Prefatory Note

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

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

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Report to the FOMC on Economic Conditions and Monetary Policy

Book A

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

March 6, 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

The COVID-19 outbreak and related financial market reactions have led us to downgrade our near-term forecast markedly. Our baseline forecast assumes that localized coronavirus flare-ups in the United States and abroad will continue over the next couple of quarters. We project that the macroeconomic effects of these outbreaks will subtract roughly 1 percentage point from U.S. GDP growth in the first half of this year. (See the box "Effects of COVID-19 on Economic Activity" for more details.) As a result, we currently expect GDP to advance at a 1.4 percent pace in the first half of this year, a notable slowdown from its 2.3 percent pace last year. In the second half of the year, GDP growth steps up to 2.9 percent, as the negative effects of the coronavirus outbreak wane and economic activity normalizes.

Our confidence that we have correctly assessed the severity of the situation is limited, and we currently view the uncertainty around our projection as greater than usual. It is quite possible that the outbreak will be more severe than we assume, leading to considerable suffering, widespread disruptions to production, and sharp reductions in consumer confidence and spending. To address these possible outcomes, the Risks and Uncertainty (R&U) section discusses estimates of contagion, mortality, and the costs of prevention and presents alternative scenarios that contain larger negative effects than assumed in the baseline.

The continued unwinding of the negative macroeconomic effects of the coronavirus boosts GDP growth next year. Meanwhile, we have made two other adjustments that increase our projection so that, on net, the level of GDP is a little higher at the end of 2022 relative to our previous forecast. First, the path of interest rates is more supportive of economic activity due to both the intermeeting cut in the federal funds rate target and a small change to the policy rule that we use in the baseline projection. Second, our estimate of potential output is now slightly higher, and our estimate of the natural rate of unemployment slightly lower, than in the January Tealbook, reflecting a reassessment of factors affecting trend labor force participation. All told, GDP growth is 2.1 percent this year, picks up to 2.3 percent in 2021—because of the post-coronavirus bounceback in activity—and then slows to 1.7 percent in 2022, as the bounceback fades and as interest rates move higher. Because GDP is forecast to grow slightly faster than

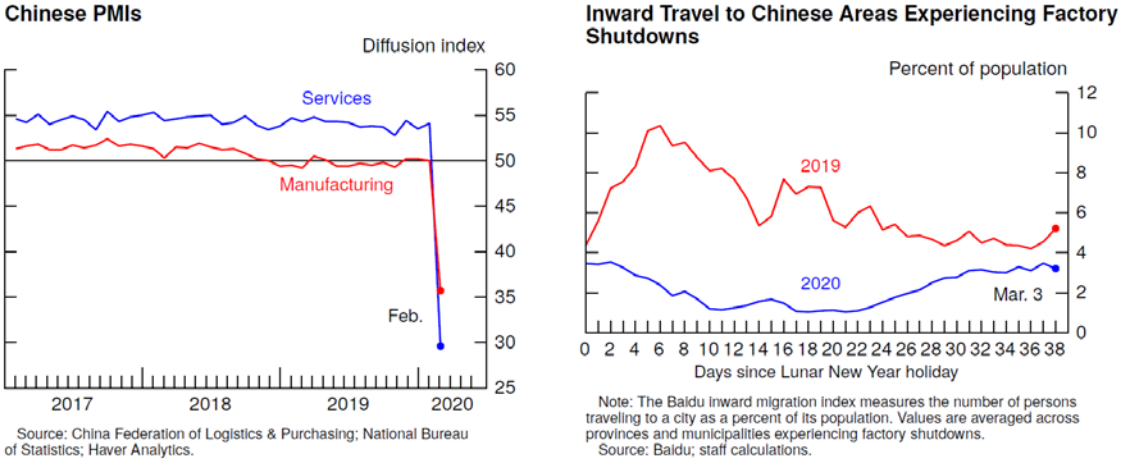
Effects of COVID-19 on Economic Activity

The emergence of COVID-19 in the Chinese province of Hubei in early January has quickly grown into a global public health crisis. Although the vast majority of COVID-19 cases have been reported in China, infections have now been confirmed in over 75 countries, and case counts are increasing in the United States. While the magnitude and duration of the shocks to global and domestic economic activity resulting from COVID-19 are highly uncertain, this discussion describes the channels through which the virus is assumed to affect economic activity in the baseline and provides estimates of the effect on foreign and domestic growth.[1]

Our baseline forecast assumes that outbreaks in the world's major economies will not be as severe as those in China. Outside of China, we expect the virus to affect economic activity through decreased consumer and business confidence, trade and supply chain disruptions, and markedly reduced spending on travel. In our baseline projection, there will be localized COVID-19 flare-ups in the United States and abroad that lead to the sporadic shutdown of public events and schools and spur governments to implement temporary prevention measures. While we anticipate that only a small proportion of the global population becomes infected, even contained flare-ups will hold down GDP growth. Moreover, risks to this baseline projection are likely tilted toward the downside, and the implications of a wider spread of the virus are discussed in the Risks and Uncertainty section.

The economic effects of the virus are already apparent in China, where authorities imposed quarantines on Wuhan and 15 other cities in the major manufacturing hub of Hubei province and temporarily shut factories across the country. These measures have had a severe effect on economic activity, as evidenced by a plunge in all components of China's official purchasing managers index (PMI) in February (figure 1, left panel).[2] Moreover, unofficial indicators suggest that, even as factories

Figure 1: China Indicators



[1] While escalating concerns over the COVID-19 outbreak have led to sizable effects in global financial markets, this discussion primarily focuses on the nonfinancial developments related to COVID-19, and the estimated U.S. effects shown in the table do not include effects working though financial market conditions. See "Key Background Factors" in this section for further discussion.

[2] There were comparable falls in the private Caixin PMIs in February.

have reopened, they are still operating well below capacity. Indeed, travel data (figure 1, right panel) suggest that many workers have yet to return to their employers after the Lunar New Year holiday, and indicators such as coal consumption are sharply below levels typically seen following the holiday.[3]

As shown in the first row of the table, our baseline projection assumes that COVID-19 will lower first-quarter GDP growth in China by some 14 percentage points to negative 8 percent. But with the official Chinese case count appearing to stabilize, our baseline scenario projects that quarantines in China will be lifted by the end of March. We therefore project a bounceback in Chinese growth in the second quarter, as factories ramp up production and retail sales partially retrace lost ground.

The disruption in Chinese activity will be felt throughout the global economy, with emerging Asia most exposed because of highly integrated regional supply chains as well as its dependence on Chinese demand and tourism. Moreover, as the virus spreads to other countries, it will increasingly exert an effect on activity that is independent of the effect from trade ties with China. The current outbreaks in Japan, Korea, Iran, and Italy will likely suppress domestic demand in these countries for several months, and similar—albeit weaker—effects will probably arise in many other countries. Overall, in our baseline projection, COVID-19 lowers foreign growth excluding China by 1.4 percentage points in the first quarter, with recovery starting in the third quarter of this year (line 2 of the table).

The decline and subsequent bounceback in foreign growth pass through to U.S. exports of goods and services and, in turn, to production. Indeed, U.S. exports to China alone in 2019 represented about 1 percent of U.S. GDP. The effects of lower foreign growth on U.S. exports of goods and nontravel services, shown in line 3a of the table, subtract 0.5 percentage point from U.S. GDP growth in the first quarter, followed by positive contributions in the second half of 2020.[4] An additional effect on U.S. net exports results from disruption to international travel, shown in line 3b, which lowers U.S. GDP growth in the first quarter by a further 0.2 percentage point.

COVID-19 Effects on GDP Growth
(percentage points, annual rate)

	2020				2020	2021
	Q1	Q2	Q3	Q4	Q4/Q4	Q4/Q4
1 China	**-14.3**	**8.9**	**4.6**	**1.6**	**-.2**	**.0**
2 Foreign ex. China	**-1.4**	**-.7**	**.2**	**.5**	**-.4**	**.3**
3 U.S. GDP	**-.8**	**-1.3**	**.3**	**.4**	**-.3**	**.3**
Due to:						
3a. Goods and other services exports	-.5	-.1	.2	.2	-.1	.1
3b. Net exports of travel	-.2	-.1	.1	.1	.0	.0
3c. Supply chain effects	.0	-.2	.0	.1	.0	.0
3d. Sentiment/uncertainty/prevention	-.1	-1.1	-.1	.0	-.3	.3
3e. Government purchases	.0	.1	.1	.0	.0	.0

Source: Staff calculations.

[3] Factories in China's industrial centers are heavily dependent on migrant laborers who typically travel home during the Lunar New Year holiday.

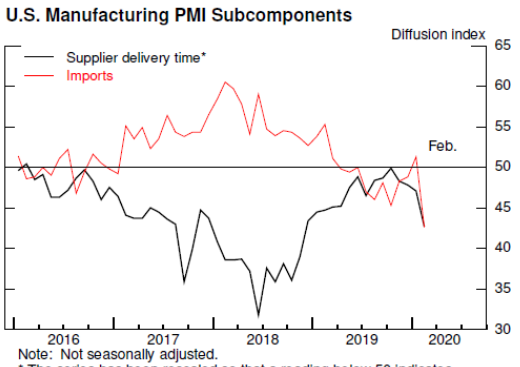
[4] Part of the line 3a export effects reflect a new expected timing of purchases from China specified by the phase-one trade agreement. Because of the effects of the virus in China, we now expect nearly all phase-one purchases to occur in the second half of 2020, in contrast to our January Tealbook assumption that they would be spread evenly throughout the year.

Interrupted manufacturing activity in Asia will also lower U.S. imports of goods in the first half of this year, which we expect to restrain U.S. production via supply chain disruptions.[5] Company anecdotes and industry reports have indicated that disruptions to intermediate inputs beyond the end of February would likely suppress domestic production. Consistent with these warnings, reports of supply chain disruptions have begun to surface in the Beige Book and in the regional manufacturing surveys. Moreover, as shown in figure 2, the February ISM manufacturing survey indicates declining imports and slowing supplier deliveries (left panel), a pattern that is also apparent for Asian manufacturers (right panel). All told, we expect supply chain difficulties to damp U.S. GDP growth by 0.2 percentage point in the second quarter (line 3c of the table). As U.S. imports recover and the longer-lived supply chain effects unwind, activity is expected to return to normal in the second half of 2020.[6]

Importantly, our baseline projection also assumes that concern about the virus leads U.S. consumers and businesses to curtail domestic travel plans and to avoid public places and large-scale events. In addition, we expect that businesses, facing heightened uncertainty, will tamp down their investment plans. Altogether, the resulting restraint on consumer spending and business investment will hold back U.S. GDP through much of 2020, with drags of 1.1 percentage points in the second quarter and 0.1 percentage point in the third quarter (line 3d of the table). By contrast, we expect that government spending to combat the virus will provide a small direct boost to GDP growth in the second and third quarters; see line 3e of the table.

Putting the pieces together for domestic activity, and excluding the effects of recent financial developments, we project that the effects of COVID-19 will subtract 0.8 percentage point from U.S. GDP growth in the first quarter and 1.3 percentage points in the second quarter of 2020 (line 3 of the table). As a result, private employment gains will be held down by about 20,000 in March and by about 50,000 per month from April through June, with these effects unwinding thereafter. Turning to prices, even with some upward pressure on goods prices from supply chain disruptions and stockouts, we expect the virus-induced drop in commodity prices, downward pressure on services prices, and the boost to the dollar to contribute to softer PCE inflation this year.

Figure 2: U.S. and Asian Purchasing Managers Indexes



Note: Not seasonally adjusted.
* The series has been rescaled so that a reading below 50 indicates slowing deliveries.
Source: Institute for Supply Management.

Note: Series is a trade-weighted average of the supplier delivery time component of manufacturing PMIs for Korea, Japan, Indonesia, Malaysia, Philippines, Taiwan, Thailand, and Vietnam.
Source: IHS Markit/Haver Analytics.

[5] Based on daily Automatic Identification System data for individual cargo vessels, we estimate that outbound traffic from Chinese ports is still far below normal levels.

[6] In comparison with the supply chain disruptions associated with the 2011 Tohoku earthquake and tsunami in Japan, the disruptions for U.S. manufacturers that we currently anticipate due to COVID-19 occur more gradually and are somewhat less than half the size.

Revisions to the Staff Projection since the Previous SEP

The FOMC most recently published its Summary of Economic Projections, or SEP, following the December FOMC meeting. The following table compares the staff's current economic projection with the one we presented in the Tealbook from late November, before the December meeting.

In the near term, the current projection is weaker than in the November Tealbook, largely reflecting the anticipated effects of the coronavirus. But those effects are assumed to be fully reversed by next year, and, on net, the GDP projection is somewhat stronger than in November. That upward revision is largely the result of more-supportive financial conditions, in part associated with a lower assumed path for the federal funds rate. In addition, the projection now includes a stronger outlook for labor force participation and potential output and a slightly lower natural rate of unemployment. With those changes, we now project the unemployment rate to edge down to 3.2 percent by next year. Core PCE inflation is a bit lower this year than in the November Tealbook, and headline inflation is more noticeably lower, given the oil price reductions associated with the coronavirus's effects on global demand. After this year, our inflation projection is unrevised.

As noted, the federal funds rate assumed in our projection is revised lower, reflecting the revised policy rule that we implemented in this Tealbook along with the recent intermeeting rate cut.

Staff Economic Projections Compared with the November Tealbook

Variable	2019	2020		2020	2021	2022	Longer run
		H1	H2				
Real GDP[1]	2.3	1.4	2.9	2.1	2.3	1.7	1.7
November Tealbook	*2.1*	*2.2*	*2.0*	*2.1*	*1.9*	*1.7*	*1.7*
Unemployment rate[2]	3.5	3.6	3.5	3.5	3.2	3.2	4.3
November Tealbook	*3.6*	*3.5*	*3.5*	*3.5*	*3.5*	*3.5*	*4.4*
PCE inflation[1]	1.4	.9	1.8	1.3	2.0	1.9	2.0
November Tealbook	*1.5*	*1.7*	*1.8*	*1.7*	*1.9*	*1.9*	*2.0*
Core PCE inflation[1]	1.6	1.6	1.9	1.8	1.9	1.9	n.a.
November Tealbook	*1.6*	*1.9*	*1.8*	*1.9*	*1.9*	*1.9*	*n.a.*
Federal funds rate[2]	1.65	1.21	1.38	1.38	1.81	2.04	2.50
November Tealbook	*1.65*	*1.88*	*2.05*	*2.05*	*2.34*	*2.49*	*2.50*
Memo: Federal funds rate, end of period	1.63	1.23	1.42	1.42	1.84	2.05	2.50
November Tealbook	*1.64*	*1.89*	*2.06*	*2.06*	*2.37*	*2.53*	*2.50*
Output gap[2,3]	1.5	1.2	1.7	1.7	2.2	2.1	n.a.
November Tealbook	*1.5*	*1.7*	*1.8*	*1.8*	*1.8*	*1.7*	*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.

Comparing the Staff Projection with Other Forecasts

The staff's projection for GDP growth in 2020 is a touch above the projections from both the Survey of Professional Forecasters (SPF) and the Blue Chip consensus, although both forecasts are relatively stale given the timing of the coronavirus outbreak and the recent financial market turmoil. The staff forecasts GDP growth that is 0.4 percentage point faster than the Blue Chip in 2021.

The staff's unemployment rate projection is 0.1 percentage point lower than the SPF and Blue Chip projections in 2020, and while the staff projects a further decline of 0.3 percentage point in the unemployment rate by the end of 2021, the Blue Chip consensus forecast ticks higher that year.

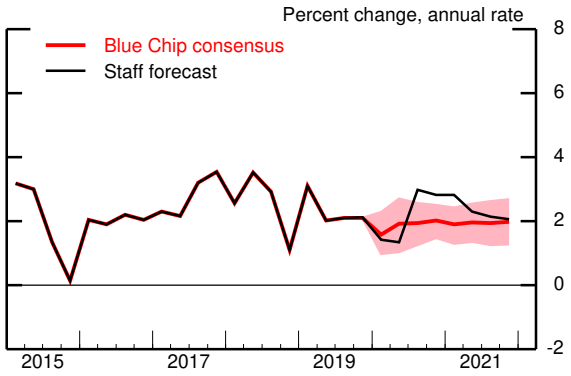
The staff's forecasts of total CPI and PCE inflation are weaker than the Blue Chip and SPF forecasts in 2020. In 2021, we project slightly higher CPI inflation than both outside forecasts. Our projection of total PCE price inflation is in line with the 2021 SPF consensus projection. The staff forecast of core PCE inflation is 0.1 percentage point below the SPF forecast in 2020 and the same in 2021.

	2019	2020	2021
GDP (Q4/Q4 percent change)			
March Tealbook	2.3	2.1	2.3
Blue Chip (2/10/20)	2.3	1.9	1.9
SPF median (2/14/20)	2.3	2.0	n.a.
Unemployment rate (Q4 level)			
March Tealbook	3.5	3.5	3.2
Blue Chip (2/10/20)	3.5	3.6	3.7
SPF median (2/14/20)	3.5	3.6	n.a.
CPI inflation (Q4/Q4 percent change)			
March Tealbook	2.0	1.5	2.3
Blue Chip (2/10/20)	2.0	2.0	2.1
SPF median (2/14/20)	2.0	2.1	2.2
PCE price inflation (Q4/Q4 percent change)			
March Tealbook	1.4	1.3	2.0
SPF median (2/14/20)	1.4	1.9	2.0
Core PCE price inflation (Q4/Q4 percent change)			
March Tealbook	1.6	1.8	1.9
SPF median (2/14/20)	1.6	1.9	1.9

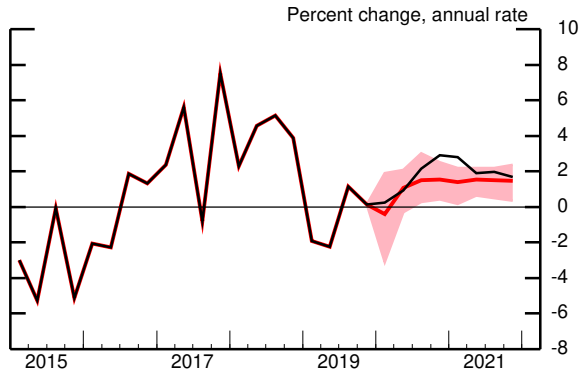
Note: SPF is the Survey of Professional Forecasters, CPI is the consumer price index, and PCE is personal consumption expenditures. Blue Chip does not provide results for overall and core PCE price inflation. The Blue Chip consensus forecast includes input from about 50 panelists, and the SPF about 40. Roughly 20 panelists contribute to both surveys.
n.a. Not available.
Source: Blue Chip Economic Indicators; Federal Reserve Bank of Philadelphia.

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

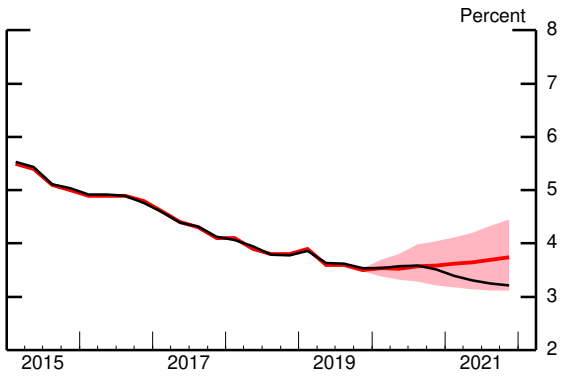
Real GDP



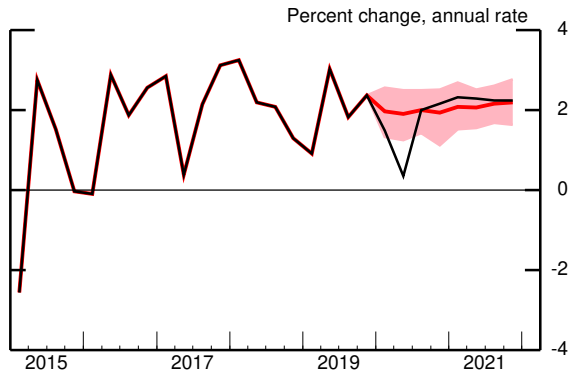
Industrial Production



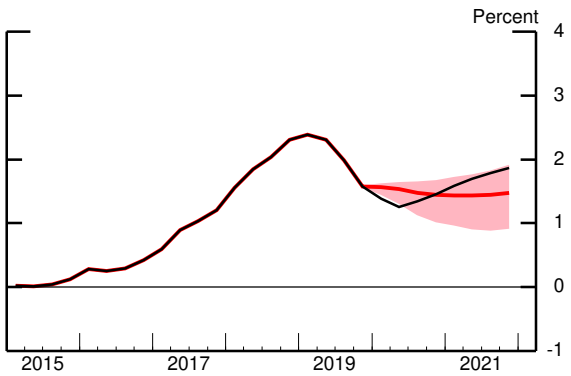
Unemployment Rate



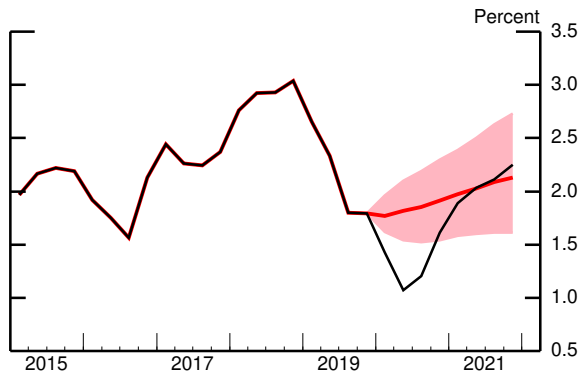
Consumer Price Index



Treasury Bill Rate



10-Year Treasury Yield



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

its potential rate, the unemployment rate moves lower and reaches 3.2 percent by the end of 2021.

Core PCE prices increased 1.6 percent over the 12 months ending in January. We now expect the 12-month change in core inflation to remain close to this level through the middle of the year before moving up to 1.8 percent by the end of the year. This projection is lower than in January, as the net economic effects of the coronavirus reduce inflation in 2020. We expect core PCE inflation of 1.9 percent in 2021 and 2022, the same as in the January Tealbook. Given the sharp declines in oil prices since the turn of the year, total PCE inflation runs below core inflation in 2020 but about in line with core thereafter.

KEY BACKGROUND FACTORS

Escalating concerns over the coronavirus outbreak have weighed heavily on investor sentiment, prompting a drop in equity prices and an increase in safe-haven demands that pushed down Treasury yields and bid up the exchange value of the dollar. The intermeeting cut in the target range for the federal funds rate and an expectation of additional cuts this year further pushed down Treasury yields. Some of the decrease in Treasury yields passed through to private interest rates, including investment-grade corporate bond yields and mortgage rates, which should cushion the anticipated blow to domestic demand from the coronavirus outbreak.

Monetary Policy

- The path for the federal funds rate has been marked down notably in this projection, reflecting both the intermeeting rate cut and a change to our assumed policy rule. The federal funds rate is now assumed to move up to 2 percent by the end of 2022, down from 2.6 percent in the January Tealbook.
    - In this forecast, we tweaked the policy rule that we use in the baseline projection to bring it into line with the risk-management considerations apparently present in recent SEPs. Specifically, we incorporated a temporary 50 basis point downward adjustment to the rule's intercept. By itself, this adjustment flattens the policy path and lowers the policy rate about 15 basis points at the end of this year and around 40 basis points at the end of 2022. Beyond

2022, the intercept rises to the assumed longer-run equilibrium level for the real federal funds rate of 0.5 percent.

- According to a staff term structure model that adjusts market quotes for term premiums, market participants currently appear to expect the federal funds rate to decline roughly 45 basis points by the June meeting and rise gradually over the forecast horizon. As discussed in the Financial Market Developments section of this Tealbook, there is substantial uncertainty about market expectations at present; for example, the staff's Macro-Finance model points to an even lower rate path, closer to the unadjusted forward rates.

Other Interest Rates

- The current 10-year yield is sharply lower than in our January forecast but is revised less in the medium term, as safe-haven demands are assumed to fade. We project that the 10-year Treasury yield will climb to 2.5 percent in 2022:Q4, as the term premium moves up to a more normal level.

- Investment-grade corporate bond yields and mortgage rates also declined sharply in recent weeks; nevertheless, their spreads relative to the 10-year Treasury yield are somewhat wider than at the time of the January Tealbook. We project these wider spreads will persist only for a couple of quarters, reflecting elevated risk premiums in the near term. In 2021 and 2022, these private rates increase in line with the 10-year Treasury yield.

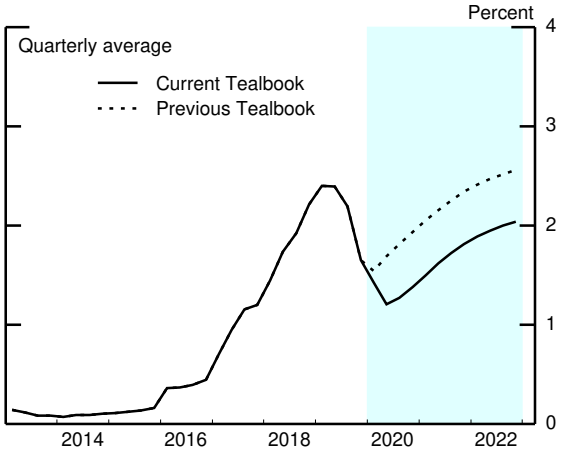
Equity Prices

- Stock price indexes have fallen 8 percent since the time of the January Tealbook. We expect equity prices to recover somewhat as coronavirus-related concerns fade later in the year. Thereafter, equity prices grow at an annual rate of 2.8 percent, as the equity premium returns to a level near its average in 2019, which was a bit below the median of its historical distribution.

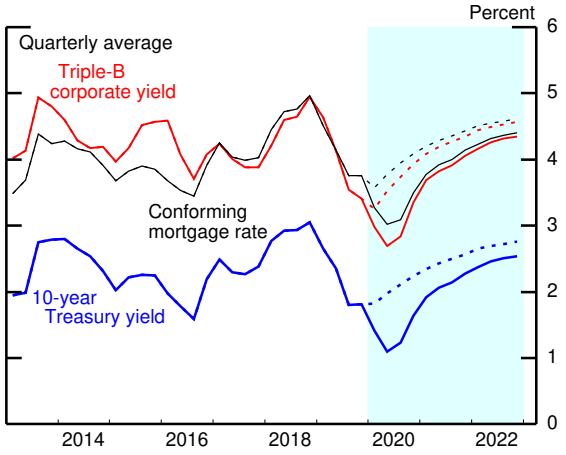
Domestic Econ Devel & Outlook

Key Background Factors underlying the Baseline Staff Projection

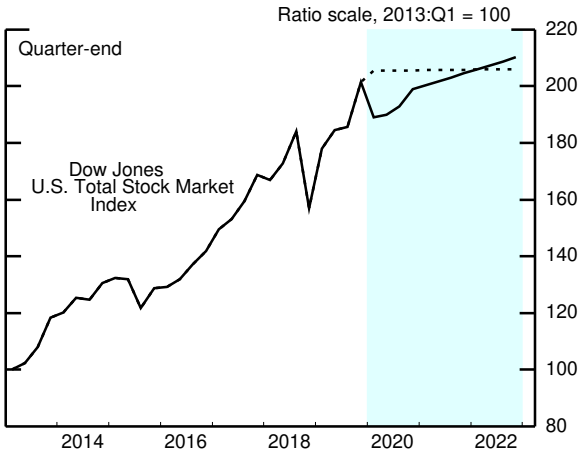
Federal Funds Rate



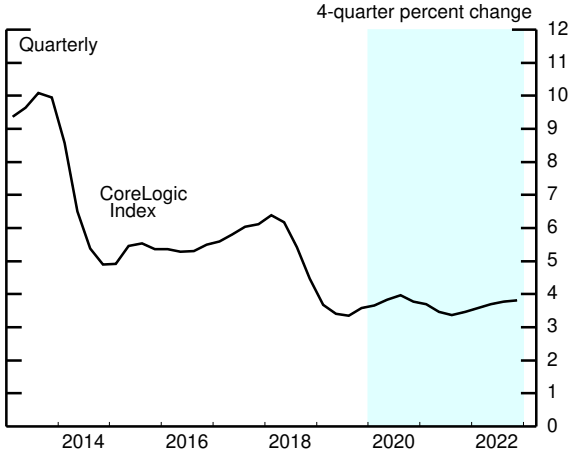
Long-Term Interest Rates



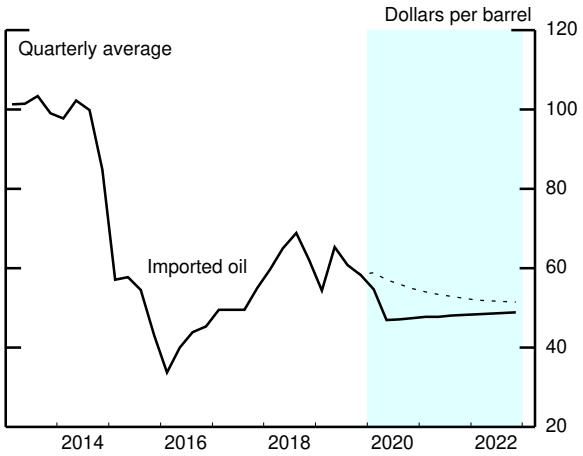
Equity Prices



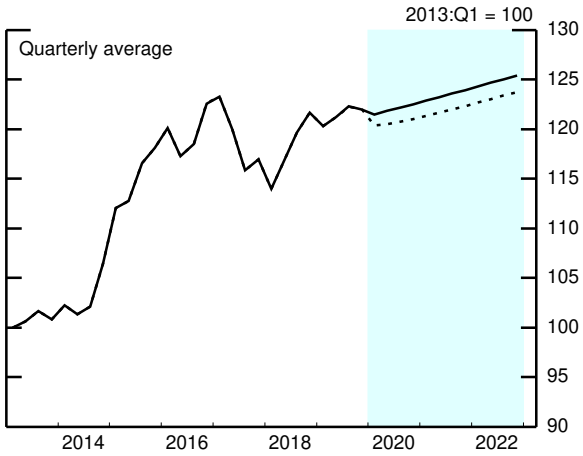
House Prices



Oil Prices



Broad Real Dollar



Foreign Economic Activity and the Dollar

- Foreign GDP is projected to decline 0.6 percent in the first quarter and then increase 2.3 percent in the second quarter. The sharp decline and rebound primarily reflect the assumed effects of the COVID-19 outbreak.

