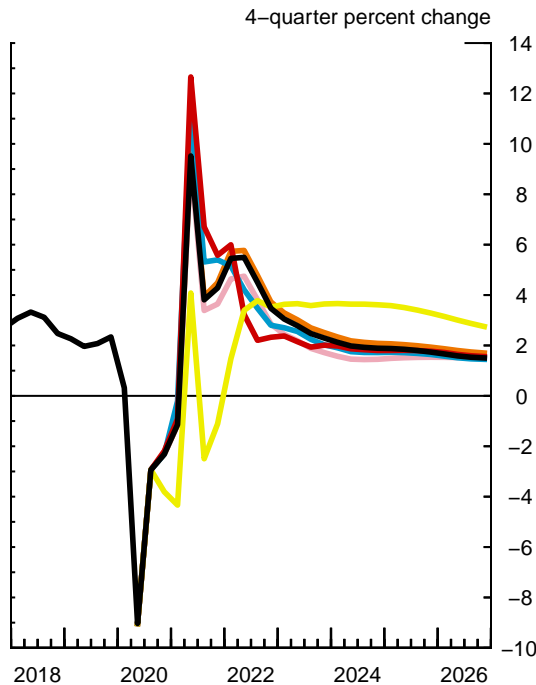
Unemployment Rate
Percent

PCE Prices excluding Food and Energy
4–quarter percent change
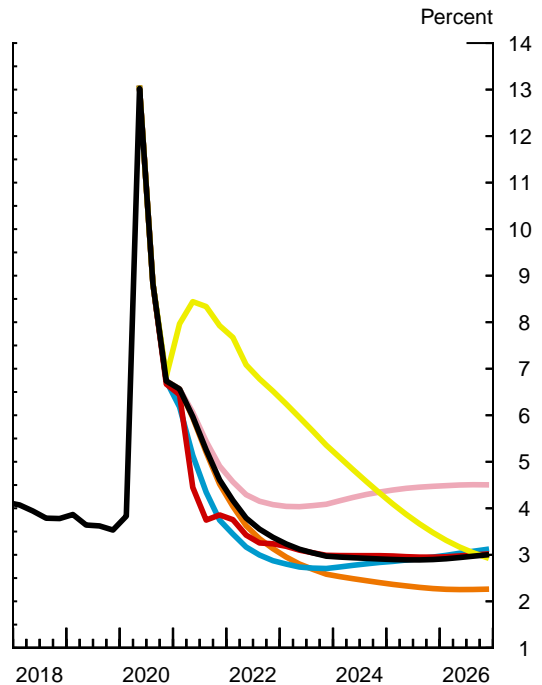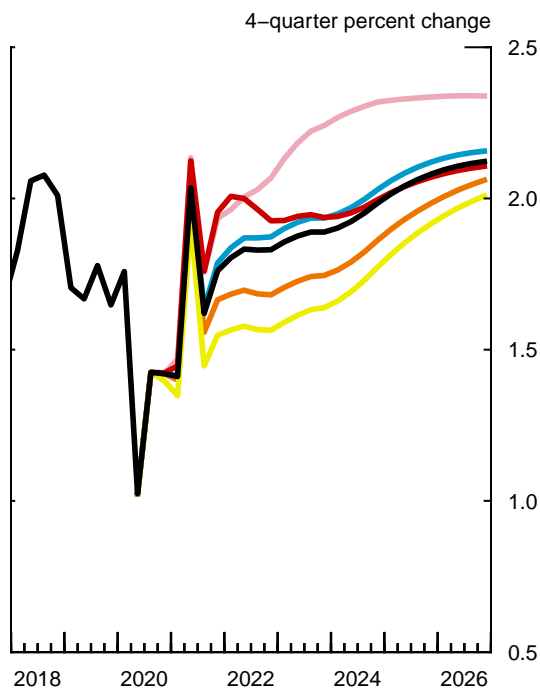
Federal Funds Rate
Percent
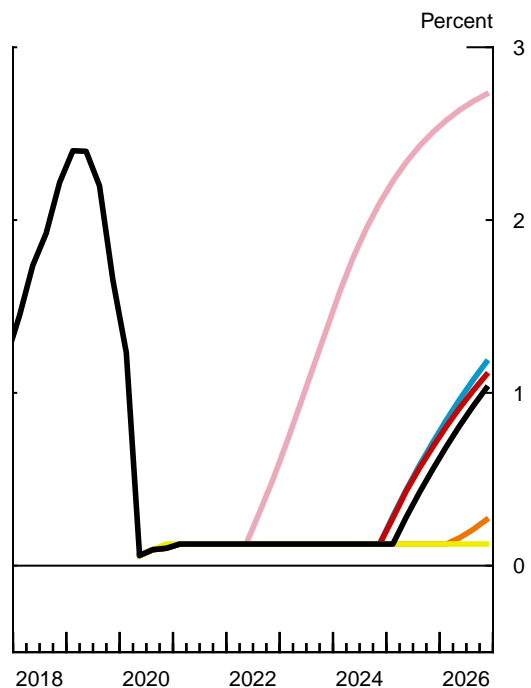
Note: Events such as the COVID–19 pandemic are unprecedented in the data used to construct the confidence intervals usually shown in this exhibit. We judge that our usual methodology is not currently reliable, particularly for the near–term projections, and thus confidence intervals are not presented.

Alternative Scenarios

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

Measure and scenario	2020 H1	2020 H2	2020	2021	2022	2023	2024	2025-26
Real GDP								
Tealbook baseline and extension	-19.2	18.2	-2.3	4.3	3.5	2.3	1.9	1.6
Second round of severe restrictions	-19.2	14.6	-3.8	-1.1	3.5	3.6	3.6	3.0
Early vaccine	-19.2	18.5	-2.2	5.6	2.3	2.0	1.8	1.7
Additional fiscal support	-19.2	18.2	-2.3	5.4	2.8	2.0	1.7	1.5
Inflationary pressures	-19.2	18.2	-2.3	3.6	2.8	1.7	1.5	1.5
Lower inflation expectations	-19.2	18.2	-2.3	4.5	3.7	2.5	2.1	1.8
Unemployment rate[1]								
Tealbook baseline and extension	13.0	6.7	6.7	4.6	3.4	3.0	2.9	3.0
Second round of severe restrictions	13.0	6.8	6.8	7.9	6.5	5.4	4.3	2.9
Early vaccine	13.0	6.7	6.7	3.9	3.2	3.0	3.0	3.0
Additional fiscal support	13.0	6.7	6.7	3.7	2.9	2.7	2.8	3.1
Inflationary pressures	13.0	6.7	6.7	4.9	4.1	4.1	4.3	4.5
Lower inflation expectations	13.0	6.7	6.7	4.5	3.1	2.6	2.4	2.3
Total PCE prices								
Tealbook baseline and extension	-.2	2.6	1.2	1.8	1.8	1.9	2.0	2.1
Second round of severe restrictions	-.2	2.2	1.0	1.2	1.5	1.7	1.9	2.1
Early vaccine	-.2	2.6	1.2	2.0	1.9	1.9	2.0	2.1
Additional fiscal support	-.2	2.6	1.2	1.8	1.8	1.9	2.0	2.1
Inflationary pressures	-.2	2.6	1.2	1.9	2.0	2.2	2.3	2.3
Lower inflation expectations	-.2	2.6	1.2	1.7	1.6	1.8	1.9	2.0
Core PCE prices								
Tealbook baseline and extension	.4	2.4	1.4	1.8	1.8	1.9	2.0	2.1
Second round of severe restrictions	.4	2.4	1.4	1.5	1.6	1.6	1.8	2.0
Early vaccine	.4	2.4	1.4	2.0	1.9	1.9	2.0	2.1
Additional fiscal support	.4	2.4	1.4	1.8	1.9	1.9	2.0	2.1
Inflationary pressures	.4	2.4	1.4	1.9	2.1	2.2	2.3	2.3
Lower inflation expectations	.4	2.4	1.4	1.7	1.7	1.7	1.9	2.0
Federal funds rate[1]								
Tealbook baseline and extension	.1	.1	.1	.1	.1	.1	.1	1.0
Second round of severe restrictions	.1	.1	.1	.1	.1	.1	.1	.1
Early vaccine	.1	.1	.1	.1	.1	.1	.1	1.1
Additional fiscal support	.1	.1	.1	.1	.1	.1	.1	1.2
Inflationary pressures	.1	.1	.1	.1	.5	1.4	2.1	2.7
Lower inflation expectations	.1	.1	.1	.1	.1	.1	.1	.3

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

Risks & Uncertainty

Risks & Uncertainty

rest of the year. By the end of 2021, the level of U.S. GDP is 6.6 percent below the baseline. The decline in aggregate demand causes core inflation to remain subdued at 1.5 percent in 2021.

Compared with the baseline, the disruption to economic activity is more protracted, in part because of persistent damage to the functioning of labor markets and continued tight financial conditions. Indeed, at the end of 2023, when the natural rate has returned to its long-run value, the unemployment rate is 5.4 percent, 1.1 percentage points above the natural rate. The persistent weakness of aggregate demand depresses inflation, which averages around 20 basis points below the baseline through 2025. The stubbornly low inflation causes the federal funds rate to remain at the ELB until the last quarter of 2026.

Early Vaccine (NK/SIR, SIGMA)

The baseline projection assumes that vaccine distribution in the United States will start in the first half of 2021 but that herd immunity will not be reached until the third quarter of 2021. However, as outlined in the box "News on COVID-19 Vaccines and Herd Immunity" in the Domestic Economic Developments and Outlook section, the number of doses sufficient to immunize most of the U.S. population could be available by the end of the second quarter of 2021. Moreover, some epidemiologists put the threshold for herd immunity at only 50 percent of the population rather than the 60 to 70 percent immunization threshold the staff assumes. Thus, herd immunity could be reached sooner than assumed in the baseline. In this scenario, we assume that a vaccine becomes available in the first quarter of 2021 and that it has been widely administered in the advanced economies by the end of the second quarter. Widespread vaccination in emerging economies occurs in the second half of 2021, somewhat earlier than in baseline.

An earlier vaccine results in a more buoyant recovery in consumer and business confidence, which in turn attenuates the recessionary dynamics that are currently part of our baseline outlook. Consequently, economic activity abroad is 1.3 percent above the baseline by late 2021 in the AFEs and 2.1 percent above baseline by early 2022 in the EMEs, where the rollout of the vaccine lags by one quarter. Further reversal of flight-to-safety flows to the United States leads to a 2 percent depreciation of the dollar in late 2021.

At home, the early arrival of the vaccine leads to a more rapid relaxation of social-distancing efforts and a stronger recovery in economic activity in the first half of 2021. In the NK/SIR model, the boost to economic activity is further magnified by households' increased

willingness to take advantage of low interest rates as the virus recedes.[5] As a result, according to the NK/SIR model, the level of GDP would already be back above its pre-pandemic level at the end of the second quarter of 2021, when the unemployment rate reaches 4.4 percent. The unemployment rate remains below the baseline path through the first half of 2023. The strength in aggregate demand and, to a lesser extent, the depreciation of the dollar boost inflation, which averages around 10 basis points above the baseline over the 2021–25 period. This higher path for inflation causes the federal funds rate to lift off from the ELB in the first quarter of 2025, one quarter earlier than in the baseline.

Additional Fiscal Support (FRB/US)

While the baseline assumes no additional fiscal support beyond that provided in previous legislation, talks are ongoing regarding additional fiscal stimulus, presenting an upside risk to the baseline forecast. In this scenario, we consider the effect of a $900 billion fiscal package beginning in the first quarter of 2021. The additional fiscal assistance accelerates the recovery in our simulation. The four-quarter change in GDP is 1.9 percentage points higher than baseline by the middle of next year as the stimulus flows through the economy. The unemployment rate is 0.9 percentage point lower than baseline by the end of next year and reaches 2.9 percent by the end of 2022. While the additional fiscal stimulus boosts the level of GDP over the next two years, after that, there is little effect. Consequently, inflation is only slightly higher than baseline by 2025, and the federal funds rate lifts off from the ELB in the first quarter of 2025, just one quarter earlier than in the baseline.

Inflationary Pressures (FRB/US)

The COVID-19 crisis has unleashed an unprecedented mixture of supply and demand forces. In the early stages of the crisis, inflation moved down in large part because demand for many goods and services directly affected by social distancing, such as apparel, accommodation, and air travel, fell sharply. Over the summer, inflation rebounded noticeably as prices for durable goods jumped. Although that rebound proved to be transitory, it is possible that further COVID-19-related increases in inflation are around the corner. For example, while supply chain disruptions do not appear to have had large aggregate inflation effects thus far, continued strengthening of demand could lead to shortages of some key inputs. Similarly, as the economy normalizes, firms may be better positioned to pass on to consumers the costs of measures taken to protect workers and customers from the virus, adding additional upward pressure on prices. Finally, the crisis may also be leading to greater tightness in labor markets than we have assumed

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[5] In the model, increasing one's consumption increases the probability of becoming infected with the virus. Households weigh this heightened risk of infection against the benefits of taking advantage of low interest rates. As a result, consumption becomes temporarily less interest-sensitive as long as the risk of infection is high.

because, for example, fear of the disease could suppress labor supply or the closure of schools could lead parents to withdraw from the labor force to care for children. While these factors are already reflected to some extent in our baseline projection, they may have a larger effect than we have assumed.

In this scenario, supply–demand imbalances exert greater upward pressure on inflation than in the baseline; in addition, longer-run inflation expectations become more sensitive to realized price inflation.[6] These assumptions interact to produce an increase in price inflation. Inflation moves up to 1.9 percent next year, compared with 1.8 percent in the baseline, and reaches 2.3 percent by the end of 2024. In response to the higher path of inflation, the federal funds rate lifts off in the second half of 2022 and increases steeply thereafter. With monetary policy tighter than in the baseline, GDP rises more slowly, and the unemployment rate is 0.7 percentage point higher than in the baseline by the end of 2022.

Lower Inflation Expectations (FRB/US)

Inflation was running persistently below 2 percent even before the pandemic, and some measures of longer-run inflation expectations are now at, or near, historically low levels. Reflecting these data, the staff estimates that underlying trend inflation has been 1.8 percent for a number of years. However, it is possible that the trend could be even lower. In this scenario, we assume that underlying trend inflation has been 1.6 percent over the past few years—the average of core PCE inflation over the past decade—and that it will respond only sluggishly to realized inflation going forward. At the same time, we assume that financial market participants understand that the Committee remains committed to a 2 percent inflation objective and thus anticipate additional monetary stimulus relative to the Tealbook baseline to offset the lower level of trend inflation.[7]

Under these assumptions, overall inflation averages 1.7 percent over the medium term, 0.1 percentage point lower than in the baseline. Lower realized inflation implies that the federal funds rate stays at the effective lower bound until the first quarter of 2026. Because financial markets anticipate a more accommodative stance for monetary policy compared with the baseline, long-term interest rates are lower and real activity is stronger than in the Tealbook

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

[7] More specifically, this scenario treats expectations of the path of the federal funds rate for the purposes of asset market pricing as model consistent. By contrast, inflation expectations are formed using the FRB/US model's VAR-based mechanism.

projection, with the unemployment rate reaching a low of 2.3 percent in 2026, around
¾ percentage point below the baseline at that time.

MODEL-BASED ASSESSMENT OF RISK

Model-based estimates of uncertainty and risks suggest that the likelihood of extreme
events has declined since the spring, a point we illustrate in two exhibits. In the exhibit labeled
"Conditional Distributions of Staff Forecast Errors 1 Year Ahead," the distributions for several
U.S. macroeconomic variables are estimated, conditional on measures of real economic activity,
inflation, financial market conditions, and an index of overall macroeconomic uncertainty.[8] The
exhibit shows that the expected distribution of staff forecast errors is unusually wide for the
coming year and is adversely skewed. A key factor driving this model prediction is the evolution
of the macroeconomic activity uncertainty index that is an input into the model; the index, in
turn, reflects the extreme movements in spending, production, and employment in the recent
past. As economic activity has recovered, the distribution has narrowed, although extreme
adverse events are currently about as probable as during the Great Recession, consistent with our
judgmental assessment that uncertainty remains high.

A complementary perspective about the distribution of risk is provided by the exhibit
"Conditional Distributions of 1-Year-Ahead GDP Growth." The exhibit shows distributions for
GDP growth rates over the next year in the United States and the aggregate foreign economy,
conditional on real-time indicators of macroeconomic and financial conditions. Specifically, the
distributions in red are obtained from "growth at risk" estimates based on quantile regressions
(QR) as discussed in the June Tealbook.[9] The distributions in blue are obtained from a two-state
Markov-switching (MS) model for the conditional mean and volatility of GDP growth, with one
regime capturing normal economic times—periods of high growth and low volatility—and a
second regime capturing bad economic times—periods of low growth and high volatility. The
probability of switching between the two regimes varies with current macroeconomic and
financial conditions.[10]

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[8] This analysis uses a framework similar in spirit to quantile regressions using past forecast errors as the
dependent variable. The variables that serve as inputs into the model are shown in the exhibit "Macroeconomic
Indexes Underlying the Conditional Distributions of Staff Forecast Errors 1 Year Ahead."

[9] See the box "Risk Estimates for the U.S. and Foreign GDP Outlook" in the Risks and Uncertainty section
of the June 2020 Tealbook A.