- This pattern is most notable in China, where we expect quarantines and closures to depress first-quarter GDP growth by 14 percentage points, implying a GDP growth rate of negative 8 percent. As workers return to their jobs, Chinese GDP growth bounces back to 15 percent in the second quarter, reversing some but not all of the first-quarter shortfall.

- We also expect COVID-19 to hurt first-quarter growth outside of China, both as disruptions in China spill over to the global economy through reduced Chinese demand and disrupted supply chains and as virus outbreaks elsewhere have negative effects on sentiment and consumption. For the first quarter, we expect the economies in the rest of emerging market Asia, Australia, the euro area, and Japan to contract and economic growth elsewhere to be well below trend. This weakness persists into the second quarter, with the euro area falling into recession with two consecutive quarters of negative GDP growth. We see the main adverse effects of the virus as having played out by the third quarter, after which foreign activity normalizes over the following few quarters. That said, foreign growth in 2020, on a four-quarter basis, is down 0.3 percentage point relative to our previous Tealbook forecast.

- The dollar appreciated 1.5 percent since the January Tealbook, as the boost from safe-haven flows outweighed the effects of lower U.S. interest rates. We expect that the broad real dollar will appreciate at an annual rate of 1.1 percent through the forecast horizon, as market expectations for the federal funds rate move up toward the staff forecast.

Fiscal Policy

- Our projection incorporates the emergency supplemental appropriations package for COVID-19, leading to roughly $8 billion more in government purchases spread throughout the next two years. This spending boosts GDP growth by 0.1 percentage point in the second and third quarters of this year and is a very small drag later in the projection as the spending winds down.

- We estimate that the direct fiscal impetus from fiscal policy at all levels of government contributed 0.8 percentage point to aggregate demand growth last year, as the 2017 tax cuts continued to provide impetus to private spending, past increases in budget appropriations boosted federal purchases, and state and local infrastructure investment surged. With the support to growth from these factors expected to wane over time, the impetus from fiscal policy steps down over the medium term from 0.5 percentage point this year to 0.1 percentage point in 2021 and 2022.

Oil and Other Commodity Prices

- The spot price of Brent crude oil, at $51 per barrel, is down $14 per barrel since the January Tealbook. Farther-dated futures prices are also down but by much less. Reduced demand from China, combined with concerns about the further spread of the coronavirus, has weighed on prices. The downward pressure from reduced demand has more than offset upward price pressure from oil production disruptions in Libya. OPEC's announcement of additional supply cuts provided little support to oil prices, as Russia, which had previously coordinated with OPEC, showed little willingness to participate in the most recent round of cuts.

- Demand shortfalls resulting from COVID-19 have also weighed on other commodities, with metals prices down 8.5 percent and agricultural commodity prices down 5.7 percent relative to the January Tealbook.

THE OUTLOOK FOR GDP

The incoming spending indicators suggest that aggregate demand has grown at a moderate pace in recent months. However, we have penciled in a slowdown in GDP growth in the first half of 2020, to a 1.4 percent pace, reflecting a sizable negative effect from the coronavirus on economic activity.

- The **coronavirus outbreak** holds down GDP growth this year through a combination of a reduction in consumer spending, U.S. goods and services

Special Factors Affecting the Near-Term GDP Forecast
(Percentage point contributions to annualized percent changes)

	2019			2020		2019		2020	
	Q2	Q3	Q4	Q1	Q2	H1	H2	H1	H2
All special factors	- .15	- .30	- .10	- .75	-1.35	- .10	- .20	-1.05	.45
January Tealbook	*- .15*	*- .30*	*- .10*	*.10*	*.35*	*- .10*	*- .20*	*.25*	- .05
Coronavirus	--	--	--	- .80	-1.30	--	--	-1.10	.40
Boeing 737 Max	- .15	- .05	--	- .45	- .05	- .10	--	- .25	.15
GM strike	--	- .25	- .10	.50	--	--	- .20	.25	- .05
GDP ex. special factors	2.2	2.4	2.2	2.2	2.7	2.7	2.3	2.4	2.5
January Tealbook	*2.2*	*2.4*	*2.1*	*1.9*	*2.3*	*2.7*	*2.3*	*2.1*	*2.3*

Note: Table excludes multiplier and effects that come through changes in financial market conditions. Explicit trade policy effects subtract 0.1 percentage point each from 2019 Q4/Q4 and 2020 Q4/Q4, but they are not parsed in particular quarters.

exports, manufacturing output, and capital spending. The table above parses the effects of several transitory special factors, including coronavirus, on our near-term projection. (Note that the table does *not* include the macroeconomic effects arising from changes in financial market conditions.) The direct effects of the coronavirus outbreak begin to unwind in the second half of the year, as bouncebacks in exports and production outweigh the drag on spending from lingering negative sentiment.

- **Consumer spending growth** slowed notably in the fourth quarter, to a 1.7 percent pace, and we have sharply marked down our projection for spending in the first half of the year to 1.6 percent.[1] While most of the revision to spending in the first quarter is in response to softer incoming retail spending data and a drop in energy consumption due to unseasonably warm weather, we also expect that increased uncertainty and preventive measures associated with localized COVID-19 flare-ups weigh heavily on spending in

[1] In the near term, the effects of the coronavirus may complicate the interpretation of data on consumer spending. For example, consumers' stockpiling of nondurable goods—such as canned goods and hand sanitizer—may temporarily mask a softening in the underlying pace of spending. However, the consumer staples most likely to be stockpiled represent a tiny fraction of overall consumer spending.

An example going in the other direction is that expenditures by foreign tourists in the United States are initially captured in the source data for consumer spending (retail sales and the Quarterly Services Survey), but for GDP, the BEA attempts to reclassify those tourist expenditures as services exports rather than consumption. Thus, to the extent that spending by foreign tourists is captured in the retail sales data, there is a risk that incoming data may initially signal larger declines in domestic consumption than will actually be reported in the NIPA.

Domestic Econ Devel & Outlook

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

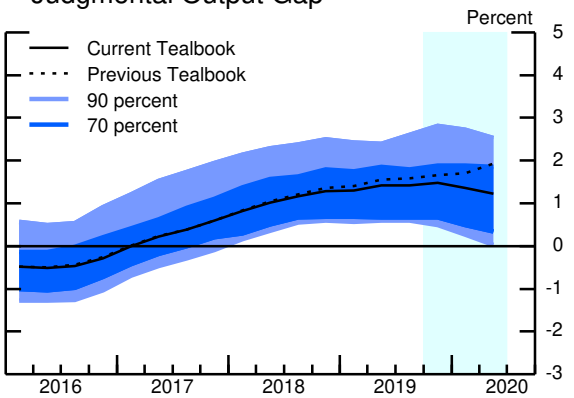
(Percent change at annual rate from final quarter of preceding period except as noted)

Measure	2017	2018	2019	2019 Q4	2020 Q1	2020 Q2
Output gap[1]	**.6**	**1.3**	**1.5**	**1.5**	**1.4**	**1.2**
Previous Tealbook	*.6*	*1.4*	*1.7*	*1.7*	*1.7*	*1.9*
Real GDP	2.8	2.5	2.3	2.1	1.4	1.3
Previous Tealbook	*2.8*	*2.5*	*2.3*	*2.0*	*2.0*	*2.6*
Measurement error in GDP	.1	-.1	.2	.0	.0	.0
Previous Tealbook	*.1*	*-.1*	*.2*	*.0*	*.0*	*.0*
Potential output	1.8	1.9	1.9	1.9	1.9	1.9
Previous Tealbook	*1.8*	*1.8*	*1.8*	*1.8*	*1.8*	*1.8*

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.

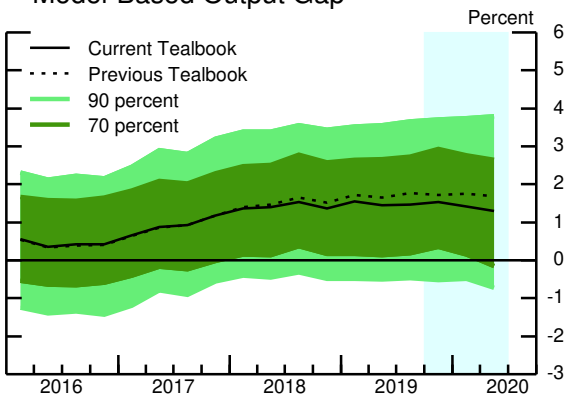
1. Percent, average for the final quarter in the period.

Judgmental Output Gap



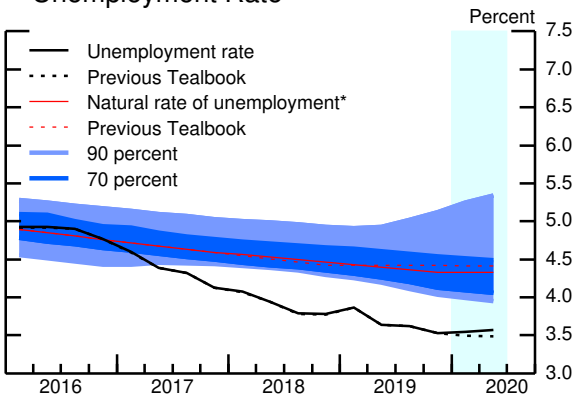
Note: Shaded regions show the distribution of historical revisions to the staff's estimates of the output gap.
Source: Various macroeconomic data; staff assumptions.

Model-Based Output Gap



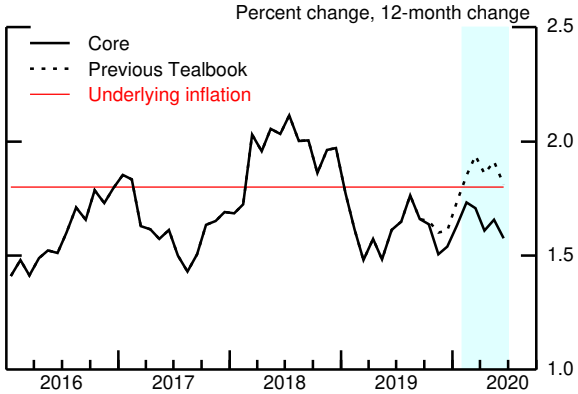
Note: Shaded regions denote model-computed uncertainty bands.
Source: Various macroeconomic data; staff assumptions.

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.

the coming months.[2] PCE returns to a 2.5 percent pace in the second half of the year as coronavirus concerns fade.

- We estimate that **BFI** declined at a 1¾ percent pace in the second half of 2019, and we think investment will strengthen only modestly in the first half of this year, rising at a 0.8 percent pace.

    - E&I spending growth is expected to average 2.2 percent in the first half of 2020, about 1 percentage point slower than in our January projection. We think that heightened business uncertainty associated with the coronavirus outbreak will weigh on E&I spending. In addition, we now assume deliveries of the Boeing 737 Max will resume in the third quarter of 2020, whereas in the January Tealbook, we assumed they would resume in the first.

    - Investment in nonresidential structures is projected to decline at a 4 percent pace over the first half of the year, a somewhat more modest decline than in the January Tealbook. While we have penciled in large decreases in drilling and mining sector investment, reflecting crude oil price declines, recent data showed strong structures investment in other sectors.

- **Housing market activity** continues to strengthen, and we expect residential investment to rise at an 8¾ percent pace in the first half of this year. We largely attribute the robust housing market to the sharp decline in mortgage rates since late 2018, but unseasonably warm weather in recent months has also helped boost activity.

- **Exports** of goods and services are expected to decline in the first half of 2020 after stagnating over the past two years. Weak foreign growth has weighed on exports for some time, and this drag will increase in the first half of 2020, as the effects of COVID-19 further depress foreign growth. Virus-related concerns and travel bans reduce travel by foreigners to the United States,

[2] Measures of consumer sentiment through February from both the Michigan survey and the Conference Board survey have not yet shown any decrease. The Bloomberg weekly Consumer Comfort Index and the Morning Consult daily indexes on consumer confidence have moved down some in February. The Rasmussen Consumer Index fell sharply at the end of February and has continued to drift down in the first week of March.

Summary of the Near-Term Outlook for GDP

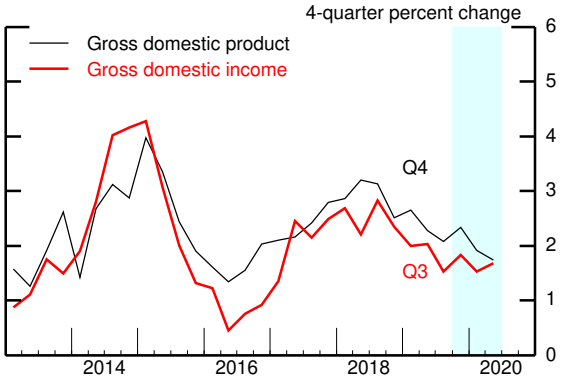
(Percent change at annual rate except as noted)

Measure	2019:Q4		2020:Q1		2020:Q2	
	Previous Tealbook	Current Tealbook	Previous Tealbook	Current Tealbook	Previous Tealbook	Current Tealbook
Real GDP	**2.0**	**2.1**	**2.0**	**1.4**	**2.6**	**1.3**
Private domestic final purchases	1.3	1.5	2.3	2.1	2.9	1.6
Personal consumption expenditures	1.5	1.7	2.4	1.9	2.6	1.4
Residential investment	4.3	6.1	7.0	10.3	7.6	7.2
Nonres. private fixed investment	-.8	-1.2	.5	.6	2.7	1.0
Government purchases	2.3	2.6	1.2	1.4	1.2	1.7
Contributions to change in real GDP						
Inventory investment[1]	-.5	-1.1	-.4	-.6	-.3	-.5
Net exports[1]	1.0	1.5	.2	.1	.4	.2

1. Percentage points.

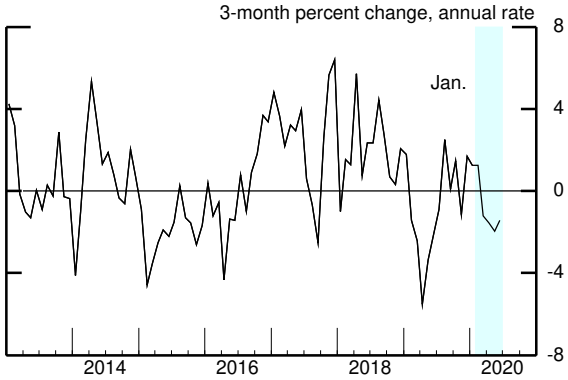
Recent Nonfinancial Developments (1)

Real GDP and GDI



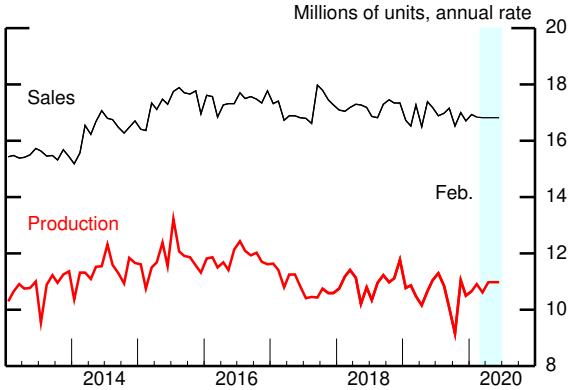
Source: U.S. Dept. of Commerce, Bureau of Economic Analysis.

Manufacturing IP ex. Motor Vehicles and Parts



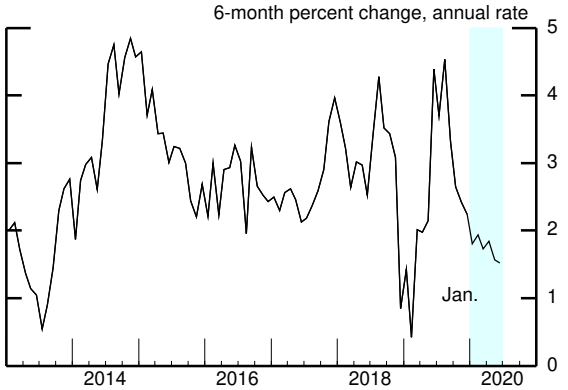
Source: Federal Reserve Board, G.17 Statistical Release, "Industrial Production and Capacity Utilization."

Sales and Production of Light Motor Vehicles



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

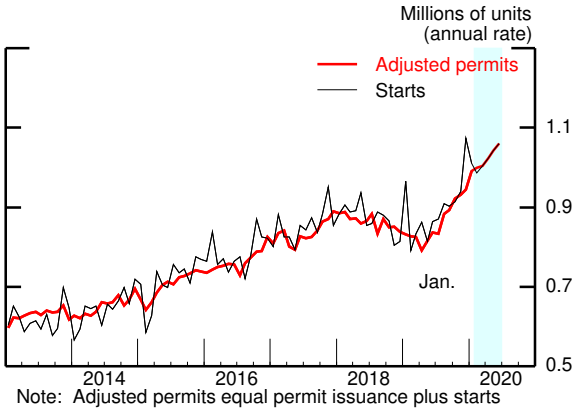
Real PCE Growth



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

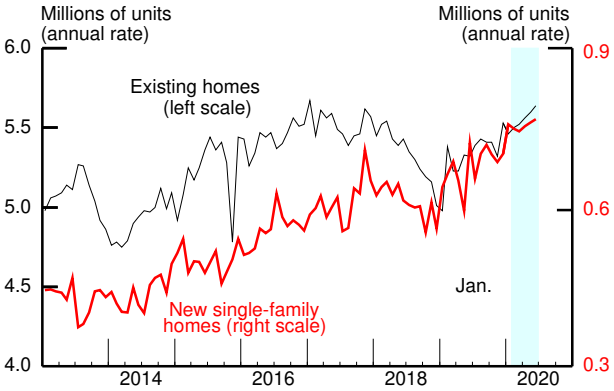
Recent Nonfinancial Developments (2)

Single-Family Housing Starts and Permits



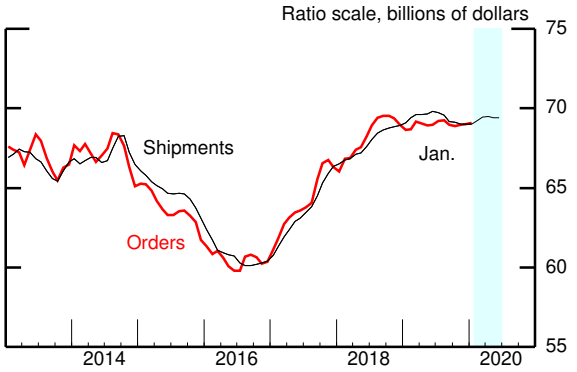
Note: Adjusted permits equal permit issuance plus starts outside of permit-issuing areas.
Source: U.S. Census Bureau.

Home Sales



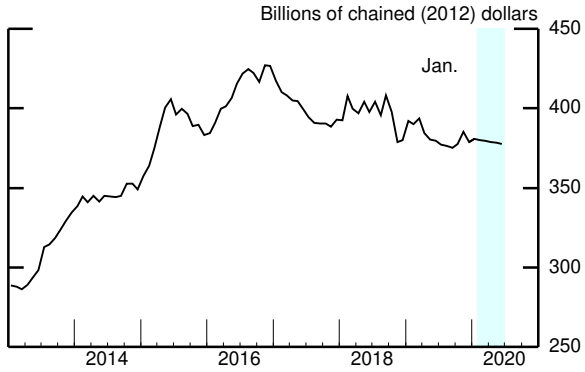
Source: For existing, National Association of Realtors; for new, U.S. Census Bureau.

Nondefense Capital Goods ex. Aircraft



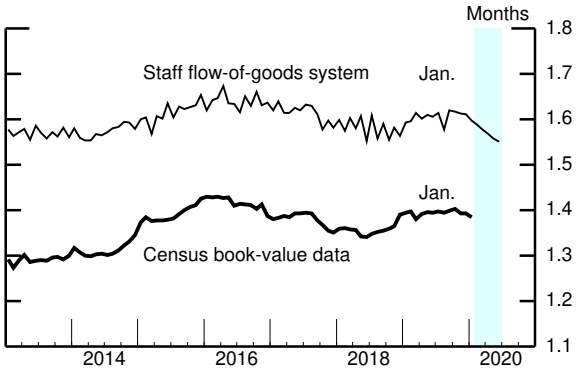
Note: Data are 3-month moving averages.
Source: U.S. Census Bureau.

Nonresidential Construction Put in Place



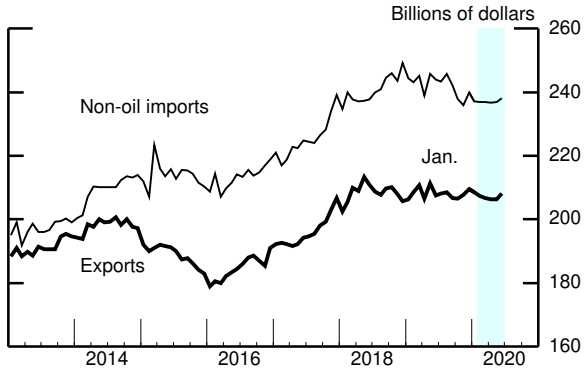
Note: Nominal CPIP deflated by BEA prices through 2019:Q3 and by the staff's estimated deflator thereafter.
Source: U.S. Census Bureau.

Inventory Ratios



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

Exports and Non-oil Imports



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

Federal Reserve System Nowcasts of 2020:Q1 Real GDP Growth
(Percent change at annual rate from previous quarter)

Federal Reserve entity	Type of model	Nowcast as of Mar. 5, 2020
Federal Reserve Bank		
Boston	• Mixed-frequency BVAR	2.2
New York	• Factor-augmented autoregressive model combination	1.8
	• Factor-augmented autoregressive model combination, financial factors only	2.3
	• Dynamic factor model	1.7
Cleveland	• Bayesian regressions with stochastic volatility	2.3
	• Tracking model	2.2
Atlanta	• Tracking model combined with Bayesian vector autoregressions (VARs), dynamic factor models, and factor-augmented autoregressions (known as GDPNow)	2.8
Chicago	• Dynamic factor model	2.8
	• Bayesian VARs	2.2
St. Louis	• Dynamic factor model	2.4
	• News index model	1.6
	• Let-the-data-decide regressions	2.7
Kansas City	• Accounting-based tracking estimate	3.3
Board of Governors	• Tealbook estimate (judgmental)	1.4
	• Mixed-frequency dynamic factor model (DFM-SM)	2.8
	• Mixed-frequency dynamic factor model (DFM-BM)	3.2
Memo: Median of Federal Reserve System nowcasts		2.3

lowering services exports. Exports are also held down, to a lesser extent, by the effects of a stronger dollar and tariffs. Our forecast has goods exports increasing briskly in the second half of 2020, as foreign activity begins to normalize, Chinese purchases are boosted because of the delayed implementation of provisions in the phase-one trade deal, and 737 Max aircraft exports resume. Relative to the previous Tealbook, export growth for 2020 as a whole is 0.6 percentage point lower.

- Goods **imports,** which fell last year, in part reflecting increased tariffs and the weakness in global manufacturing, are expected to decline further in the first half of 2020 given coronavirus-related production disruptions abroad. We assume that this drop in imports leads to a drawdown in inventories, leaving GDP little affected.

- The available data suggest that **manufacturing production** moved up in February after edging down in January, leaving the level of factory output little changed, on net, over the past year. We project that manufacturing output will generally move sideways in coming months, weighed down by the delay in restarting production of the 737 Max and the effects of COVID-19 on supply chains and the demand for U.S. manufactured goods. Output steps up in the second half of the year, as the effects of the virus outbreak fade and as production of the 737 Max resumes.

As noted earlier, we now expect GDP to advance 2.1 percent this year and 2.3 percent in 2021 before stepping down to an about-trend pace of 1.7 percent in 2022. The negative macroeconomic effects of the coronavirus outbreak reduce our forecast for GDP growth this year relative to the January Tealbook. However, our forecast for GDP growth in 2021 is now stronger than it had been, mostly reflecting a normalization in global economic activity and more accommodative financial conditions.

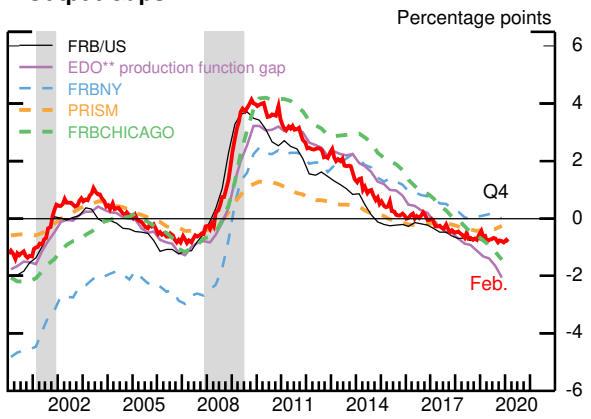
THE OUTLOOK FOR THE LABOR MARKET AND AGGREGATE SUPPLY

The labor market has remained strong so far this year. Payroll employment expanded robustly in both January and February, the unemployment rate remained low, and the labor force participation rate (LFPR) moved higher on balance. In this projection, we again raised our estimate of trend LFPR and lowered our estimate of the

Alternative Measures of Slack

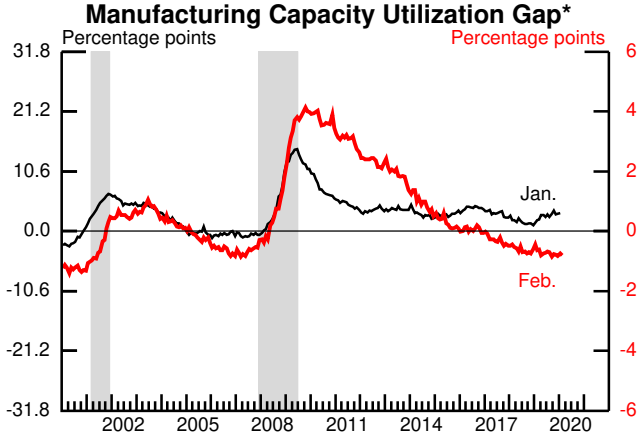
The red line in each panel is the staff's measure of the unemployment rate gap (right axis).

Output Gaps



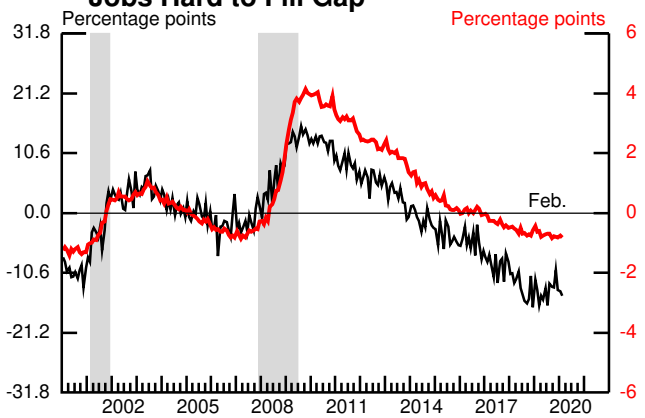
** EDO is Estimated, Dynamic, Optimization-based model.
Source: Federal Reserve Board; PRISM: Federal Reserve Bank of Chicago; Federal Reserve Bank of Philadelphia, PRISM Model Documentation (June 2011); FRBNY: Federal Reserve Bank of New York Staff Report 618 (May 2013, revised April 2014).

Manufacturing Capacity Utilization Gap*



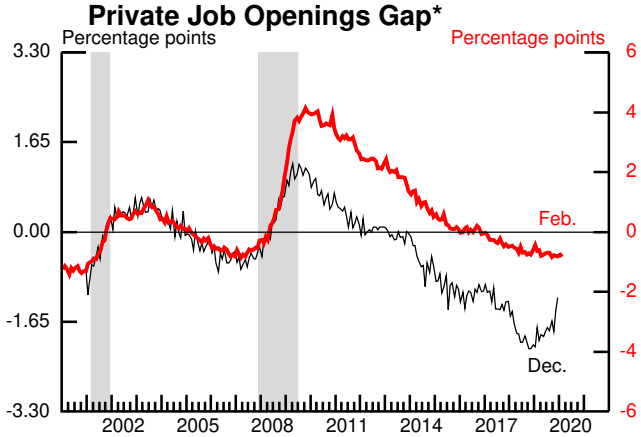
Source: Federal Reserve Board.

Jobs Hard to Fill Gap*



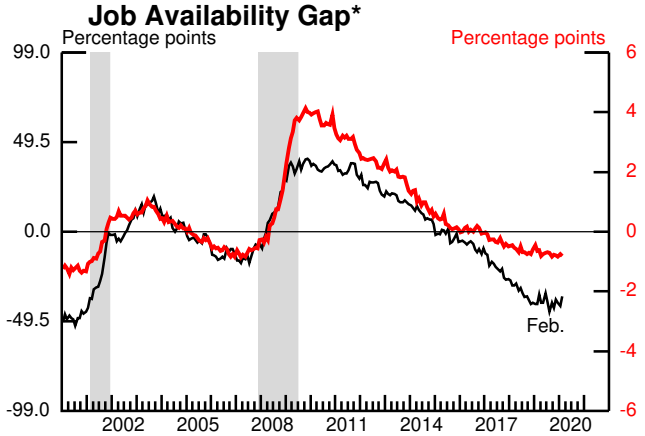
Note: Percent of small businesses surveyed with at least one "hard to fill" job opening. Seasonally adjusted by Federal Reserve Board staff.
Source: National Federation of Independent Business, Small Business Economic Trends Survey.

Private Job Openings Gap*



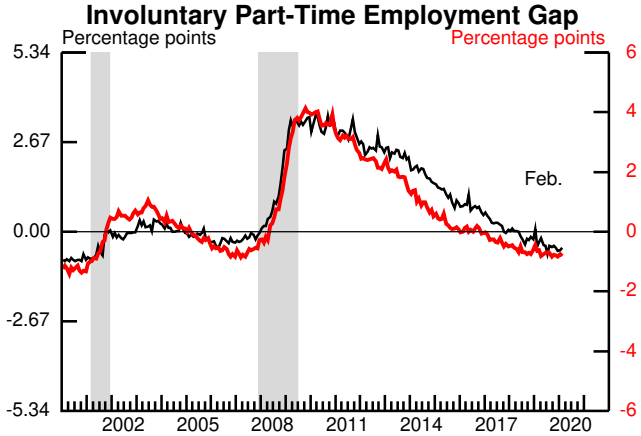
Note: Job openings rate is the number of job openings divided by employment plus job openings.
Source: Job Openings and Labor Turnover Survey; U.S. Department of Labor, Bureau of Labor Statistics, Current Employment Statistics.

Job Availability Gap*



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



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.

natural rate of unemployment. Consequently, our estimate of potential output is a bit higher in this projection.

- Total **nonfarm payroll employment** increased 273,000 in both January and February, considerably more than we had expected, and we took some signal from the strength of these readings going forward. But the anticipated reduction in output associated with the COVID-19 outbreak also led us to incorporate a drag on employment of 20,000 in March and 50,000 per month from April to June. Altogether, we expect private job gains to slow from 198,000 per month in the first quarter to 108,000 in the second. Total payrolls grow faster than private payrolls in the second quarter, reflecting a boost to federal government hiring for the 2020 census.
    - The BLS released its annual benchmark revision to payroll employment with the January employment report. As expected, total payroll employment growth is now reported to have been 193,000 per month in 2018, about 30,000 lower than the previously published estimate. Average job growth in 2019 is now estimated to be 178,000 per month, a touch higher than we expected in the January Tealbook.
- Other labor market measures suggest that private-sector employment growth has been more muted the past few months. Our FRB/ADP pooled employment estimate suggests private job gains of about 152,000 per month in the final quarter of last year and an average of 148,000 for the first two months of 2020 (compared with the BLS's estimate of 200,000 for 2019:Q4 and 225,000 in January and February). In addition, the Quarterly Census of Employment and Wages, to which the BLS payroll data are ultimately benchmarked, has released data that suggest next year's benchmark may be another sizable downward revision.
- The **job openings rate** registered its largest-ever two-month decline over November and December. However, other indicators of vacancies do not corroborate the sharp decline in the JOLTS measure, and indicators of hiring, such as small business hiring plans and household perceptions of job availability, do not seem consistent with an abrupt weakening of labor

demand. Similarly, initial claims for unemployment insurance continue to point to healthy labor market conditions.

- The **unemployment rate** was 3.5 percent in February, as we expected in the January Tealbook. We now expect that the unemployment rate will tick up to 3.6 percent in the second quarter and remain there through the third quarter—consistent with the anticipated effects of the COVID-19 outbreak on economic activity—before gradually declining through the middle of next year. The unemployment rate in the second half of this year is now projected to be 0.2 percentage point higher than in the January Tealbook.

- The **LFPR** was 63.4 percent in February, 0.2 percentage point above our January Tealbook projection and 0.3 percentage point above its level one year ago. We expect the LFPR to edge down to 63.2 percent in the second quarter.

We revised some of our aggregate supply assumptions in this projection.

- Given the string of one-sided surprises to our labor force participation rate forecasts, we again raised our estimate of **trend LFPR** beginning in 2018 and continuing throughout the medium term. The higher LFPR trend over history led us to revise up our estimate of potential output beginning in 2018. This adjustment narrowed the output gap at the end of last year by 0.2 percentage point.

    - We now expect that rising educational attainment (particularly for women) and delayed retirements—two structural factors discussed in the alternative view box "The Labor Force Participation Rate Has More Room to Improve"—will continue to put upward pressure on the trend through the medium term.

    - In addition, our forecast now incorporates new evidence showing that the LFPR may respond to changes in the output gap more slowly than we had assumed in previous projections. Taking this evidence into consideration, we now think that the gap between the LFPR and its trend will continue to widen even as the output gap flattens in 2022.

- Our forecast for the LFPR is now about flat and ends the projection at 63.2 percent, 0.6 percentage point higher than in the January Tealbook. This change led us to mark up our forecast for total payroll employment over the next three years. We now expect total payroll gains of 135,000 per month in 2021 and 111,000 in 2022. Starting in the third quarter of this year, the unemployment rate moves down, ending 2021 at 3.2 percent and remaining flat in 2022.

- We also edged down our estimate of the **natural rate of unemployment** by 0.1 percentage point, to 4.3 percent. The information we use to inform our estimate of the natural rate—residuals from our wage and price inflation equations, data on the demographic and educational composition of the workforce, and various measures of labor market efficiency and tightness—cannot meaningfully distinguish between natural rates of 4.4 percent and 4.3 percent. However, given our assessment that the output gap was 0.2 percentage point lower at the end of last year than we previously thought, nudging down our estimate of the natural rate of unemployment aligns better with our Okun's law model.

- **Business-sector productivity** increased 1.7 percent in 2019. We continue to expect productivity to rise 1.2 percent per year over the next few years, in line with our estimate of its structural trend and equal to its average growth over the past five years.

- Reflecting the combined effects of the increased potential output and our lower forecast of GDP growth in 2020, the **output gap** in 2020:Q4 is ½ percentage point less positive than it was in the January Tealbook. However, we still project above-trend GDP growth this year and next. The output gap widens in those years and ends the medium-term projection at 2.1 percent, just 0.1 percentage point below the January Tealbook forecast.

THE OUTLOOK FOR INFLATION

Core PCE prices increased 1.6 percent over the 12 months ending in January. Even though the low inflation readings from early 2019 are about to roll out of the 12-month calculation, we no longer expect the 12-month change to pick up materially

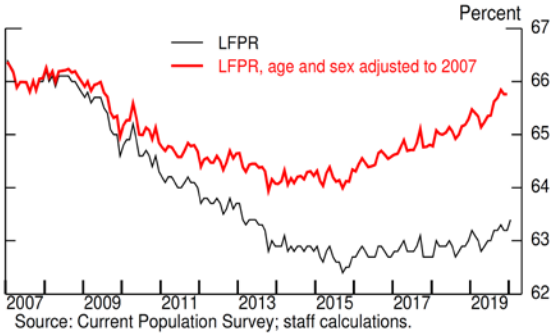
Alternative View: The Labor Force Participation Rate Has More Room to Improve

The labor force participation rate (LFPR) increased notably over the past year even though the aging of the population continued exerting downward pressure of ¼ percentage point per year on that rate. This improvement reflected increases in the LFPRs of nearly all age groups of the population, some of which started increasing several years ago. However, those increases in group rates have been masked in the overall LFPR by the effects of aging as baby boomers started to reach the ages traditionally associated with retirement. Indeed, as figure 1 shows, the LFPR calculated by holding age–sex shares of the population constant (which controls for the aging population and better reflects changes in group rates) has been increasing since 2015, whereas the published LFPR has been mostly flat over that period. Despite these increases in subgroup LFPRs, recent Tealbook projections have implicitly assumed that these rates would remain flat, on average, going forward. Although the upward revision to the LFPR projection in this Tealbook helps, as seen in figure 2, this alternative view argues that there remains substantial upside risk to the staff's LFPR forecast and trend estimate, as recent improvements among certain subgroups reflect both cyclical and structural factors that are likely to persist over at least the next few years.

One reason for optimism that the LFPR might continue to improve is that there could still be cyclical improvements in the pipeline. Some recent research suggests that participation responds with a considerable lag to business cycle fluctuations. Cajner, Coglianese, and Montes (2019; henceforth CCM) show that a 1 percent increase in output takes four years to raise the LFPR by ¼ percentage point.[1] This long-lived cyclicality means that some of the current improvements in the LFPR reflect improvements in the output gap from several years ago. Applying the CCM elasticities to the Tealbook estimate of the output gap implies cyclical improvement in the LFPR of roughly 0.1 percentage point per year from 2020 through 2022, reflecting changes in the output gap over the past few years.

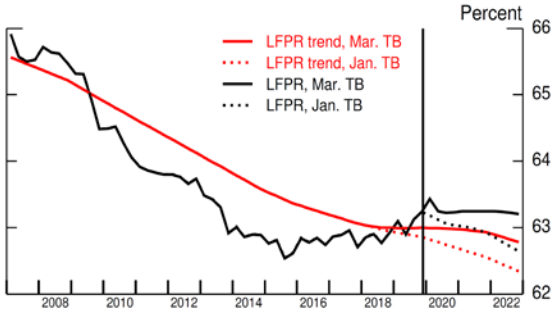
A second reason for optimism is that there may be some structural factors putting upward pressure on the LFPR *trend*. One factor is the increasing level of educational attainment of prime-age people. Indeed, the ¾ percentage point per year increases in the LFPR of prime-age women since 2015 are at least in part related to increases in the share of women who

Figure 1. Labor Force Participation Rate, Age and Sex Adjusted



Source: Current Population Survey; staff calculations.

Figure 2. Labor Force Participation Rate Forecast by Tealbook



Note: Vertical line indicates 2019 Q4.
Source: Current Population Survey; staff estimate.

Note: Joshua Montes prepared this alternative view.

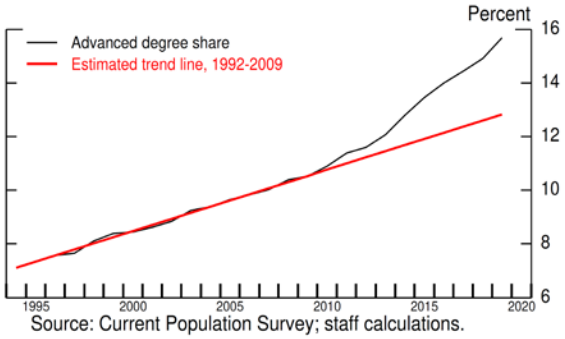
[1] See Tomaz Cajner, John Coglianese, and Joshua Montes (2019), "The Long-Lived Cyclicality of the Labor Force Participation Rate," mimeo (Washington: Board of Governors of the Federal Reserve System, Division of Research and Statistics, March).

now hold advanced degrees (figure 3). Before 2010, that share had been increasing at a steady, gradual pace, but since then it has increased at a much faster pace. This development has boosted the prime-age LFPR of women, as women with advanced degrees have much higher LFPRs than those with a bachelor's degree only. Overall, increases in educational attainment have boosted the LFPR of prime-age women by 0.2 percentage point per year since 2010, almost entirely driven by increases in the advanced degree share. A similar analysis for prime-age men suggests that increases in educational attainment have boosted their LFPR by 0.1 percentage point per year. All told, increases in educational attainment among prime-age people may be boosting their participation by almost 0.2 percentage point and the overall LFPR by 0.1 percentage point per year in recent years.

Of course, structural forces, such as technology and globalization, that have been pushing down LFPRs of less-educated workers for the past several decades may be partially offsetting the boost from increasing levels of educational attainment.[2] However, these forces affected specific cohorts of people that are starting to move into retirement years. Younger, more educated cohorts that are more able to adapt to the technological and global landscape are replacing those older cohorts. Given the increases in prime-age LFPRs, some of the effects of technology and globalization have likely abated and are imparting a smaller offset to the positive effects of increases in educational attainment.

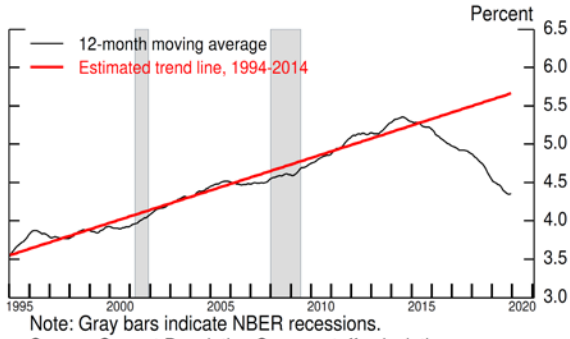
Additionally, the share of prime-age people who report being out of the labor force because of disability has declined by roughly 1 percentage point since 2014 after having risen steadily for several decades (figure 4). A portion of that multidecade increase likely reflected less-educated people taking up disability as a means of income replacement in response to demand shocks from technology and globalization; the more recent decline in disability rates suggests that some of the effects of those factors have abated.[3] Consequently, much of the declines in disability rates that are pushing up LFPRs likely represent structural improvement, boosting the trend LFPR by about 0.1 percentage point per year.

Figure 3. Share of Prime-Age Women with Advanced Degrees



Source: Current Population Survey; staff calculations.

Figure 4. Share of Prime-Age People Reporting as Disabled

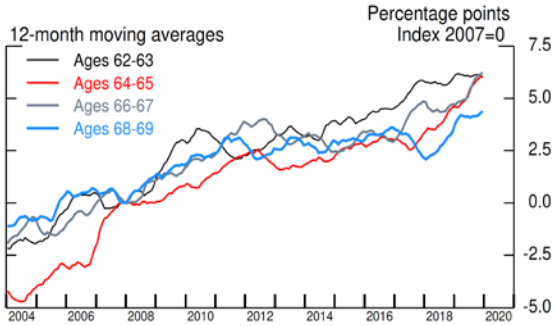


Note: Gray bars indicate NBER recessions.
Source: Current Population Survey; staff calculations.

[2] For an example of research that shows how factors like technology and globalization have historically induced less-educated people to not participate in the labor market, see David Autor, David Dorn, and Gordon H. Hanson (2016), "The China Shock: Learning from Labor-Market Adjustment to Large Changes in Trade," *Annual Review of Economics,* vol. 8 (October), pp. 205–40.

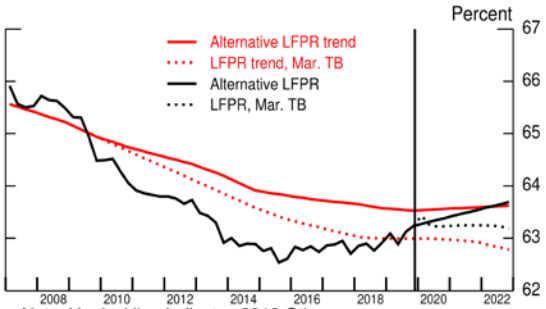
[3] For more details on how the income-replacement rate associated with Social Security Disability Insurance may incentivize low-wage people to forgo paid employment and collect disability benefits, see David H. Autor and Mark G. Duggan (2003), "The Rise in Disability Rolls and the Decline in Unemployment," *Quarterly Journal of Economics,* vol. 118 (February), pp. 157–206.

Figure 5. Changes in Labor Force Participation Rates since 2007



Source: Current Population Survey.

Figure 6. Labor Force Participation Rate Trend and Forecast



Note: Vertical line indicates 2019 Q4.
Source: Current Population Survey; staff estimate.

Lastly, LFPRs for those 55 and older have been trending up, reflecting structural factors that are likely to persist over at least the next several years. One factor is that the health capacity to work at older ages has increased, allowing older workers to extend their work lives.[4] A second factor is that recent increases in the retirement age at which people can receive a full Social Security Old-Age and Survivors Insurance (OASI) benefit have incentivized people to work longer.[5] OASI affects the LFPRs of 62 to 70 year olds the most; LFPRs at each age within that group have increased by 0.4 percentage point per year since 2007 (figure 5). All told, increases in the single-age LFPRs for people 55 and older have boosted the overall LFPR by 0.1 percentage point per year recently. Because the full retirement age will continue to increase (by law) and the health capacity to work is likely to continue increasing, it is reasonable to expect these factors to continue putting upward pressure on the overall LFPR and its trend.

Taken together, these structural and cyclical factors suggest that the overall LFPR still has considerable scope for improvement (figure 6). The structural factors identified here start slowing the decline in trend LFPR relative to the staff's estimate around 2010. Eventually, the boost from those structural factors is enough to offset the ¼ percentage point per year downward drag from aging, yielding a flat alternative trend estimate of 63.5 percent in 2019 and beyond and implying that some cyclical weakness currently remains on the participation margin. Further, this alternative trend LFPR is a stark contrast to the March Tealbook estimate that declines to 62.8 percent by the end of 2022; that difference suggests that the potential labor force in 2022 will include 2¼ million more people than in the March Tealbook. Beyond that, the higher alternative trend LFPR implies a much higher level of potential output than in the March Tealbook. Finally, adding the alternative trend to the cyclical improvement implied by the CCM elasticities suggests that the LFPR will improve by about 15 basis points per year, reaching 63.7 percent by the end of 2022—½ percentage point above the Tealbook estimate.

[4] See Courtney Coile, Kevin S. Milligan, and David A. Wise (2016), "Health Capacity to Work at Older Ages: Evidence from the U.S." NBER Working Paper Series 21940 (Cambridge, Mass.: National Bureau of Economic Research, January), https://www.nber.org/papers/w21940. They show that older men have an additional health capacity to work of about two years compared with that capacity if the relationship between employment and mortality was the same as in 1995. These estimates include the period of the recent opioid epidemic, suggesting that the health capacity to work at older ages has improved despite that development.

[5] The full retirement age for OASI gradually increased from 65 to 66 years old from 2002 to 2009, and it will increase from 66 to 67 years old between 2020 and 2027. People can claim early retirement and receive a lesser benefit at age 62.

over the near term, as we think that the lower commodity prices, the higher dollar, and weaker economic activity related to the coronavirus will weigh on price inflation in the coming months. While we expect some of the COVID-19 effects to be reversed later in the year, our inflation projection for this year as a whole is lower than it was in the January Tealbook. We forecast core inflation of 1.8 percent in 2020, 0.1 percentage point lower than in January, and 1.9 percent in 2021 and 2022. Given the declines in oil prices over the past couple of months, total inflation runs below core this year and about in line with core thereafter.

- On net, the incoming data on **core PCE price inflation** through January have come in somewhat lower than in the previous Tealbook, reflecting lower-than-expected readings on nonmarket services. Although we did not take signal for future inflation from the nonmarket miss, the lower projected path for import price inflation, in conjunction with weaker economic activity, led us to mark down our forecast of core PCE price inflation in 2020 to 1.8 percent.

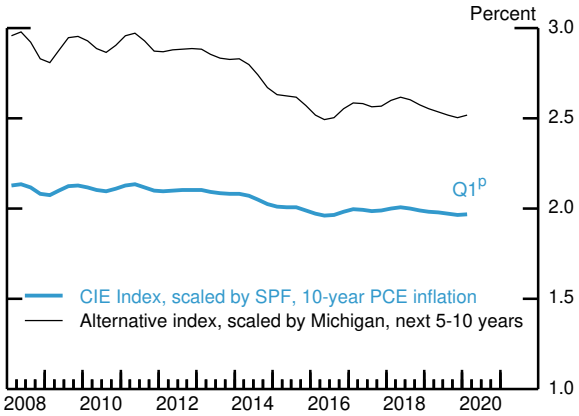
- We expect the **coronavirus** outbreak to be, on net, a drag on inflation this year. The drop in oil and other commodity prices, the increase in the exchange value of the dollar, and a lower level of resource utilization all reduce inflation this year. Although supply chain disruptions may exert upward pressure on goods prices, based on our assessment of the price effects of the 2011 earthquake in Japan, we expect these pressures to be small.

- With spot prices of crude oil down sharply since the new year, we forecast that **PCE energy prices** will fall at an annual rate of 13 percent in the first half of 2020 and bottom out late this year. As a result, the 12-month change in **total PCE prices** steps down over the first half of the year, from 1.7 percent in January to 1.2 percent in June.

- We expect that **effective prices for imported core goods** (that is, including tariffs), after increasing a relatively modest 1 percent in 2019, will be little changed in the first half of this year. Relative to the January Tealbook, we revised down our forecast for import price inflation in response to the sharp decline in commodity prices and the recent dollar appreciation. In 2021, effective core import price inflation steps back up to 1 percent, a still-subdued level that reflects an appreciating dollar and no additional tariff changes.

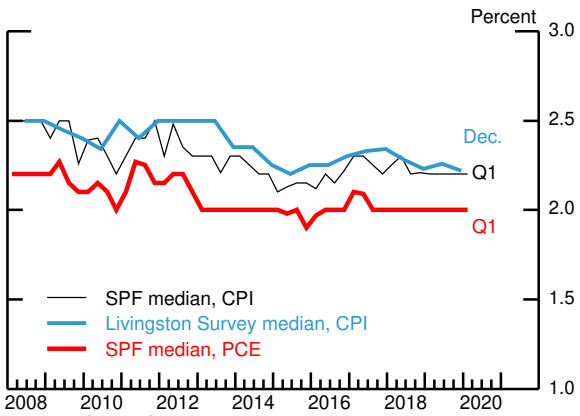
Survey Measures of Longer-Term Inflation Expectations

Index of Common Inflation Expectations



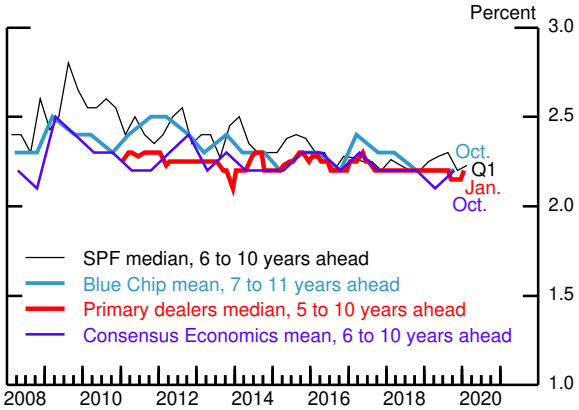
p Preliminary estimate based on data available to date.
Note: Index of 21 inflation expectations indicators.
Source: Staff calculations.

Next 10 Years



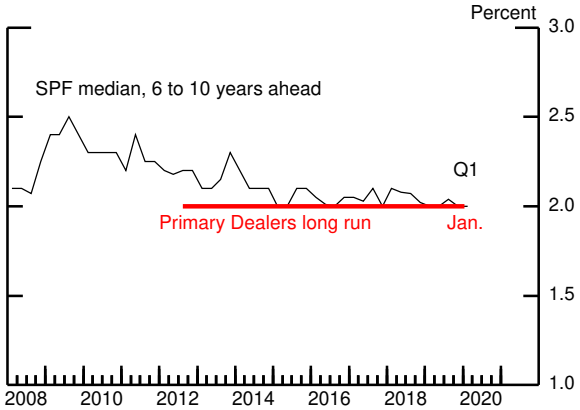
Note: SPF is Survey of Professional Forecasters.
Source: Federal Reserve Bank of Philadelphia.

CPI Forward Expectations



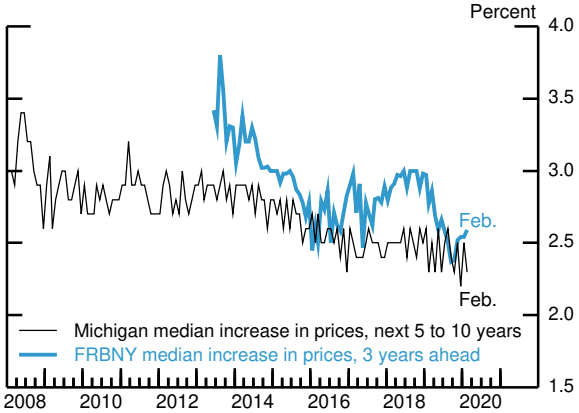
Source: Federal Reserve Bank of Philadelphia; Blue Chip Economic Indicators; Federal Reserve Bank of New York; Consensus Economics.

PCE Forward Expectations



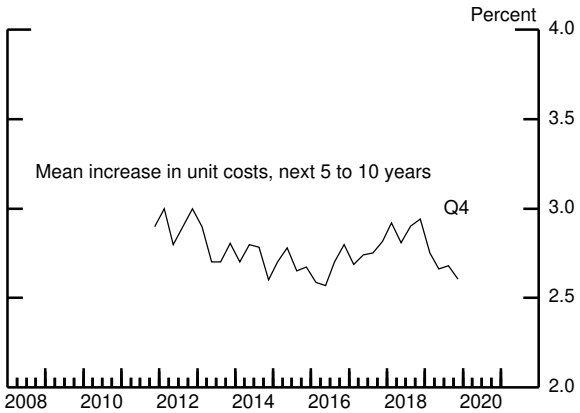
Source: Federal Reserve Bank of Philadelphia; Federal Reserve Bank of New York.

Surveys of Consumers



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

Survey of Business Inflation Expectations



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

- The 12-month changes in the Dallas Fed's trimmed mean PCE price index and the staff's common component of core PCE prices remain fairly close to their readings from a year ago. These measures contrast with the core and market-based core PCE price indexes, whose 12-month changes are still down over this period.

- **Longer-term inflation expectations** appear to remain well anchored.

  - In the Survey of Professional Forecasters for 2020:Q1, the median expectation for PCE price inflation over the next 10 years remained at 2.0 percent. Longer-term inflation expectations from the Michigan survey were 2.3 percent in February, near the low end of their range in recent years. In the February FRBNY Survey of Consumer Expectations, the median three-year-ahead expected inflation edged up to 2.6 percent, well within the range observed over the past few years.[3]

  - TIPS-based measures of longer-term inflation compensation have fallen 25 to 30 basis points since the previous Tealbook.

  - The staff's common inflation expectations index, which synthesizes these and other measures of inflation expectations, has remained about flat in the first quarter.

The incoming data suggest that **labor compensation** continues to rise at a moderate pace, roughly as we expected in January.

- Average hourly earnings of employees on private nonfarm payrolls rose 3.0 percent over the 12 months ending in February, a bit of a step-down from the pace seen in the middle of 2019.

- The employment cost index (ECI) rose 2.7 percent over the 12 months ending in December. We expect the ECI to continue to grow at about this pace through the medium term.

- Compensation per hour in the business sector increased 3.6 percent over the four quarters of 2019, revised down from the BLS's surprisingly high initial

[3] Please note that the results of the February FRBNY Survey of Consumer Expectations are confidential until 10:30 a.m. on March 9, 2020.

estimate of 4.3 percent. Over the remainder of the forecast, we project business-sector compensation per hour to rise roughly 3¾ percent per year, a pace we think is in line with tight labor market conditions, trend price inflation, and trend productivity growth. (Increases in business-sector compensation tend to run a little higher than those in the ECI.)

THE LONG-TERM OUTLOOK

- We now assume that the natural rate of unemployment is 4.3 percent. Potential output growth slows to its long-run value of 1.7 percent in 2023, as the boost to potential growth from the 2017 tax cuts wanes.

- The real long-run equilibrium federal funds rate is still assumed to be 0.5 percent, and the nominal yield on 10-year Treasury securities is 3 percent in the longer run.

- Given the outlook for inflation and resource utilization, the nominal federal funds rate increases gradually from 2.0 percent at the end of 2022 to its long-run value of 2.5 percent in 2025.

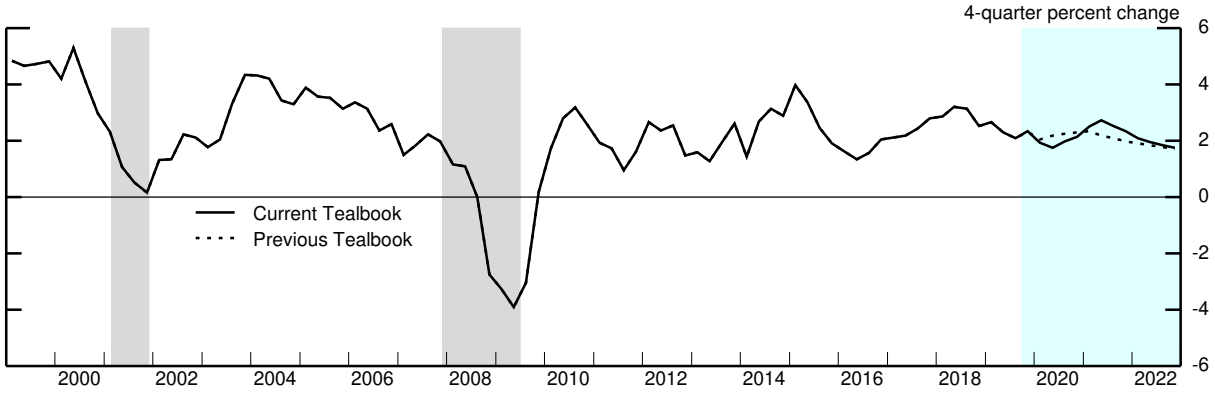
- As monetary policy is assumed to tighten further beyond the medium term, GDP growth slows from 1.7 percent in 2022 to 1.3 percent in 2025 before rising gradually to its long-run value. The unemployment rate moves up gradually from 3.2 percent at the end of 2022 toward its assumed natural rate in subsequent years. Core PCE price inflation edges up from 1.9 percent at the end of the medium term to its long-run value of 2.0 percent.