[10] See Dario Caldara, Danilo Cascaldi-Garcia, Pablo Cuba-Borda, and Francesca Loria (2020),
"Understanding Growth-at-Risk: A Markov-Switching Approach," unpublished paper, Board of Governors of the
Federal Reserve System, Division of International Finance and Division of Research and Statistics, October. The
paper also provides a comparison of the Markov-switching and the growth-at-risk frameworks along a number of

Risks & Uncertainty

Conditional Distributions of Staff Forecast Errors 1 Year Ahead

Unemployment Rate

Percentage points

GDP Growth

Percentage points

CPI Inflation

Percentage points
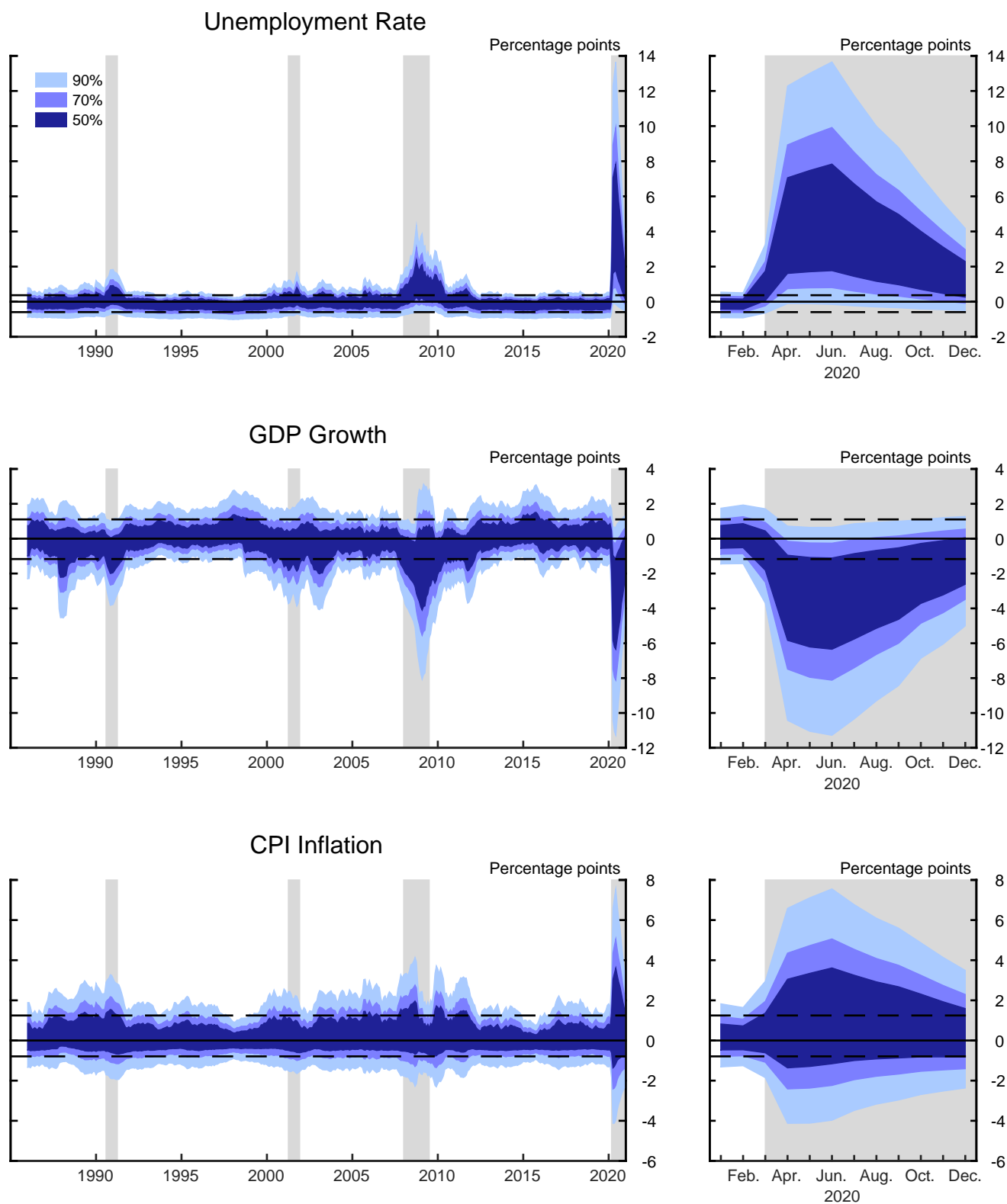
Note: The exhibit shows estimates of quantiles of the distribution of errors for 4-quarter-ahead staff forecasts. The estimates are conditioned on indicators of real activity, inflation, financial market conditions, and the volatility of high-frequency macroeconomic indicators. Dashed lines denote the median 15th and 85th percentiles. Gray shaded bars indicate recession periods as defined by the National Bureau of Economic Research.

Macroeconomic Indexes Underlying the Conditional Distributions
of Staff Forecast Errors 1 Year Ahead

Risks & Uncertainty

Financial Market Conditions

Standard deviations

Source: Staff estimates.

Macroeconomic Uncertainty

Standard deviations

Source: Staff estimates.

Real Activity

Standard deviations

Source: Staff estimates.

Inflation

Standard deviations

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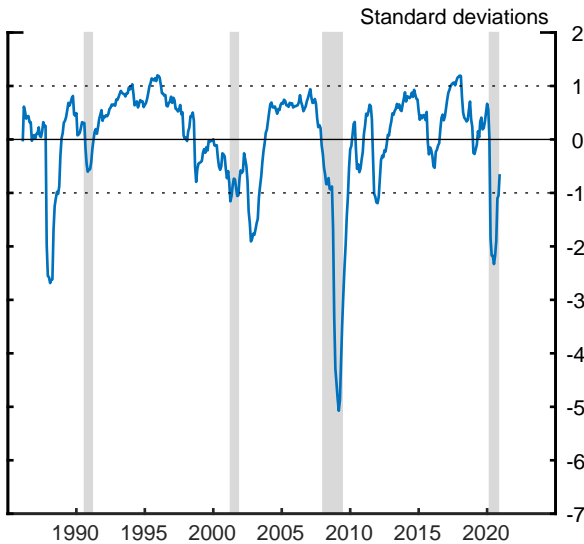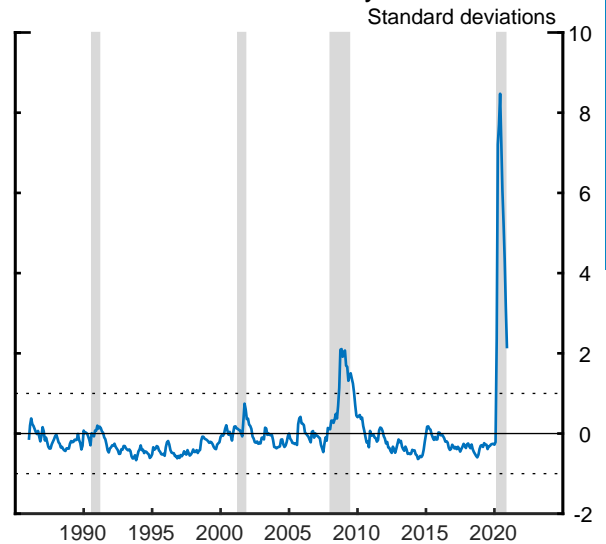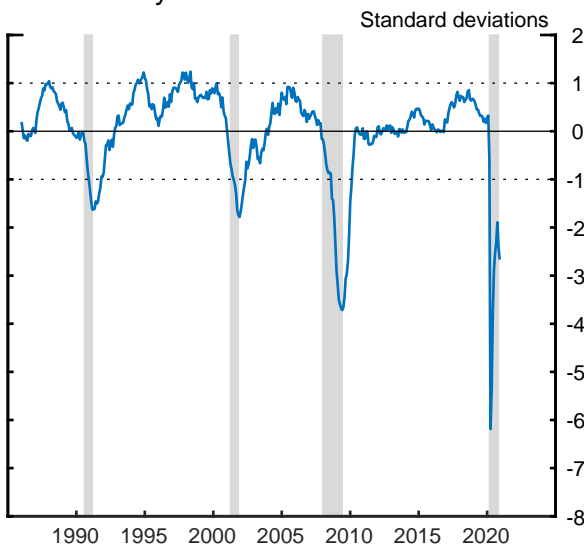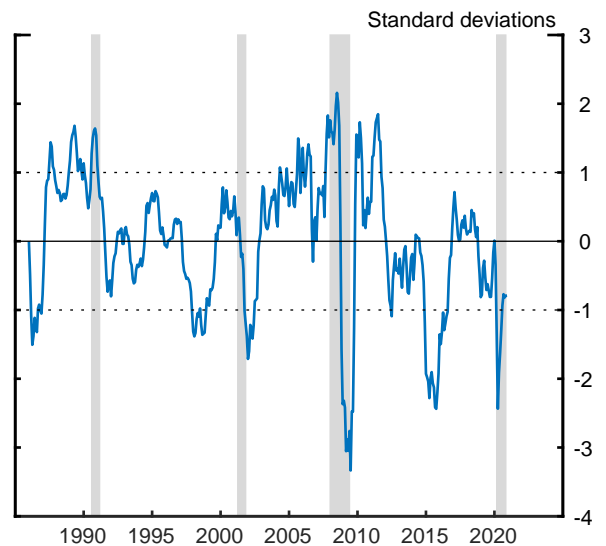
Note: The gray shaded bars indicate a period of business recession as defined by the National Bureau of Economic Research.

Conditional Distributions of 1-Year-Ahead GDP Growth

United States
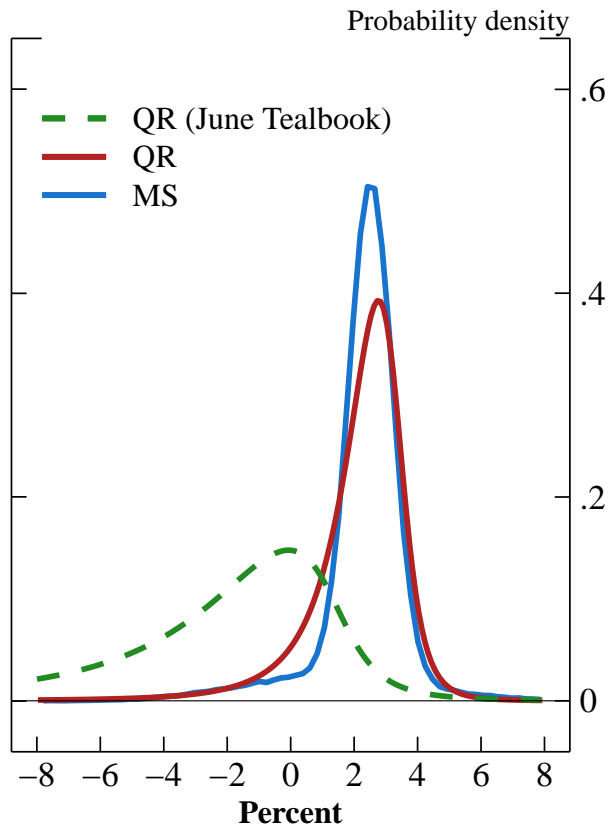
Foreign Economy Aggregate
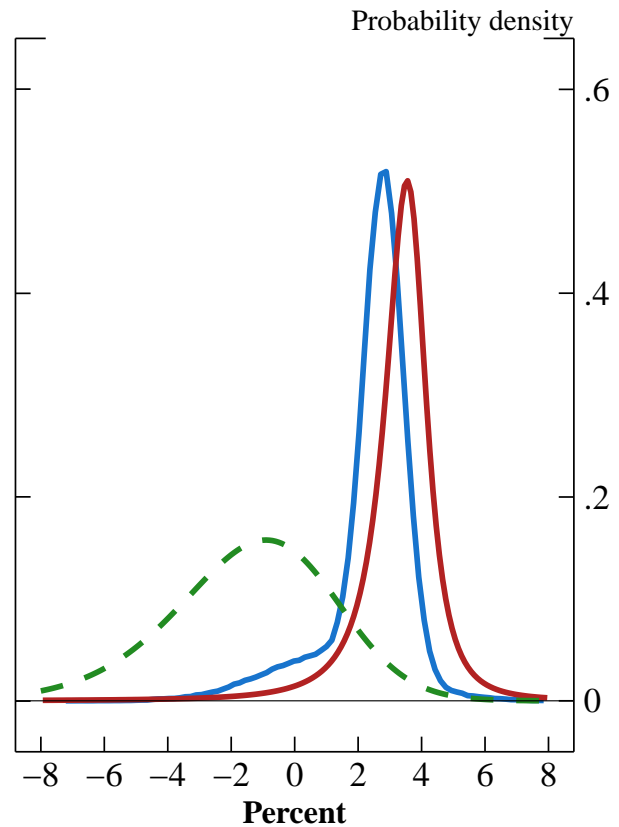
Note: The exhibit shows estimates of the conditional distribution of GDP growth for the United States and for the foreign economy aggregate 1 year ahead. The blue distribution is estimated using a two-state Markov-switching model (MS). The dashed green and solid red distributions are estimated using a quantile regression model (QR). The estimates are conditioned on domestic and foreign indicators of macroeconomic and financial conditions. Data are current as of October 2020. The June Tealbook distribution is based on data through April 2020.

Source: Staff calculations.

Despite differences in methodology, both the QR and the MS models suggest that risks are tilted to the downside, but extreme outcomes are deemed unlikely. For the United States, the MS and QR models estimate a 25 percent probability that GDP growth will be below 2 percent and 1.5 percent, respectively. For the aggregate foreign economy, the models assign a 25 percent probability of GDP growth below 2.8 percent and 2 percent, respectively. For comparison, in the June Tealbook, the QR model estimated a 25 percent probability that GDP growth in the United States would be below *negative* 4.4 percent and *negative* 3.1 percent for the aggregate foreign economy.

ALTERNATIVE MODEL FORECASTS

As shown in the exhibit "Alternative Model Forecasts," the FRB/US model projects that GDP will grow 6.2 percent in 2021 and 3.3 percent, on average, in 2022 and 2023, 0.4 percentage point faster than in the Tealbook baseline outlook over the medium term.[11] The FRB/US model projects that private consumption growth and investment will rebound strongly in 2021 as low interest rates provide favorable financing conditions and the effects of temporary shocks fade. With GDP growth in the FRB/US model's projection for 2021 and 2022 stronger than its potential pace of about 2 percent, the output gap turns positive in the second half of 2021 and rises over the projection period, reaching 4.4 percent at the end of 2023. The unemployment rate moves down to an exceptionally low value of 2.2 percent at the end of 2023, below the staff projection of 3.0 percent. Core PCE inflation gradually moves up from 1.4 percent in 2020 to 2.1 percent in 2023.

The EDO model projects GDP growth of 4.6 percent in 2021 and 2.9 percent, on average, in 2022 and 2023, well above the model's estimate of a 2.4 percent average growth rate of potential output over those years. Core PCE inflation increases quickly over the projection period and surpasses 2 percent in late 2021. The model predicts unemployment will decline to 4.8 percent by the end of 2023 as economic activity recovers. The federal funds rate rises to 4.2 percent by the end of the medium term.[12]

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dimensions, including parsimony in the number of estimated parameters, influence of extreme observations, and the inclusion of estimation uncertainty in the conditional distributions.

[11] We condition the FRB/US forecast on staff projections for federal government spending and tax policies, foreign GDP growth, foreign inflation, and the paths of the U.S. dollar and oil prices. The FRB/US forecast procedure also does not make any explicit assumptions about some adverse effects from social distancing beyond 2020. Finally, the federal funds rate is governed by the same policy rule as in the baseline.

[12] In the EDO model forecast, the federal funds rate is governed by the model's estimated rule. The high value for the federal funds rate that results has three sources. First, the EDO model assumes that, in the absence of shocks, the federal funds rate would converge to a value around 4 percent. Second, the natural rate of unemployment in EDO is 5.2 percent, and a 4.8 percent unemployment rate is associated with a positive output gap, raising the federal funds rate. Third, core inflation is above target by the end of the medium term.

Risks & Uncertainty

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

Measure and projection	2020		2021		2022		2023	
	Previous Tealbook	Current Tealbook	*Previous Tealbook*	Current Tealbook	*Previous Tealbook*	Current Tealbook	*Previous Tealbook*	Current Tealbook
Real GDP								
Staff	-2.8	-2.3	*3.5*	4.3	*3.7*	3.5	*2.6*	2.3
FRB/US[1]	-2.8	-2.3	*6.8*	6.2	*4.4*	3.9	*4.0*	2.7
EDO[1]	-2.8	-2.3	*4.4*	4.6	*3.4*	3.1	*3.2*	2.8
Unemployment rate[2]								
Staff	*7.2*	6.7	*5.2*	4.6	*3.7*	3.4	*3.1*	3.0
FRB/US[1]	*7.2*	6.7	*5.8*	4.6	*4.3*	3.1	*2.9*	2.2
EDO[1]	*7.7*	7.0	*5.4*	5.0	*4.9*	4.7	*4.8*	4.8
Total PCE prices								
Staff	*1.3*	1.2	*1.6*	1.8	*1.7*	1.8	*1.9*	1.9
FRB/US[1]	*1.3*	1.2	*1.7*	1.9	*1.8*	2.1	*1.9*	2.1
EDO[1]	*1.3*	1.2	*1.7*	1.9	*1.9*	2.2	*2.0*	2.2
Core PCE prices								
Staff	*1.6*	1.4	*1.6*	1.8	*1.8*	1.8	*1.9*	1.9
FRB/US[1]	*1.6*	1.4	*1.8*	1.9	*1.9*	2.1	*1.9*	2.1
EDO[1]	*1.6*	1.4	*1.7*	1.9	*1.9*	2.2	*2.0*	2.2
Federal funds rate[2]								
Staff	*.1*	.1	*.1*	.1	*.1*	.1	*.1*	.1
FRB/US[1]	*.1*	.1	*.1*	.1	*.1*	.6	*.1*	1.2
EDO[1]	*.1*	.1	*2.4*	3.0	*3.4*	3.9	*3.9*	4.2

1. The FRB/US and EDO forecasts condition on the staff forecast for 2020. The EDO projections integrate over the posterior distribution of model parameters. Projections labeled "*Previous Tealbook*" are forecasts conditional on information available at the close of the October Tealbook.
2. Percent, average for Q4.

Decomposition of FRB/US Real GDP Growth Forecast
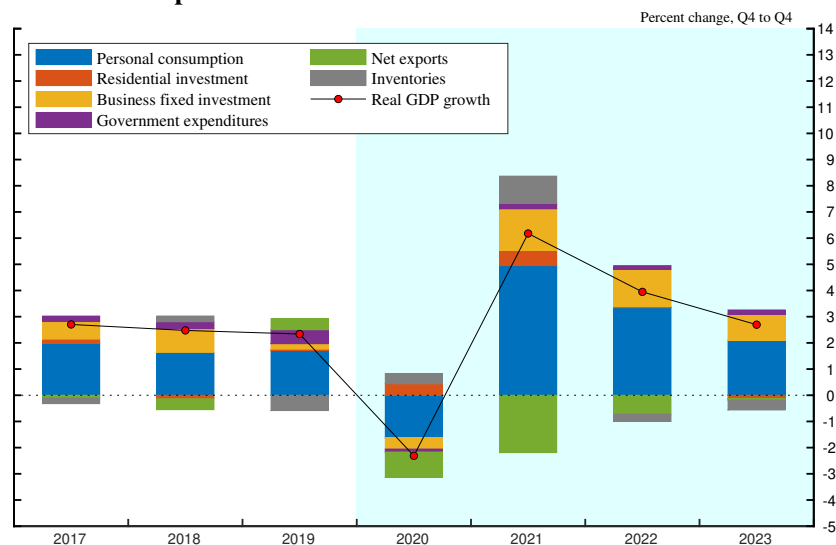
Note: Shading represents the projection period.
Source: Staff calculations.

Monetary Policy Strategies

This section discusses a range of strategies for setting the federal funds rate and compares the associated interest rate paths and macroeconomic outcomes with those in the Tealbook baseline projection. Compared with the October Tealbook, the near-term prescriptions of simple policy rules are revised down slightly, reflecting primarily downward revisions in inflation in the first two quarters of 2021. Because the staff has strengthened the medium-term economic projection, the policy rate paths implied by the simple policy rules and optimal control strategies considered here are slightly higher in coming years relative to their counterparts from the October Tealbook. An additional exhibit, discussed later, provides updated estimates of the equilibrium longer-run real federal funds rate.

NEAR-TERM PRESCRIPTIONS OF SELECTED SIMPLE POLICY RULES

The top-left panel of the first exhibit shows the near-term prescriptions for the federal funds rate of the Taylor (1993) rule, the inertial Taylor (1999) rule, and the asymmetric discounted average inflation targeting (ADAIT) rule under two different initializations of the discounted average inflation gap.[1] Under the variants of the ADAIT rule, the policy rate responds to past deviations of core PCE inflation from the 2 percent objective, dating back to either 2020 (ADAIT–2020) or 2012 (ADAIT–2012), with the effects of these deviations fading over time.[2] The ADAIT rule featured here illustrates an approach to policy that seeks, at least in part, to "make up" for past inflation deviations from the 2 percent objective. Consistent with elements of the FOMC's revised Statement on Longer-Run Goals and Monetary Policy Strategy (consensus statement), such an approach—particularly when combined with a shortfalls-only response to employment gaps—can help generate inflation that rises modestly above 2 percent following periods

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[1] The simple policy rules examined here use intercept terms that are consistent with a real federal funds rate of 50 basis points in the longer run. The appendix to this Tealbook section provides technical details on these simple policy rules.