Projections of Real GDP and Related Components

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

Measure	2019	2019 H2	2020 H1	2020	2021	2022
Real GDP	**2.3**	**2.1**	**1.4**	**2.1**	**2.3**	**1.7**
Previous Tealbook	*2.3*	*2.1*	*2.3*	*2.3*	*2.0*	*1.7*
Final sales	2.7	2.7	2.0	2.4	2.2	1.6
Previous Tealbook	*2.6*	*2.3*	*2.7*	*2.6*	*1.9*	*1.7*
Personal consumption expenditures	2.6	2.4	1.6	2.0	2.8	2.3
Previous Tealbook	*2.6*	*2.3*	*2.5*	*2.5*	*2.4*	*2.3*
Residential investment	1.6	5.4	8.7	9.2	-2.9	-6.4
Previous Tealbook	*1.2*	*4.4*	*7.3*	*5.0*	*-3.9*	*-4.3*
Nonresidential structures	-5.2	-6.4	-3.9	-3.7	1.1	-.8
Previous Tealbook	*-7.3*	*-10.7*	*-5.0*	*-2.8*	*-.1*	*-1.7*
Equipment and intangibles	1.4	-.4	2.2	3.4	4.8	2.0
Previous Tealbook	*2.2*	*1.1*	*3.4*	*4.1*	*3.6*	*1.8*
Federal purchases	4.4	3.6	2.5	1.9	-.2	.4
Previous Tealbook	*4.2*	*3.3*	*1.9*	*1.3*	*.2*	*.4*
State and local purchases	2.2	1.3	1.0	1.0	1.0	1.0
Previous Tealbook	*2.1*	*1.2*	*.8*	*.9*	*1.0*	*1.0*
Exports	.3	1.5	-.8	4.0	3.6	3.4
Previous Tealbook	*-.9*	*-1.0*	*4.7*	*4.6*	*4.0*	*3.5*
Imports	-2.2	-3.5	-1.7	2.1	3.9	3.2
Previous Tealbook	*-2.3*	*-3.8*	*1.8*	*2.3*	*3.4*	*3.2*
	Contributions to change in real GDP (percentage points)					
Inventory change	-.4	-.6	-.6	-.3	.1	.2
Previous Tealbook	*-.2*	*-.3*	*-.4*	*-.3*	*.0*	*.0*
Net exports	.4	.7	.1	.2	-.1	-.1
Previous Tealbook	*.2*	*.4*	*.3*	*.2*	*.0*	*.0*

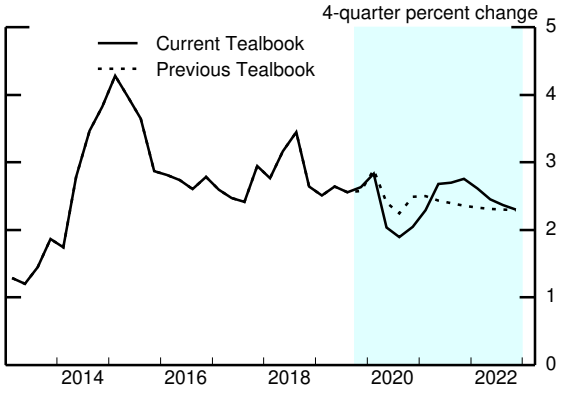
Real GDP



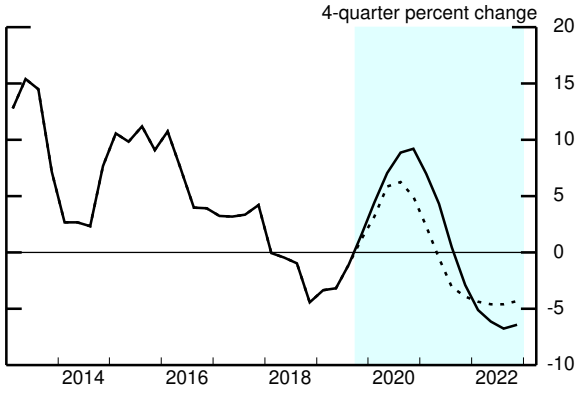
Note: The gray shaded bars indicate a period of business recession as defined by the National Bureau of Economic Research.
Source: U.S. Department of Commerce, Bureau of Economic Analysis.

Components of Final Demand

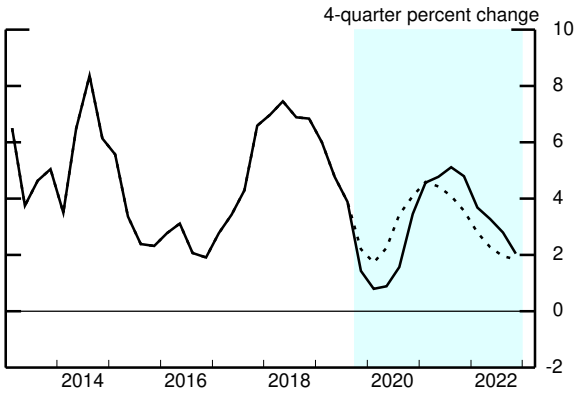
Personal Consumption Expenditures



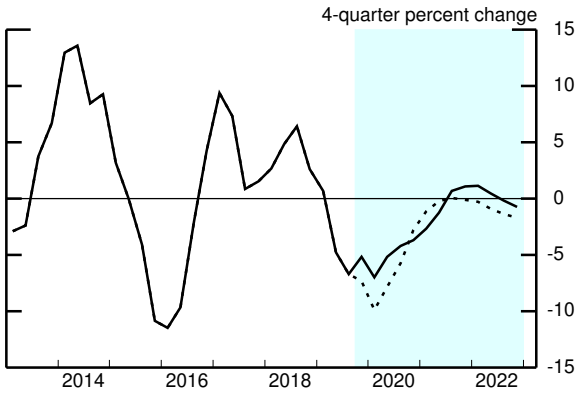
Residential Investment



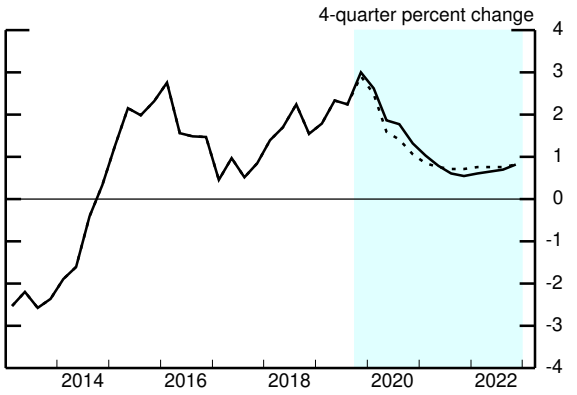
Equipment and Intangibles



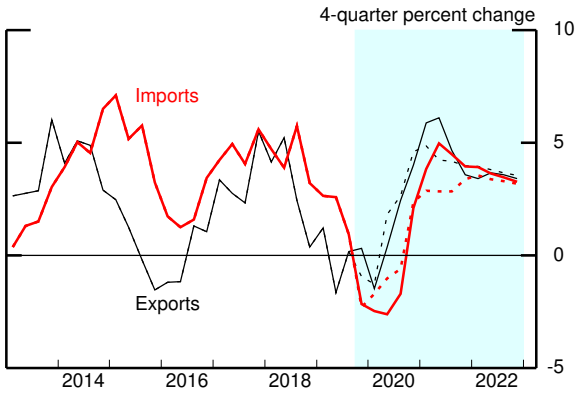
Nonresidential Structures



Government Consumption and Investment



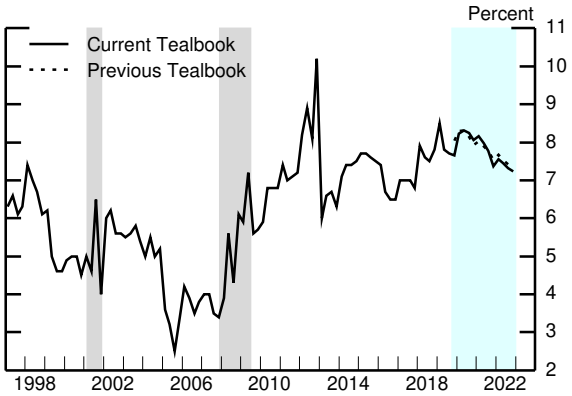
Exports and Imports



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

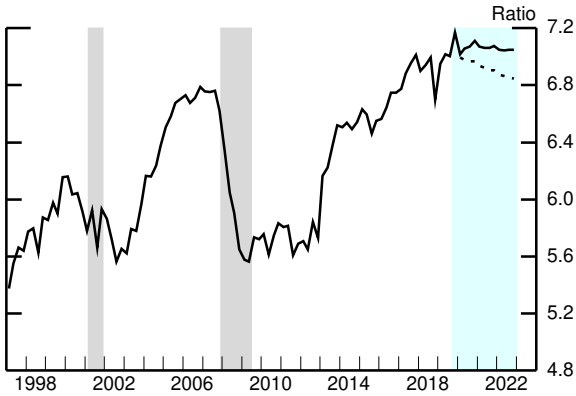
Aspects of the Medium-Term Projection

Personal Saving Rate



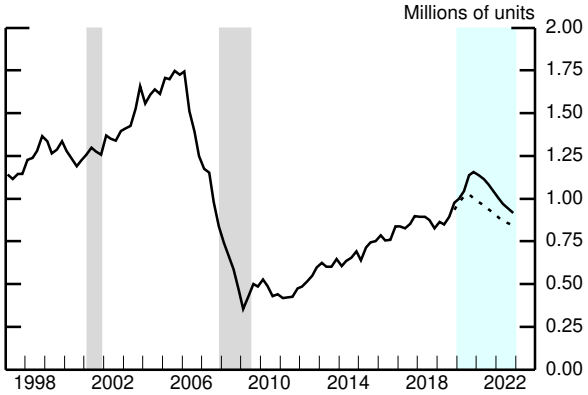
Source: U.S. Dept. of Commerce, Bureau of Economic Analysis.

Wealth-to-Income Ratio



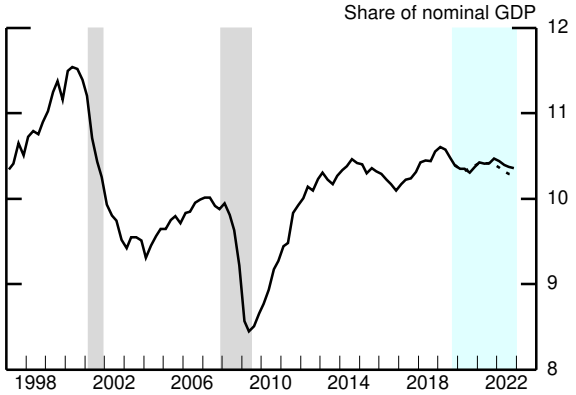
Note: Ratio of household net worth to disposable personal income.
Source: For net worth, Federal Reserve Board, Financial Accounts of the United States; for income, U.S. Dept. of Commerce, Bureau of Economic Analysis.

Single-Family Housing Starts



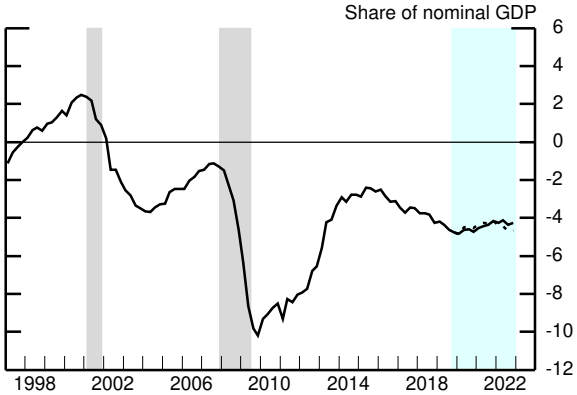
Source: U.S. Census Bureau.

Equipment and Intangibles Spending



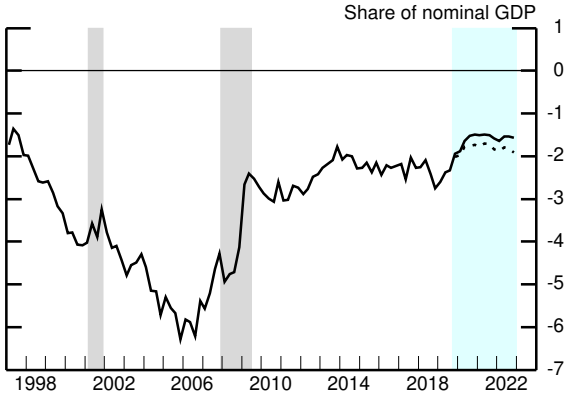
Source: U.S. Dept. of Commerce, Bureau of Economic Analysis.

Federal Surplus/Deficit



Note: 4-quarter moving average.
Source: *Monthly Treasury Statement.*

Current Account Surplus/Deficit

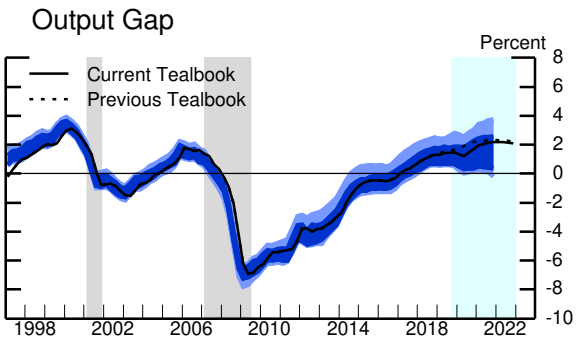


Source: U.S. Dept. of Commerce, Bureau of Economic Analysis.

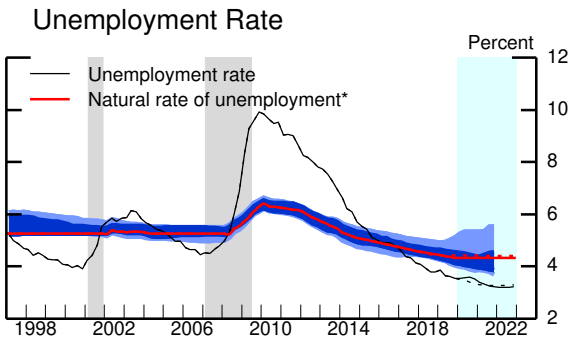
Note: The gray shaded bars indicate a period of business recession as defined by the National Bureau of Economic Research.

Domestic Econ Devel & Outlook

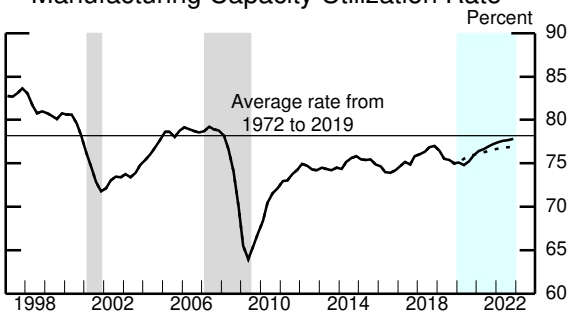
Cyclical Position of the U.S. Economy: Longer-Term Perspective



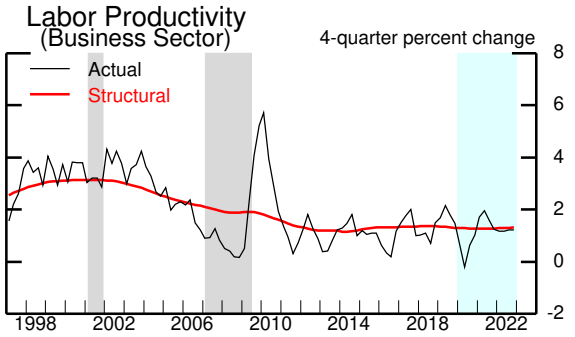
Note: Shaded regions show the 70 percent and 90 percent confidence intervals of the distribution of historical revisions to the staff's estimates of the output gap.
Source: Various macroeconomic data; staff assumptions.



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.



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



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	1974-95	1996-2000	2001-07	2008-10	2011-17	2018	2019	2020	2021	2022
Potential output	3.1	3.6	2.7	1.9	1.5	1.9	1.9	1.9	1.9	1.8
Previous Tealbook	*3.1*	*3.6*	*2.7*	*1.9*	*1.5*	*1.8*	*1.8*	*1.8*	*1.8*	*1.8*
Selected contributions:[1]										
Structural labor productivity[2]	1.7	2.9	2.7	1.8	1.3	1.4	1.3	1.3	1.3	1.3
Previous Tealbook	*1.7*	*2.9*	*2.7*	*1.8*	*1.3*	*1.3*	*1.3*	*1.2*	*1.3*	*1.4*
Capital deepening	.7	1.4	1.0	.5	.8	.7	.7	.5	.5	.5
Multifactor productivity	.8	1.1	1.4	1.0	.3	.5	.4	.6	.6	.6
Structural hours	1.5	1.3	.8	.5	.4	.9	.5	.4	.7	.5
Previous Tealbook	*1.5*	*1.3*	*.8*	*.5*	*.4*	*.9*	*.3*	*.6*	*.6*	*.5*
Labor force participation	.4	-.1	-.2	-.4	-.4	-.1	.0	.0	-.1	-.2
Previous Tealbook	*.4*	*-.1*	*-.2*	*-.4*	*-.4*	*-.2*	*-.1*	*-.2*	*-.2*	*-.3*
Memo:										
Output gap[3]	-1.2	2.5	.3	-5.4	.6	1.3	1.5	1.7	2.2	2.1
Previous Tealbook	*-1.2*	*2.5*	*.3*	*-5.4*	*.6*	*1.4*	*1.7*	*2.2*	*2.3*	*2.2*

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.

The Outlook for the Labor Market

Measure	2019	2019 H2	2020 H1	2020	2021	2022
Nonfarm payroll employment[1]	178	207	226	152	135	111
Previous Tealbook	*176*	*189*	*207*	*150*	*103*	*74*
Private employment[1]	162	186	153	135	125	101
Previous Tealbook	*162*	*169*	*147*	*140*	*93*	*64*
Labor force participation rate[2]	63.2	63.2	63.2	63.2	63.2	63.2
Previous Tealbook	*63.2*	*63.2*	*63.1*	*63.0*	*62.9*	*62.6*
Civilian unemployment rate[2]	3.5	3.5	3.6	3.5	3.2	3.2
Previous Tealbook	*3.5*	*3.5*	*3.5*	*3.3*	*3.3*	*3.3*
Employment-to-population ratio[2]	61.0	61.0	61.0	61.0	61.2	61.2
Previous Tealbook	*61.0*	*61.0*	*60.9*	*60.9*	*60.9*	*60.6*

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	2019 H2	2020 H1	2020	2021	2022
Percent change at annual rate from final quarter of preceding period						
PCE chain-weighted price index	1.4	1.4	.9	1.3	2.0	1.9
Previous Tealbook	*1.5*	*1.6*	*1.6*	*1.6*	*1.9*	*1.9*
Food and beverages	.9	.0	.4	1.1	2.5	2.3
Previous Tealbook	*.9*	*.1*	*.8*	*1.3*	*2.3*	*2.3*
Energy	-1.3	-1.9	-13.4	-7.5	1.7	1.8
Previous Tealbook	*-.4*	*-.2*	*-5.6*	*-3.8*	*.1*	*.7*
Excluding food and energy	1.6	1.7	1.6	1.8	1.9	1.9
Previous Tealbook	*1.6*	*1.8*	*1.9*	*1.9*	*1.9*	*1.9*
Prices of core goods imports[1]	-1.1	-1.1	.7	.6	1.0	.8
Previous Tealbook	*-.9*	*-.7*	*1.8*	*1.3*	*.9*	*.8*

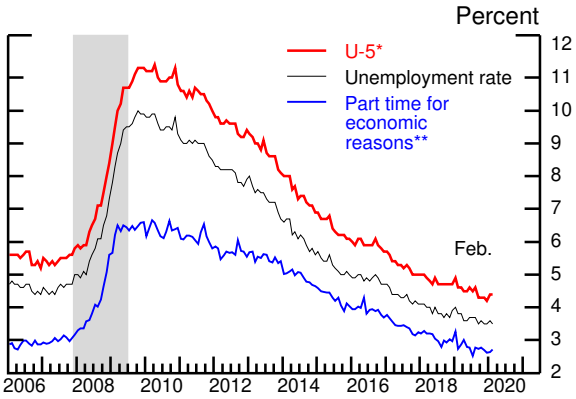
	Dec. 2019	Jan. 2020	Feb. 2020[2]	Mar. 2020[2]	Apr. 2020[2]	May 2020[2]
12-month percent change						
PCE chain-weighted price index	1.5	1.7	1.7	1.4	1.1	1.1
Previous Tealbook	*1.6*	*1.8*	*1.8*	*1.7*	*1.5*	*1.6*
Excluding food and energy	1.5	1.6	1.7	1.7	1.6	1.7
Previous Tealbook	*1.6*	*1.7*	*1.8*	*1.9*	*1.9*	*1.9*

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

Domestic Econ Devel & Outlook

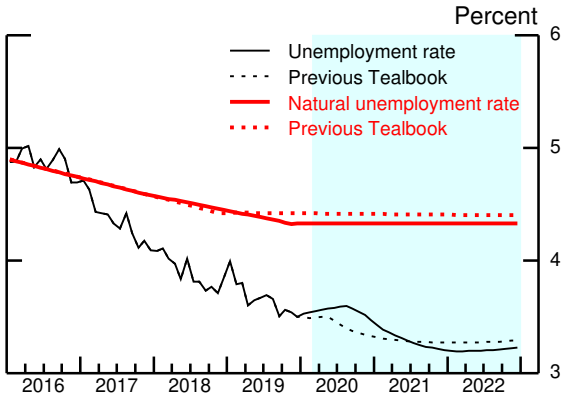
Labor Market Developments and Outlook (1)

Measures of Labor Underutilization



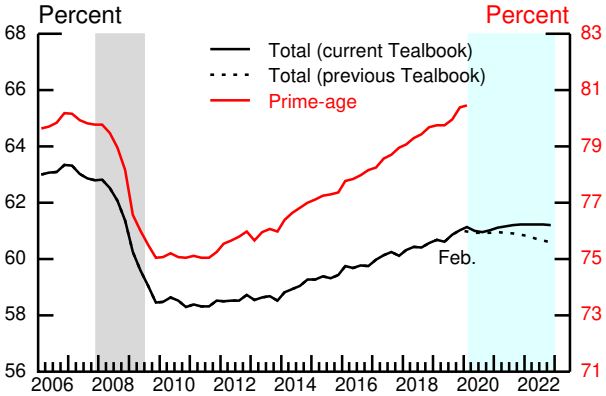
* U-5 measures total unemployed persons plus all marginally attached to the labor force as a percent of the labor force plus persons marginally attached to the labor force.
** Percent of Current Population Survey employment.
Source: U.S. Department of Labor, Bureau of Labor Statistics.

Unemployment Rate



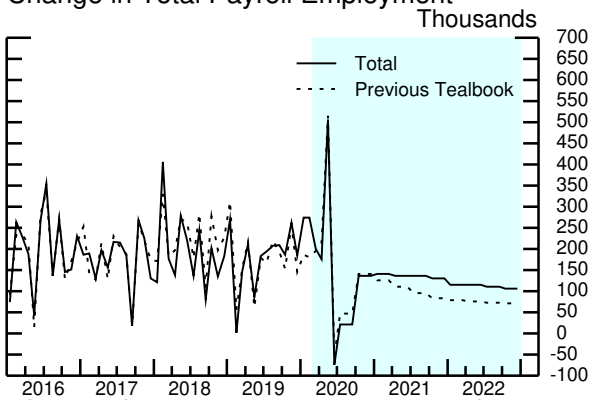
Source: U.S. Department of Labor, Bureau of Labor Statistics.

Employment-to-Population Ratio



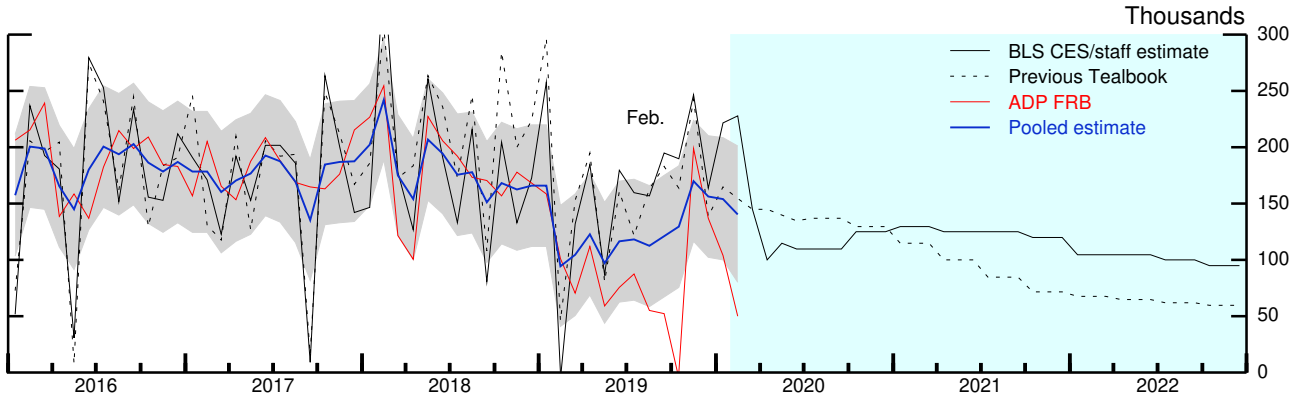
Note: Every curve except the one for the prime-age population corresponds with the left axis.
Source: U.S. Department of Labor, Bureau of Labor Statistics.

Change in Total Payroll Employment



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

Change in Private Payroll Employment

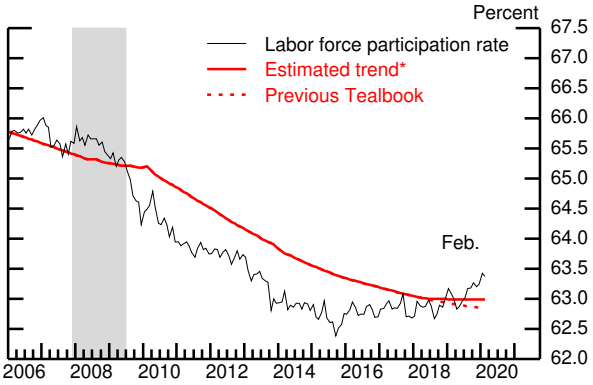


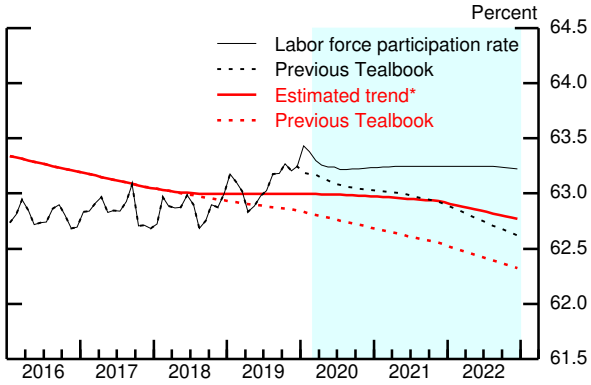
Note: Gray shaded area around blue line is 90 percent confidence interval around pooled estimate.
Source: U.S. Department of Labor, Bureau of Labor Statistics; staff calculations using microdata from ADP.

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)

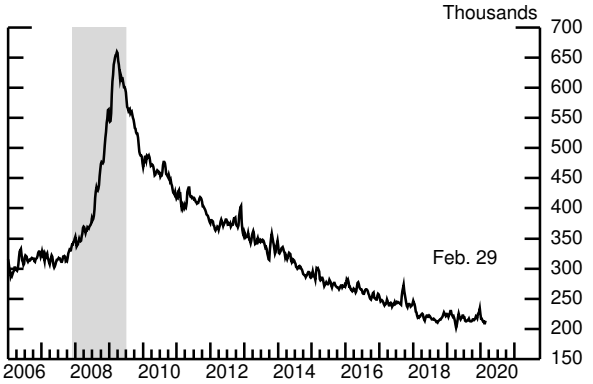
Labor Force Participation Rate





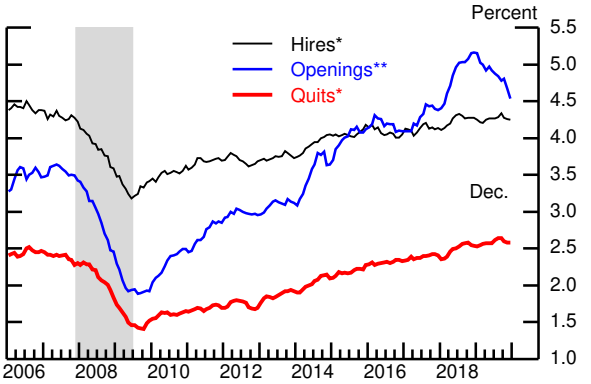
Note: Published data adjusted by staff to account for changes in population weights.
* Includes staff estimate of the effect of extended and emergency unemployment benefits.
Source: U.S. Department of Labor, Bureau of Labor Statistics; staff assumptions.

Initial Unemployment Insurance Claims



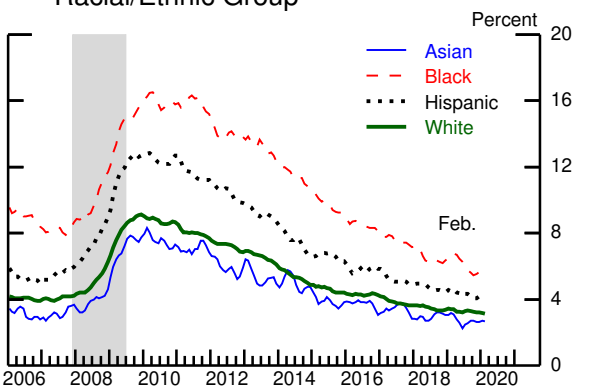
Note: 4-week moving average.
Source: U.S. Department of Labor, Employment and Training Administration.

Hires, Quits, and Job Openings



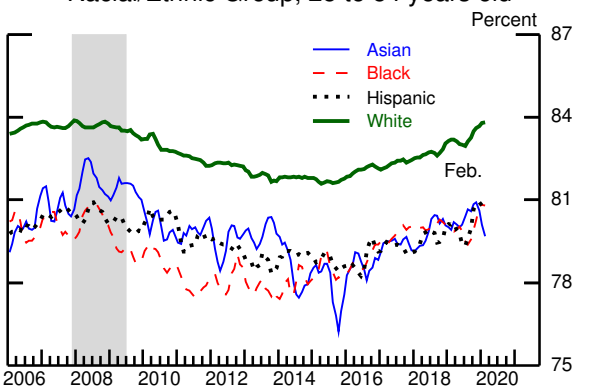
* Percent of private nonfarm payroll employment, 3-month moving average.
** Percent of private nonfarm payroll employment plus unfilled jobs, 3-month moving average.
Source: Job Openings and Labor Turnover Survey.

Unemployment Rate by Racial/Ethnic Group



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

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

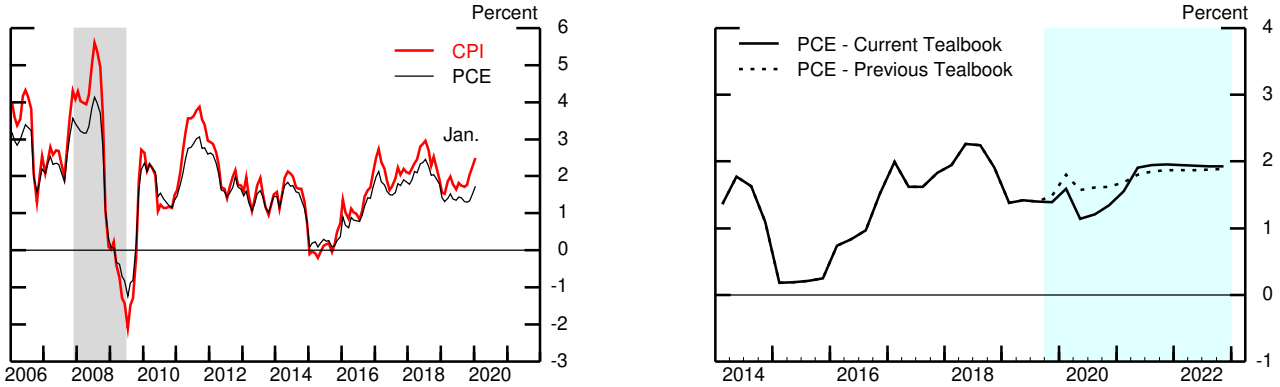


Note: These categories are not mutually exclusive, as the ethnicity Hispanic may include people of any race. The Current Population Survey defines Hispanic ethnicity as those who report their origin is Mexican, Puerto Rican, Cuban, Central American, or South American (and some others). 3-month moving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

Inflation Developments and Outlook (1)

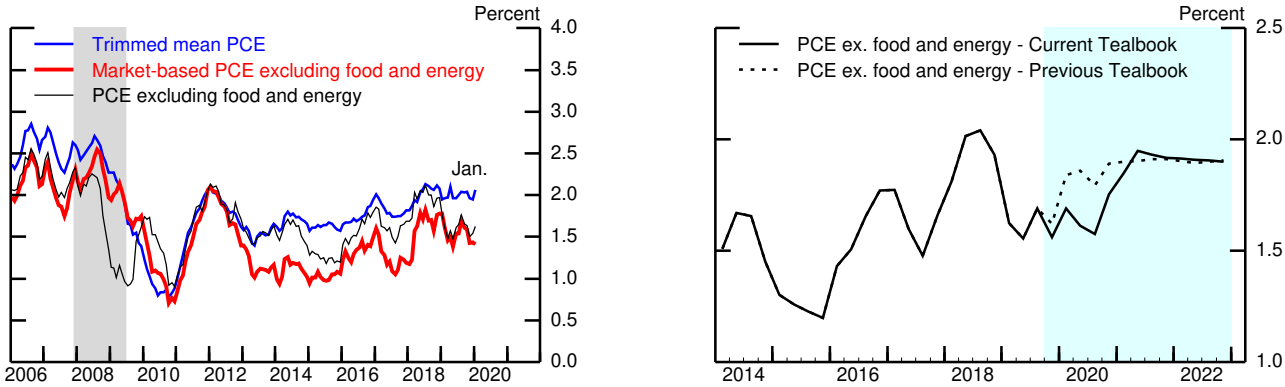
(Percent change from year-earlier period)

Headline Consumer Price Inflation



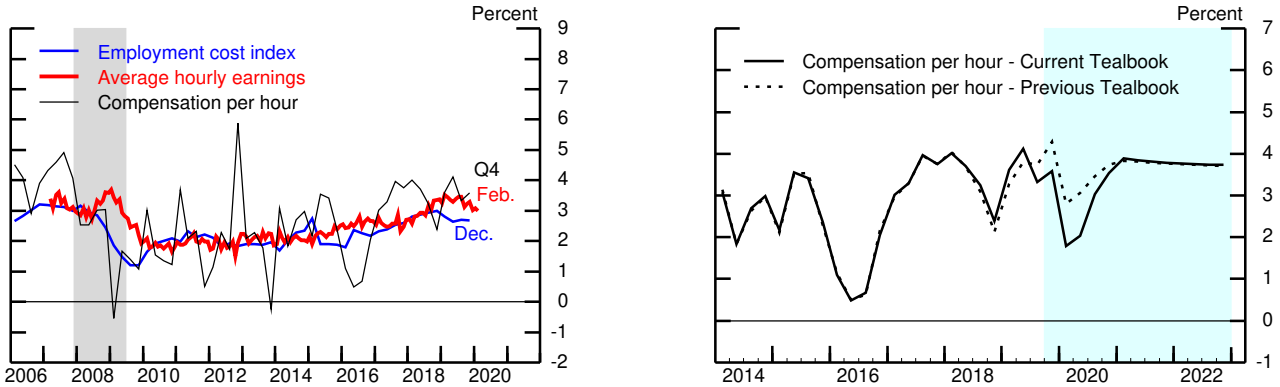
Source: For CPI, U.S. Department of Labor, Bureau of Labor Statistics; for PCE, U.S. Department of Commerce, Bureau of Economic Analysis.

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



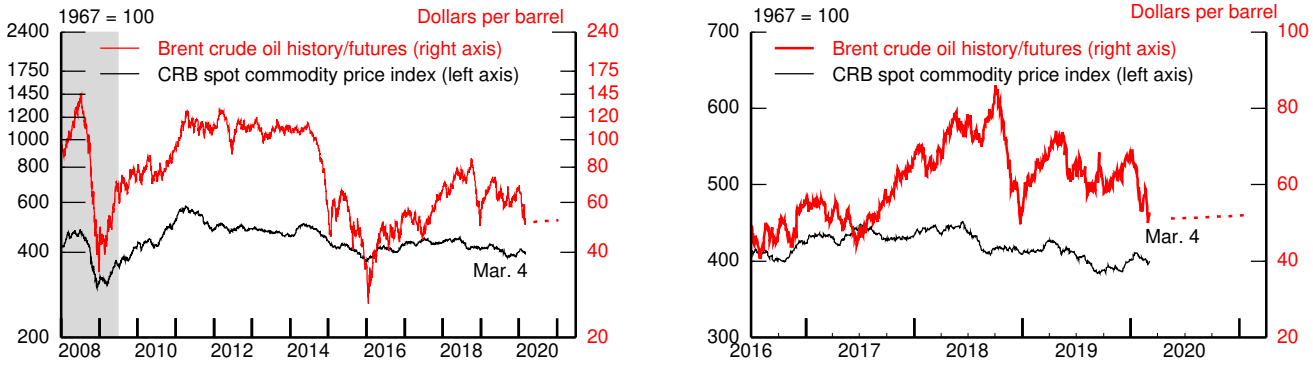
Note: Compensation per hour is for the business sector. Average hourly earnings are for the private nonfarm sector. The employment cost index is for the private sector.
Source: U.S. Department of Labor, Bureau of Labor Statistics.

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)

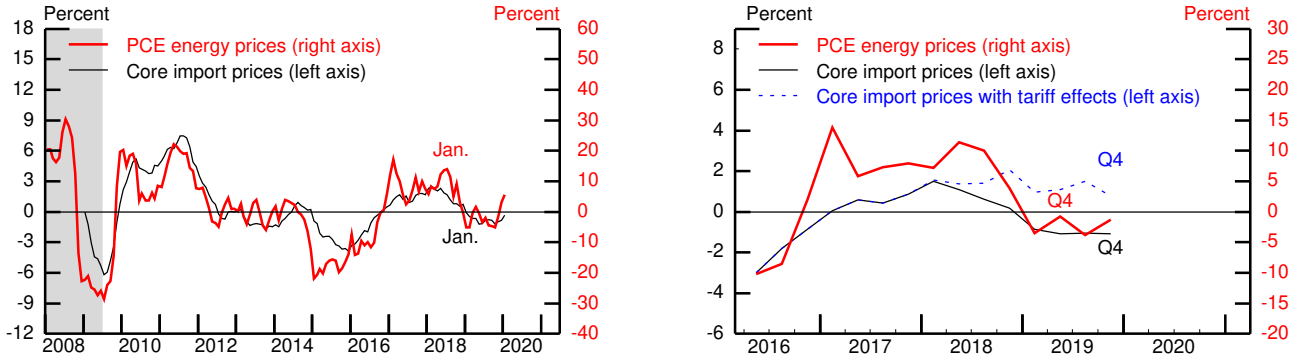
(Percent change from year-earlier period, except as noted)

Commodity and Oil Price Levels



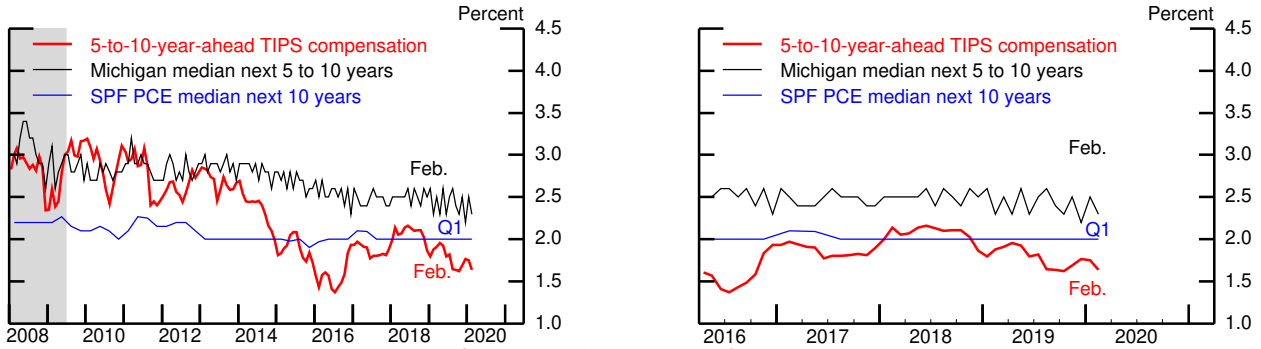
Note: Futures prices (dotted lines) are the latest observations on monthly futures contracts.
Source: For oil prices, U.S. Department of Energy, Energy Information Agency; for commodity prices, Commodity Research Bureau (CRB).

Energy and Import Price Inflation



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

Long-Term Inflation Expectations and Compensation



Note: Based on a comparison of an estimated TIPS (Treasury Inflation-Protected Securities) yield curve with an estimated nominal off-the-run Treasury yield curve, with an adjustment for the indexation-lag effect.
SPF Survey of Professional Forecasters.
Source: For Michigan, University of Michigan Surveys of Consumers; for SPF, the Federal Reserve Bank of Philadelphia; for TIPS, Federal Reserve Board staff calculations.

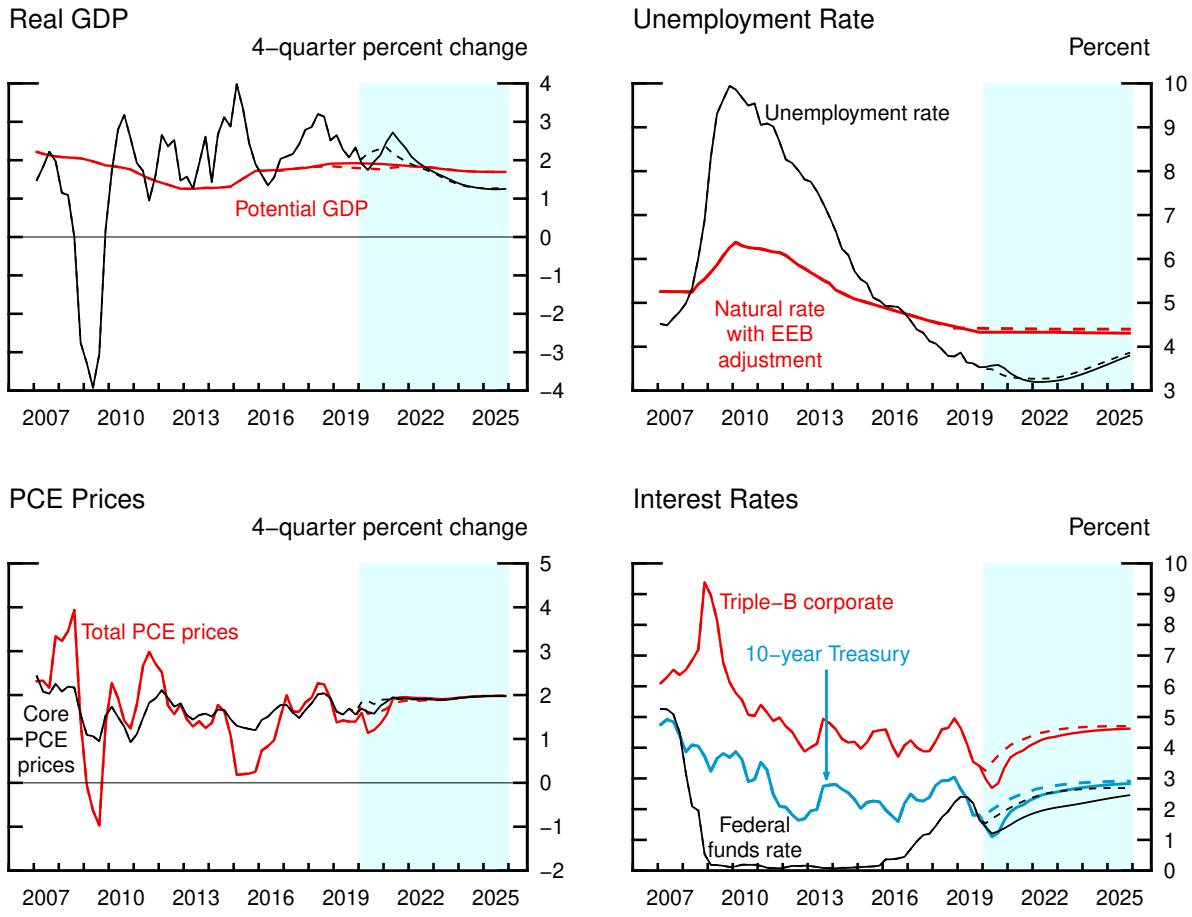
Note: The gray shaded bars indicate a period of business recession as defined by the National Bureau of Economic Research.

The Long–Term Outlook

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

Measure	2020	2021	2022	2023	2024	2025	Longer run
Real GDP	2.1	2.3	1.7	1.4	1.3	1.3	1.7
Previous Tealbook	*2.3*	*2.0*	*1.7*	*1.4*	*1.3*	*1.3*	*1.7*
Civilian unemployment rate[1]	3.5	3.2	3.2	3.4	3.6	3.8	4.3
Previous Tealbook	*3.3*	*3.3*	*3.3*	*3.4*	*3.6*	*3.9*	*4.4*
PCE prices, total	1.3	2.0	1.9	1.9	2.0	2.0	2.0
Previous Tealbook	*1.6*	*1.9*	*1.9*	*1.9*	*2.0*	*2.0*	*2.0*
Core PCE prices	1.8	1.9	1.9	1.9	2.0	2.0	2.0
Previous Tealbook	*1.9*	*1.9*	*1.9*	*1.9*	*2.0*	*2.0*	*2.0*
Federal funds rate[1]	1.38	1.81	2.04	2.17	2.32	2.45	2.50
Previous Tealbook	*1.94*	*2.34*	*2.56*	*2.64*	*2.69*	*2.68*	*2.50*
10-year Treasury yield[1]	1.6	2.3	2.5	2.7	2.8	2.8	3.0
Previous Tealbook	*2.2*	*2.6*	*2.8*	*2.9*	*2.9*	*2.9*	*3.0*

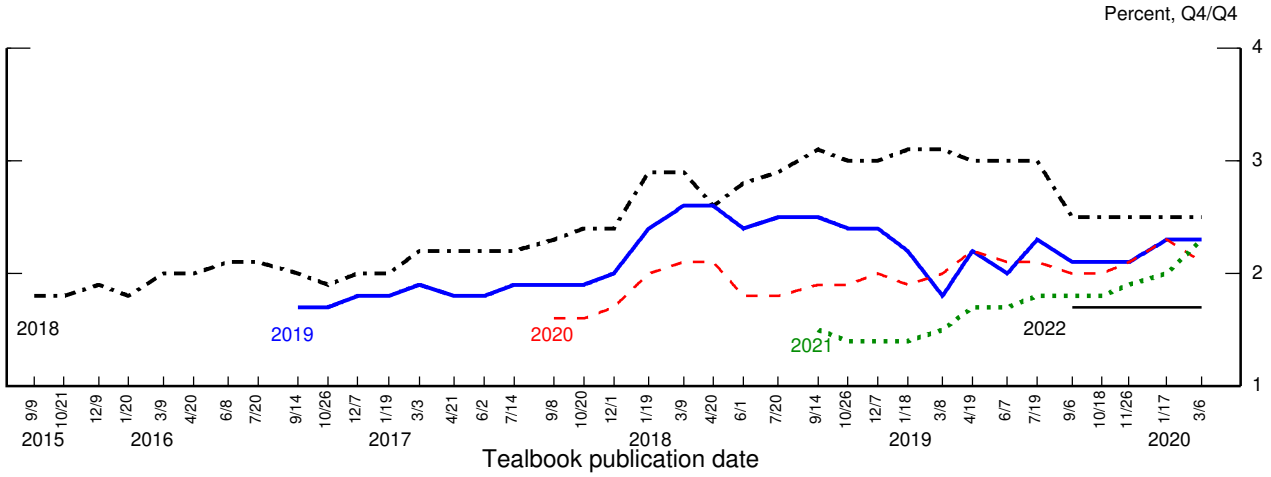
1. Percent, average for the final quarter of the period.



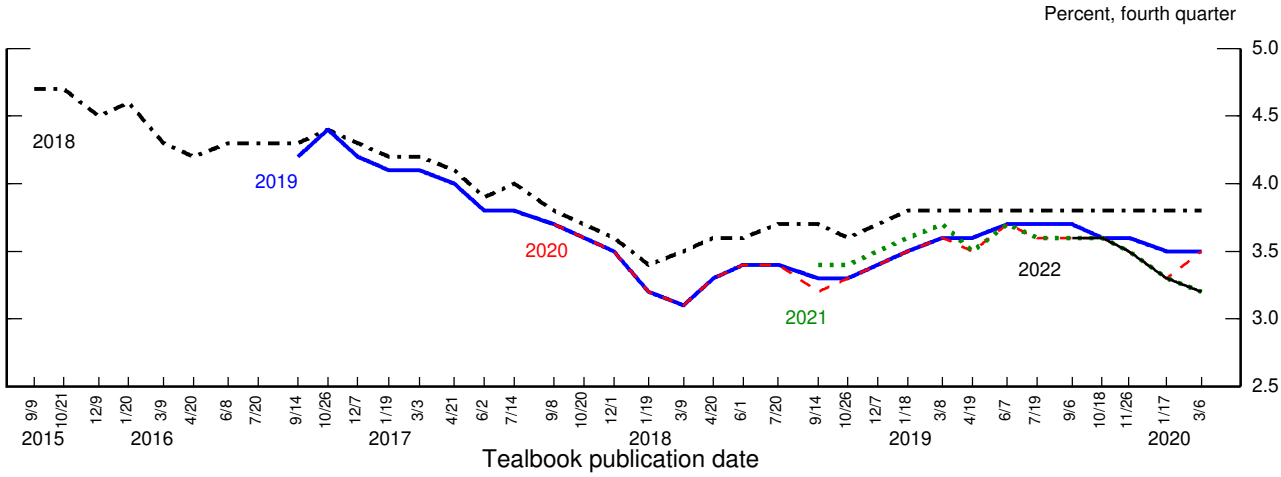
Note: In each panel, shading represents the projection period, and dashed lines are the previous Tealbook.

Evolution of the Staff Forecast

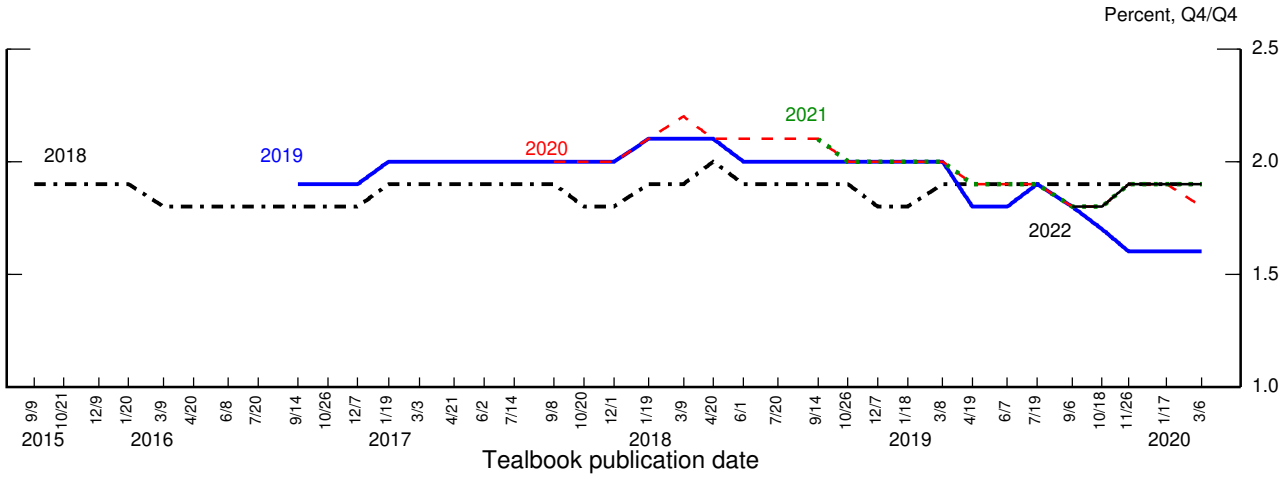
Change in Real GDP



Unemployment Rate



Change in PCE Prices excluding Food and Energy



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International Economic Developments and Outlook

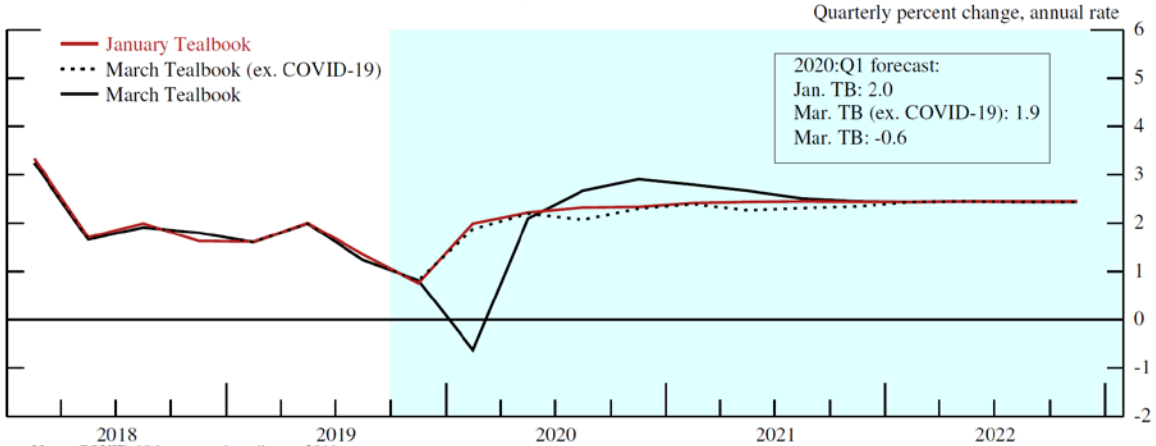
The global economy was already feeble before the COVID-19 outbreak . . .

Even before coronavirus disease 2019 (COVID-19) pulled the rug from under the global economy, foreign growth was extremely weak. Our aggregate of foreign GDP growth was only 0.8 percent in the fourth quarter, its worst reading since the Global Financial Crisis. We had anticipated a pickup in momentum going into this year as trade policy uncertainty lessened some and as temporary drags from tax hikes in Japan and unrest in some countries faded. The increasingly adverse economic effects of COVID-19 now rule out any near-term improvement and pose grave risks to the international outlook going forward.

. . . but the virus has thrown us a giant curveball

We slashed our forecast of growth abroad for the first quarter, pushing it into negative territory, based on the disruptions we have seen in China and throughout the world (see the figure). We valiantly assume these disruptions will unwind later in the year and economic activity will return to near the pre-COVID-19 path by the end of next year. But our conviction around this baseline is limited. We explore more dire ways this shock may play out in the Risks and Uncertainty section.

Total Foreign Growth Forecast



Note: COVID-19 is coronavirus disease 2019.
Source: Federal Reserve Board staff calculations.

Int'l Econ Devel & Outlook

COVID-19 will likely cause a massive hit to the Chinese economy in the first quarter

The virus affects the global economy through its direct effect on China and the global spillovers that follow from the China shock. China accounts for the vast majority of reported COVID-19 cases to date, and the response of the Chinese authorities has been aggressive. With large parts of the Chinese economy shut down and February PMIs having plunged to record lows, we have penciled in a contraction of 8 percent at an annual rate in the first quarter, more than 14 percentage points below our January Tealbook forecast, and the hit could well be larger.

In China, with the virus apparently close to peaking, we expect a V-shaped recovery

The Chinese authorities' aggressive response appears to have yielded some success in containing the spread of the virus in China, at least for now. In recent weeks, the number of new infections outside of Hubei province (where the virus originated) appears to have slowed to a trickle. Moreover, Chinese authorities have begun to shift their focus from containing the spread of the virus to getting China back to work. As such, we expect activity to ramp up steadily going forward, likely boosted by policy stimulus in the next few quarters. We thus expect a somewhat V-shaped recovery in China, with growth surging to well above its trend pace in the second and third quarters. Even so, we expect output at the end of 2020 to be somewhat lower than what we had before the outbreak of the virus.

Economic spillovers to the global economy from China's slowdown will likely be significant

The Chinese economy is the world's second-largest economy, so we expect the global spillovers of the shock to be large. First, lower Chinese demand will weigh heavily on foreign economies, especially those in emerging Asia, many of which export upward of 10 percent of GDP to China. Many economies also benefit from Chinese tourism, which has plummeted. Lower Chinese activity has depressed commodity prices, hurting commodity-exporting countries, especially those already struggling in Latin America. Lastly, the interruption in Chinese manufacturing is disrupting global supply chains. Taken together, these spillovers are expected to weigh most heavily on the Asia-Pacific region. Accordingly, these countries also share more of the V-shaped recovery we expect for China, with contractions in the first quarter followed by above-trend growth in the rest of the year.

As the virus spreads beyond China, we see a large and prolonged hit to foreign growth through sentiment effects and local production disruptions

Besides spillovers from China, the spread of the virus to the rest of the world—as evidenced by the late-February jump of confirmed cases in Korea, Iran, Italy, and Japan—augurs additional economic disruptions in major economies worldwide, many of which are especially vulnerable to such a shock after having slowed sharply in the second half of last year. This prospect has triggered large risk-off moves in global financial markets, which, if sustained, are likely to act as a further and potentially self-reinforcing drag on activity.

At this stage, we have no way of knowing how disruptive the spread of COVID-19 will be. In our baseline, we assume no major outbreaks on the scale of China, although additional outbreaks are likely to pop up around the world over the next several months. The effects of the virus will likely show up in the data toward the end of the first quarter in most foreign economies, which results in a significant drag in the first half of the year—pushing Japan and the euro area into a recession—followed by a gradual recovery.

Some policy easing is in the pipeline, and more is likely

Policy easing should provide some offset to the drag from the virus. In China, authorities have focused their firepower largely on targeted credit support to keep firms afloat during the lockdowns. We expect more macro stimulus as the Chinese economy moves past the initial phase of the crisis. Authorities in Hong Kong, Korea, and Singapore have announced sizable fiscal stimulus packages, while central banks in Indonesia, Malaysia, the Philippines, and Thailand cut their policy rates and the Bank of Korea is providing credit support to small firms. We also expect policy stimulus in the advanced foreign economies (AFEs). Indeed, the Bank of Canada (BOC) and the Reserve Bank of Australia cut their policy rates in early March, citing virus-related concerns, and we expect the Bank of England (BOE) and the European Central Bank (ECB) to follow suit. We assume most AFEs will introduce substantial fiscal stimulus measures beyond what has already been announced.

Risks are overwhelmingly, but not entirely, tilted to the downside

Given how little is known about how the virus might spread or how it will affect the global economy, the uncertainty around our baseline outlook is highly elevated. More dire scenarios are certainly possible, as featured in the Risks and Uncertainty section. One possibility (described in our "Moderate COVID-19 Outbreak" scenario) is that the lifting of quarantines and travel restrictions in China and in some other countries leads to a resurgence in infections, and global efforts to contain the virus require somewhat deeper and more prolonged disruptions to activity than we currently expect. We present a more harrowing alternative in our "Severe Global Pandemic" scenario in which there are a large number of casualties in the United States and abroad, uncertainty and fear depress spending, global manufacturing grinds to a prolonged halt, and the global financial system comes under strain, bringing about a sharper and more protracted global downturn.

Of course, given the profound uncertainties, the virus may also prove to be more easily containable or less disruptive than we anticipate, resulting in a more V-shaped overall recovery than in our baseline. We discuss this possibility in the "More-Favorable Resolution" alternative scenario. We are monitoring the situation closely and will adjust our thinking as developments unfold.

EMERGING MARKET ECONOMIES

- ***China.*** Measures to contain the spread of COVID-19 have been highly disruptive to the Chinese economy and are likely to remain so through this quarter. The city of Wuhan has been on lockdown since January 23, and similar measures have since been implemented in 15 other cities in Hubei province. The lockdowns presage a precipitous decline in domestic demand and have resulted in significant supply chain disruptions across the country, given Hubei's status as a hub for auto and tech manufacturing. Post–Lunar New Year factory reopenings were postponed to February 10 (from January 29) in more than 20 provinces and municipalities, compounding these disruptions. In the first reading on activity since the outbreak, the official Chinese manufacturing and services PMIs plunged to record lows in February. High-frequency indicators (for example, internal travel and coal consumption) suggest that even with approval to reopen, factories have been slow to

return to their pre-virus production levels, as regional travel restrictions make it difficult for workers to report back to their employers and for firms to source inputs.

We expect a roughly V-shaped outcome for GDP growth, with a sizable GDP contraction (of 8 percent at an annual rate) in the first quarter, followed by a 15 percent bounceback in the second as people return to work and manufacturing and retail sales retrace sharply. China's official case count shows new cases are down sharply and points to a decline in total active cases in the coming weeks, which would allow the authorities to roll back most public health measures by the end of the quarter. Even so, we expect the recovery from the virus to take time, with output at the end of the year still below what we had in the January Tealbook but returning almost to its pre-virus path by the end of the forecast period.