[2] The first variant of the ADAIT rule is specified to coincide with the release of the FOMC's revised consensus statement on August 27 of this year. To initialize its measure of the inflation gap, this variant includes inflation deviations in the four quarters up to and including that date. Correspondingly, the second variant of the rule is specified so that it coincides with the release of the original consensus statement in January 2012.

Policy Rules and the Staff Projection

Monetary Policy Strategies

Near−Term Prescriptions of Selected Simple Policy Rules[1]
(Percent)

	2021:Q1	2021:Q2
Taylor (1993) rule	**.89**	**1.85**
Previous Tealbook projection	*1.28*	*1.98*
Inertial Taylor (1999) rule	**.11**	**.27**
Previous Tealbook projection	*.19*	*.34*
ADAIT−2020 rule	**.01**	**−.03**
Previous Tealbook projection	*.06*	*.02*
ADAIT−2012 rule	**−.20**	**−.42**
Previous Tealbook projection	*−.16*	*−.37*
Addendum:		
Tealbook baseline	**.13**	**.13**
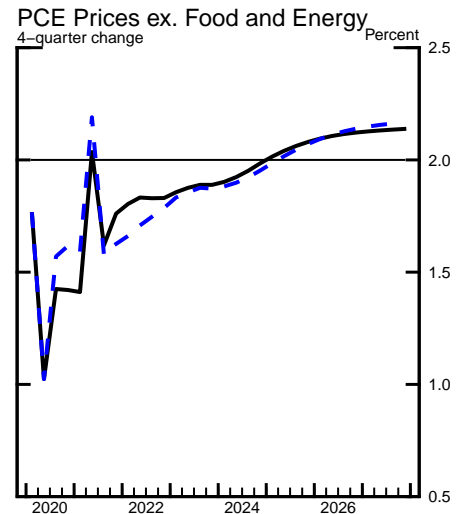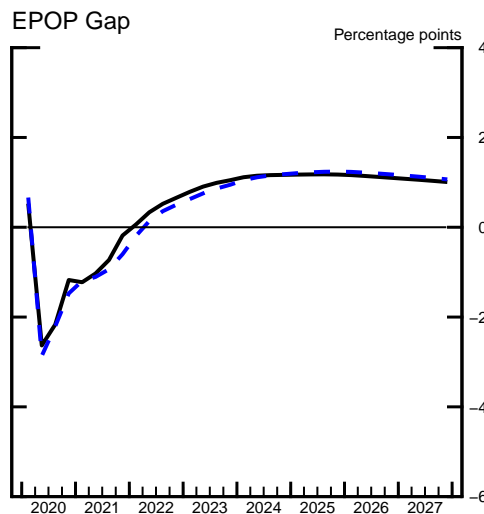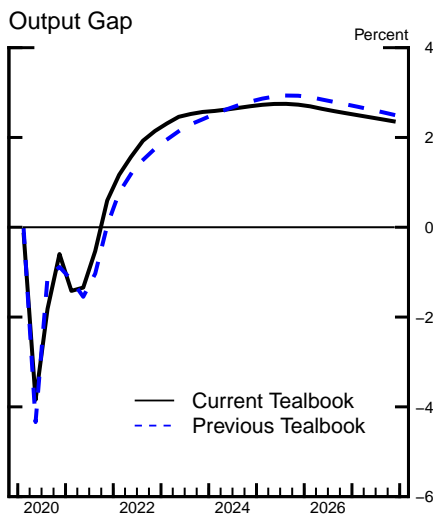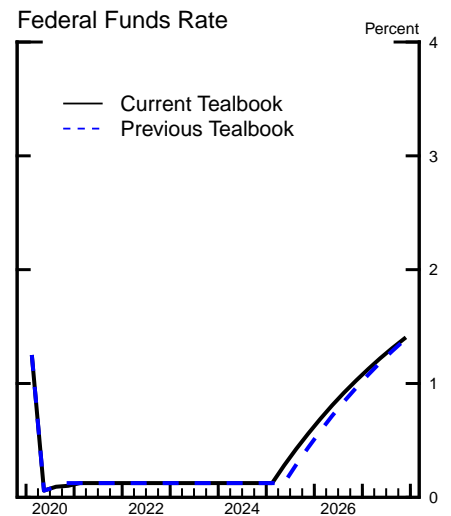
Federal Funds Rate

Output Gap

EPOP Gap

PCE Prices ex. Food and Energy

A Medium−Term Notion of the Equilibrium Real Federal Funds Rate Under the Tealbook Baseline (Percent)[2]

	Current Value	*Previous Tealbook*
FRB/US *r**	.16	*.01*
Average projected real federal funds rate	−1.63	*−1.62*

1. The lines denoted "Previous Tealbook projection" report prescriptions based on the previous Tealbook's staff outlook for inflation and resource slack.

2. The "FRB/US *r**" is the level of the real federal funds rate that, if maintained over a 12−quarter period (beginning in the current quarter) in the FRB/US model, sets the output gap equal to zero in the final quarter of that period given a baseline Tealbook projection. The "Average projected real federal funds rate" is calculated under the Tealbook baseline projection over the same 12−quarter period as FRB/US *r**.

in which inflation has been running persistently below 2 percent. However, many other policy rules, or variations on existing rules, could deliver similar outcomes.

The simple rule prescriptions in the top-left panel are not subject to the effective lower bound (ELB) on the policy rate and take as given the Tealbook baseline projections for the output gap, the employment-to-population ratio (EPOP) gap, and core inflation. These projections are shown in the middle panels.[3] The top-right panel provides the staff's baseline path for the federal funds rate. The federal funds rate departs the ELB in the second quarter of 2025, one quarter earlier than in the October Tealbook.

- The Taylor (1993) rule calls for the policy rate to rise above ¾ percent in the first quarter of 2021 and above 1¾ percent in the second quarter. These prescriptions are a little lower than in the October Tealbook, mainly because the staff has revised down its near-term projections for inflation in reaction to incoming data.

- For the same reasons, the prescriptions of the inertial Taylor (1999) rule have also slightly declined relative to their counterparts in the October Tealbook.

- The ADAIT rule with the inflation gap initialized in 2020 prescribes levels for the federal funds rate that are close to zero. When the inflation gap is instead initialized in 2012, the ADAIT rule prescribes levels for the federal funds rate that are somewhat below zero, reflecting the larger discounted average inflation (DAI) gap. The DAI gap and the EPOP gap shortfall, which enter the formulas for these rules, are little changed from their values in the previous projection. Therefore, the policy rate prescriptions for both variants of the ADAIT rule are little changed from those in the October Tealbook.

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

The bottom panel of the first exhibit reports estimates of a medium-term concept of the equilibrium real federal funds rate (r^*) generated under the current and previous

---

[3] The Tealbook baseline and dynamic simulations presented later in this section of the Tealbook embed the assumption that the federal funds rate is subject to an ELB of 12½ basis points, a value that corresponds to the midpoint of the current target range. In addition, all dynamic simulations incorporate the staff's baseline estimates of the macroeconomic effects of the Federal Reserve's balance sheet policies and federal fiscal policies.

Tealbook baselines. This concept of *r**, labeled "FRB/US *r**," corresponds to the level of the real federal funds rate that, if maintained over a 12-quarter period starting in the current quarter, would bring the output gap to zero in the final quarter of that period, according to the FRB/US model. This measure is a summary of the projected underlying strength of the real economy but does not take into account considerations such as achieving the inflation objective or avoiding sharp changes in the federal funds rate.

The current value of the Tealbook-consistent FRB/US *r**, at 16 basis points, is a little higher than in the October Tealbook, reflecting a slightly wider output gap at the end of the medium term. The estimated equilibrium real rate is about 1¾ percentage points above the average projected real federal funds rate in the Tealbook baseline, under which output runs above its potential level starting at the end of 2021.[4]

SIMPLE POLICY RULE SIMULATIONS

The second exhibit reports the Tealbook baseline projection and results obtained from dynamic simulations of the FRB/US model under the Taylor (1993) rule, the inertial Taylor (1999) rule, and the two variants of the ADAIT rule. These simulations reflect the endogenous responses of resource utilization and inflation to the different federal funds rate paths implied by the policy rules, subject to the ELB constraint. The simulations for each rule are carried out under the assumptions that policymakers commit to following that rule in the future and that financial market participants, price setters, and wage setters correctly anticipate that monetary policy will follow through on this commitment and are aware of the implications for interest rates and the economy.

- As described in the Domestic Economic Developments and Outlook section of this Tealbook, and as shown by the solid black line in the top-left panel, in the baseline projection the federal funds rate departs from the ELB in 2025. Thereafter, the policy rate rises above 1¼ percent by the end of 2027.

- The Taylor (1993) rule and the inertial Taylor (1999) rule call for the policy rate to depart from the ELB in the first and third quarters of 2021, respectively. Under the Taylor (1993) rule, the policy rate runs higher than

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[4] In this Tealbook, we do not report an *r** value consistent with the median responses in the September 2020 Summary of Economic Projections (SEP). Creating a SEP-consistent baseline involves interpolating between year-end projections. Such a procedure may not capture the unprecedented speeds of both the economic decline and the economic recovery that have been observed this year.

under the inertial Taylor (1999) rule until the end of the period shown, at which point both rules prescribe a policy rate somewhat above 2 percent. Inflation does not return to the 2 percent objective in this decade because, in these two rules, output exceeding its potential level calls for increases in the federal funds rate.

- The exhibit shows two variants of the ADAIT rule: one using the discounted average inflation gap initialized in 2012 and another in which that gap is initialized in 2020.

  o The ADAIT–2020 rule (the green dashed lines) calls for the federal funds rate to depart from the ELB early in 2022. Thereafter, the prescribed level for the federal funds rate rises only slowly, approaching 1½ percent toward the end of the period shown. Because this rule responds only to shortfalls from the EPOP trend, as opposed to deviations in either direction, the policy rate remains low even after the EPOP gap closes in 2022. Under this rule, the path for the real 10-year Treasury yield is somewhat higher than in the Tealbook baseline, resulting in slightly higher unemployment and lower inflation outcomes.

  o With its larger inflation gap to make up, the ADAIT–2012 rule (the orange dashed lines) calls for raising the federal funds rate above the current target range in 2024, more than two years later than the ADAIT–2020 rule but one year earlier than the Tealbook baseline.[5] Thereafter, the policy rate rises slowly, and after the period shown it runs slightly below the path for the policy rate in the Tealbook baseline. The resulting path of the real 10-year Treasury yield is similar to the Tealbook baseline path, and thus the associated macroeconomic outcomes are almost indistinguishable.

  o Under both versions of the ADAIT rule, inflation rises slightly above 2 percent toward the end of the period shown. This overshoot is modestly more pronounced under the ADAIT–2012 rule than under

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[5] While the federal funds rate in this simulation rises above the Tealbook baseline path in the last quarter of 2022, it only rises above 25 basis points in the second quarter of 2024.

Simple Policy Rule Simulations

Monetary Policy Strategies

Nominal Federal Funds Rate
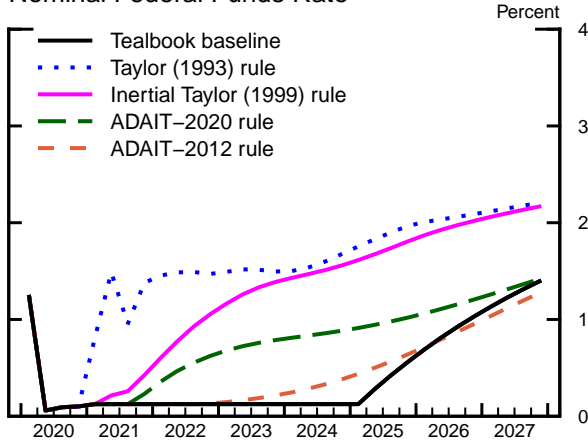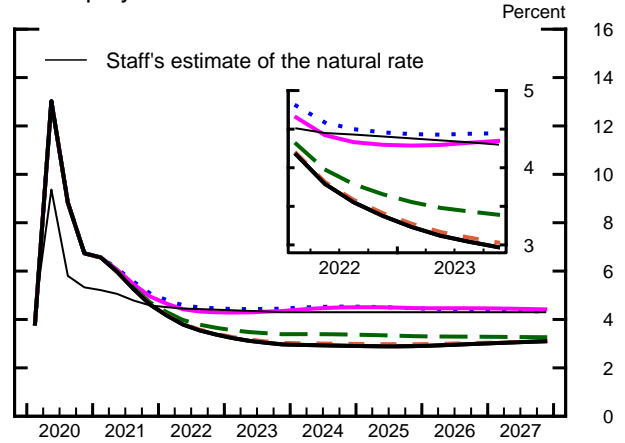
Percent

- Tealbook baseline
- Taylor (1993) rule
- Inertial Taylor (1999) rule
- ADAIT–2020 rule
- ADAIT–2012 rule

Unemployment Rate

Percent

— Staff's estimate of the natural rate

Real Federal Funds Rate

Percent

EPOP Gap

Percentage points

Real 10–Year Treasury Yield

Percent

PCE Inflation

4–quarter percent change
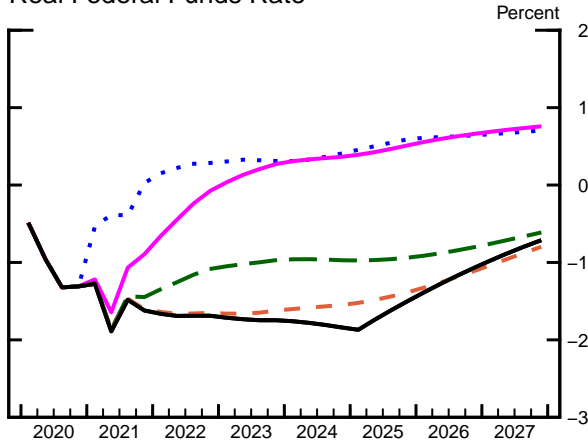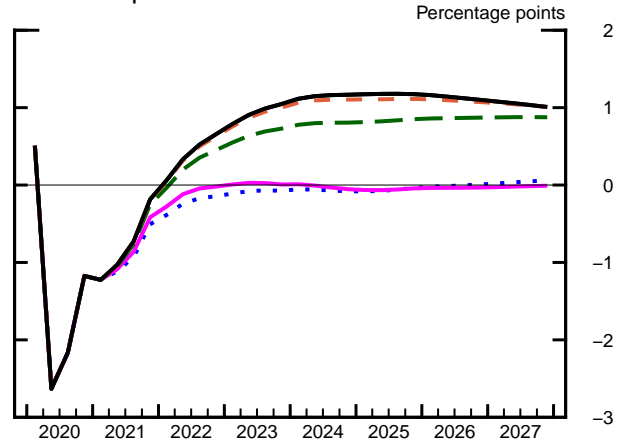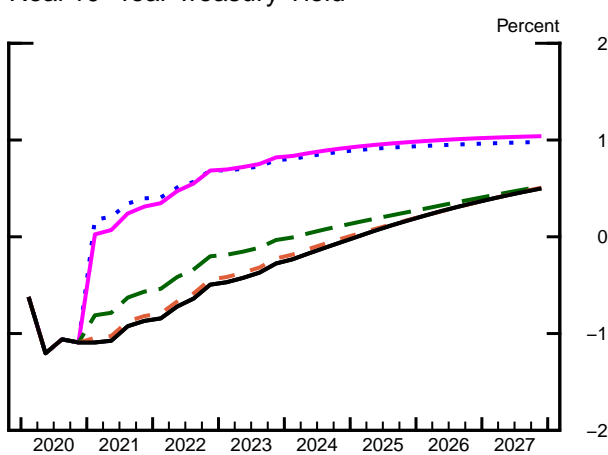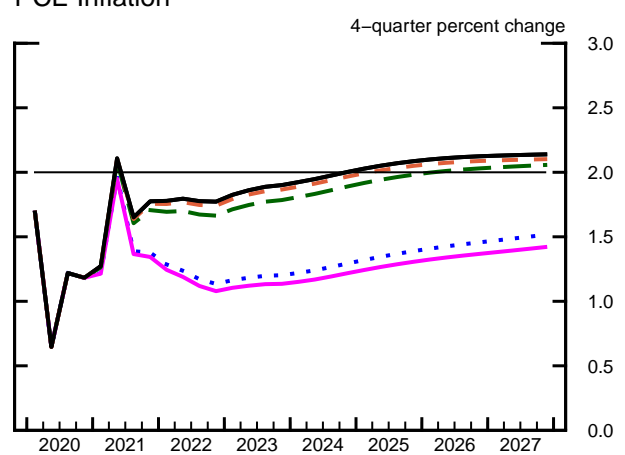
Note: The simulations in this exhibit are based on policy rules that respond to core PCE inflation.

the ADAIT–2020 rule because the former variant carries forward a
more negative inflation gap.

- The simple policy rules featured in this section prescribe raising the federal
funds rate earlier than in the Tealbook baseline projection because the staff
assumed in the baseline projection that the federal funds rate departs the ELB
only after the unemployment rate falls below 4.1 percent and inflation rises
above 2 percent.

OPTIMAL CONTROL SIMULATIONS UNDER DISCRETION

In the third exhibit, we display optimal control simulations conditional on the
Tealbook baseline under different assumptions about policymakers' preferences, as
captured by a loss function expressed in terms of macroeconomic outcomes. The concept
of optimal control that we employ here is one in which policymakers set the policy rate
that is optimal from their perspective, period by period, without regard to past policy
commitments and with the knowledge that future policymakers will also not be bound to
follow any particular policy rate path. We refer to simulations like these, which do not
embed the assumption of commitment, as being run under discretion.[6]

We assume that policymakers choose the level of the federal funds rate to
minimize the present value of the weighted sum of a squared inflation gap measure, the
squared EPOP gap, and squared changes in the federal funds rate.[7] We consider two
inflation gap measures: the difference between headline inflation (measured on a four-
quarter basis) and 2 percent, and the DAI gap initialized in 2020—a metric that carries
forward past inflation misses.[8] These two inflation gap measures are comparable to those
used in the Taylor-type rules and the ADAIT–2020 rule, respectively.[9] We also consider

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[6] For a more detailed discussion of commitment and discretion in the context of monetary policy
strategies, see Fernando Duarte, Benjamin K. Johannsen, Leonardo Melosi, and Taisuke Nakata (2020),
"Strengthening the FOMC's Framework in View of the Effective Lower Bound and Some Considerations
Related to Time-Inconsistent Strategies," Finance and Economics Discussion Series 2020-067
(Washington: Board of Governors of the Federal Reserve System, August),
https://dx.doi.org/10.17016/FEDS.2020.067.

[7] The appendix to this section contains further details on the methodology.

[8] Using the discounted average inflation gap initialized in 2012 results in policy rate paths that are
more accommodative by a similar margin as the difference between the policy rate paths under the
ADAIT–2012 and the ADAIT–2020 rules shown in the second exhibit.

[9] For the purposes of the optimal control simulations, the discounted average inflation gap is
defined in terms of PCE inflation. For the simple policy rules, core PCE inflation is used.