- ***Asia ex. China.*** The region looked poised for a robust start to 2020 were it not for COVID-19. Indicators for both manufacturing and services rebounded at the end of last year, with especially strong high-tech production, an improvement in new export orders, and rising consumer confidence. Together with diminishing drag from protests in Hong Kong, these gains caused GDP growth in the region to bounce from 0.3 percent in the third quarter to 3.5 percent in the fourth. January indicators were also relatively upbeat on the whole.

  With Chinese manufacturing and travel now severely curtailed, however, economies in the area have seen immediate breaks in their supply chains (notably, Korea) and plunging tourism from China (especially in Hong Kong and Thailand). Further, as the virus has spread across the region, countries have started to experience sharp declines in consumer confidence and in demand for services given the shutdowns in schools, markets, and restaurants (especially in Korea), further exacerbating the slowdown. The sparse data we have for February show a sharp decline in Korean trade with China, even as trade with other regions held up, and a fall in manufacturing PMIs across much of the region.

  Overall, we expect a significant contraction of 2 percent in GDP this quarter, nearly 5 percentage points below the growth rate projected in the January Tealbook. GDP growth jumps to 4.1 percent in the second quarter as trade with China begins to normalize and rises further in the second half as the direct effects of COVID-19 on these economies wanes. We expect growth to maintain an above-trend pace through

next year—in part reflecting some relocation of supply chains from China to other countries in the region—before settling at 3.5 percent (about potential) by 2022.

- ***Mexico.*** We expect Mexico to face headwinds from COVID-19 through weaker U.S. demand, supply disruptions, and a hit to business sentiment. As such, we have built in a moderate drag from the virus in the first and second quarters. Even before the latest threat to the economy from the virus, Mexico's economy was stagnating, with GDP contracting 0.5 percent in the fourth quarter, partly reflecting temporary factors such as the General Motors strike. Our anticipated pickup in the Mexican economy is now more sluggish due to the adverse effects of the virus, with growth of only 1.4 percent this year and 2 percent next year.

- ***Brazil.*** Barring a major outbreak in the country, the economic effects of COVID-19 will be felt mainly through tighter financial conditions and a fall in demand for commodities, which account for roughly half of Brazil's exports. This drag will further slow Brazil's already disappointing recovery. Real GDP growth slipped back a bit in the fourth quarter to 2 percent, held down by weak domestic demand. We see growth falling further, to 1.4 percent in the first half of this year, before picking up to 2.5 percent in the second half of the year.

ADVANCED FOREIGN ECONOMIES

- ***Euro Area.*** Given that its growth momentum was already quite weak, the euro area is projected to fall into a recession because of the adverse consequences of the COVID-19 outbreak. Real GDP growth slowed to a meager 0.2 percent last quarter, ¾ percentage point below our January Tealbook estimate. This quarter looks to be worse. The virus has spread widely through the euro area. In Italy, one of the hardest-hit countries, all schools and universities have been closed, some public gatherings have been canceled, and tourism, which accounts for 6 percent of the economy, is projected to take a serious blow. In the euro area, the virus is expected to weigh on activity through lower exports, supply chain disruptions, and negative sentiment and wealth effects. All told, we see euro-area GDP contracting by an average of 0.3 percent during the first half of the year.

  Against this backdrop, we expect the ECB to announce at its March 12 meeting the introduction of targeted liquidity measures aimed at small and medium-sized businesses, including a new round of targeted longer-term refinancing operations.

We also see the ECB signaling its readiness to provide further stimulus if needed. As such, with the euro area projected to fall into a recession and inflation and inflation expectations weakening, we assume that the ECB will cut its deposit rate 10 basis points to negative 0.6 percent in the second quarter and increase the amount of monthly net asset purchases from €20 billion to €30 billion.

We also expect the region's fiscal authorities to enact stimulus measures. The Italian government already announced a package amounting to 0.35 percent of Italian GDP, including tax credits for companies and additional spending resources for its health sector. Over time, we see additional euro-area fiscal stimulus, equivalent to 0.4 percent of the region's GDP. With the effects of the virus outbreak assumed to be contained by the third quarter, we expect the euro-area economy to start recovering during the second half of the year, with growth picking up to an above-trend pace of 2 percent next year.

COVID-19 is likely to deal yet another blow to euro-area inflation. We had been hoping that a pickup in growth and accommodative monetary policy would gradually lift inflation toward the ECB target. The recession and lower commodity prices will damp near-term inflation, and, even with more accommodative monetary policy, we now have inflation reaching only 1.4 percent in 2022, 0.2 percentage point lower than our January Tealbook forecast.

- ***Japan.*** A plunge in economic activity at the end of last year together with the adverse effects of the virus outbreak this quarter suggests that the Japanese economy may already be in a recession. Real GDP contracted 6.3 percent in the fourth quarter, well beyond our expectations, as a result of disruptions from severe typhoons and a pullback of domestic demand following a consumption tax hike in October. On top of that, the virus has hit Japan particularly hard and is projected to weigh on economic activity through lower tourism, disruptions in global supply chains, and weaker consumer sentiment. All told, we expect real GDP to fall further in the first quarter and to rebound only slowly thereafter. Of note, we assume the economy will not receive a boost from the July 2020 Tokyo Olympics, which we see as being delayed and possibly also scaled back.

  In response to the sharp economic slowdown, made worse by the COVID-19 outbreak, the Japanese government announced stimulus measures, amounting to about 0.2 percent of GDP. With the situation projected to worsen, we assume that

additional fiscal measures—equivalent to 0.4 percent of GDP—will be introduced over the course of this year. The Bank of Japan is assumed to continue to provide ample liquidity and to increase its pace of purchases of Japanese exchange-traded funds but is less likely to cut its policy rates given skepticism about benefits of further negative interest rates.

United Kingdom. Given the direct and indirect effects of COVID-19, we now expect that U.K. GDP, after growing only 0.1 percent in the fourth quarter, will continue to stagnate in the first half of this year. Even after the virus-related slump, growth picks up only modestly in the second half of the year as uncertainty related to its future relationship with the European Union continues to weigh on the economy. We assume that the BOE will not stand idle in the face of virus-related headwinds but will employ a number of its policy tools. In particular, we have built in a cut to the policy rate from 0.75 percent to 0.25 percent in March and assume some expansion in targeted lending and possibly a reduction in the countercyclical capital buffer for banks. We also expect the U.K. government to introduce spending measures (0.5 percent of GDP) to support the recovery; these measures would be in addition to an already assumed stimulus package of 0.5 percent of GDP pledged earlier by Conservatives.

- ***Canada.*** Momentum in the Canadian economy slowed further at the end of last year. Real GDP growth stepped down to 0.3 percent in the fourth quarter from 1.1 percent in the third, as a rail strike disrupted exports and business investment contracted sharply. With the virus expected to weigh on activity, growth should remain weak through the third quarter of 2020, partly resulting from the decline in oil prices. As the effects of the outbreak abate, GDP growth should rebound in the fourth quarter and remain above potential through mid-2021, supported by accommodative monetary and fiscal policies.

  On March 4, the BOC cut its policy rate 50 basis point to 1.25 percent, citing weaker-than-expected investment and exports in the fourth quarter and concerns about the economic effects of COVID-19. The dovish tone of the announcement led us to pencil in another rate cut for the second quarter. We also expect fiscal easing of about 0.2 percent of GDP in the second half of 2020 in light of COVID-19 effects.

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Comparing the Staff International Growth Outlook with Other Forecasts

The staff's projection for foreign GDP growth in 2020 is now well below that of outside forecasters. As shown in the first row of table 1, the staff projects a sharp decline in foreign growth in 2020 on a year-over-year basis, whereas both the International Monetary Fund (IMF) and Consensus Economics forecast a pickup this year.[1] This large difference is due to the fact that the IMF forecast was released in January, before the news of the coronavirus disease 2019 (COVID-19) outbreak, and that of Consensus Economics between mid-February and early March.[2]

Both the staff and outside forecasters, as shown in figure 1, have revised down their outlooks for foreign growth repeatedly since mid-2018. Panel A, which shows the evolution of foreign growth in 2019 on a year-over-year basis, reveals that the staff forecast (the teal line) has tracked that of Consensus Economics (the red line). The IMF forecast (the purple line), which is produced only four times a year, significantly lagged the other forecasts. Panel B, which shows the evolution of foreign growth for 2020, highlights the sharp markdown to the staff forecast in this Tealbook following the COVID-19 outbreak.

Table 1: Comparison of Foreign Real GDP Forecasts

	Year-over-year percent change						Q4/Q4 percent change	
	2019			2020			2019	2020
	FRB	IMF	Consensus	FRB	IMF	Consensus	FRB	FRB
1. Total foreign	1.6	1.6	1.6	1.2	2.0	1.7	1.4	1.9
2. Advanced foreign economies	1.4	1.3	1.3	.6	1.4	1.2	1.1	.9
3. Canada	1.6	1.5	1.7	1.1	1.8	1.6	1.5	1.2
4. Euro area	1.2	1.0	1.0	.3	1.1	.9	.9	.6
5. Japan	.8	1.0	1.0	-1.3	.7	.0	-.4	.3
6. United Kingdom	1.4	1.3	1.3	.4	1.4	1.1	1.1	.4
7. Emerging market economies	1.8	1.9	1.9	1.8	2.5	2.2	1.7	2.8
8. China	6.1	6.1	6.1	4.5	6.0	5.5	6.0	5.8
9. Emerging Asia ex. China	2.0	2.2	2.0	1.8	2.6	2.0	2.2	3.1
10. Mexico	-.1	.0	.1	.6	1.0	1.0	-.4	1.4
11. Brazil	1.1	1.2	1.1	1.9	2.2	2.1	1.7	2.0
Memo								
Emerging market economies ex. China	.9	1.0	1.0	1.3	1.8	1.5	.9	2.2

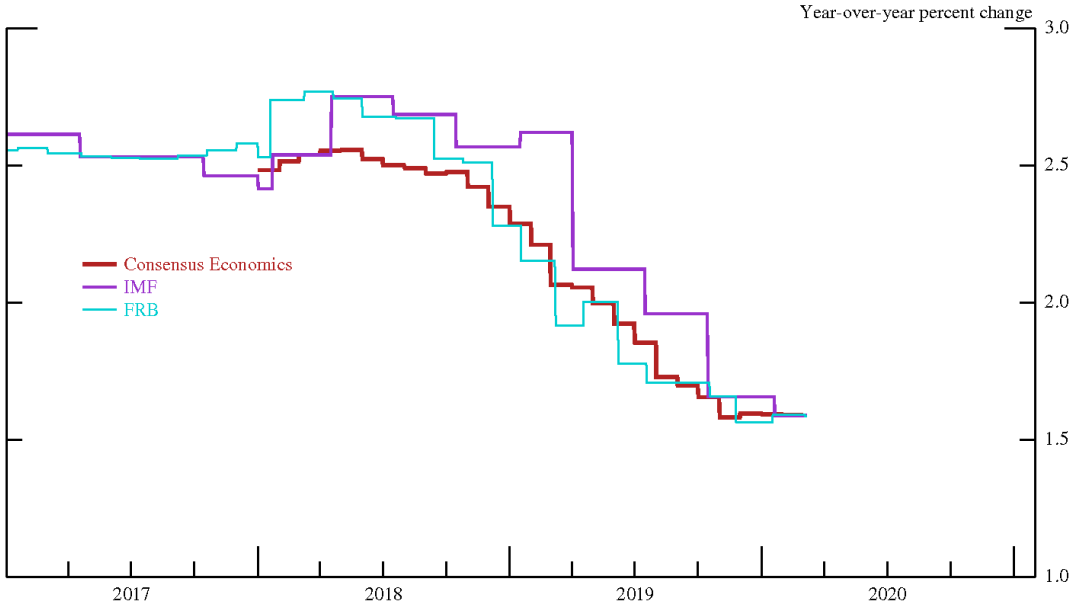
Note: Gross domestic product (GDP) aggregates are weighted by shares of U.S. nonagricultural exports. India is excluded from all year-over-year forecast aggregates, as Consensus Economics reports Indian growth on a fiscal year basis. Federal Reserve Board (FRB) forecasts are from the current Tealbook. International Monetary Fund (IMF) forecasts for all individual countries are from the January 2020 World Economic Outlook update; however, all regional aggregates (including the euro area) contain forecasts of smaller countries, which account for less than 20 percent of total foreign GDP, from the the October 2019 World Economic Outlook. Consensus Economics forecasts were published February 10 for advanced foreign economies, February 10 for Asian countries, February 20 for Latin American countries, and March 2 for some countries affected by coronavirus disease 2019, including China, Japan, and Brazil.
Source: FRB Tealbook forecasts; International Monetary Fund; Consensus Economics.

[1] On a Q4/Q4 basis, as shown in the last two columns of table 1, the staff outlook for foreign growth picks up in 2020, as the foreign economies are projected to have largely recovered from the COVID-19 shock by year-end.

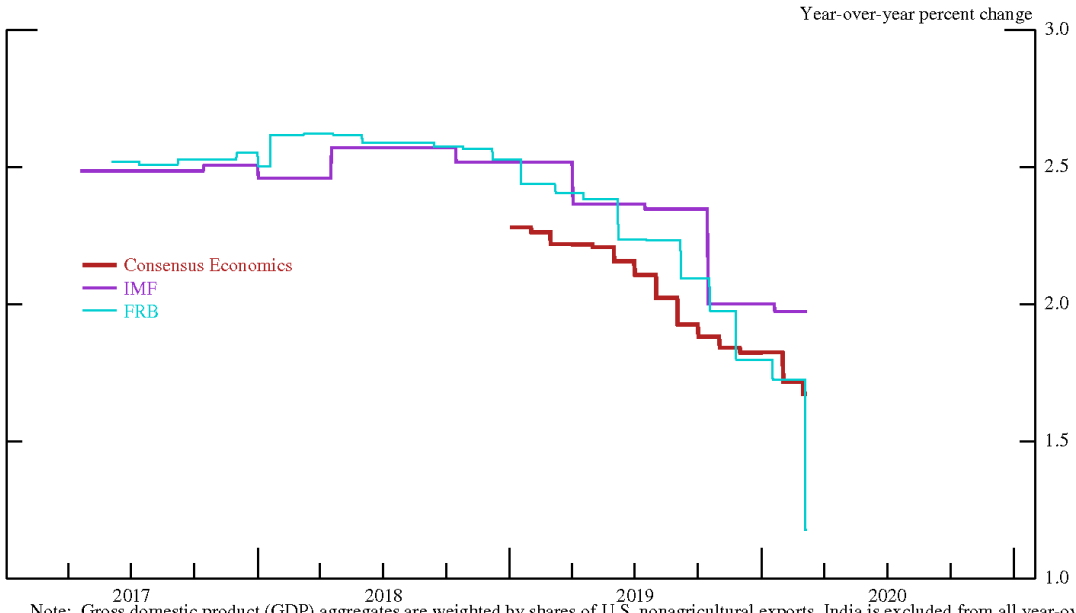
[2] On March 2, Consensus Economics released new preliminary forecasts for some countries, including China, and is scheduled to release updates for other advanced and Asian economies on March 12. On March 4, IMF Managing Director Kristalina Georgieva noted that "global growth in 2020 will drop below last year's level" because of the virus outbreak, but she provided no indication that the IMF would publish a new forecast before April as regularly scheduled; see Kristalina Georgieva (2020), "IMF Makes Available $50 Billion to Help Address Coronavirus," speech delivered at the Joint Press Conference with the World Bank Group, International Monetary Fund, Washington, March 4, https://www.imf.org/en/News/Articles/2020/03/04/sp030420-imf-makes-available-50-billion-to-help-address-coronavirus.

Figure 1: Evolution of Foreign Growth Forecasts

A. Forecasts of 2019 Real GDP



B. Forecasts of 2020 Real GDP



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 all individual countries are from the January 2020 World Economic Outlook update; however, all regional aggregates (including the euro area) contain forecasts of smaller countries, which account for less than 20 percent of GDP, from the October 2019 World Economic Outlook. Consensus Economics forecasts were published February 10 for advanced foreign economies, February 10 for Asian countries, February 20 for Latin American countries, and March 2 for some countries affected by coronavirus disease 2019, including China, Japan, and Brazil.

Source: FRB Tealbook forecasts; International Monetary Fund; Consensus Economics.

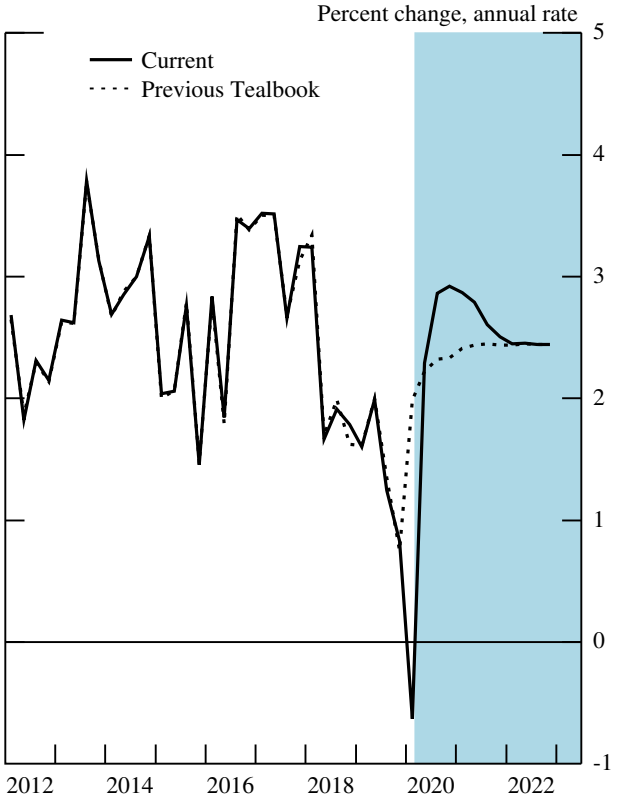
The Foreign GDP Outlook

Real GDP* Percent change, annual rate**

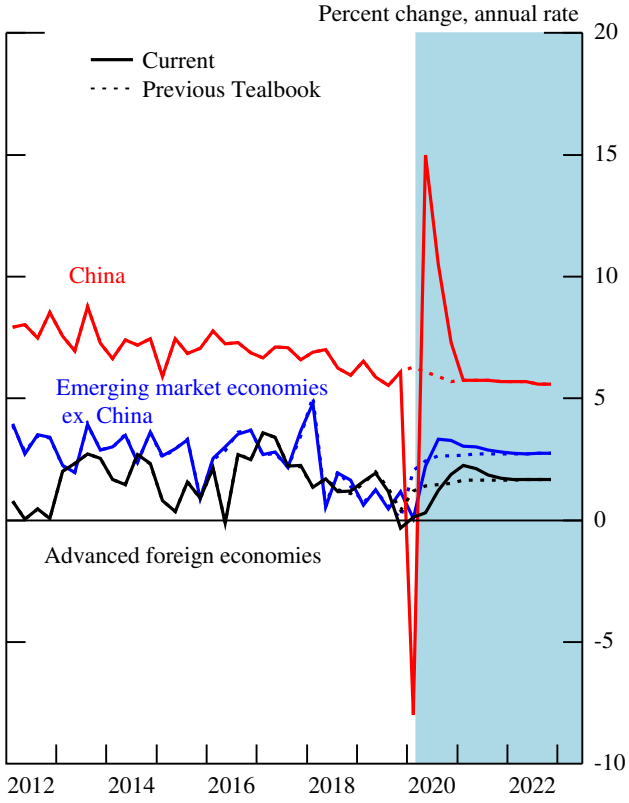
	2019			2020			2020	2021	2022
	H1	Q3	Q4	Q1	Q2	H2			
1. Total foreign	1.8	1.2	.8	-.6	2.3	2.9	1.9	2.7	2.4
Previous Tealbook	*1.8*	*1.4*	*.8*	*2.0*	*2.2*	*2.3*	*2.2*	*2.4*	*2.4*
2. Advanced foreign economies	1.8	1.2	-.3	.1	.3	1.6	.9	2.0	1.7
Previous Tealbook	*1.7*	*1.3*	*.4*	*1.2*	*1.4*	*1.5*	*1.4*	*1.6*	*1.7*
3. Canada	2.2	1.1	.3	.9	.8	1.6	1.2	2.1	1.8
4. Euro area	1.2	1.1	.2	-.2	-.4	1.5	.6	2.1	1.6
5. Japan	2.3	.5	-6.3	-2.4	.4	1.7	.3	1.2	.8
6. United Kingdom	1.1	2.0	.1	.4	-.2	.8	.4	1.5	1.5
7. Emerging market economies	1.8	1.3	2.0	-1.4	4.3	4.2	2.8	3.4	3.2
Previous Tealbook	*1.9*	*1.4*	*1.1*	*2.8*	*3.1*	*3.2*	*3.0*	*3.2*	*3.2*
8. China	6.2	5.5	6.1	-8.0	15.0	8.9	5.8	5.7	5.6
9. Emerging Asia ex. China	2.5	.3	3.5	-2.1	4.1	5.3	3.1	4.0	3.5
10. Mexico	-.5	-.3	-.5	1.1	.9	1.8	1.4	2.0	2.0
11. Brazil	1.0	2.5	2.0	1.0	1.9	2.5	2.0	2.8	2.8
Memo									
Emerging market economies ex. China	.9	.5	1.2	.1	2.2	3.3	2.2	2.9	2.7

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

Total Foreign GDP



Foreign GDP



The Foreign Inflation Outlook

Consumer Prices* Percent change, annual rate**

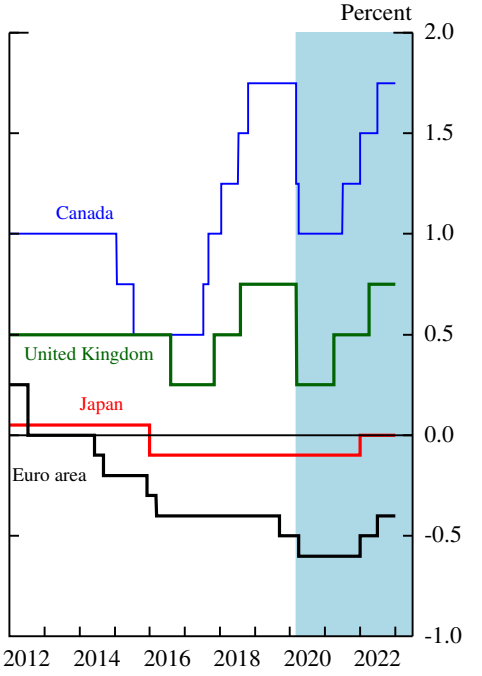
	2019			2020			2020	2021	2022
	H1	Q3	Q4	Q1	Q2	H2			
1. Total foreign	2.0	2.2	3.5	3.0	1.8	2.2	2.3	2.3	2.3
Previous Tealbook	*2.0*	*2.3*	*3.5*	*2.8*	*2.1*	*2.3*	*2.3*	*2.3*	*2.3*
2. Advanced foreign economies	1.4	.9	1.1	.9	.8	1.3	1.1	1.4	1.5
Previous Tealbook	*1.4*	*1.0*	*1.0*	*1.5*	*1.4*	*1.5*	*1.4*	*1.5*	*1.6*
3. Canada	2.5	1.6	1.7	1.4	1.8	2.0	1.8	2.0	2.0
4. Euro area	1.1	.7	1.1	.4	.2	1.2	.7	1.3	1.5
5. Japan	.4	.4	.8	.6	.4	.5	.5	.6	.8
6. United Kingdom	1.8	1.8	.3	2.2	1.2	1.8	1.7	1.9	1.8
7. Emerging market economies	2.4	3.1	5.2	4.5	2.5	2.8	3.2	2.8	2.8
Previous Tealbook	*2.4*	*3.2*	*5.2*	*3.7*	*2.5*	*2.8*	*3.0*	*2.8*	*2.8*
8. China	2.4	4.6	7.6	5.7	2.0	2.5	3.2	2.5	2.5
9. Emerging Asia ex. China	1.7	1.2	3.2	3.8	2.5	2.7	2.9	2.7	2.7
10. Mexico	2.8	2.8	3.4	3.2	3.1	3.2	3.2	3.2	3.2
11. Brazil	4.1	2.2	3.2	5.5	3.8	3.8	4.2	3.7	3.5
Memo									
Emerging market economies ex. China	2.4	2.1	3.4	3.6	2.9	3.0	3.1	3.0	2.9

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

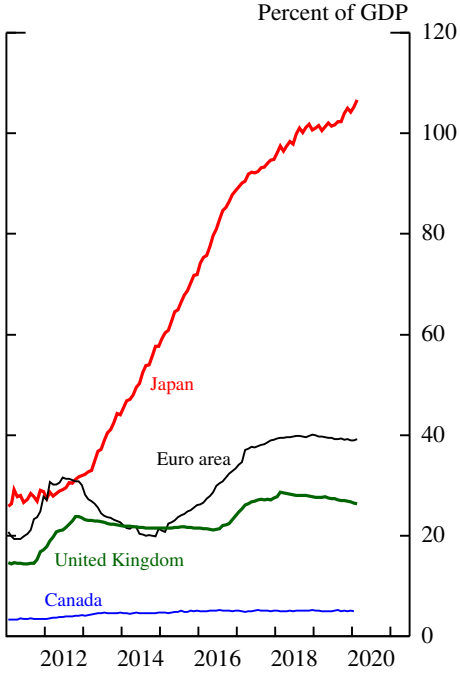
Int'l Econ Devel & Outlook

Foreign Monetary Policy

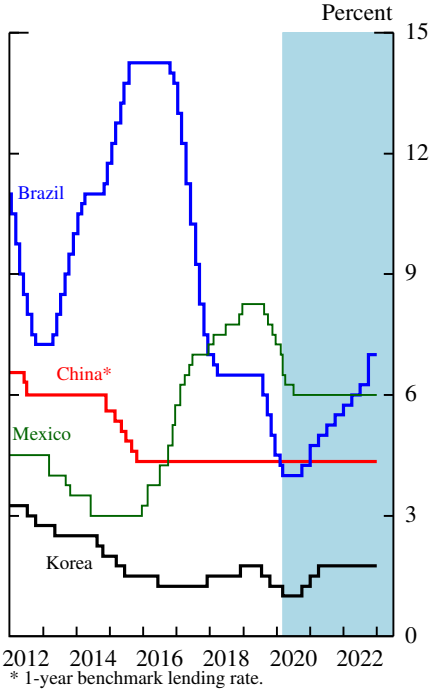
AFE Policy Rates



AFE Central Bank Balance Sheets



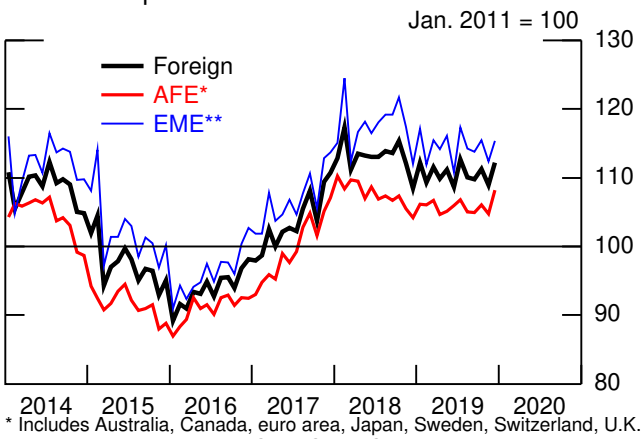
EME Policy Rates



* 1-year benchmark lending rate.

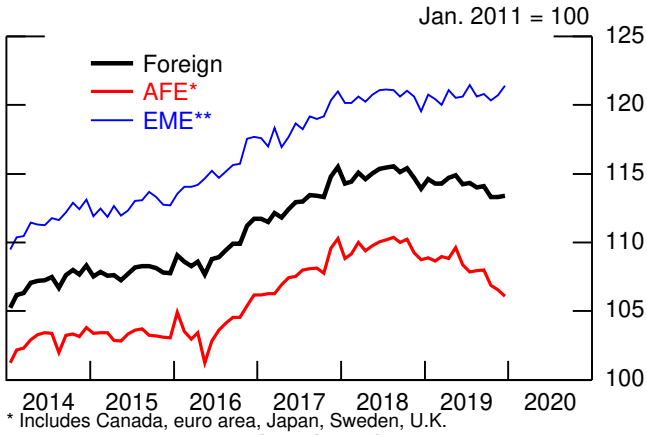
Recent Foreign Indicators

Nominal Exports



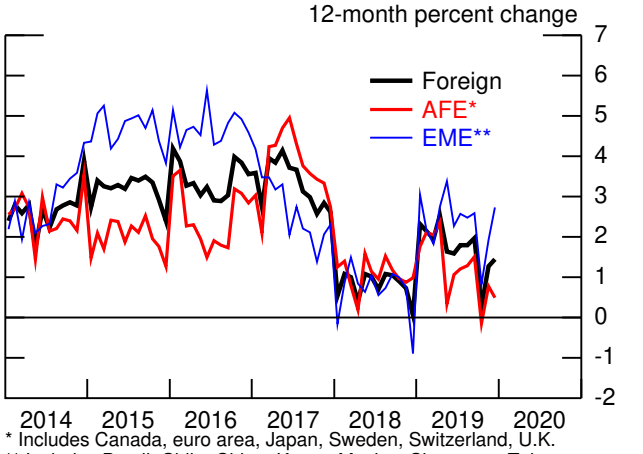
* Includes Australia, Canada, euro area, Japan, Sweden, Switzerland, U.K.
** Includes Argentina, Brazil, Chile, China, Colombia, Hong Kong, India, Indonesia, Israel, Korea, Malaysia, Mexico, Singapore, Taiwan, Thailand.