Optimal Control Simulations under Discretion

Nominal Federal Funds Rate

Percent

- Tealbook baseline
- Asymmetric weights, DAI
- Asymmetric weights, 4–quarter inflation
- Equal weights, DAI
- Equal weights, 4–quarter inflation

Unemployment Rate

Percent

- Staff's estimate of the natural rate

Real Federal Funds Rate

Percent

EPOP Gap

Percentage points

Real 10–Year Treasury Yield

Percent

PCE Inflation

4–quarter percent change
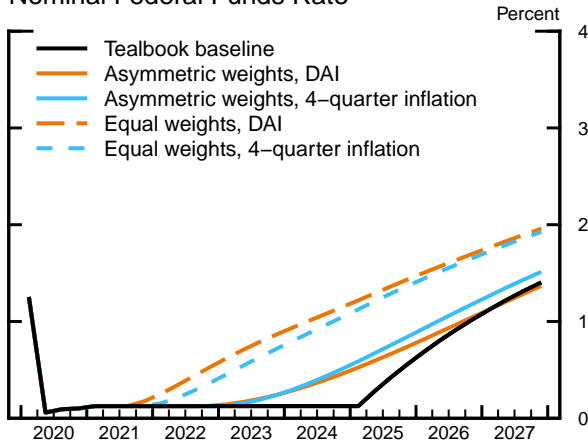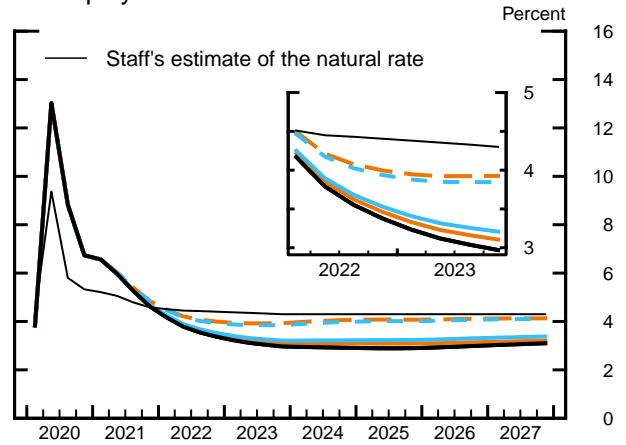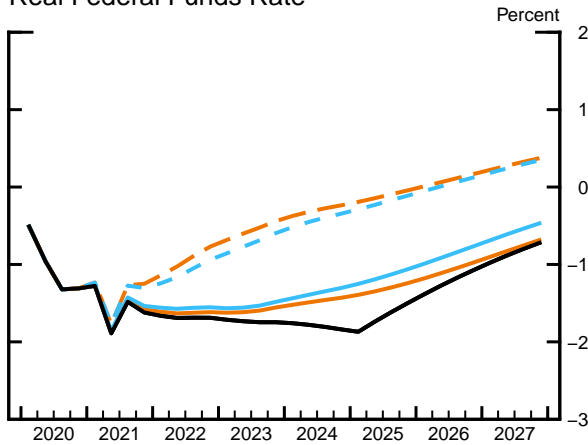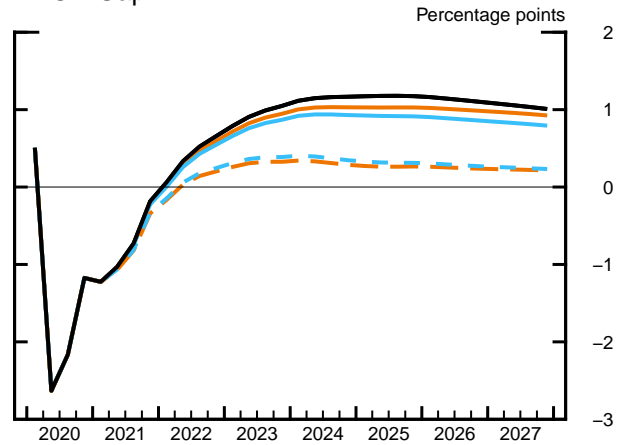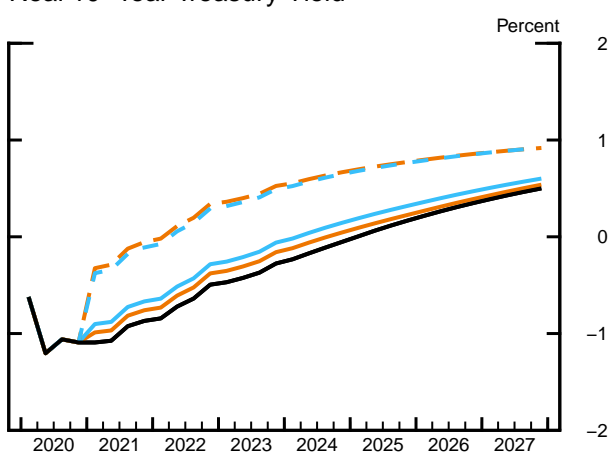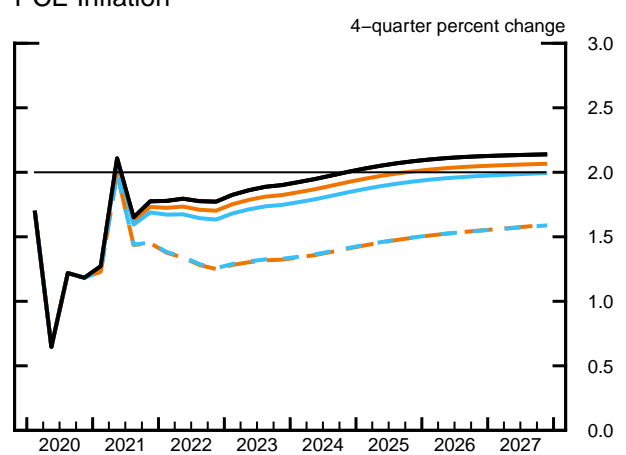
two specifications of the weight on the EPOP gap in the loss function: asymmetric
weights and equal weights.

Asymmetric Weights

- Under asymmetric weights, policymakers assign no cost to positive EPOP
  gaps but penalize negative EPOP gaps using the same unit weight that they
  assign to the other two components of the loss function. Under these
  preferences, policymakers' desire to close the inflation gap measure over time
  is not balanced against a desire to prevent employment from running above its
  estimated trend level.

- With asymmetric weights, under both the four-quarter inflation gap measure
  and the DAI gap measure, the federal funds rate departs from the ELB at the
  start of 2024, five quarters earlier than in the Tealbook baseline.[10] Thereafter,
  the path for the federal funds rate under both specifications rises slowly, with
  prescriptions under the loss function based on the DAI gap being somewhat
  more accommodative. In optimal control simulations under discretion with
  the FRB/US model, it is difficult to achieve an overshoot of inflation without
  a loss function that includes past inflation deviations. When the loss function
  includes the DAI gap, which carries forward past inflation misses, inflation
  rises modestly above 2 percent for a few years beyond the period shown
  before converging back to 2 percent. However, when the loss function
  includes the four-quarter inflation gap, inflation just reaches 2 percent at the
  end of the period shown and does not overshoot 2 percent in any significant
  way thereafter.[11]

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[10] The timing of departure from the ELB depends importantly on the weight that policymakers
place on changes in the federal funds rate. When this weight is lowered, the federal funds rate departs the
ELB later than in the Tealbook baseline but rises more steeply thereafter. Because the resulting policy rate
path leaves real longer-term yields little changed, the macroeconomic effects of the resulting policy rate
path are very similar.

[11] When simulations are run under commitment with asymmetric weights, policymakers choose to
overshoot the 2 percent inflation objective regardless of the inflation gap measure. Under these policies,
policymakers commit to overshooting the 2 percent inflation objective in the future in order to support
employment and inflation in the near term. By contrast, with equal weights in the loss function, inflation
runs below 2 percent in the optimal control simulations under commitment.

Equal Weights

- The simulations labeled "Equal weights" present cases in which policymakers are assumed to place equal weights on the three components of the loss functions, regardless of the state of the economy. In particular, the equal-weights loss function calls for a symmetric response to the measure of labor market slack to eliminate both positive and negative deviations from the staff's estimate of maximum employment, rather than responding only to shortfalls. Thus, in current circumstances, these strategies seek to counter both the high level of resource slack in the near term and the persistently tight labor market in the medium term in the Tealbook baseline.

- Under both inflation gap measures, the policy rate departs from the ELB about three years earlier than in the Tealbook baseline. Because policymakers attempt to eliminate all labor market deviations rather than only shortfalls, the federal funds rate prescriptions under equal weights are markedly less accommodative than those under asymmetric weights. Notably, inflation does not return to 2 percent until well after the period shown and never meaningfully overshoots the longer-run goal.

ESTIMATES OF THE EQUILIBRIUM REAL FEDERAL FUNDS RATE IN THE LONGER RUN

The next exhibit shows selected estimates of the equilibrium real federal funds rate in the longer run, denoted r^{LR}. This concept is the rate consistent with the economy operating at its potential once the transitory effects of economic shocks have abated. This rate, along with the Committee's inflation objective, determines the longer-run level of the nominal federal funds rate and other interest rates in the staff's projection and economic models. In addition, r^{LR} serves as a parameter in the formulas of the simple policy rules considered in this section of Tealbook A.

- The top panel of the exhibit shows the range of historical values through 2020:Q3 from eight model-based time-series estimates of r^{LR}.[12]

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[12] The top panel reports the range of "one sided" estimates—that is, the estimates for a particular date are conditioned only on data up to that date. It is also possible to construct "two sided" estimates that make use of all currently available data to estimate historical values of r^{LR}. Unlike the estimates reported

o   The unprecedented swings in economic activity in the second and third quarters of this year have had large effects on some of the estimates of r^{LR}. In the second quarter, a number of the models translated the severe deterioration in the economic data as an indication that r^{LR} declined.

o   However, these downward revisions have since reversed, to varying degrees, in light of the rebound in economic activity and inflation in the third quarter. These reversals contrast with the behavior of time-series estimates of r^{LR} after the Global Financial Crisis, when the estimated step-down proved both large and persistent.

o   Not all of the time-series estimates of r^{LR} have been volatile over recent history, however. Estimates that are based on models that make use of longer-term yields, which by their nature are forward-looking variables, have moved little in both the second and third quarters.[13]

- The middle panel shows the latest estimates of r^{LR} and their associated uncertainty ranges.[14] The point estimates for 2020:Q3 vary from about negative 0.6 percent to positive 2.1 percent, with a mean of just below 1 percent. These numbers and the uncertainty ranges should be interpreted with some caution, in part because the magnitude, speed, and nature of the recent swings in economic activity is well outside the U.S. historical experience that informed the construction and estimation of these models.

- The lower panel of the exhibit reports longer-term estimates of the real federal funds rate from selected sources. The assumption for the longer-term real

<div style="text-align: right; writing-mode: vertical-rl;">Monetary Policy Strategies</div>

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here, the two-sided estimates do not exhibit large swings in r^{LR} in the second and third quarters because they can "look through" the estimated temporary component of the downturn. Although the modeling approaches and econometric techniques differ across models, the studies have the common feature that they use time-series methods to infer r^{LR} on the basis of the co-movement of either macroeconomic series (such as inflation, interest rates, and real GDP) or both macroeconomic and financial data (such as TIPS yields). See the appendix to this section for sources and methodology regarding these estimates.

[13] The models that use long-term yields to estimate r^{LR} are those by Christensen and Rudebusch (2019), Del Negro and others (2017), and Johannsen and Mertens (2018).

[14] Two of the models used in the exhibit, Laubach and Williams (2003) and Holston, Laubach, and Williams (2017), have been modified by their authors to be conducive to continued estimation during and after the COVID-19 pandemic. A reference providing details on these modifications is included in the appendix to this section.

Estimates of the Equilibrium Real Federal Funds Rate in the Longer Run

Selected Time−Series Estimates

Quarterly   Percent
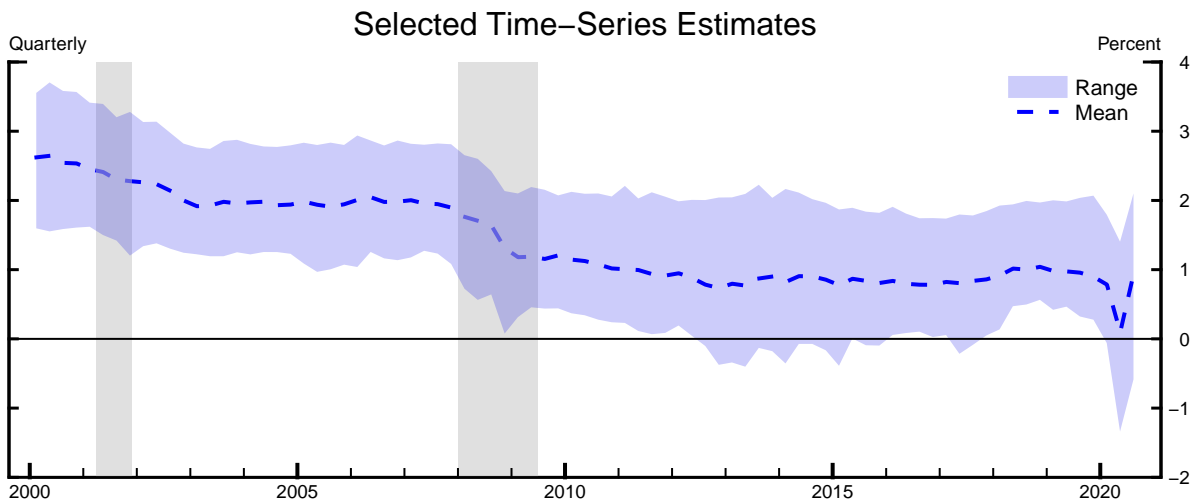
Latest Point Estimates and Uncertainty Ranges

	Point estimate	Uncertainty range 68 percent
Christensen and Rudebusch (2019)	−.13	[−1.11 , 0.86]
Del Negro, Giannone, Giannoni, and Tambalotti (2017)	1.12	[0.77 , 1.49]
Holston, Laubach, and Williams (2017)	2.10	[−.45 , 4.65]
Johannsen and Mertens (2018)	1.37	[0.65 , 2.26]
Kiley (2015)	−.58	[−2.51 , 1.05]
Laubach and Williams (2003)	1.33	[−6.04 , 8.71]
Lewis and Vazquez−Grande (2019)	1.30	[0.51 , 2.05]
Lubik and Matthes (2016)	1.00	[−.22 , 2.24]

Longer−Run Values from Selected Forecasters

	Release date	Percent
Tealbook baseline	Dec. 2020	.50
Median SEP	Sept. 2020	.50
Median Survey of Primary Dealers	Nov. 2020	.25
Blue Chip Economic Indicators consensus	Oct. 2020	−.35
Blue Chip Financial Forecasts consensus	Dec. 2020	−.30
Congressional Budget Office	July 2020	.44

Note: The latest time−series estimates in the top panel are for 2020:Q3. The shaded vertical areas in the top panel are NBER recessions. See the appendix for the sources of the values reported in the bottom panel. The models of Laubach and Williams (2003) and Holston, Laubach, and Williams (2017) have been modified by their authors to allow continued estimation during and after the COVID−19 pandemic.

Monetary Policy Strategies

federal funds rate in the Tealbook baseline is 50 basis points and coincides with the median longer-run projection in the September SEP; these estimates are unchanged from before the current crisis. The median in the November Survey of Primary Dealers stands at 25 basis points, unchanged from its value in July and down 15 basis points from its reading in January before the pandemic. The Blue Chip Economic Indicators consensus estimate, at negative 35 basis points, has moved down almost ½ percentage point since the last survey in March.[15] The Blue Chip Financial Forecasts consensus estimate, which differs from the Economic Indicators consensus estimate by the set of forecasters and the dates at which the survey is conducted, stands at negative 15 basis points. This estimate has also moved down almost ½ percentage point since the previous survey in June. By contrast, the Congressional Budget Office estimate is close to the Tealbook baseline assumption.

The final four exhibits tabulate the simulation results under the Tealbook baseline for key variables under the policy rules shown in the exhibit "Simple Policy Rule Simulations" and the optimal control simulations shown in the exhibit "Optimal Control Simulations under Discretion."

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[15] Unlike the estimate from the Survey of Primary Dealers, which is a "longer run" forecast, the two Blue Chip estimates are forecasts for the period from 2027 through 2031.

Outcomes of Simple Policy Rule Simulations
(Percent change, annual rate, from end of preceding period, except as noted)

Outcome and strategy	2020	2021	2022	2023	2024	2025	2026	2027
Nominal federal funds rate[1]								
Taylor (1993)	.1	1.4	1.5	1.5	1.7	2.0	2.1	2.2
Inertial Taylor (1999)	.1	.4	1.1	1.4	1.6	1.8	2.0	2.2
ADAIT-2020	.1	.2	.6	.8	.9	1.0	1.2	1.4
ADAIT-2012	.1	.1	.1	.2	.4	.6	1.0	1.3
Extended Tealbook baseline	.1	.1	.1	.1	.1	.6	1.0	1.4
Real GDP								
Taylor (1993)	-2.3	3.3	2.5	1.7	1.7	1.8	1.6	1.6
Inertial Taylor (1999)	-2.3	3.5	2.5	1.6	1.6	1.7	1.5	1.6
ADAIT-2020	-2.3	4.1	3.2	2.1	1.8	1.8	1.6	1.7
ADAIT-2012	-2.3	4.3	3.4	2.3	1.9	1.7	1.6	1.6
Extended Tealbook baseline	-2.3	4.3	3.5	2.3	1.9	1.7	1.5	1.5
Unemployment rate[1]								
Taylor (1993)	6.7	5.1	4.5	4.4	4.5	4.5	4.4	4.3
Inertial Taylor (1999)	6.7	4.9	4.3	4.3	4.5	4.5	4.5	4.4
ADAIT-2020	6.7	4.7	3.7	3.4	3.4	3.3	3.3	3.3
ADAIT-2012	6.7	4.6	3.4	3.0	3.0	3.0	3.0	3.1
Extended Tealbook baseline	6.7	4.6	3.4	3.0	2.9	2.9	3.0	3.1
Total PCE prices								
Taylor (1993)	1.2	1.4	1.1	1.2	1.3	1.4	1.5	1.5
Inertial Taylor (1999)	1.2	1.3	1.1	1.1	1.2	1.3	1.4	1.4
ADAIT-2020	1.2	1.7	1.7	1.8	1.9	2.0	2.0	2.1
ADAIT-2012	1.2	1.8	1.7	1.9	2.0	2.0	2.1	2.1
Extended Tealbook baseline	1.2	1.8	1.8	1.9	2.0	2.1	2.1	2.1
Core PCE prices								
Taylor (1993)	1.4	1.4	1.2	1.2	1.3	1.4	1.5	1.5
Inertial Taylor (1999)	1.4	1.3	1.1	1.1	1.2	1.3	1.4	1.4
ADAIT-2020	1.4	1.7	1.7	1.8	1.9	2.0	2.0	2.1
ADAIT-2012	1.4	1.7	1.8	1.9	1.9	2.0	2.1	2.1
Extended Tealbook baseline	1.4	1.8	1.8	1.9	2.0	2.1	2.1	2.1

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

Outcomes of Simple Policy Rule Simulations, Quarterly
(4-quarter percent change, except as noted)