Industrial Production



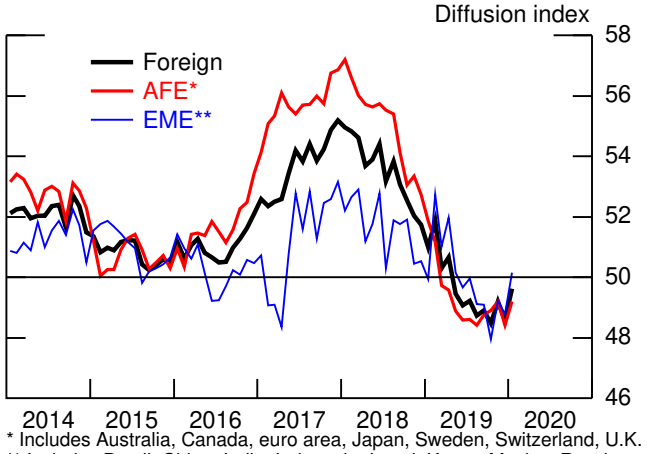
* Includes Canada, euro area, Japan, Sweden, U.K.
** Includes Argentina, Brazil, Chile, China, Colombia, India, Indonesia, Israel, Korea, Malaysia, Mexico, Philippines, Russia, Singapore, Taiwan, Thailand.

Retail Sales



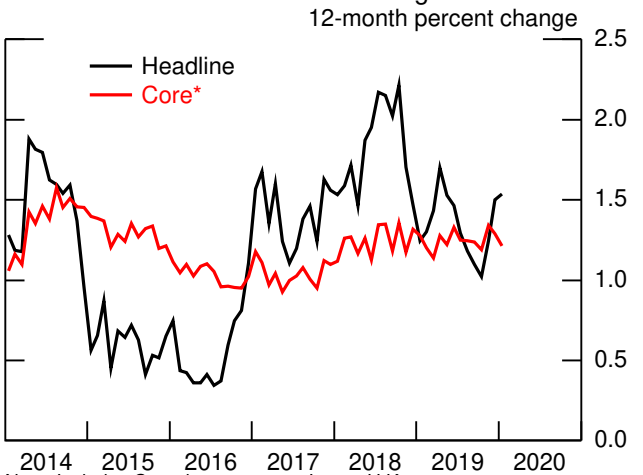
* Includes Canada, euro area, Japan, Sweden, Switzerland, U.K.
** Includes Brazil, Chile, China, Korea, Mexico, Singapore, Taiwan.

Manufacturing PMI



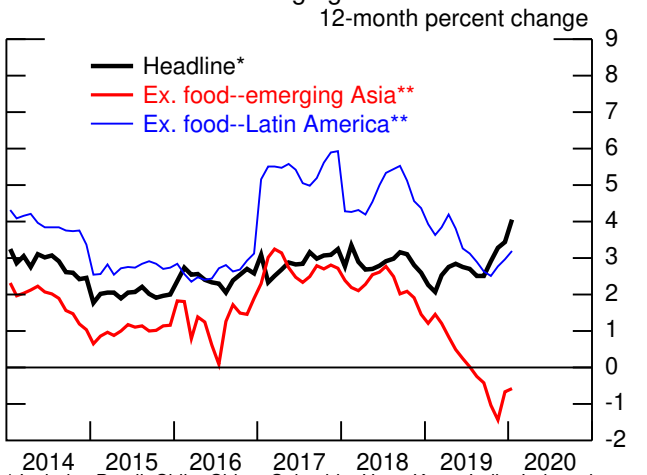
* Includes Australia, Canada, euro area, Japan, Sweden, Switzerland, U.K.
** Includes Brazil, China, India, Indonesia, Israel, Korea, Mexico, Russia, Singapore, Taiwan, Turkey.

Consumer Prices: Advanced Foreign Economies



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

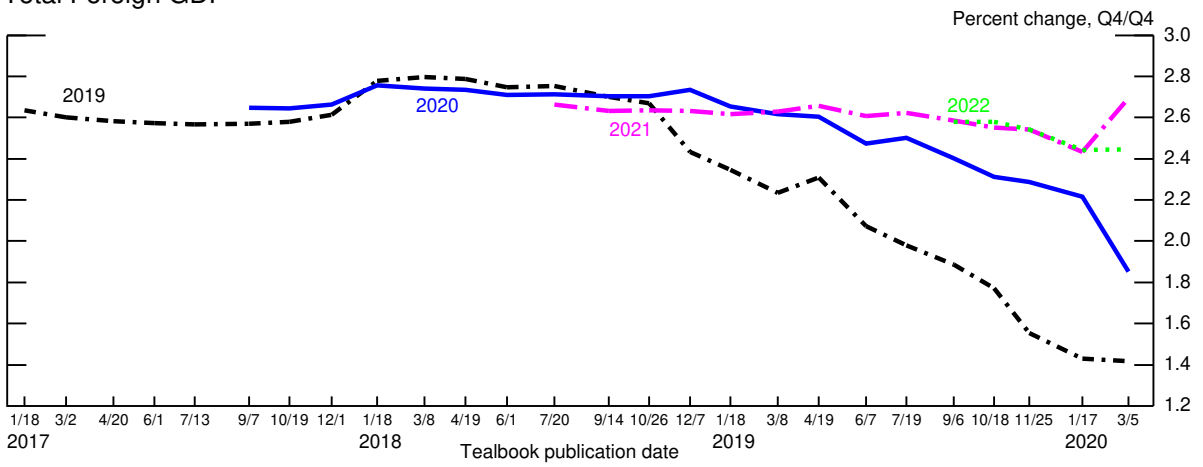
Consumer Prices: Emerging Market Economies



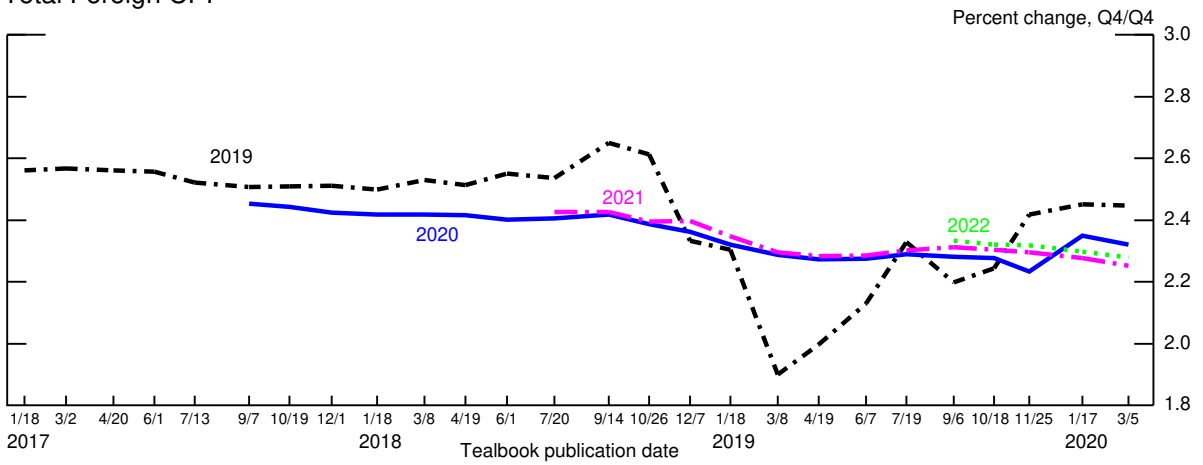
* Includes Brazil, Chile, China, Colombia, Hong Kong, India, Indonesia, Korea, Malaysia, Mexico, Philippines, Singapore, Taiwan, Thailand.
** Excludes all food; staff calculation. Latin America excludes Argentina and Venezuela.

Evolution of Staff's International Forecast

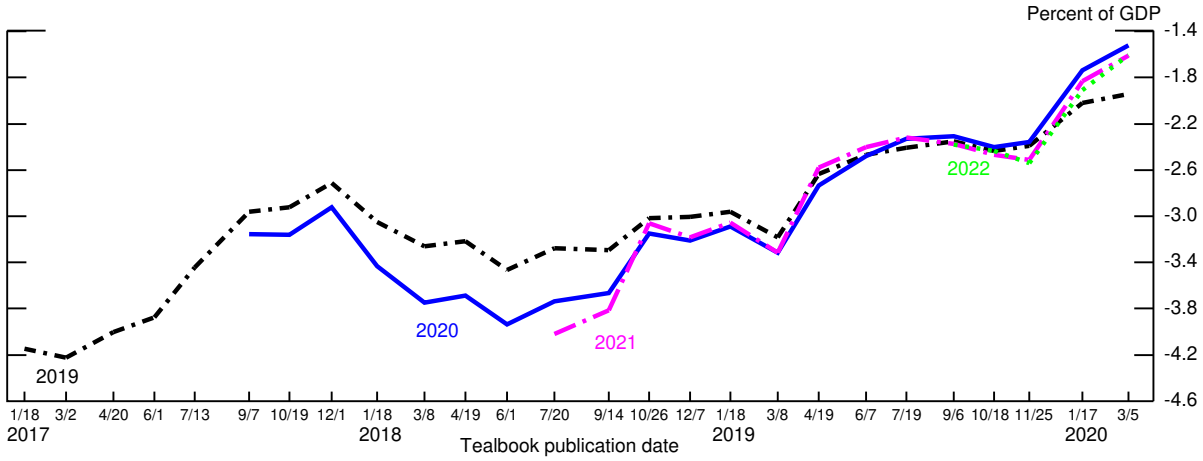
Total Foreign GDP



Total Foreign CPI



U.S. Current Account Balance



Int'l Econ Devel & Outlook

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Financial Market Developments

Financial markets were relatively calm early in the intermeeting period. However, beginning around February 20, spiraling concerns regarding the effects of the COVID-19 outbreak on global economic activity dominated financial market developments at home and abroad. Equity prices, sovereign yields, and the market-implied expected trajectory of the federal funds rate all plummeted and the volatility of asset prices soared. In response to the evolving risks for the economic outlook, on March 3 the FOMC announced a 50 basis point reduction in the target range for the federal funds rate. Since then, the market-implied expected path for the federal funds rate and Treasury yields across the maturity spectrum fell further, on net, with longer-term yields reaching all-time record low levels. Equity prices rose briefly following the March 3 FOMC announcement, but those gains were soon reversed. The net percentage declines in broad stock price indexes over the intermeeting period as well as the net declines in medium- and long-term Treasury yields were all among the largest on record for 26-day periods (the number of trading days since the January FOMC meeting) since 1971.[1]

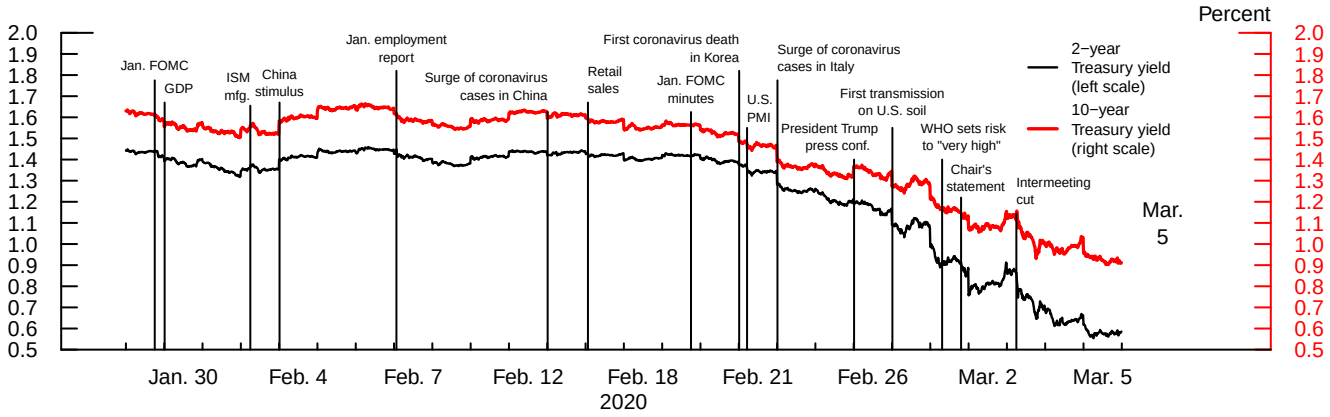
Trading in secondary markets—including those for Treasury securities and equity index futures—continued to function reasonably well despite the surge in volatility and a significant contemporaneous reduction in some measures of market liquidity. In addition, short-term funding markets showed few signs of stress, although some short-term spreads have widened. Moreover, primary issuance of both corporate bonds and leveraged loans contracted sharply, with no issuance on some days.

- A straight read of the options-implied probability distribution for the federal funds rate following the upcoming FOMC meeting suggests that the probabilities of an additional 25 basis point or 50 basis point reduction in the target range at the meeting are about 30 percent and 45 percent, respectively. About a 5 percent probability is attached to no change in the range, and a 20 percent probability is attached to reductions of more than 50 basis points.

[1] This document describes financial market developments through March 5. On the morning of March 6, the Employment Situation report was released. Although the report indicated stronger labor market performance than market participants had expected in February, little reaction was evident in market prices immediately following the release, likely because the surveys were conducted in the middle of the month, before the escalation of concerns about the coronavirus.

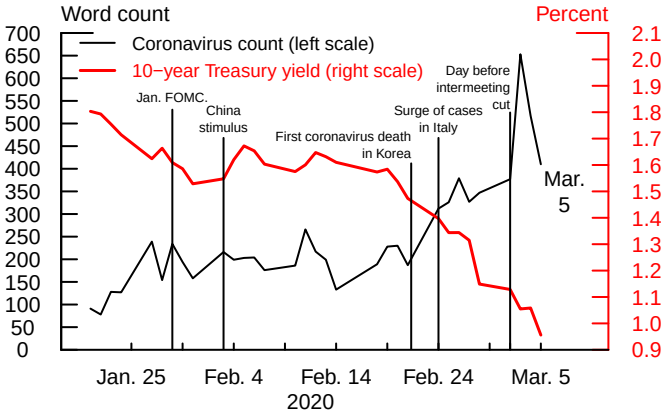
Policy Expectations and Treasury Yields

Intraday Treasury Yields



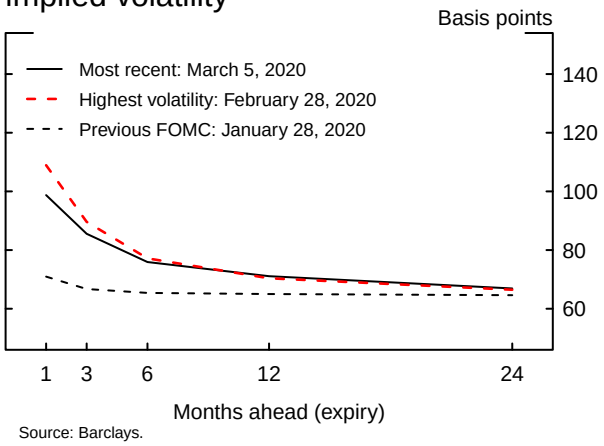
Note: Data are spaced at 5−minute intervals from 8:00 a.m. to 4:00 p.m.
Source: Bloomberg.

Coronavirus Media Count versus Yields



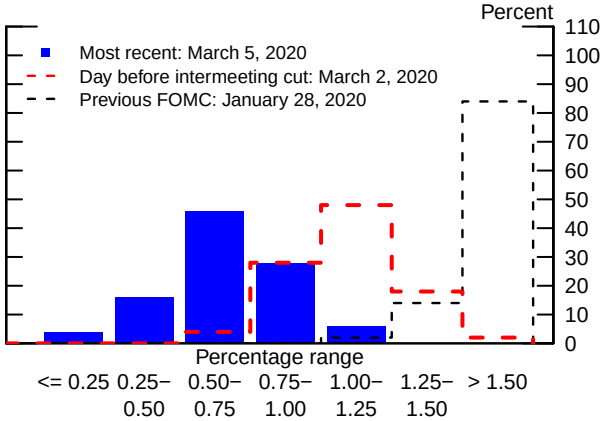
Note: Coronavirus media count shows the daily number of coronavirus−related words in Associated Press, Reuters, *Wall Street Journal, Financial Times, Washington Post,* and *New York Times.*
Source: Dow Jones Factiva Database; Board staff calculations.

Term structure of 10−year swaption−implied volatility



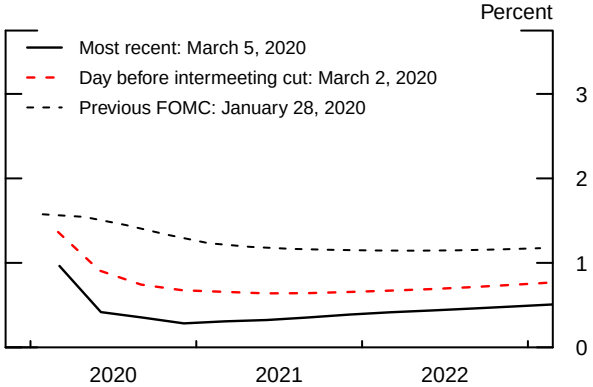
Source: Barclays.

Market−Implied Probability Distribution of the Federal Funds Rate after March FOMC



Note: Estimated from federal funds futures options; not adjusted for risk premiums.
Source: CME Group; Board staff calculations.

Implied Federal Funds Rate



Note: Zero term premium path is estimated using overnight index swap quotes with a spline approach and a term premium of 0 basis points.

Financial Markets

- OIS quotes, unadjusted for term premiums, now imply about 80 basis points of additional reduction in the federal funds rate by the end of 2020 to a level around 30 basis points.

- Broad stock price indexes dropped 8 percent, on net, over the intermeeting period. The VIX index shot up, reaching nearly 50 percent at one point before ending the period at around 40 percent. Spreads on 10-year investment- and speculative-grade corporate bonds widened substantially by 34 basis points and 72 basis points, respectively.

- On net, 2-, 10-, and 30-year nominal Treasury yields plunged 85 basis points, 71 basis points, and 51 basis points, respectively, with the 10- and 30-year yields reaching all-time record low levels.

- Inflation compensation at the 5-year and 5-to-10-year horizons also fell steeply by 41 basis points and 19 basis points, respectively, to 1.13 percent and 1.50 percent.

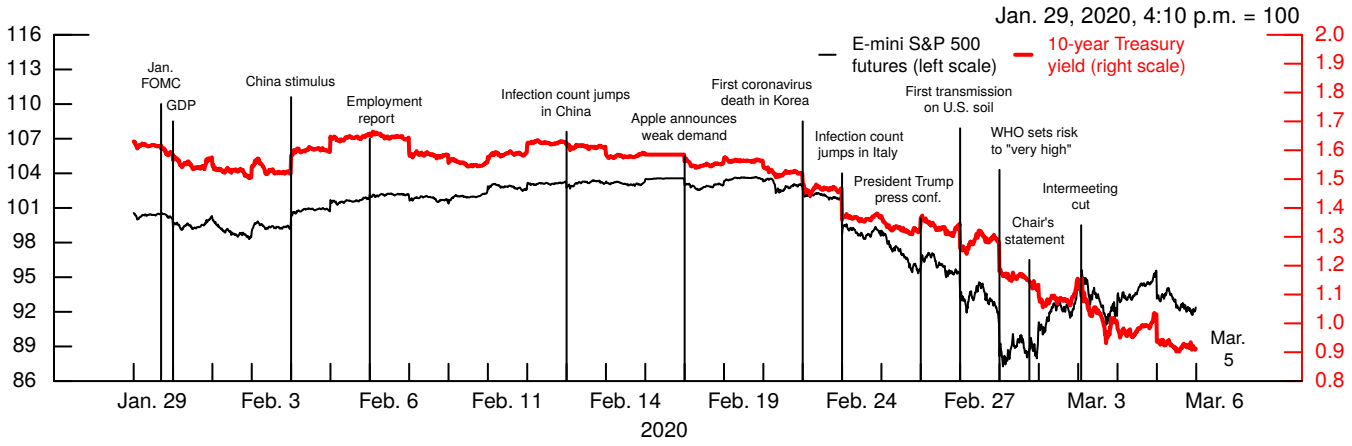
- On balance, foreign equity indexes fell sharply and long-term AFE sovereign yields declined notably. The broad dollar index increased modestly, as the boost from safe-haven demands outweighed the effects of lower U.S. interest rates.

DOMESTIC DEVELOPMENTS

Escalating concerns about the effects of COVID-19 on global economic growth and the actual and anticipated monetary policy responses to the outbreak drove declines in Treasury yields since mid-February, while macroeconomic data releases over the intermeeting period had only minor effects. Early in the intermeeting period, nominal Treasury yields decreased moderately, but those declines were retraced as the spread of the virus appeared to slow and as Chinese authorities announced stimulus measures to offset the economic effect of the virus. However, beginning around February 20 evidence started to mount that the outbreak was spreading globally, prompting yields to fall sharply amid increased safe-haven demands for Treasury securities and declines in expectations for the path of short-term interest rates. Since the unscheduled FOMC announcement on March 3, Treasury yields across the maturity spectrum continued to fall as concerns about the virus intensified further.

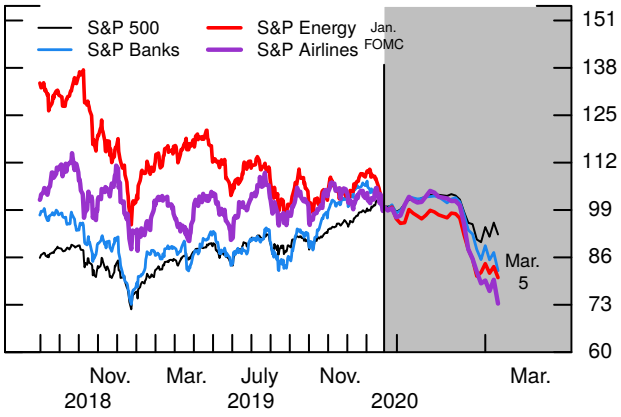
Corporate Asset Market Developments

Intraday S&P 500 Futures and 10-Year Treasury Yield



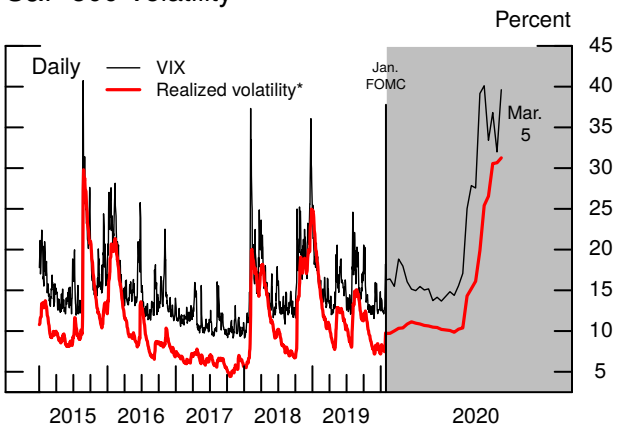
Note: Data are spaced at 5-minute intervals from 9:30 a.m. to 4:10 p.m.
Source: Bloomberg.

Selected S&P 500 Stock Price Indexes



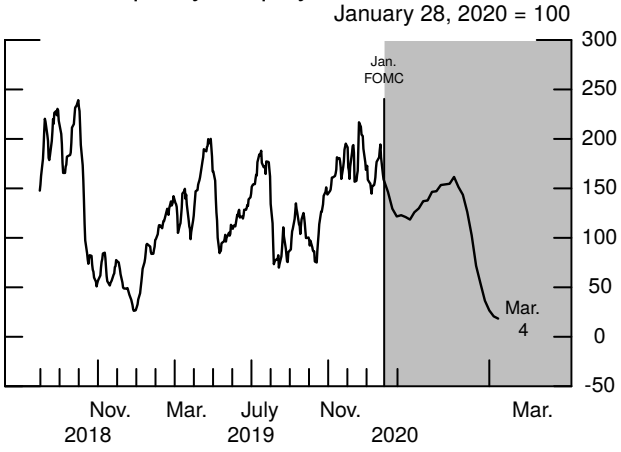
Note: The shaded gray area represents an expanded window focusing on the period following the previous FOMC meeting.
Source: Bloomberg.

S&P 500 Volatility



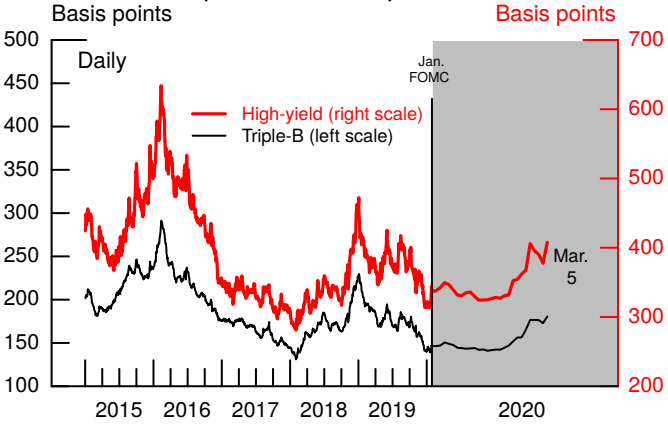
* 5-minute returns used in exponentially weighted moving average with 75 percent of weight distributed over the most recent 20 days.
Note: The shaded gray area represents an expanded window focusing on the period following the previous FOMC meeting.
Source: Bloomberg.

Market Liquidity - Equity Index Futures



Note: The shaded gray area represents an expanded window focusing on the period following the previous FOMC meeting. Average Depth: (Avg bid size + avg ask size) / 2
Source: Tickhistory, Series: ES

10-Year Corporate Bond Spreads



Note: The shaded gray area represents an expanded window focusing on the period following the previous FOMC meeting. Spreads over 10-year Treasury yield.
Source: Merrill Lynch; Federal Reserve Bank of New York; Board staff calculations.

Financial Markets

On net, 2-, 10-, and 30-year Treasury yields plummeted 85 basis points, 71 basis points, and 51 basis points, respectively. The 10- and 30-year yields ended the period at 0.95 percent and 1.67 percent, respectively, both of which were all-time end-of-day lows. A staff term structure model suggests that about two-thirds of the decline in the 10-year yield reflected lower expected short-term interest rates and the remainder reflected lower term premiums. Measures of inflation compensation declined by less than nominal rates, with 5-year and 5-to-10-year TIPS-based measures of inflation compensation falling about 41 basis points and 19 basis points, respectively. Staff models attribute the majority of the declines in inflation compensation to lower expected inflation, with lower risk premiums playing a smaller role. Both 5-year and 5-to-10-year measures of inflation compensation reached 1.13 percent and 1.50 percent, respectively, their lowest levels since 2016.

Derivative markets for fixed-income securities reflected a ramping-up of uncertainty regarding future interest rates over the intermeeting period. The one-month-ahead swaption-implied volatility of the 10-year interest rate increased 28 basis points, on net, and at one point during the period reached its highest level since the "taper tantrum" episode of 2013. Volatilities implied by longer-dated options increased by less; for example, the 12-month-ahead implied volatility of the 10-year rate ended the period only a few basis points higher.

Amid the increased volatility in Treasury markets over the intermeeting period, liquidity deteriorated markedly, with lower market depth and bid-ask spreads wider than values seen during the worsening of trade tensions in August and September of last year. However, Treasury markets reportedly continued to function reasonably well, with participants' ability to execute trades remaining largely unhindered and transaction volumes rising to higher-than-usual levels.

Regarding policy expectations before the March 3 FOMC announcement, market-based measures for the path of the federal funds rate had fallen sharply over the intermeeting period. The probability of a reduction in the target range for the federal funds rate at or before the March 17–18 meeting, as implied by options quotes, had approached 100 percent before the March 3 announcement, with the probability increasing sharply over the week beginning February 24. On the eve of the announcement, a straight read of OIS quotes suggested about 100 basis points of policy

easing through the end of 2020, implying a level for the federal funds rate of about 65 basis points by the end of 2020.

After the March 3 announcement by the FOMC, market-implied measures of the path of the federal funds rate fell further. As of yesterday's market close, a straight read of quotes in options markets suggests that the probabilities of an additional 25 basis point or 50 basis point reduction in the target range at the March FOMC meeting are 30 percent and 45 percent, respectively, with smaller odds attached to larger reductions and to no change. OIS quotes—not adjusted for term premiums—suggest an additional 80 basis points of easing (on top of the 50 basis points already delivered) through the end of 2020, consistent with a level of 30 basis points for the federal funds rate by the end of this year.

Model-based measures of policy expectations that adjust OIS quotes for risk premiums currently provide a wide range of signals about the expected trajectory of the federal funds rate. However, the models are in agreement that the lion's share of the declines in OIS quotes over the intermeeting period—both before and after the March 3 announcement—reflect that expectations for the path of the federal funds rate fell steeply, with less of a role being played by lower risk premiums.

In equity markets, broad stock price indexes rose somewhat early in the intermeeting period, posting new historical highs on February 19. Subsequently, escalating concerns regarding the effects on global economic activity of the COVID-19 outbreak caused a massive decline in broad stock price indexes. The S&P 500 index plunged 11½ percent during the last week of February—the largest weekly decline since 2008. The FOMC announcement on the morning of March 3 elicited a positive response, but share prices reversed course and fell substantially over the remainder of that day. On net, broad stock price indexes dropped 8 percent over the intermeeting period. Although the intermeeting declines were broad based across sectors, airlines, energy, and banks were among the worst performers, ending the period down 27 percent, 19½ percent, and 18 percent, respectively. One-month option-implied volatility on the S&P 500 index (the VIX) soared, briefly reaching about 50 percent before ending the period around 40 percent, a level still close to the 98th percentile of its historical distribution since 1990.

Liquidity for the e-mini S&P 500 futures contract deteriorated coincident with the increase in the VIX index in the latter portion of the period.[2] However, market participants as well as contacts at the Commodity Futures Trading Commission described the market as functioning reasonably well.

Corporate bond spreads over comparable-maturity Treasury yields widened significantly, on balance, although yields on corporate bonds remained at or set new historical lows. On net, investment- and speculative-grade 10-year bond spreads widened by 34 basis points and 72 basis points, respectively. These increases in bond spreads were above the top 5th percentile of their historical distributions since 1997. Nonetheless, the level of bond spreads were near their median historical level. Spreads on speculative-grade energy bonds widened especially sharply amid plunging oil prices. Liquidity in the secondary market for corporate bonds appeared to hold up well, and bond trading volumes were solid. However, the rate of primary issuance of corporate debt fell substantially. (For more details, see the Financing Conditions for Businesses and Households section.)