Outcome and strategy	2020		2021				2022	
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
Nominal federal funds rate[1]								
Taylor (1993)	.1	.1	.8	1.5	1.0	1.4	1.5	1.5
Inertial Taylor (1999)	.1	.1	.1	.2	.3	.4	.6	.8
ADAIT-2020	.1	.1	.1	.1	.1	.2	.4	.5
ADAIT-2012	.1	.1	.1	.1	.1	.1	.1	.1
Extended Tealbook baseline	.1	.1	.1	.1	.1	.1	.1	.1
Real GDP								
Taylor (1993)	-2.9	-2.3	-1.1	9.2	3.2	3.3	4.2	4.3
Inertial Taylor (1999)	-2.9	-2.3	-1.1	9.3	3.3	3.5	4.4	4.5
ADAIT-2020	-2.9	-2.3	-1.1	9.4	3.7	4.1	5.2	5.2
ADAIT-2012	-2.9	-2.3	-1.1	9.5	3.8	4.3	5.4	5.5
Extended Tealbook baseline	-2.9	-2.3	-1.1	9.5	3.8	4.3	5.5	5.5
Unemployment rate[1]								
Taylor (1993)	8.8	6.7	6.6	6.1	5.6	5.1	4.8	4.6
Inertial Taylor (1999)	8.8	6.7	6.6	6.1	5.5	4.9	4.7	4.4
ADAIT-2020	8.8	6.7	6.6	6.0	5.3	4.7	4.3	4.0
ADAIT-2012	8.8	6.7	6.6	6.0	5.3	4.6	4.2	3.8
Extended Tealbook baseline	8.8	6.7	6.6	6.0	5.3	4.6	4.2	3.8
Total PCE prices								
Taylor (1993)	1.2	1.2	1.2	2.0	1.4	1.4	1.3	1.2
Inertial Taylor (1999)	1.2	1.2	1.2	2.0	1.4	1.3	1.2	1.2
ADAIT-2020	1.2	1.2	1.3	2.1	1.6	1.7	1.7	1.7
ADAIT-2012	1.2	1.2	1.3	2.1	1.6	1.8	1.8	1.8
Extended Tealbook baseline	1.2	1.2	1.3	2.1	1.7	1.8	1.8	1.8
Core PCE prices								
Taylor (1993)	1.4	1.4	1.4	1.9	1.4	1.4	1.3	1.3
Inertial Taylor (1999)	1.4	1.4	1.4	1.9	1.3	1.3	1.3	1.2
ADAIT-2020	1.4	1.4	1.4	2.0	1.6	1.7	1.7	1.7
ADAIT-2012	1.4	1.4	1.4	2.0	1.6	1.7	1.8	1.8
Extended Tealbook baseline	1.4	1.4	1.4	2.0	1.6	1.8	1.8	1.8

1. Percent, average for the quarter.

Monetary Policy Strategies

Outcomes of Optimal Control Simulations under Discretion
(Percent change, annual rate, from end of preceding period, except as noted)

Outcome and strategy	2020	2021	2022	2023	2024	2025	2026	2027
Nominal federal funds rate[1]								
Asymmetric weights (DAI)	.1	.1	.1	.2	.5	.7	1.0	1.4
Asymmetric weights (4-quarter inflation)	.1	.1	.1	.2	.5	.8	1.2	1.5
Equal weights (DAI)	.1	.2	.5	.9	1.1	1.4	1.7	2.0
Equal weights (4-quarter inflation)	.1	.1	.4	.7	1.0	1.4	1.7	1.9
Extended Tealbook baseline	.1	.1	.1	.1	.1	.6	1.0	1.4
Real GDP								
Asymmetric weights (DAI)	-2.3	4.2	3.4	2.2	1.8	1.7	1.5	1.6
Asymmetric weights (4-quarter inflation)	-2.3	4.2	3.3	2.2	1.8	1.7	1.5	1.5
Equal weights (DAI)	-2.3	3.8	2.8	1.8	1.6	1.7	1.5	1.5
Equal weights (4-quarter inflation)	-2.3	3.8	2.9	1.8	1.6	1.6	1.5	1.5
Extended Tealbook baseline	-2.3	4.3	3.5	2.3	1.9	1.7	1.5	1.5
Unemployment rate[1]								
Asymmetric weights (DAI)	6.7	4.6	3.5	3.1	3.1	3.1	3.1	3.2
Asymmetric weights (4-quarter inflation)	6.7	4.7	3.5	3.2	3.2	3.2	3.3	3.4
Equal weights (DAI)	6.7	4.8	4.0	3.9	4.1	4.1	4.1	4.1
Equal weights (4-quarter inflation)	6.7	4.8	3.9	3.8	4.0	4.0	4.1	4.1
Extended Tealbook baseline	6.7	4.6	3.4	3.0	2.9	2.9	3.0	3.1
Total PCE prices								
Asymmetric weights (DAI)	1.2	1.7	1.7	1.8	1.9	2.0	2.0	2.1
Asymmetric weights (4-quarter inflation)	1.2	1.7	1.6	1.7	1.8	1.9	2.0	2.0
Equal weights (DAI)	1.2	1.5	1.2	1.3	1.4	1.5	1.5	1.6
Equal weights (4-quarter inflation)	1.2	1.5	1.3	1.3	1.4	1.5	1.5	1.6
Extended Tealbook baseline	1.2	1.8	1.8	1.9	2.0	2.1	2.1	2.1
Core PCE prices								
Asymmetric weights (DAI)	1.4	1.7	1.8	1.8	1.9	2.0	2.0	2.1
Asymmetric weights (4-quarter inflation)	1.4	1.7	1.7	1.7	1.8	1.9	2.0	2.0
Equal weights (DAI)	1.4	1.4	1.3	1.3	1.4	1.5	1.5	1.6
Equal weights (4-quarter inflation)	1.4	1.4	1.3	1.3	1.4	1.5	1.5	1.6
Extended Tealbook baseline	1.4	1.8	1.8	1.9	2.0	2.1	2.1	2.1

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

Monetary Policy Strategies

Outcomes of Optimal Control Simulations under Discretion, Quarterly

(4-quarter percent change, except as noted)

Outcome and strategy	2020		2021				2022	
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
Nominal federal funds rate[1]								
Asymmetric weights (DAI)	.1	.1	.1	.1	.1	.1	.1	.1
Asymmetric weights (4-quarter inflation)	.1	.1	.1	.1	.1	.1	.1	.1
Equal weights (DAI)	.1	.1	.1	.1	.1	.2	.3	.3
Equal weights (4-quarter inflation)	.1	.1	.1	.1	.1	.1	.2	.2
Extended Tealbook baseline	.1	.1	.1	.1	.1	.1	.1	.1
Real GDP								
Asymmetric weights (DAI)	-2.9	-2.3	-1.1	9.5	3.8	4.2	5.4	5.4
Asymmetric weights (4-quarter inflation)	-2.9	-2.3	-1.1	9.5	3.7	4.2	5.3	5.3
Equal weights (DAI)	-2.9	-2.3	-1.1	9.3	3.5	3.8	4.8	4.8
Equal weights (4-quarter inflation)	-2.9	-2.3	-1.1	9.4	3.5	3.8	4.8	4.9
Extended Tealbook baseline	-2.9	-2.3	-1.1	9.5	3.8	4.3	5.5	5.5
Unemployment rate[1]								
Asymmetric weights (DAI)	8.8	6.7	6.6	6.0	5.3	4.6	4.2	3.8
Asymmetric weights (4-quarter inflation)	8.8	6.7	6.6	6.0	5.3	4.7	4.3	3.9
Equal weights (DAI)	8.8	6.7	6.6	6.0	5.4	4.8	4.5	4.2
Equal weights (4-quarter inflation)	8.8	6.7	6.6	6.0	5.4	4.8	4.5	4.2
Extended Tealbook baseline	8.8	6.7	6.6	6.0	5.3	4.6	4.2	3.8
Total PCE prices								
Asymmetric weights (DAI)	1.2	1.2	1.3	2.1	1.6	1.7	1.7	1.7
Asymmetric weights (4-quarter inflation)	1.2	1.2	1.3	2.1	1.6	1.7	1.7	1.7
Equal weights (DAI)	1.2	1.2	1.2	2.0	1.4	1.5	1.4	1.3
Equal weights (4-quarter inflation)	1.2	1.2	1.2	2.0	1.4	1.5	1.4	1.3
Extended Tealbook baseline	1.2	1.2	1.3	2.1	1.7	1.8	1.8	1.8
Core PCE prices								
Asymmetric weights (DAI)	1.4	1.4	1.4	2.0	1.6	1.7	1.7	1.8
Asymmetric weights (4-quarter inflation)	1.4	1.4	1.4	2.0	1.6	1.7	1.7	1.7
Equal weights (DAI)	1.4	1.4	1.4	1.9	1.4	1.4	1.4	1.4
Equal weights (4-quarter inflation)	1.4	1.4	1.4	1.9	1.4	1.4	1.4	1.4
Extended Tealbook baseline	1.4	1.4	1.4	2.0	1.6	1.8	1.8	1.8

1. Percent, average for the quarter.

Monetary Policy Strategies

Appendix

Implementation of the Simple Rules and Optimal Control Simulations

The monetary policy strategies considered in this section of Tealbook A typically fall into one of two categories. Under simple policy rules, policymakers set the federal funds rate according to a reaction function that includes a small number of macroeconomic factors. Under optimal control policies, policymakers compute a path for the federal funds rate that minimizes a loss function meant to capture policymakers' preferences over macroeconomic outcomes.

The two approaches have different merits and limitations. The parsimony of simple rules makes them relatively easy to communicate to the public, and, because they respond only to variables that are central to a range of models, proponents argue that they may be more robust to uncertainty about the structure of the economy. However, simple rules omit, by construction, other potential influences on policy decisions; thus, strict adherence to such rules may, at times, lead to unsatisfactory outcomes. By comparison, optimal control policies respond to a broader set of economic factors; their prescriptions optimally balance various policy objectives. That said, optimal control policies assume substantial knowledge on the part of policymakers and are sensitive to the assumed loss function and the specifics of the particular model.

Given the different strengths and weaknesses of the two approaches, they are probably best considered together as a means to assess the various tradeoffs policymakers may face when pursuing their mandated objectives.

A DISCOUNTED AVERAGE INFLATION GAP

The Monetary Policy Strategies section makes use of a discounted average inflation (DAI) gap in both the simple rules and optimal control exhibits. This inflation gap measure seeks to capture current and past inflation deviations from 2 percent in a manner that allows those deviations to become bygones gradually over time. Specifically, the discounted average inflation gap in period t (labeled $\bar{\pi}gap_t$) is defined by a recursive formula,

$$\bar{\pi}gap_t = \left(\frac{1}{D}\right)\left(\frac{1}{1+3\gamma}\right)(\pi_t - 2) + \gamma\,\bar{\pi}gap_{t-1},$$

where π_t is the quarterly inflation rate expressed at an annual rate and γ is a parameter controlling the speed at which past inflation deviations from 2 percent are gradually discounted. The fraction $1/(1+3\gamma)$ is a technical adjustment to account for annualized inflation rates. The fraction $1/D$ converts the recursive object into a weighted average by dividing the gap by the annualized duration of the process. $D = 1/(4(1-\gamma))$ is also a function of γ, the speed at which past inflation deviations are discounted. In our benchmark implementation, we set γ=0.95, implying an annualized duration of five years, which places the majority of the weight on inflation misses over roughly a business cycle frequency.

In the simple policy rule simulations, core PCE price inflation is used to create the DAI gap for the asymmetric discounted average inflation targeting (ADAIT) rule. In the optimal control simulations, headline PCE price inflation is used.

POLICY RULES USED IN THE MONETARY POLICY STRATEGIES SECTION

The table "Simple Rules" that follows gives expressions for three simple policy rules reported in the exhibits of the Monetary Policy Strategies section.[1] R_t denotes the nominal federal funds rate prescribed by a strategy for quarter t. The right-hand-side variables of the first two rules include the staff's projection of trailing four-quarter core PCE price inflation for the current quarter (π_t^4) and the output gap estimate for the current period ($ygap_t$). The value of policymakers' longer-run inflation objective, denoted π^{LR}, is 2 percent. The additional right-hand-side variables of the ADAIT rule include the DAI gap, described in this appendix and denoted $\bar{\pi}gap_t$. The ADAIT rule also responds to shortfalls of employment from its trend level, as determined by the gap between the level of the employment-to-population (EPOP) ratio and the staff's estimate of its trend (henceforth, the EPOP gap), with the response being limited to shortfalls via the minimum operator that replaces positive values of the EPOP gap with zero.

<div align="center">

Simple Rules

</div>

Taylor (1993) rule	$R_t = r^{LR} + \pi_t^4 + 0.5(\pi_t^4 - \pi^{LR}) + 0.5ygap_t$
Inertial Taylor (1999) rule	$R_t = 0.85R_{t-1} + 0.15(r^{LR} + \pi_t^4 + 0.5(\pi_t^4 - \pi^{LR}) + ygap_t)$
ADAIT rule	$R_t = 0.85R_{t-1} + 0.15(r^{LR} + 2 + 1.5 D \bar{\pi}gap_t + 1.5 \min(EPOPgap_t, 0))$

The first rule in the table was studied by Taylor (1993). The inertial Taylor (1999) rule features more inertia and a stronger response to resource slack over time compared with the Taylor (1993) rule. The inertial Taylor (1999) rule has been featured prominently in analysis by Board staff. The ADAIT rule was introduced in the September 2020 Tealbook following changes to the FOMC's Statement on Longer-Run Goals and Monetary Policy Strategy. The intercepts of the three rules, denoted r^{LR}, are constant and chosen so that they are consistent with a 2 percent longer-run inflation objective and an equilibrium real federal funds rate in the longer run of 0.5 percent.

NEAR-TERM PRESCRIPTIONS OF SELECTED POLICY RULES

The "Near-Term Prescriptions of Selected Policy Rules" reported in the first exhibit are calculated taking as given the Tealbook projections for inflation and measures of resource slack. When the Tealbook is published early in a quarter, the prescriptions are shown for the current and next quarters. When the Tealbook is published late in a quarter, the prescriptions are shown for

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[1] In the staff's construction of the baseline projection, not shown in this table, the federal funds rate departs from the ELB in the quarter after the unemployment rate is below 4.1 percent and the four-quarter inflation rate is above 2.0 percent. Thereafter, the federal funds rate follows an inertial version of the Taylor (1999) rule, but with no response to the output gap when the gap is positive. The intercept in this rule is also adjusted in a time-varying way.

the next two quarters. In both cases, rules that include a lagged policy rate as a right-hand-side variable use the midpoint of the current target range of the federal funds rate as that value in the first quarter shown and then condition on their simulated lagged federal funds rate for the second quarter shown.

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

The bottom panel of the exhibit "Policy Rules and the Staff Projection" provides estimates of one notion of the equilibrium real federal funds rate that uses the Tealbook baseline. The simulations are conducted using the FRB/US model, the staff's large-scale econometric model of the U.S. economy. "FRB/US r^*" is the real federal funds rate that, if maintained over a 12-quarter period (beginning in the current quarter), makes the output gap equal to zero in the final quarter of that period, given the Tealbook economic projection. This measure depends on a broad array of economic factors, some of which take the form of projected values of the model's exogenous variables.[2] The measure is derived under the assumption that agents in the model form VAR-based expectations—that is, agents use small-scale statistical models so that their expectations of future variables are determined solely by historical relationships.

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

FRB/US MODEL SIMULATIONS

The results presented in the exhibits "Simple Policy Rule Simulations" and "Optimal Control Simulations under Discretion" are derived from dynamic simulations of the FRB/US model. Each simulated policy strategy is assumed to be in force over the whole period covered by the simulation; this period extends several decades beyond the time horizon shown in the exhibits. The simulations are conducted under the assumption that market participants as well as price and wage setters form model-consistent expectations and are predicated on the staff's extended Tealbook projection, which includes the macroeconomic effects of the Committee's large-scale asset purchase programs. When the Tealbook is published early in a quarter, all of the simulations begin in that quarter; when the Tealbook is published late in a quarter, all of the simulations begin in the subsequent quarter.

The simple rule simulations embed the assumption that policymakers will adhere to the policy strategy in the future and that financial market participants, price setters, and wage setters not only believe that policymakers will follow through with their strategy, but also fully understand the macroeconomic implications of policymakers doing so. Such policy strategies are

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

described as commitment strategies. By contrast, the optimal control simulations embed the assumption that policymakers will re-optimize every period, described as discretion strategies. Under discretion, there may be policy rate paths that would result in more desirable macroeconomic outcomes than the path chosen. However, these outcomes are not feasible, as they require future policymakers to take actions that may not be optimal from the perspective of those future policymakers. As under the commitment case, financial market participants, price setters, and wage setters fully understand the macroeconomic implications of the policymakers' strategy.

COMPUTATION OF OPTIMAL CONTROL POLICIES UNDER DISCRETION

To demonstrate the differences generated by the use of different inflation gap measures, the current Tealbook reports results from two specific gap measures: the four-quarter inflation gap and the DAI gap. The four-quarter inflation gap, measured as the difference between four-quarter headline PCE price inflation, π_t^{PCE}, and the Committee's 2 percent objective, has historically been used in optimal control simulations in this section. The DAI gap is described earlier in this appendix.

In the following equations, the resulting loss functions embed the assumption that policymakers discount the future using a quarterly discount factor, $\beta = 0.9963$:

Four-quarter inflation gap specification

$$L_t = \sum_{\tau=0}^{T} \beta^\tau \left\{ \lambda_\pi \left(\pi_{t+\tau}^{PCE} - \pi^{LR} \right)^2 + \lambda_{e,t+\tau} (EPOPgap_{t+\tau})^2 + \lambda_R (R_{t+\tau} - R_{t+\tau-1})^2 \right\};$$

DAI gap specification

$$L_t = \sum_{\tau=0}^{T} \beta^\tau \left\{ \lambda_\pi \left(\bar{\pi}gap_{t+\tau} \right)^2 + \lambda_{e,t+\tau} (EPOPgap_{t+\tau})^2 + \lambda_R (R_{t+\tau} - R_{t+\tau-1})^2 \right\}.$$

The exhibit "Optimal Control Simulations under Discretion" considers weighting structures on the inflation gap, the EPOP gap, and the policy rate change components of the loss function. The table "Loss Functions" shows the weights used in each of the equal-weights and asymmetric-weights specifications.

Loss Functions

	λ_π	$\lambda_{e,t+\tau}$		λ_R
		$EPOPgap_{t+\tau} < 0$	$EPOPgap_{t+\tau} \geq 0$	
Equal weights	1	1	1	1
Asymmetric weights	1	1	0	1

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The first weighting structure, labeled "Equal weights," assigns equal weights to all three components at all times. The second weighting structure, labeled "Asymmetric weights," uses the same weights as the equal-weights structure whenever the EPOP gap is below the staff's estimate of its trend. However, this second weighting structure assigns no penalty to the EPOP gap moving above the staff's estimate of its trend. The optimal control policy and associated outcomes depend on the relative (rather than the absolute) values of the weights.

For each of these choices of the loss function, the optimal control policy is subject to the effective lower bound constraint on nominal interest rates. Policy tools other than the federal funds rate are taken as given and subsumed within the Tealbook baseline. The optimal control policy takes as given the initial lagged value of the federal funds rate but is otherwise unconstrained by policy decisions made before the simulation period.

ESTIMATES OF THE EQUILIBRIUM REAL FEDERAL FUNDS RATE IN THE LONGER RUN

The top panel of the exhibit "Estimates of the Equilibrium Real Federal Funds Rate in the Longer Run" shows a range of estimates of r^{LR} from eight time-series models based on the following studies: Christensen and Rudebusch (2019); Del Negro, Giannone, Giannoni, and Tambalotti (2017); Holston, Laubach, and Williams (2017); Johannsen and Mertens (2018); Kiley (2015); Laubach and Williams (2003); Lewis and Vazquez-Grande (2019); and Lubik and Matthes (2015).[3] The estimates are one sided in the sense that, at each point, they make use of historical data only up to that point in time. As a result, their historical movements can differ from the two-sided estimates reported in some of those studies.

The middle panel reports, for a selection of models, the point estimates and associated 68 percent uncertainty bands for 2020:Q3. The computation and interpretation of these bands are specific to each study.[4]

The bottom panel shows r^{LR} values from selected forecasters. These values were obtained as follows:

- "Tealbook baseline" is the staff's assumption about the level of the equilibrium real federal funds rate in the longer run.
- "Median SEP" is the median of FOMC participants' projections of the federal funds rate in the longer run minus the corresponding projection of PCE inflation.
- "Median Survey of Primary Dealers" is the long-run median dealer forecast for the target rate minus the longer-run median dealer forecast of PCE inflation.
- "Blue Chip Economic Indicators consensus" is the consensus forecast of the average value over the forecast period of the three-month Treasury bill rate, minus the

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[3] Two of the models featured in the exhibit, Laubach and Williams (2003) and Holston, Laubach, and Williams (2017), have been updated to incorporate a modification (one consistent with their basic structures) to make them more conducive to continued estimation during and after the COVID-19 pandemic. Details on this adjustment are available in Holston, Laubach, and Williams (2020).

[4] The ranges in the table represent both parameter and state uncertainty.

      corresponding forecast for the average annual change in the GDP chained price index. The forecast period covers the five-year period that begins with the first quarter of the seventh year after the survey year.

- "Blue Chip Financial Forecasts consensus" is the consensus forecast of the average value over the forecast period of the federal funds rate, minus the corresponding forecast for the average annual change in the PCE price index. The forecast period covers the five-year period that begins with the first quarter of the seventh year after the survey year.

- "Congressional Budget Office" equals the projected federal funds rate minus the projected annualized quarterly change in the core PCE index, for the last quarter of the 10th year after the release year.

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

Interval	Nominal GDP		Real GDP		PCE price index		Core PCE price index		Unemployment rate[1]	
	10/23/20	12/04/20	10/23/20	12/04/20	10/23/20	12/04/20	10/23/20	12/04/20	10/23/20	12/04/20
Quarterly										
2020:Q1	-3.4	-3.4	-5.0	-5.0	1.3	1.3	1.6	1.6	3.8	3.8
Q2	-32.8	-32.8	-31.4	-31.4	-1.6	-1.6	-.8	-.8	13.0	13.0
Q3	36.0	37.9	31.9	33.0	4.2	3.7	4.1	3.5	8.8	8.8
Q4	5.6	6.9	3.9	5.0	1.3	1.4	1.5	1.3	7.2	6.7
2021:Q1	3.0	1.4	1.4	-.3	1.4	1.6	1.5	1.6	6.6	6.6
Q2	3.0	5.4	1.0	3.4	1.6	1.7	1.6	1.7	6.2	6.0
Q3	6.7	9.5	4.8	7.3	1.7	1.9	1.6	1.9	5.8	5.3
Q4	9.1	9.0	7.1	6.9	1.8	1.9	1.7	1.9	5.2	4.6
2022:Q1	6.7	6.1	4.9	4.2	1.6	1.7	1.7	1.8	4.7	4.2
Q2	5.6	5.6	3.6	3.5	1.7	1.8	1.8	1.8	4.3	3.8
Q3	5.1	5.3	3.2	3.4	1.8	1.8	1.8	1.8	3.9	3.6
Q4	4.9	4.7	2.9	2.8	1.9	1.9	1.9	1.9	3.7	3.4
Two-quarter[2]										
2020:Q2	-19.4	-19.4	-19.2	-19.2	-.2	-.2	.4	.4	9.5	9.5
Q4	19.8	21.4	17.1	18.2	2.8	2.6	2.8	2.4	-5.8	-6.3
2021:Q2	3.0	3.4	1.2	1.5	1.5	1.7	1.6	1.6	-1.0	-.7
Q4	7.9	9.2	5.9	7.1	1.7	1.9	1.7	1.9	-1.0	-1.4
2022:Q2	6.2	5.8	4.3	3.9	1.7	1.7	1.7	1.8	-.9	-.8
Q4	5.0	5.0	3.1	3.1	1.8	1.8	1.8	1.9	-.6	-.4
Four-quarter[3]										
2019:Q4	4.0	4.0	2.3	2.3	1.5	1.5	1.6	1.6	-.3	-.3
2020:Q4	-1.7	-1.1	-2.8	-2.3	1.3	1.2	1.6	1.4	3.7	3.2
2021:Q4	5.4	6.3	3.5	4.3	1.6	1.8	1.6	1.8	-2.0	-2.1
2022:Q4	5.6	5.4	3.7	3.5	1.7	1.8	1.8	1.8	-1.5	-1.2
2023:Q4	4.6	4.3	2.6	2.3	1.9	1.9	1.9	1.9	-.6	-.4
Annual										
2019	4.0	4.0	2.2	2.2	1.5	1.5	1.7	1.7	3.7	3.7
2020	-2.6	-2.3	-3.7	-3.5	1.2	1.2	1.5	1.4	8.2	8.1
2021	5.1	5.9	3.4	4.0	1.7	1.7	1.7	1.7	5.9	5.6
2022	6.4	6.7	4.5	4.7	1.7	1.8	1.7	1.8	4.1	3.7
2023	4.8	4.6	2.8	2.6	1.9	1.9	1.9	1.9	3.3	3.1

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

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Changes in Real Gross Domestic Product and Related Items
(Percent, annual rate except as noted)

Item	2020 Q2	Q3	Q4	2021 Q1	Q2	Q3	Q4	2022 Q1	Q2	Q3	Q4	2020[1]	2021[1]	2022[1]	2023[1]
Real GDP	-31.4	33.0	5.0	-.3	3.4	7.3	6.9	4.2	3.5	3.4	2.8	-2.3	4.3	3.5	2.3
Previous Tealbook	*-31.4*	*31.9*	*3.9*	*1.4*	*1.0*	*4.8*	*7.1*	*4.9*	*3.6*	*3.2*	*2.9*	*-2.8*	*3.5*	*3.7*	*2.6*
Final sales	-28.1	25.6	3.6	-.9	4.1	7.4	6.1	3.3	4.3	3.4	2.9	-2.6	4.1	3.5	2.2
Previous Tealbook	*-28.1*	*25.2*	*3.2*	*.6*	*.8*	*4.2*	*6.8*	*4.2*	*4.0*	*3.3*	*3.2*	*-2.7*	*3.1*	*3.7*	*2.5*
Priv. dom. final purch.	-32.4	38.5	5.8	-1.6	3.4	8.7	7.5	4.2	4.8	4.1	3.6	-1.7	4.4	4.2	2.4
Previous Tealbook	*-32.4*	*36.0*	*4.0*	*.3*	*.1*	*5.1*	*8.9*	*5.8*	*4.9*	*4.3*	*4.2*	*-2.6*	*3.5*	*4.8*	*3.2*
Personal cons. expend.	-33.2	40.6	3.9	-2.5	2.2	8.2	7.1	3.2	4.5	3.9	3.8	-2.3	3.7	3.8	3.1
Previous Tealbook	*-33.2*	*39.5*	*2.6*	*-.9*	*-1.2*	*4.9*	*9.6*	*5.5*	*4.5*	*4.0*	*3.9*	*-2.8*	*3.0*	*4.5*	*3.1*
Durables	-1.7	82.9	3.9	-3.2	-1.6	3.1	1.3	5.9	7.4	4.9	4.6	13.1	-.1	5.7	4.3
Nondurables	-15.0	30.6	4.6	1.3	-2.8	7.1	5.2	2.7	4.6	3.4	3.3	5.6	2.6	3.5	2.8
Services	-41.8	37.6	3.7	-3.6	4.6	9.5	8.7	2.9	3.9	3.9	3.7	-7.0	4.7	3.6	3.0
Residential investment	-35.6	63.0	34.4	-1.2	18.1	22.4	17.7	14.3	7.5	3.6	-.8	13.8	13.9	6.0	-7.7
Previous Tealbook	*-35.6*	*62.5*	*24.6*	*-2.7*	*11.4*	*10.3*	*9.1*	*7.9*	*6.0*	*4.8*	*2.7*	*11.6*	*6.9*	*5.3*	*-1.6*
Nonres. priv. fixed invest.	-27.2	22.0	6.9	3.3	4.9	6.3	6.3	5.3	5.3	5.2	4.8	-3.0	5.2	5.1	3.0
Previous Tealbook	*-27.2*	*12.8*	*4.7*	*8.1*	*3.1*	*4.5*	*5.5*	*6.5*	*6.4*	*6.0*	*6.3*	*-5.3*	*5.3*	*6.3*	*5.3*
Equipment & intangibles	-25.2	35.4	12.8	5.7	7.0	6.5	6.0	5.4	4.9	4.3	3.7	1.4	6.3	4.6	2.7
Previous Tealbook	*-25.2*	*22.4*	*10.2*	*11.5*	*4.2*	*4.6*	*6.0*	*7.0*	*7.1*	*6.4*	*6.2*	*-1.7*	*6.5*	*6.7*	*4.7*
Nonres. structures	-33.6	-17.5	-14.3	-6.6	-3.9	5.4	7.5	4.8	7.0	9.0	9.2	-18.0	.4	7.5	4.6
Previous Tealbook	*-33.6*	*-16.7*	*-14.7*	*-5.1*	*-1.5*	*4.0*	*3.7*	*4.1*	*3.4*	*4.5*	*6.9*	*-17.9*	*.2*	*4.7*	*7.9*
Net exports[2]	-775	-1018	-1075	-1055	-1009	-1040	-1078	-1106	-1106	-1127	-1155	-914	-1046	-1123	-1169
Previous Tealbook[2]	*-775*	*-1015*	*-1024*	*-1011*	*-991*	*-1017*	*-1072*	*-1117*	*-1126*	*-1149*	*-1175*	*-901*	*-1023*	*-1142*	*-1206*
Exports	-64.4	59.6	9.5	6.7	15.9	17.6	18.5	6.0	5.3	5.0	4.9	-13.4	14.6	5.3	4.6
Imports	-54.1	92.8	14.1	2.1	4.7	16.2	17.6	7.4	3.7	5.9	6.4	-3.8	9.9	5.8	4.2
Gov't. cons. & invest.	2.5	-4.9	-2.3	.1	1.5	2.3	1.0	.9	.9	.9	1.0	-.9	1.2	.9	1.0
Previous Tealbook	*2.5*	*1.9*	*-.6*	*.6*	*1.7*	*1.1*	*.4*	*-.2*	*-.3*	*-.3*	*-.2*	*1.3*	*.9*	*-.2*	*-.2*
Federal	16.4	-6.2	-.1	-.7	1.2	1.2	.8	.6	.6	.6	.9	2.6	.6	.6	.8
Defense	3.8	3.1	2.1	.8	.8	.8	.1	.6	.6	.6	1.1	2.2	.6	.7	1.0
Nondefense	37.6	-18.1	-3.2	-2.9	1.9	1.9	1.9	.5	.5	.5	.5	3.3	.7	.5	.4
State & local	-5.4	-4.0	-3.7	.7	1.7	3.0	1.2	1.0	1.1	1.1	1.1	-3.0	1.6	1.1	1.1
Change in priv. inventories[2]	-287	-7	66	99	60	57	99	148	107	108	101	-77	79	116	108
Previous Tealbook[2]	*-287*	*-33*	*4*	*43*	*56*	*84*	*103*	*143*	*122*	*115*	*103*	*-99*	*71*	*121*	*108*

1. Change from fourth quarter of previous year to fourth quarter of year indicated.
2. Billions of chained (2012) dollars; annual values show annual averages.

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

Item	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Real GDP	2.9	2.2	2.1	2.7	2.5	2.3	-2.3	4.3	3.5	2.3
Previous Tealbook	*2.9*	*2.2*	*2.1*	*2.7*	*2.5*	*2.3*	*-2.8*	*3.5*	*3.7*	*2.6*
Final sales	3.2	2.1	2.3	2.8	2.2	2.8	-2.6	4.1	3.5	2.2
Previous Tealbook	*3.2*	*2.1*	*2.3*	*2.8*	*2.2*	*2.8*	*-2.7*	*3.1*	*3.7*	*2.5*
Priv. dom. final purch.	4.5	2.8	2.6	3.2	2.7	2.3	-1.7	4.4	4.2	2.4
Previous Tealbook	*4.5*	*2.8*	*2.6*	*3.2*	*2.7*	*2.3*	*-2.6*	*3.5*	*4.8*	*3.2*
Personal cons. expend.	3.8	3.1	2.7	2.9	2.4	2.5	-2.3	3.7	3.8	3.1
Previous Tealbook	*3.8*	*3.1*	*2.7*	*2.9*	*2.4*	*2.5*	*-2.8*	*3.0*	*4.5*	*3.1*
Durables	9.2	6.0	7.0	8.1	4.2	5.7	13.1	-.1	5.7	4.3
Nondurables	3.2	2.8	2.0	3.7	2.3	2.7	5.6	2.6	3.5	2.8
Services	3.2	2.7	2.3	1.8	2.1	1.9	-7.0	4.7	3.6	3.0
Residential investment	7.7	9.2	4.2	4.7	-3.9	1.6	13.8	13.9	6.0	-7.7
Previous Tealbook	*7.7*	*9.2*	*4.2*	*4.7*	*-3.9*	*1.6*	*11.6*	*6.9*	*5.3*	*-1.6*
Nonres. priv. fixed invest.	6.9	-.1	1.8	4.8	6.5	1.4	-3.0	5.2	5.1	3.0
Previous Tealbook	*6.9*	*-.1*	*1.8*	*4.8*	*6.5*	*1.4*	*-5.3*	*5.3*	*6.3*	*5.3*
Equipment & intangibles	6.1	2.2	1.3	6.3	8.0	1.3	1.4	6.3	4.6	2.7
Previous Tealbook	*6.1*	*2.2*	*1.3*	*6.3*	*8.0*	*1.3*	*-1.7*	*6.5*	*6.7*	*4.7*
Nonres. structures	9.3	-7.3	3.5	.0	1.2	1.9	-18.0	.4	7.5	4.6
Previous Tealbook	*9.3*	*-7.3*	*3.5*	*.0*	*1.2*	*1.9*	*-17.9*	*.2*	*4.7*	*7.9*
Net exports[1]	-577	-720	-764	-817	-878	-918	-914	-1046	-1123	-1169
Previous Tealbook[1]	*-577*	*-720*	*-764*	*-817*	*-878*	*-918*	*-901*	*-1023*	*-1142*	*-1206*
Exports	2.9	-1.5	1.5	5.8	.5	.4	-13.4	14.6	5.3	4.6
Imports	6.5	3.3	2.8	5.6	3.0	-1.9	-3.8	9.9	5.8	4.2
Gov't. cons. & invest.	.3	2.2	1.5	1.1	1.5	3.0	-.9	1.2	.9	1.0
Previous Tealbook	*.3*	*2.2*	*1.5*	*1.1*	*1.5*	*3.0*	*1.3*	*.9*	*-.2*	*-.2*
Federal	-1.1	1.3	.1	1.2	3.0	4.8	2.6	.6	.6	.8
Defense	-3.4	-.4	-.7	2.2	4.2	5.6	2.2	.6	.7	1.0
Nondefense	2.7	3.8	1.2	-.1	1.1	3.7	3.3	.7	.5	.4
State & local	1.2	2.8	2.4	1.1	.6	1.9	-3.0	1.6	1.1	1.1
Change in priv. inventories[1]	86	138	25	16	53	49	-77	79	116	108
Previous Tealbook[1]	*86*	*138*	*25*	*16*	*53*	*49*	*-99*	*71*	*121*	*108*

1. Billions of chained (2012) dollars; annual values show annual averages.

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

Item	2020 Q2	Q3	Q4	2021 Q1	Q2	Q3	Q4	2022 Q1	Q2	Q3	Q4	2020[1]	2021[1]	2022[1]	2023[1]
Real GDP	-31.4	33.0	5.0	-.3	3.4	7.3	6.9	4.2	3.5	3.4	2.8	-2.3	4.3	3.5	2.3
Previous Tealbook	*-31.4*	*31.9*	*3.9*	*1.4*	*1.0*	*4.8*	*7.1*	*4.9*	*3.6*	*3.2*	*2.9*	*-2.8*	*3.5*	*3.7*	*2.6*
Final sales	-27.9	27.2	3.6	-.9	4.1	7.4	6.2	3.3	4.3	3.3	2.9	-2.6	4.1	3.5	2.2
Previous Tealbook	*-27.9*	*26.7*	*3.2*	*.6*	*.8*	*4.2*	*6.8*	*4.2*	*4.0*	*3.3*	*3.2*	*-2.7*	*3.1*	*3.7*	*2.5*
Priv. dom. final purch.	-27.7	31.7	4.9	-1.3	2.9	7.3	6.4	3.6	4.1	3.5	3.1	-1.5	3.8	3.6	2.1
Previous Tealbook	*-27.7*	*29.8*	*3.4*	*.3*	*.1*	*4.3*	*7.5*	*4.9*	*4.1*	*3.7*	*3.6*	*-2.2*	*3.0*	*4.1*	*2.7*
Personal cons. expend.	-24.0	25.3	2.7	-1.7	1.5	5.5	4.7	2.2	3.0	2.6	2.5	-1.6	2.5	2.6	2.1
Previous Tealbook	*-24.0*	*25.5*	*1.8*	*-.6*	*-.8*	*3.3*	*6.3*	*3.7*	*3.0*	*2.7*	*2.6*	*-1.9*	*2.0*	*3.0*	*2.1*
Durables	.0	5.2	.3	-.3	-.1	.3	.1	.4	.5	.4	.3	.9	.0	.4	.3
Nondurables	-2.1	4.6	.7	.2	-.4	1.0	.8	.4	.7	.5	.5	.8	.4	.5	.4
Services	-22.0	15.5	1.7	-1.6	2.0	4.2	3.9	1.3	1.8	1.8	1.7	-3.3	2.1	1.7	1.4
Residential investment	-1.6	2.2	1.3	-.1	.8	1.0	.8	.7	.4	.2	.0	.5	.6	.3	-.4
Previous Tealbook	*-1.6*	*2.2*	*1.0*	*-.1*	*.5*	*.5*	*.4*	*.4*	*.3*	*.2*	*.1*	*.4*	*.3*	*.3*	*-.1*
Nonres. priv. fixed invest.	-3.7	3.2	.9	.4	.6	.8	.8	.7	.7	.7	.6	-.4	.7	.7	.4
Previous Tealbook	*-3.7*	*2.1*	*.6*	*1.0*	*.4*	*.6*	*.7*	*.8*	*.8*	*.8*	*.8*	*-.7*	*.7*	*.8*	*.7*
Equipment & intangibles	-2.6	3.7	1.3	.6	.7	.7	.7	.6	.5	.5	.4	.1	.7	.5	.3
Previous Tealbook	*-2.6*	*2.5*	*1.0*	*1.1*	*.4*	*.5*	*.6*	*.7*	*.7*	*.7*	*.6*	*-.2*	*.7*	*.7*	*.5*
Nonres. structures	-1.1	-.5	-.4	-.2	-.1	.1	.2	.1	.2	.2	.2	-.5	.0	.2	.1
Previous Tealbook	*-1.1*	*-.4*	*-.4*	*-.1*	*.0*	*.1*	*.1*	*.1*	*.1*	*.1*	*.2*	*-.5*	*.0*	*.1*	*.2*
Net exports	.6	-3.2	-.9	.4	.9	-.4	-.5	-.4	.0	-.3	-.4	-1.0	.1	-.3	-.1
Previous Tealbook	*.6*	*-4.0*	*-.1*	*.3*	*.4*	*-.3*	*-.8*	*-.7*	*-.1*	*-.3*	*-.4*	*-.8*	*-.1*	*-.4*	*-.2*
Exports	-9.5	4.9	.9	.7	1.5	1.8	1.9	.7	.6	.5	.5	-1.5	1.5	.6	.5
Imports	10.1	-8.1	-1.8	-.3	-.6	-2.1	-2.4	-1.0	-.5	-.8	-.9	.5	-1.4	-.8	-.6
Gov't. cons. & invest.	.8	-.4	-.4	.0	.3	.4	.2	.2	.2	.2	.2	-.2	.2	.2	.2
Previous Tealbook	*.8*	*1.0*	*-.1*	*.1*	*.3*	*.2*	*.1*	*.0*	*.0*	*.0*	*.0*	*.2*	*.2*	*.0*	*.0*
Federal	1.2	-.2	.0	.0	.1	.1	.1	.0	.0	.0	.1	.2	.0	.0	.0
Defense	.2	.3	.1	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0
Nondefense	1.0	-.5	-.1	-.1	.1	.1	.1	.0	.0	.0	.0	.1	.0	.0	.0
State & local	-.4	-.1	-.4	.1	.2	.3	.1	.1	.1	.1	.1	-.3	.2	.1	.1
Change in priv. inventories	-3.5	5.8	1.4	.6	-.7	-.1	.8	.9	-.7	.0	-.1	.3	.2	.0	.1
Previous Tealbook	*-3.5*	*5.2*	*.7*	*.7*	*.3*	*.5*	*.3*	*.7*	*-.4*	*-.1*	*-.2*	*.0*	*.5*	*.0*	*.1*

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

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

Item	2020			2021				2022				2020[1]	2021[1]	2022[1]	2023[1]
	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4				
GDP chain-wt. price index	-1.8	3.6	1.8	1.7	2.0	2.0	1.9	1.8	2.0	1.9	1.9	1.2	1.9	1.9	2.0
Previous Tealbook	*-1.8*	*2.9*	*1.5*	*1.6*	*1.9*	*1.9*	*1.8*	*1.7*	*1.9*	*1.9*	*1.9*	*1.0*	*1.8*	*1.9*	*2.0*
PCE chain-wt. price index	-1.6	3.7	1.4	1.6	1.7	1.9	1.9	1.7	1.8	1.8	1.9	1.2	1.8	1.8	1.9
Previous Tealbook	*-1.6*	*4.2*	*1.3*	*1.4*	*1.6*	*1.7*	*1.8*	*1.6*	*1.7*	*1.8*	*1.9*	*1.3*	*1.6*	*1.7*	*1.9*
Energy	-44.9	24.8	6.7	4.6	1.6	2.0	1.4	1.2	1.5	1.2	1.2	-9.8	2.4	1.3	1.3
Previous Tealbook	*-44.9*	*24.9*	*.4*	*.8*	*2.9*	*2.8*	*2.2*	*1.5*	*1.7*	*1.6*	*1.7*	*-11.2*	*2.2*	*1.6*	*1.8*
Food	15.4	-1.8	-.2	.8	1.6	2.1	2.1	.6	1.3	1.7	2.0	3.9	1.7	1.4	2.3
Previous Tealbook	*15.4*	*-1.9*	*-.6*	*.7*	*1.6*	*2.1*	*2.1*	*.6*	*1.3*	*1.7*	*2.0*	*3.8*	*1.6*	*1.4*	*2.3*
Ex. food & energy	-.8	3.5	1.3	1.6	1.7	1.9	1.9	1.8	1.8	1.8	1.9	1.4	1.8	1.8	1.9
Previous Tealbook	*-.8*	*4.1*	*1.5*	*1.5*	*1.6*	*1.6*	*1.7*	*1.7*	*1.8*	*1.8*	*1.9*	*1.6*	*1.6*	*1.8*	*1.9*
Ex. food & energy, market based	.1	2.5	1.1	1.6	1.6	1.7	1.8	1.6	1.7	1.7	1.8	1.4	1.7	1.7	1.7
Previous Tealbook	*.1*	*2.8*	*1.8*	*1.6*	*1.5*	*1.5*	*1.6*	*1.5*	*1.6*	*1.7*	*1.8*	*1.6*	*1.5*	*1.6*	*1.7*
CPI	-3.5	5.2	1.9	1.9	1.8	2.1	2.1	1.9	2.0	2.0	2.1	1.1	2.0	2.0	2.1
Previous Tealbook	*-3.5*	*5.2*	*2.1*	*1.8*	*1.8*	*2.0*	*2.1*	*1.9*	*2.0*	*2.0*	*2.1*	*1.2*	*1.9*	*2.0*	*2.2*
Ex. food & energy	-1.6	4.4	1.6	1.8	1.8	2.0	2.1	2.0	2.1	2.1	2.2	1.6	1.9	2.1	2.1
Previous Tealbook	*-1.6*	*4.4*	*2.3*	*1.9*	*1.7*	*1.9*	*2.0*	*2.0*	*2.0*	*2.0*	*2.1*	*1.8*	*1.9*	*2.0*	*2.1*
ECI, hourly compensation[2]	1.7	2.0	1.6	1.9	2.0	2.0	2.1	2.4	2.5	2.5	2.5	2.1	2.0	2.5	2.7
Previous Tealbook[2]	*1.7*	*1.3*	*1.4*	*1.9*	*2.0*	*2.1*	*2.1*	*2.5*	*2.5*	*2.5*	*2.5*	*1.9*	*2.0*	*2.5*	*2.7*
Business sector															
Output per hour	9.6	6.2	-6.1	-2.5	.1	2.3	2.5	.6	1.0	1.5	.9	2.3	.6	1.0	.9
Previous Tealbook	*9.6*	*4.9*	*-3.3*	*-4.7*	*-3.5*	*1.6*	*5.0*	*2.4*	*1.0*	*.7*	*.6*	*2.7*	*-.5*	*1.2*	*.9*
Compensation per hour	22.1	-.2	1.2	.5	-3.3	-3.3	-2.3	3.1	3.1	3.1	3.1	7.7	-2.1	3.1	3.6
Previous Tealbook	*19.6*	*-5.0*	*.0*	*-3.5*	*-3.0*	*-1.5*	*2.0*	*3.8*	*3.8*	*3.8*	*3.8*	*5.5*	*-1.5*	*3.8*	*3.8*
Unit labor costs	11.4	-6.0	7.7	3.0	-3.4	-5.5	-4.7	2.5	2.2	1.7	2.2	5.3	-2.7	2.1	2.6
Previous Tealbook	*9.1*	*-9.5*	*3.4*	*1.2*	*.5*	*-3.0*	*-2.8*	*1.4*	*2.7*	*3.0*	*3.1*	*2.7*	*-1.0*	*2.6*	*2.9*
Core goods imports chain-wt. price index[3]	-2.1	5.3	4.7	4.4	2.9	1.3	.9	1.0	.9	.9	1.0	2.1	2.4	.9	1.0
Previous Tealbook[3]	*-2.1*	*4.7*	*4.5*	*3.1*	*1.8*	*1.0*	*.8*	*1.0*	*.9*	*.9*	*.9*	*2.0*	*1.7*	*.9*	*.9*

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

Greensheets

Greensheets
Changes in Prices and Costs
(Change from fourth quarter of previous year to fourth quarter of year indicated, unless otherwise noted)

Item	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
GDP chain-wt. price index	1.5	.8	1.5	2.0	2.3	1.6	1.2	1.9	1.9	2.0
Previous Tealbook	*1.5*	*.8*	*1.5*	*2.0*	*2.3*	*1.6*	*1.0*	*1.8*	*1.9*	*2.0*
PCE chain-wt. price index	1.1	.2	1.6	1.8	2.0	1.5	1.2	1.8	1.8	1.9
Previous Tealbook	*1.1*	*.2*	*1.6*	*1.8*	*2.0*	*1.5*	*1.3*	*1.6*	*1.7*	*1.9*
Energy	-7.1	-16.4	1.9	8.0	3.8	-.6	-9.8	2.4	1.3	1.3
Previous Tealbook	*-7.1*	*-16.4*	*1.9*	*8.0*	*3.8*	*-.6*	*-11.2*	*2.2*	*1.6*	*1.8*
Food	2.8	.3	-1.8	.7	.5	.9	3.9	1.7	1.4	2.3
Previous Tealbook	*2.8*	*.3*	*-1.8*	*.7*	*.5*	*.9*	*3.8*	*1.6*	*1.4*	*2.3*
Ex. food & energy	1.5	1.2	1.8	1.7	2.0	1.6	1.4	1.8	1.8	1.9
Previous Tealbook	*1.5*	*1.2*	*1.8*	*1.7*	*2.0*	*1.6*	*1.6*	*1.6*	*1.8*	*1.9*
Ex. food & energy, market based	1.1	1.1	1.4	1.2	1.7	1.5	1.4	1.7	1.7	1.7
Previous Tealbook	*1.1*	*1.1*	*1.4*	*1.2*	*1.7*	*1.5*	*1.6*	*1.5*	*1.6*	*1.7*
CPI	1.2	.4	1.8	2.1	2.2	2.0	1.1	2.0	2.0	2.1
Previous Tealbook	*1.2*	*.4*	*1.8*	*2.1*	*2.2*	*2.0*	*1.2*	*1.9*	*2.0*	*2.2*
Ex. food & energy	1.7	2.0	2.2	1.8	2.2	2.3	1.6	1.9	2.1	2.1
Previous Tealbook	*1.7*	*2.0*	*2.2*	*1.8*	*2.2*	*2.3*	*1.8*	*1.9*	*2.0*	*2.1*
ECI, hourly compensation[1]	2.3	1.9	2.2	2.6	3.0	2.7	2.1	2.0	2.5	2.7
Previous Tealbook[1]	*2.3*	*1.9*	*2.2*	*2.6*	*3.0*	*2.7*	*1.9*	*2.0*	*2.5*	*2.7*
Business sector										
Output per hour	.3	1.0	1.3	1.0	1.3	1.8	2.3	.6	1.0	.9
Previous Tealbook	*.3*	*1.0*	*1.3*	*1.0*	*1.3*	*1.8*	*2.7*	*-.5*	*1.2*	*.9*
Compensation per hour	3.0	2.4	2.0	4.0	2.6	3.3	7.7	-2.1	3.1	3.6
Previous Tealbook	*3.0*	*2.4*	*2.0*	*4.0*	*2.6*	*3.3*	*5.5*	*-1.5*	*3.8*	*3.8*
Unit labor costs	2.7	1.4	.7	3.0	1.3	1.4	5.3	-2.7	2.1	2.6
Previous Tealbook	*2.7*	*1.4*	*.7*	*3.0*	*1.3*	*1.4*	*2.7*	*-1.0*	*2.6*	*2.9*
Core goods imports chain-wt. price index[2]	-.4	-4.2	-.8	.9	.1	-1.4	2.1	2.4	.9	1.0
Previous Tealbook[2]	*-.4*	*-4.2*	*-.8*	*.9*	*.1*	*-1.4*	*2.0*	*1.7*	*.9*	*.9*

1. Private-industry workers.
2. Core goods imports exclude computers, semiconductors, oil, and natural gas.

Class II FOMC - Restricted (FR)   December 4, 2020

Other Macroeconomic Indicators

Item	2020 Q2	2020 Q3	2020 Q4	2021 Q1	2021 Q2	2021 Q3	2021 Q4	2022 Q1	2022 Q2	2022 Q3	2022 Q4	2020[1]	2021[1]	2022[1]	2023[1]
Employment and production															
Nonfarm payroll employment[2]	-4,427	1,322	374	503	642	739	619	429	299	278	261	-759	626	317	252
Unemployment rate[3]	13.0	8.8	6.7	6.6	6.0	5.3	4.6	4.2	3.8	3.6	3.4	6.7	4.6	3.4	3.0
Previous Tealbook[3]	*13.0*	*8.8*	*7.2*	*6.6*	*6.2*	*5.8*	*5.2*	*4.7*	*4.3*	*3.9*	*3.7*	*7.2*	*5.2*	*3.7*	*3.1*
Natural rate of unemployment[3]	9.4	5.8	5.3	5.2	5.1	4.8	4.6	4.5	4.5	4.4	4.4	5.3	4.6	4.4	4.3
Previous Tealbook[3]	*9.5*	*6.0*	*5.6*	*5.3*	*5.1*	*4.9*	*4.7*	*4.7*	*4.6*	*4.6*	*4.5*	*5.6*	*4.7*	*4.5*	*4.3*
Employment-to-Population Ratio[3]	52.9	56.1	57.4	57.7	58.2	59.0	59.7	60.0	60.3	60.5	60.6	57.4	59.7	60.6	61.0
Employment-to-Population Trend[3]	55.5	58.2	58.6	58.8	59.2	59.6	59.8	59.9	59.9	59.9	59.9	58.6	59.8	59.9	59.9
Output gap[4]	-3.8	-1.8	-.6	-1.4	-1.3	-.5	.6	1.2	1.6	1.9	2.1	-.6	.6	2.1	2.6
Previous Tealbook[4]	*-4.3*	*-1.1*	*-.9*	*-1.2*	*-1.5*	*-1.0*	*.0*	*.8*	*1.2*	*1.5*	*1.7*	*-.9*	*.0*	*1.7*	*2.4*
Industrial production[5]	-42.8	41.4	6.5	4.1	3.5	7.0	6.2	4.1	2.0	2.1	1.7	-5.3	5.2	2.5	.7
Previous Tealbook[5]	*-42.9*	*39.8*	*6.2*	*6.4*	*.7*	*4.4*	*6.2*	*4.9*	*2.4*	*2.3*	*2.0*	*-5.7*	*4.4*	*2.9*	*1.3*
Manufacturing industr. prod.[5]	-46.7	55.3	8.8	4.2	4.0	8.0	7.4	4.4	2.2	2.4	1.9	-4.0	5.9	2.7	.7
Previous Tealbook[5]	*-46.9*	*53.7*	*8.2*	*7.5*	*.7*	*4.8*	*7.6*	*5.3*	*2.7*	*2.6*	*2.3*	*-4.4*	*5.1*	*3.2*	*1.4*
Capacity utilization rate - mfg.[3]	63.2	70.6	72.2	73.0	73.7	75.2	76.6	77.4	77.8	78.3	78.6	72.2	76.6	78.6	78.8
Previous Tealbook[3]	*63.1*	*70.3*	*71.8*	*73.2*	*73.4*	*74.4*	*75.9*	*76.9*	*77.4*	*77.9*	*78.4*	*71.8*	*75.9*	*78.4*	*79.2*
Housing starts[6]	1.1	1.4	1.5	1.5	1.6	1.7	1.8	1.9	1.9	1.9	1.9	1.4	1.7	1.9	1.7
Light motor vehicle sales[6]	11.3	15.3	15.7	16.3	17.3	17.3	17.3	17.0	16.9	16.8	16.8	14.3	17.0	16.9	16.8
Income and saving															
Nominal GDP[5]	-32.8	37.9	6.9	1.4	5.4	9.5	9.0	6.1	5.6	5.3	4.7	-1.1	6.3	5.4	4.3
Real disposable pers. income[5]	48.6	-13.9	-11.7	-5.7	-2.9	1.0	.8	4.4	2.3	2.6	1.3	3.7	-1.7	2.6	2.1
Previous Tealbook[5]	*46.6*	*-20.0*	*-9.8*	*-5.5*	*-2.2*	*1.6*	*2.3*	*4.3*	*2.6*	*3.0*	*1.7*	*2.1*	*-1.0*	*2.9*	*2.4*
Personal saving rate[3]	26.0	16.6	13.2	12.5	11.4	9.9	8.6	8.9	8.5	8.2	7.7	13.2	8.6	7.7	6.9
Previous Tealbook[3]	*25.7*	*14.9*	*12.2*	*11.1*	*10.9*	*10.3*	*8.8*	*8.6*	*8.2*	*8.0*	*7.6*	*12.2*	*8.8*	*7.6*	*7.0*
Corporate profits[7]	-35.2	161.1	-19.0	-50.0	25.3	59.7	47.8	7.3	9.1	4.4	2.1	-4.7	10.3	5.7	2.7
Profit share of GNP[3]	9.3	10.9	10.1	8.5	8.8	9.7	10.5	10.5	10.6	10.6	10.5	10.1	10.5	10.5	10.4
Gross national saving rate[3]	17.1	16.3	17.3	19.0	19.0	18.9	19.0	19.2	19.2	19.2	19.1	17.3	19.0	19.1	18.9
Net national saving rate[3]	-1.1	.0	1.2	2.9	3.1	3.1	3.4	3.8	3.9	3.8	3.7	1.2	3.4	3.7	3.4

1. Change from fourth quarter of previous year to fourth quarter of year indicated, unless otherwise indicated.
2. Average monthly change, thousands.
3. Percent; annual values are for the fourth quarter of the year indicated.
4. Percent difference between actual and potential output; a negative number indicates that the economy is operating below potential.
   Annual values are for the fourth quarter of the year indicated.
5. Percent change, annual rate.
6. Level, millions; annual values are annual averages.
7. Percent change, annual rate, with inventory valuation and capital consumption adjustments.

Greensheets

Greensheets

Other Macroeconomic Indicators

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

Item	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Employment and production										
Nonfarm payroll employment[1]	250	227	195	176	193	178	-759	626	317	252
Unemployment rate[2]	5.7	5.0	4.8	4.1	3.8	3.5	6.7	4.6	3.4	3.0
Previous Tealbook[2]	5.7	5.0	4.8	4.1	3.8	3.5	7.2	5.2	3.7	3.1
Natural rate of unemployment[2]	5.1	4.9	4.8	4.6	4.5	4.3	5.3	4.6	4.4	4.3
Previous Tealbook[2]	5.1	4.9	4.8	4.6	4.5	4.3	5.6	4.7	4.5	4.3
Employment-to-Population Ratio[2]	59.3	59.4	59.7	60.1	60.6	61.0	57.4	59.7	60.6	61.0
Employment-to-Population Trend[2]	60.3	60.2	60.2	60.2	60.2	60.3	58.6	59.8	59.9	59.9
Output gap[3]	-1.0	-.5	-.3	.6	1.3	1.5	-.6	.6	2.1	2.6
Previous Tealbook[3]	-1.0	-.5	-.3	.6	1.3	1.5	-.9	.0	1.7	2.4
Industrial production	3.4	-3.4	-.3	3.6	4.0	-.7	-5.3	5.2	2.5	.7
Previous Tealbook	3.4	-3.4	-.3	3.6	4.0	-.7	-5.7	4.4	2.9	1.3
Manufacturing industr. prod.	1.4	-1.7	.3	2.5	2.2	-1.2	-4.0	5.9	2.7	.7
Previous Tealbook	1.4	-1.7	.3	2.5	2.2	-1.2	-4.4	5.1	3.2	1.4
Capacity utilization rate - mfg.[2]	75.8	74.9	74.2	75.8	77.0	75.0	72.2	76.6	78.6	78.8
Previous Tealbook[2]	75.8	74.9	74.2	75.8	77.0	75.0	71.8	75.9	78.4	79.2
Housing starts[4]	1.0	1.1	1.2	1.2	1.2	1.3	1.4	1.7	1.9	1.7
Light motor vehicle sales[4]	16.5	17.4	17.5	17.1	17.2	17.0	14.3	17.0	16.9	16.8
Income and saving										
Nominal GDP	4.5	3.0	3.6	4.8	4.9	4.0	-1.1	6.3	5.4	4.3
Real disposable pers. income	5.3	3.1	1.8	3.4	3.7	1.6	3.7	-1.7	2.6	2.1
Previous Tealbook	5.3	3.1	1.8	3.4	3.7	1.6	2.1	-1.0	2.9	2.4
Personal saving rate[2]	7.5	7.4	6.6	7.0	8.1	7.3	13.2	8.6	7.7	6.9
Previous Tealbook[2]	7.5	7.4	6.6	7.0	8.1	7.3	12.2	8.8	7.6	7.0
Corporate profits[5]	6.7	-10.9	5.4	5.1	5.9	1.3	-4.7	10.3	5.7	2.7
Profit share of GNP[2]	12.1	10.5	10.6	10.6	10.8	10.5	10.1	10.5	10.5	10.4
Gross national saving rate[2]	20.3	19.4	18.4	18.8	18.7	18.4	17.3	19.0	19.1	18.9
Net national saving rate[2]	5.4	4.4	3.2	3.8	3.6	3.1	1.2	3.4	3.7	3.4

1. Average monthly change, thousands.
2. Percent; values are for the fourth quarter of the year indicated.
3. Percent difference between actual and potential output; a negative number indicates that the economy is operating below potential. Values are for the fourth quarter of the year indicated.
4. Level, millions; values are annual averages.
5. Percent change, with inventory valuation and capital consumption adjustments.

Staff Projections of Government-Sector Accounts and Related Items

Item	2018	2019	2020	2021	2022	2023	2020 Q3	2020 Q4	2021 Q1	2021 Q2
Unified federal budget[1]					Nominal dollars, billions					
Receipts	3,330	3,462	3,420	3,556	3,761	3,893	1,160	798	780	1,099
Outlays	4,109	4,447	6,552	5,023	4,900	5,041	1,548	1,404	1,253	1,215
Surplus/deficit	-779	-984	-3,132	-1,467	-1,140	-1,149	-388	-606	-472	-116
					Percent of GDP					
Surplus/deficit	-3.8	-4.6	-14.9	-6.7	-4.9	-4.7	-7.4	-11.6	-9.0	-2.2
Previous Tealbook	-3.8	-4.6	-14.9	-7.1	-5.3	-5.0	-7.4	-11.9	-9.7	-2.4
Primary surplus/deficit	-2.2	-2.9	-13.3	-5.4	-3.7	-3.6	-6.1	-9.9	-7.6	-.5
Net interest	1.6	1.8	1.6	1.3	1.2	1.1	1.2	1.7	1.4	1.7
Cyclically adjusted surplus/deficit	-4.2	-5.3	-14.0	-6.0	-5.3	-5.8	-5.5	-11.4	-8.1	-.9
Federal debt held by public	77.3	79.2	100.1	98.9	97.0	97.5	100.1	99.9	101.6	99.1
Government in the NIPA[2]					Real percent change, annual rate					
Purchases	1.5	3.0	-.9	1.2	.9	1.0	-4.9	-2.3	.1	1.5
Consumption	1.5	2.1	-1.7	1.2	.8	.7	-5.9	-4.1	-.6	1.6
Investment	1.6	6.8	2.6	1.4	1.2	2.2	-.1	5.0	2.9	1.0
State and local construction	-3.0	7.5	3.0	-1.0	-1.6	-.2	-12.7	9.2	2.0	-2.0
Real disposable personal income	3.7	1.6	3.5	-1.5	2.7	2.2	-15.9	-10.5	-5.2	-2.7
Contribution from transfers[3]	.4	.7	3.8	-2.0	.4	.5	-29.3	-12.7	-3.2	-3.5
Contribution from taxes[3]	.3	-.8	.1	-.2	-1.1	-.7	-2.6	-.6	.7	-.1
Government employment					Average net change in monthly payrolls, thousands					
Federal	1	3	5	1	1	1	82	-76	1	1
State and local	8	12	-106	51	38	36	79	-38	25	53
Fiscal indicators[2]					Percentage point contribution to change in real GDP, annual rate					
Fiscal effect (FE)[4]	.4	.9	4.9	-3.2	.0	.2	2.6	-1.3	-4.9	-5.9
Discretionary policy actions (FI)	.6	.8	3.5	-2.8	.0	.2	.2	.0	-4.5	-5.6
Previous Tealbook	.6	.8	3.8	-2.7	-.2	.0	*1.2*	-.1	-4.1	-5.1
Federal purchases	.2	.3	.2	.0	.0	.0	-.2	.0	.0	.1
State and local purchases	.1	.2	-.3	.2	.1	.1	-.1	-.4	.1	.2
Taxes and transfers	.3	.3	3.7	-3.0	-.2	.0	1.2	.4	-4.4	-5.8
Cyclical	-.1	-.1	1.0	-.5	-.4	-.2	1.4	-.7	-1.3	-.1
Other	-.1	.2	.4	.2	.4	.2	.9	-.6	.9	-.2

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

Greensheets

Greensheets

Foreign Real GDP and Consumer Prices: Selected Countries
(Quarterly percent changes at an annual rate)

Measure and country	2020				2021 (Projected)				2022 (Projected)			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Real GDP[1]												
Total foreign	-10.6	-34.2	40.4	1.7	2.9	8.3	6.3	4.7	3.3	2.9	2.8	2.7
Previous Tealbook	*-10.9*	*-34.4*	*36.5*	*6.5*	*4.7*	*4.4*	*4.6*	*4.1*	*3.2*	*2.9*	*2.8*	*2.8*
Advanced foreign economies	-9.0	-39.0	45.9	-4.0	.7	11.3	8.1	5.7	3.4	2.5	2.3	2.3
Canada	-7.3	-38.1	40.5	-.5	-1.0	10.0	8.0	6.0	3.7	2.6	2.5	2.5
Japan	-2.3	-28.8	21.4	4.3	3.3	2.3	4.8	3.0	1.6	1.2	1.1	1.1
United Kingdom	-9.7	-58.7	78.0	-10.2	1.7	19.8	17.2	8.1	5.7	3.0	2.0	1.8
Euro area	-14.1	-39.5	60.5	-10.2	1.2	15.3	7.8	5.9	3.0	2.5	2.3	2.3
Germany	-7.4	-33.8	38.5	-4.7	1.8	9.9	6.5	5.3	2.8	2.4	2.3	2.3
Emerging market economies	-12.1	-29.1	35.0	7.7	5.1	5.3	4.5	3.8	3.2	3.2	3.3	3.2
Asia	-19.0	-2.3	21.3	8.4	7.3	6.3	5.5	5.0	4.5	4.3	4.2	4.2
Korea	-5.0	-12.0	8.8	5.5	6.5	5.5	4.5	3.0	2.3	2.3	2.3	2.3
China	-36.3	59.1	13.1	10.2	6.0	5.7	5.7	5.6	5.6	5.6	5.5	5.5
Latin America	-4.8	-50.3	53.4	7.9	2.6	4.2	3.6	2.6	1.7	2.1	2.3	2.2
Mexico	-4.9	-52.4	58.0	7.1	2.7	4.5	3.7	2.5	1.5	1.9	2.2	2.0
Brazil	-6.0	-33.2	34.6	5.0	-1.0	2.0	3.0	3.0	2.8	2.8	2.8	2.8
Addendum												
Emerging market economies ex. China	-6.1	-40.0	40.1	7.2	4.9	5.2	4.3	3.4	2.7	2.8	2.9	2.8
Consumer prices[2]												
Total foreign	2.3	-2.1	2.7	1.2	2.1	2.2	2.1	2.2	2.2	2.2	2.2	2.2
Previous Tealbook	*2.3*	*-2.2*	*2.7*	*1.8*	*2.0*	*2.2*	*2.1*	*2.2*	*2.2*	*2.2*	*2.2*	*2.2*
Advanced foreign economies	.6	-2.0	1.0	.8	1.0	1.2	1.0	1.2	1.2	1.2	1.3	1.3
Canada	.5	-3.3	3.0	2.3	1.2	1.5	1.6	1.8	1.8	1.9	1.9	1.9
Japan	.3	-1.0	.7	-2.1	.4	.3	.4	.5	.5	.6	.6	.7
United Kingdom	2.0	-1.5	1.5	1.3	1.8	3.7	1.5	1.4	1.7	1.8	1.8	1.8
Euro area	.7	-1.4	-.4	.8	1.1	1.0	.9	1.0	1.0	1.0	1.1	1.1
Germany	1.6	-1.0	-2.7	.9	1.0	1.3	1.3	1.5	1.5	1.5	1.5	1.5
Emerging market economies	3.5	-2.2	3.9	1.5	2.7	2.8	2.9	2.9	2.8	2.8	2.9	2.9
Asia	3.5	-3.9	2.8	.2	2.4	2.5	2.6	2.6	2.6	2.6	2.6	2.6
Korea	1.6	-3.2	2.5	.7	2.7	2.1	2.1	2.1	2.1	2.1	2.1	2.1
China	4.2	-4.3	2.3	-1.0	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Latin America	3.8	1.9	6.8	4.4	3.6	3.6	3.6	3.6	3.5	3.5	3.5	3.5
Mexico	3.3	2.0	7.1	3.8	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Brazil	4.9	-1.6	3.9	7.1	3.7	3.7	3.7	3.7	3.6	3.5	3.5	3.5
Addendum												
Emerging market economies ex. China	3.0	-.7	5.1	3.2	2.9	3.1	3.1	3.1	3.0	3.0	3.1	3.1

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

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

Measure and country	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
							----Projected----			
Real GDP[1]										
Total foreign	2.9	2.1	2.8	3.2	2.2	1.3	-4.3	5.5	2.9	2.7
Previous Tealbook	*2.9*	*2.1*	*2.9*	*3.2*	*2.1*	*1.3*	*-4.0*	*4.5*	*2.9*	*2.8*
Advanced foreign economies	2.0	.9	1.8	2.9	1.6	1.2	-6.1	6.4	2.6	2.2
Canada	2.8	-.4	1.7	3.1	2.3	1.7	-5.4	5.7	2.8	2.5
Japan	-.4	1.0	1.2	2.6	-.3	-.7	-3.1	3.3	1.3	1.1
United Kingdom	2.6	2.4	1.6	1.6	1.2	1.0	-12.1	11.4	3.1	1.5
Euro area	1.5	2.0	2.0	3.1	1.2	1.0	-7.0	7.4	2.5	2.2
Germany	2.3	1.1	1.9	3.6	.3	.4	-5.1	5.8	2.4	2.2
Emerging market economies	3.8	3.2	3.9	3.6	2.9	1.5	-2.4	4.7	3.2	3.3
Asia	5.2	4.7	5.3	5.4	4.4	3.1	1.0	6.0	4.3	4.1
Korea	2.6	3.5	2.6	2.9	3.2	2.4	-1.0	4.9	2.3	2.3
China	7.3	6.9	6.9	6.9	6.5	5.9	6.0	5.7	5.5	5.4
Latin America	2.7	1.8	2.4	2.0	1.2	-.3	-5.9	3.2	2.1	2.3
Mexico	3.4	2.7	3.1	1.8	1.3	-.7	-6.4	3.3	1.9	2.2
Brazil	-.2	-5.5	-1.9	2.5	1.1	1.5	-3.0	1.7	2.8	2.6
Addendum										
Emerging market economies ex. China	3.0	2.4	3.3	2.8	2.1	.6	-4.1	4.5	2.8	2.8
Consumer prices[2]										
Total foreign	2.0	1.4	1.9	2.5	2.4	2.4	1.0	2.1	2.2	2.3
Previous Tealbook	*2.0*	*1.4*	*1.9*	*2.5*	*2.4*	*2.4*	*1.2*	*2.1*	*2.2*	*2.3*
Advanced foreign economies	1.2	.5	.9	1.5	1.7	1.2	.1	1.1	1.2	1.4
Canada	2.0	1.3	1.4	1.8	2.1	2.1	.6	1.5	1.9	2.0
Japan	2.5	.1	.3	.6	.8	.5	-.6	.4	.6	.8
United Kingdom	.9	.1	1.2	3.0	2.3	1.4	.8	2.1	1.7	1.9
Euro area	.2	.3	.7	1.4	1.9	1.0	-.1	1.0	1.0	1.2
Germany	.4	.5	1.0	1.6	2.1	1.2	-.3	1.3	1.5	1.5
Emerging market economies	2.6	2.0	2.6	3.2	2.9	3.3	1.6	2.8	2.8	2.9
Asia	1.8	1.5	2.1	2.0	2.0	3.3	.6	2.5	2.6	2.7
Korea	1.0	.9	1.4	1.4	1.7	.3	.4	2.2	2.1	2.1
China	1.5	1.4	2.1	1.7	2.1	4.2	.3	2.5	2.5	2.5
Latin America	4.7	3.2	4.0	6.3	5.0	3.3	4.2	3.6	3.5	3.4
Mexico	4.2	2.3	3.2	6.6	4.8	2.9	4.0	3.2	3.2	3.2
Brazil	6.5	10.4	7.1	2.8	4.1	3.4	3.5	3.7	3.5	3.5
Addendum										
Emerging market economies ex. China	3.5	2.3	3.0	4.2	3.4	2.6	2.6	3.0	3.1	3.2

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

Greensheets

Greensheets

U.S. Current Account

Quarterly Data

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

| | 2020 | | | | 2021 | | | Projected----- | 2022 | | | |
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
U.S. current account balance	**-446.1**	**-657.3**	**-697.1**	**-720.6**	**-610.0**	**-570.3**	**-624.7**	**-679.3**	**-708.6**	**-699.4**	**-722.8**	**-744.4**
Previous Tealbook	*-446.1*	*-682.2*	*-818.9*	*-779.6*	*-748.2*	*-697.1*	*-730.5*	*-795.9*	*-843.5*	*-837.4*	*-852.5*	*-867.9*
Current account as percent of GDP	-2.1	-3.4	-3.3	-3.4	-2.8	-2.6	-2.8	-3.0	-3.1	-3.0	-3.0	-3.1
Previous Tealbook	*-2.1*	*-3.5*	*-3.9*	*-3.6*	*-3.5*	*-3.2*	*-3.3*	*-3.5*	*-3.7*	*-3.6*	*-3.6*	*-3.6*
Net goods & services	-505.9	-634.7	-753.6	-762.9	-754.2	-705.2	-727.4	-759.0	-784.3	-776.3	-794.2	-820.5
Investment income, net	220.0	125.4	193.3	177.4	281.4	265.2	235.9	214.8	212.9	207.2	204.7	211.2
Direct, net	306.1	268.3	307.5	283.9	380.1	356.4	325.6	304.7	302.9	298.6	298.6	309.2
Portfolio, net	-86.0	-142.9	-114.1	-106.5	-98.7	-91.2	-89.7	-89.9	-90.0	-91.4	-93.9	-98.0
Other income and transfers, net	-160.2	-148.0	-136.8	-135.1	-137.2	-130.4	-133.2	-135.1	-137.2	-130.4	-133.2	-135.1

Annual Data

Billions of dollars

| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | -------Projected------- | | |
								2021	2022	2023
U.S. current account balance	**-367.8**	**-407.4**	**-394.9**	**-365.3**	**-449.7**	**-480.2**	**-630.3**	**-621.1**	**-718.8**	**-725.0**
Previous Tealbook	*-367.8*	*-407.4*	*-394.9*	*-365.3*	*-449.7*	*-480.2*	*-681.7*	*-742.9*	*-850.3*	*-860.5*
Current account as percent of GDP	-2.1	-2.2	-2.1	-1.9	-2.2	-2.2	-3.0	-2.8	-3.0	-2.9
Previous Tealbook	*-2.1*	*-2.2*	*-2.1*	*-1.9*	*-2.2*	*-2.2*	*-3.3*	*-3.4*	*-3.6*	*-3.5*
Net goods & services	-484.1	-491.3	-481.2	-513.8	-579.9	-576.9	-664.3	-736.4	-793.8	-826.7
Investment income, net	209.7	195.5	208.0	268.3	261.6	248.4	179.0	249.3	209.0	235.6
Direct, net	284.2	277.3	289.7	350.3	342.5	329.3	291.4	341.7	302.3	344.0
Portfolio, net	-74.5	-81.8	-81.7	-82.0	-80.8	-80.9	-112.4	-92.4	-93.3	-108.4
Other income and transfers, net	-93.4	-111.6	-121.7	-119.8	-131.4	-151.8	-145.0	-134.0	-134.0	-134.0

Abbreviations

ABS	asset-backed securities
ADAIT	asymmetric discounted average inflation targeting
AFE	advanced foreign economy
AUM	assets under management
BLS	Bureau of Labor Statistics
BOC	Bank of Canada
BOE	Bank of England
BOJ	Bank of Japan
CARES Act	Coronavirus Aid, Relief, and Economic Security Act
CDC	Centers for Disease Control and Prevention
CDS	credit default swap
C&I	commercial and industrial
CLO	collateralized loan obligation
CMBS	commercial mortgage-backed securities
COVID-19	coronavirus disease 2019
CP	commercial paper
CRE	commercial real estate
DAI	discounted average inflation
EB	extended benefit
ECB	European Central Bank
ECI	employment cost index
E&I	equipment and intellectual property products
ELB	effective lower bound
EME	emerging market economy
EPOP	employment-to-population ratio

EU	European Union
EUA	Emergency Use Authorization
FDA	Food and Drug Administration
FIMA	Federal Insurance and Mitigation Administration
FOMC	Federal Open Market Committee; also, the Committee
FPUC	Federal Pandemic Unemployment Compensation
FRB/US	A large-scale macroeconometric model of the U.S. economy
FX	foreign exchange
GDP	gross domestic product
G-SIB	global systemically important bank
IMF	International Monetary Fund
IPO	initial public offering
LBO	leveraged buyout
LFPR	labor force participation rate
M&A	merger and acquisition
MBS	mortgage-backed securities
MLF	Municipal Liquidity Facility
MMF	money market fund
MS	Markov-switching
NCD	negotiable certificate of deposit
NK/SIR model	A Board staff model that couples a small-scale new Keynesian model with a model that incorporates factors related to the COVID-19 pandemic
OIS	overnight index swap
PCE	personal consumption expenditures
PPP	Paycheck Protection Program
QE	quantitative easing
QR	quantile regressions

RBA	Reserve Bank of Australia
SEP	Summary of Economic Projections
SIGMA	A calibrated multicountry DSGE model
SLOOS	Senior Loan Officer Opinion Survey on Bank Lending Practices
SOFR	Secured Overnight Financing Rate
SOMA	System Open Market Account
S&P	Standard & Poor's
TALF	Term Asset-Backed Securities Loan Facility
TIPS	Treasury Inflation-Protected Securities
TLTRO III	targeted longer-term refinancing operations III
UI	unemployment insurance
VAR	vector autoregression
VIX	one-month-ahead option-implied volatility on the S&P 500 index