FOREIGN DEVELOPMENTS

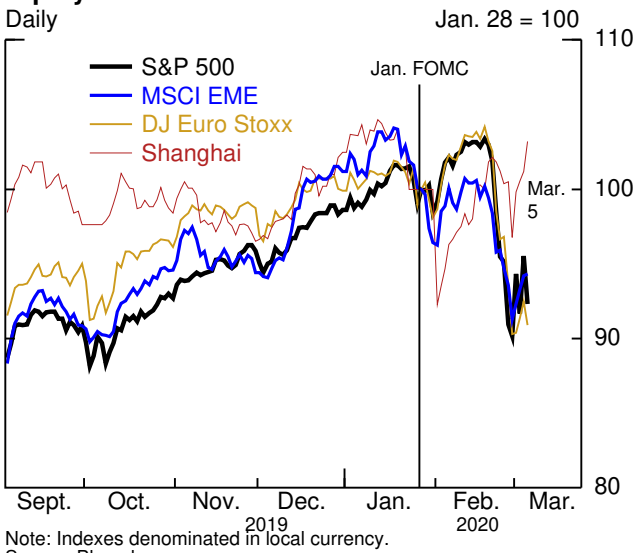
Over the intermeeting period, global asset prices have also been volatile and mostly driven by COVID-19 developments. While investors reacted positively to Chinese policy responses to the outbreak, growth in the number of reported cases outside of China weighed heavily on investor sentiment. On balance, most foreign equity indexes and long-term sovereign yields moved notably lower, while safe-haven demand drove the exchange value of the dollar modestly higher, largely against EME currencies.

Global equity indexes took a nosedive as it became clearer that the COVID-19 was going to have a larger and more widespread effect. Since the January FOMC meeting, major global equity indexes are down as much as 11 percent, and measures of realized and implied equity volatility increased sharply and remain elevated relative to historical norms. In contrast, the Shanghai Composite index increased moderately amid aggressive policy action by Chinese authorities and, reportedly, direct intervention in

[2] We focus on the evolution of market liquidity in the e-mini S&P 500 futures contract because this is one of two "price discovery" instruments in equity markets (the other being the S&P 500 SPDR exchange-traded fund) whose price incorporates relevant information first and therefore leads that of the related instruments.

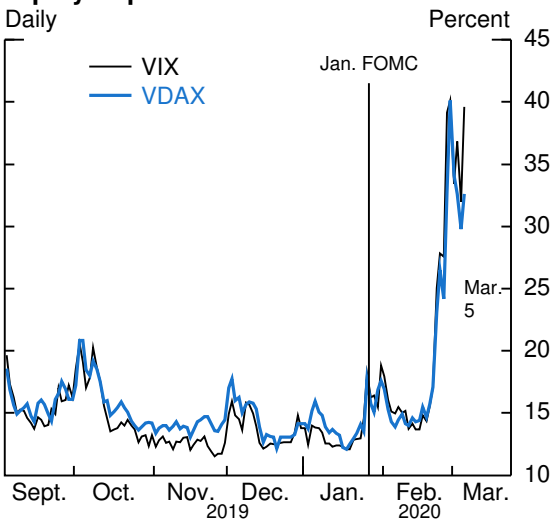
Foreign Developments

Equity Indexes



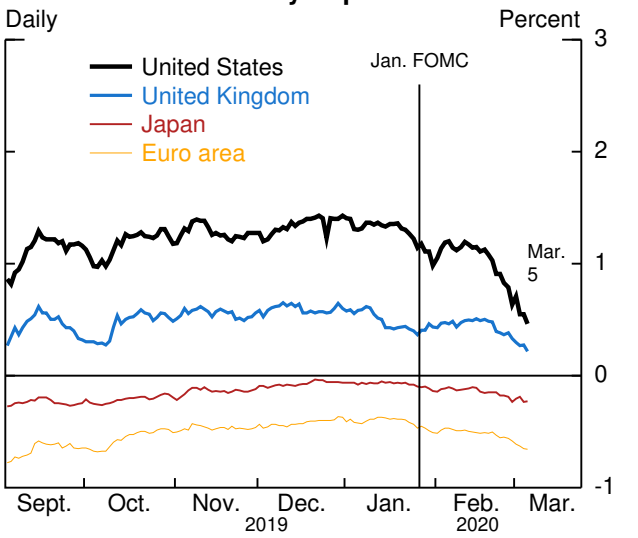
Note: Indexes denominated in local currency.
Source: Bloomberg.

Equity-Implied Volatilities



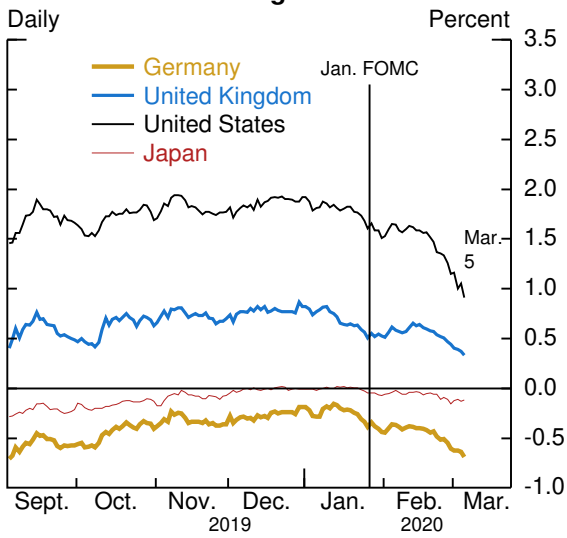
Source: Bloomberg.

24-Month-Ahead Policy Expectations



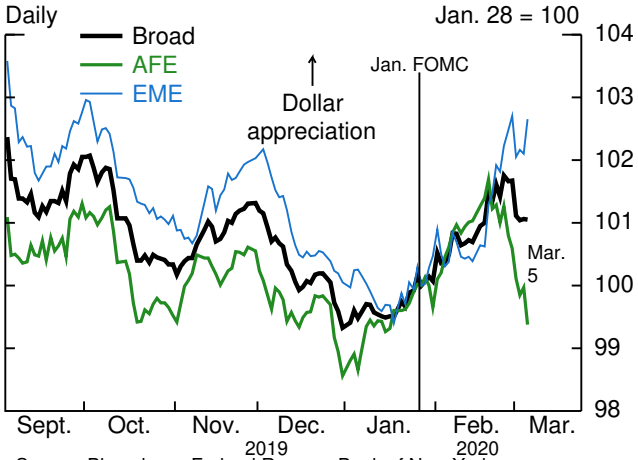
Source: Bloomberg.

10-Year AFE Sovereign Yields



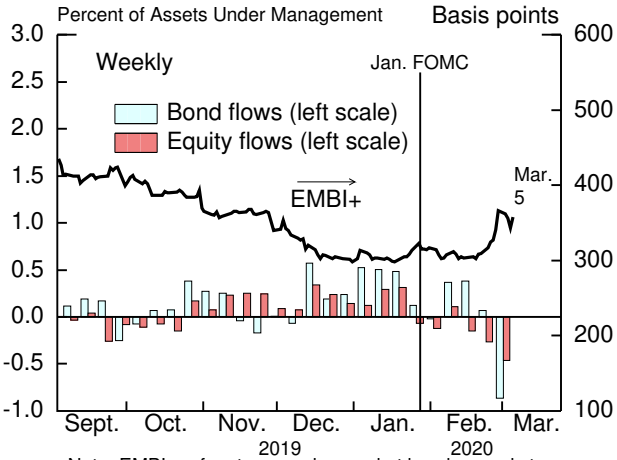
Source: Bloomberg.

Exchange Rates



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

EME Spreads and Fund Flows*



Note: EMBI+ refers to emerging market bond spreads to Treasury securities.
* Average weekly flow by month.
Source: Emerging Portfolio Fund Research, JP Morgan EMBI+. Excludes intra-China flows.

equity markets. Broad measures of emerging market sovereign credit spreads widened notably, and dedicated EME funds experienced substantial outflows late in the period.

Increasing concerns over the economic effect of COVID-19 spurred policy action by some foreign central banks and boosted expectations for further action more widely. The Bank of Canada lowered its overnight lending rate by 50 basis points, its first cut since 2015, and market pricing suggests at least one more cut this year. Central banks in Australia, Indonesia, Malaysia, the Philippines, and Thailand also cut their policy rates. In some countries including China, Korea, and Japan, central banks took additional policy actions such as credit support to small firms or repo operations. Market-based policy expectations for the near term declined in the euro area and Japan; however, the moves were relatively modest given the perceived limited scope for further rate cuts. Additionally, finance ministers and central bankers from the G-7 issued a joint statement indicating their willingness to use policy tools to tackle the economic effect of COVID-19.

Declining policy expectations and flight-to-safety demand pushed major long-term AFE sovereign yields notably lower. German 10-year yields decreased 35 basis points, with about half of the decline driven by term premiums, according to staff models. In the euro area, 5-to-10-year-ahead inflation compensation declined 18 basis points to a record low of 1.09 percent. Staff models attribute most of the decline in inflation compensation to the expectations component. Peripheral euro-area sovereign yields over German equivalent yields rose moderately.

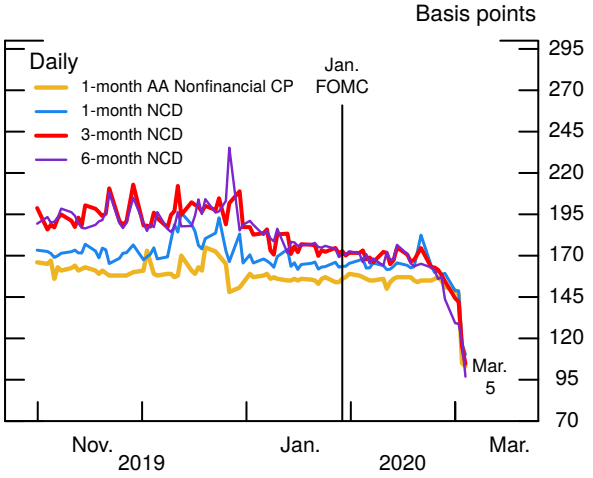
The broad dollar index increased modestly, on net, despite the precipitous drop in U.S. yields, as flight-to-safety demand supported the dollar against most currencies. Flight-to-safety demand also supported the Japanese yen and the Swiss franc, and each appreciated about 2.8 percent. The Chinese renminbi initially depreciated against the dollar but retraced somewhat following the policy actions of Chinese authorities. Other EM currencies depreciated sharply, notably the Brazilian *real* and Mexican peso, as market participants likely view them as vulnerable to a global slowdown and declining commodity prices.

SHORT-TERM FUNDING MARKETS AND FEDERAL RESERVE OPERATIONS

Escalating concerns over the COVID-19 outbreak did not appear to have substantially affected broad dollar funding markets, although some limited effects have

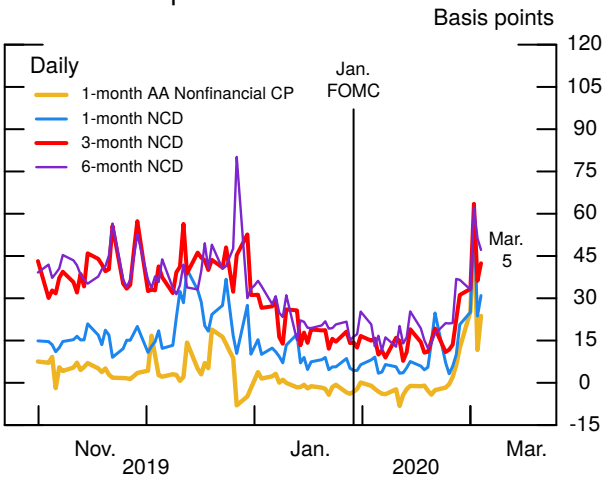
Short-Term Funding Markets

Unsecured Rates



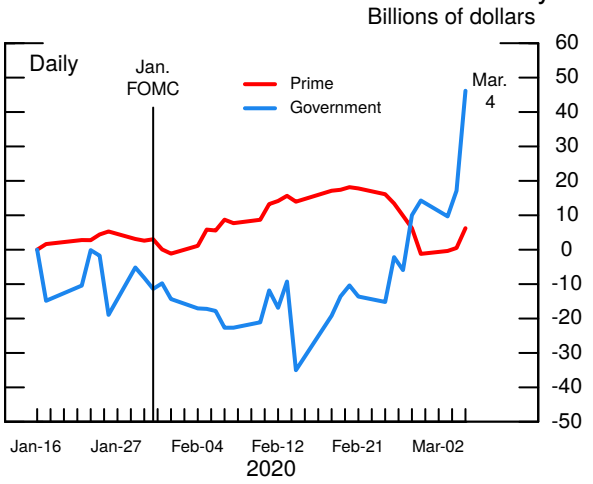
Note: CP is commercial paper; NCD is negotiable certificate of deposit.
Source: Depository Trust & Clearing Corporation.

Unsecured Spreads



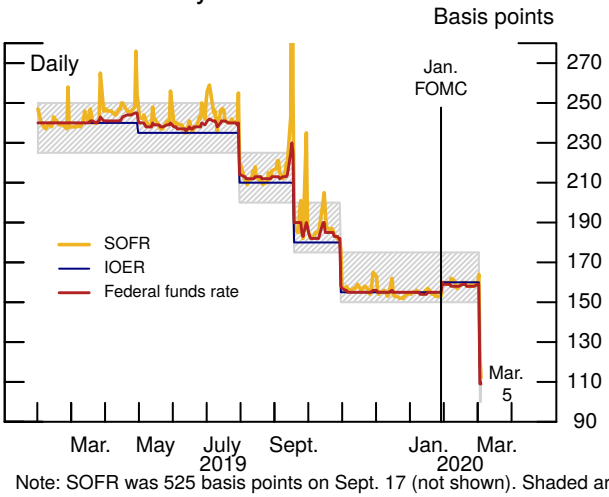
Note: CP is commercial paper; NCD is negotiable certificate of deposit. All spreads are to OIS of the same tenor.
Source: Depository Trust & Clearing Corporation.

MMF Cumulative Flows Since Mid-January 2020



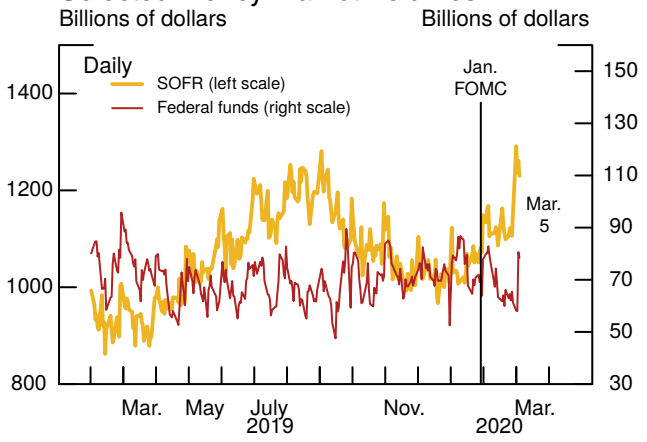
Note: MMF is money market fund.
Source: iMoneyNet

Selected Money Market Rates



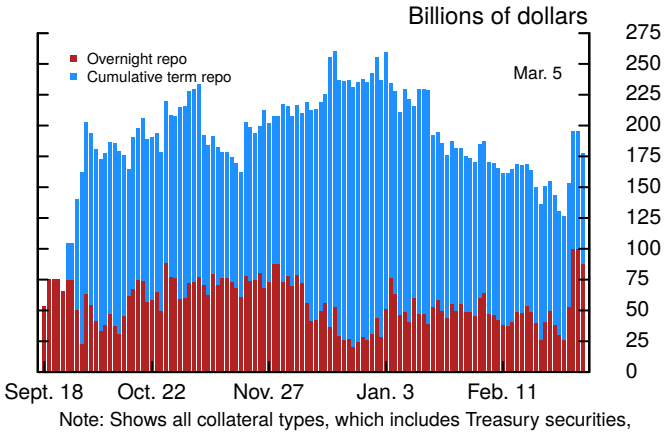
Note: SOFR was 525 basis points on Sept. 17 (not shown). Shaded area is the target range for the federal funds rate. IOER is interest on excess reserves; SOFR is Secured Overnight Financing Rate.
Source: Federal Reserve Bank of New York; Federal Reserve Board.

Selected Money Market Volumes



Note: SOFR is Secured Overnight Financing Rate.
Source: Federal Reserve Bank of New York; Federal Reserve Board.

Fed Overnight and Term Repo Operations



Note: Shows all collateral types, which includes Treasury securities, agency MBS, and agency debt. Repo is repurchase agreement.
Source: Federal Reserve Bank of New York public release.

Financial Markets

emerged. In the commercial paper market, outstanding levels and maturities were stable, including for issuers with lower ratings and for Chinese, Japanese, and European issuers. Rates on unsecured commercial paper and negotiable certificates of deposit with maturities exceeding one month declined substantially, but not as fast as the expected path of the federal funds rate, so spreads to OIS rates for these instruments widened. Spreads for issuers in the energy and transportation sectors widened more substantially, likely reflecting coronavirus effects on these industries. In late February, prime money market funds (MMFs) had moderate outflows while government MMFs attracted inflows, likely reflecting some shift to safety by investors. Outflows from prime funds abated in early March.

Overnight secured and unsecured interest rates moved in line with the 5 basis point technical adjustment to interest on excess reserves (IOER) at the January FOMC meeting, as well as the 50 basis point decrease in the target range for the federal funds rate announced by the FOMC on March 3.[3] The effective federal funds rate printed 1 or 2 basis points below the IOER rate on most days. The secured overnight financing rate averaged 1 basis point below IOER for most of the intermeeting period but firmed briefly at the beginning of March.

The Desk continued to conduct both temporary and permanent open market operations aimed at maintaining ample reserves and addressing money market pressures that could adversely affect policy implementation. Demand for repo operations increased at the beginning of March as elevated private repo rates made the Federal Reserve's repo operations more attractive; as a result, term and overnight repo operations were both oversubscribed on two days. As of March 5, the total amount of repo operations outstanding was $177 billion, and cumulative reserve management purchases of Treasury bills were $293 billion.

[3] At its January meeting, the FOMC increased both the IOER and overnight reverse repurchase (ON RRP) rates by 5 basis points, to 1.60 percent and 1.50 percent, respectively. On March 3, the FOMC lowered the target range for the federal funds rate to 1 to 1¼ percent and reduced the IOER and ON RRP rates by 50 basis points to 1.10 percent and 1.00 percent, respectively.

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Financing Conditions for Businesses and Households

Business financing conditions were strained in late February as market volatility weighed on bond, leveraged loan, and IPO issuance. However, historically low yields on investment-grade corporate bonds eventually facilitated a robust resumption of issuance in early March, though reportedly only for firms in industries less likely to be affected by the coronavirus outbreak. Financing conditions for households appeared to be supported by a drop in mortgage rates and remained broadly accommodative, with the caveat that we have fewer real-time indicators for the consumer credit market.

- Before the escalation of coronavirus concerns, all indicators pointed to robust issuance and accommodative supply conditions in the business finance market.

- Since the increase in market volatility, yields on investment-grade corporate bonds declined further, for a total drop over the intermeeting period of more than 30 basis points, as the large declines in Treasury yields were only partly offset by wider spreads. Yields on speculative-grade bonds were about unchanged over the period.

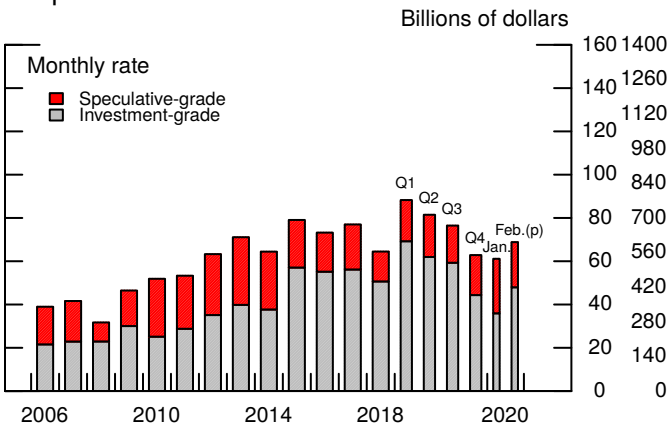
- The volatility also resulted in a near standstill in corporate bond issuance for six business days. The investment-grade market reopened on March 3 for some industries. Leveraged loan issuance was muted, with only intermittent offerings. Several firms reportedly put their IPO plans on hold. However, the volatility seemingly left only a minor imprint on CMBS issuance.

- Nevertheless, financing conditions for households appeared to remain accommodative. Mortgage rates decreased further to historical lows, and mortgage activity has reportedly surged in response. Consumer ABS issuance stayed solid throughout the intermeeting period.

- Financial conditions indexes for business financing pointed to a moderate tightening, on net, since February 24 and remained around the accommodative levels observed a year ago.

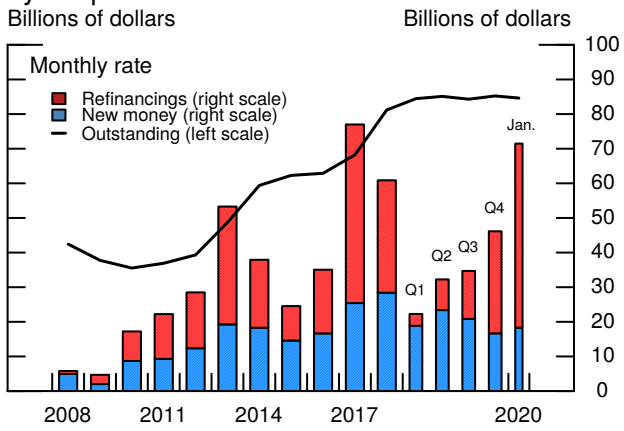
Business Finance

Gross Issuance of Nonfinancial Corporate Bonds



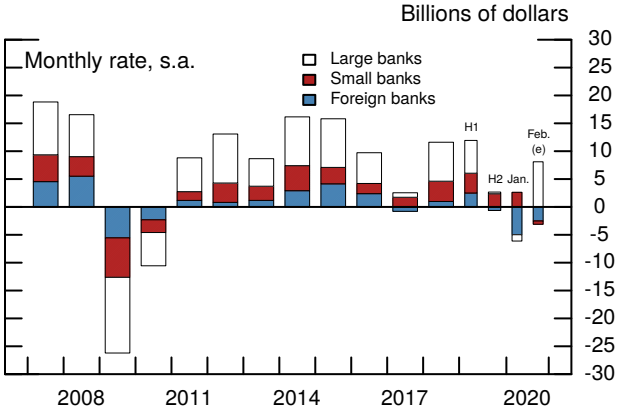
Note: Bonds are categorized by Moody's, Standard & Poor's, and Fitch.
p Preliminary.
Source: Mergent Fixed Income Securities Database.

Institutional Leveraged Loan Issuance, by Purpose



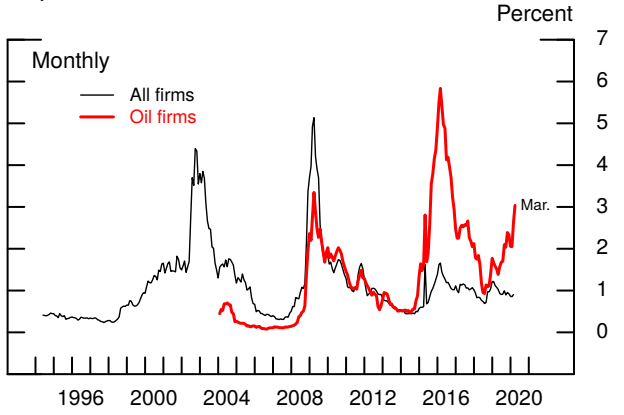
Source: Thomson Reuters LPC LoanConnector.

Commercial and Industrial Loans



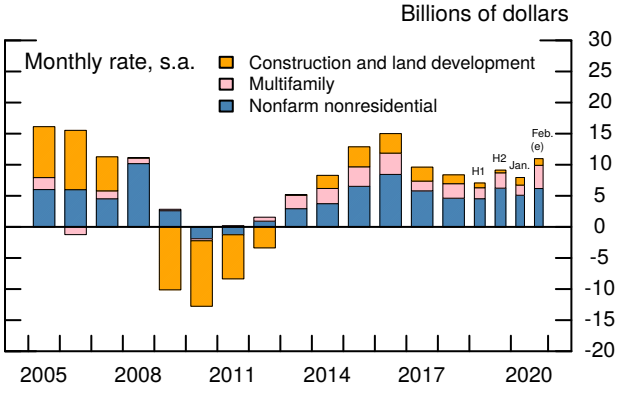
e Estimated.
Source: Federal Reserve Board staff calculations; Federal Reserve Board, Form FR 2644, Weekly Report of Selected Assets and Liabilities of Domestically Chartered Commercial Banks and U.S. Branches and Agencies of Foreign Banks.

Expected Nonfinancial Year-Ahead Defaults



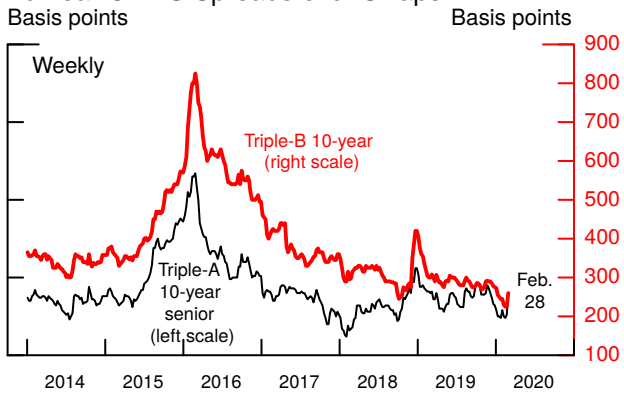
Note: Firm-level estimates of default weighted by firm liabilities as a percent of total liabilities, excluding defaulted firms.
Source: Calculated using firm-level data from Moody's KMV.

Commercial Real Estate Loans



e Estimated.
Source: Federal Reserve Board staff calculations; 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.

10-Year CMBS Spreads over Swaps



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

Financing Conditions

BUSINESS FINANCING CONDITIONS

Nonfinancial Businesses

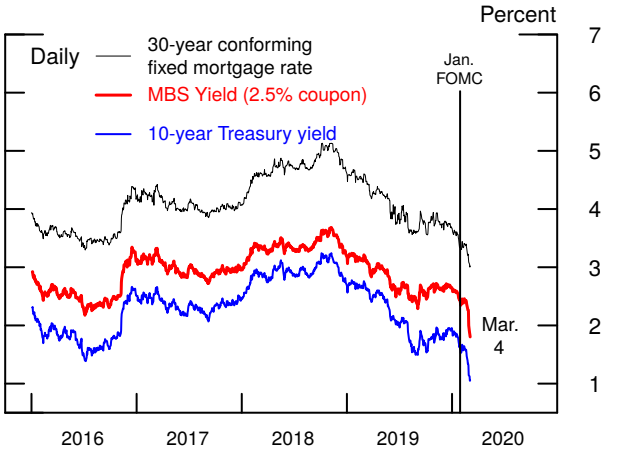
Corporate bond issuance came to a near standstill following the escalation of coronavirus concerns on February 24. Issuers appeared reluctant to come to market in the midst of elevated volatility even as yields for investment-grade bonds declined from already historically low levels. Investment-grade bond issuance resumed on March 3, reportedly for industries less likely to be affected by coronavirus disruptions, with many deals oversubscribed and a robust pipeline of deals in the works for that week. However, speculative-grade issuers remained on the sidelines. Leveraged loan issuance has also been intermittent since around February 24, with only occasional deals coming to market, and secondary-market bid prices for leveraged loans decreased. Some firms reportedly postponed plans to go public, but the pipeline of firms with expected equity IPOs in 2020 appeared to remain solid.

Earlier in the first quarter, rock-bottom corporate bond yields facilitated robust corporate bond issuance, particularly among speculative-grade bonds. Institutional leveraged loan issuance was strong before the escalation of coronavirus concerns, driven by refinancing activity. Most issuance concentrated on single-B or lower-rated loans, in line with the sharp narrowing of spreads for these loans. C&I loan balance growth was modest, consistent with the slowing growth observed in late 2019. This sluggish growth likely reflected the continued weakening in borrower demand reported by banks in the January SLOOS. Gross equity issuance through both IPOs and seasoned offerings was robust.

Credit quality indicators for nonfinancial corporations have remained solid, in general, so far in the first quarter. The volume of nonfinancial corporate bond rating upgrades was close to the volume of downgrades. However, the KMV year-ahead expected default rate ticked up in March to levels slightly above the median of its historical distribution, reflecting higher expected default rates among speculative-grade firms as well as energy firms. The outlook for earnings per share for S&P 500 firms—already tepid before coronavirus concerns—is likely to be revised down in the near future, as an increasing number of firms have announced reductions in their revenue and profit targets for this quarter as a result of coronavirus concerns.

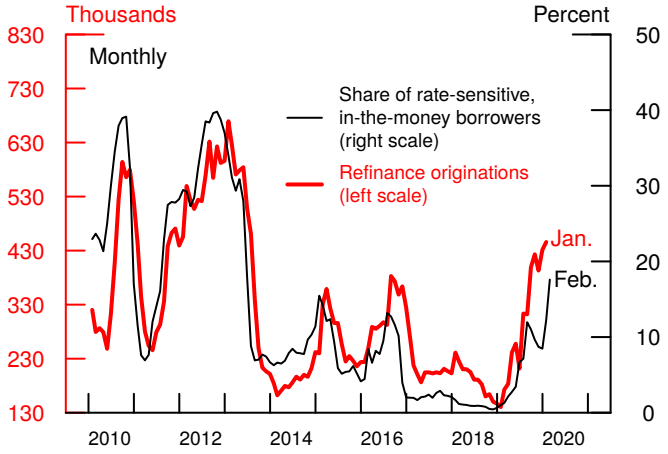
Household Finance

Mortgage Rate and MBS Yield



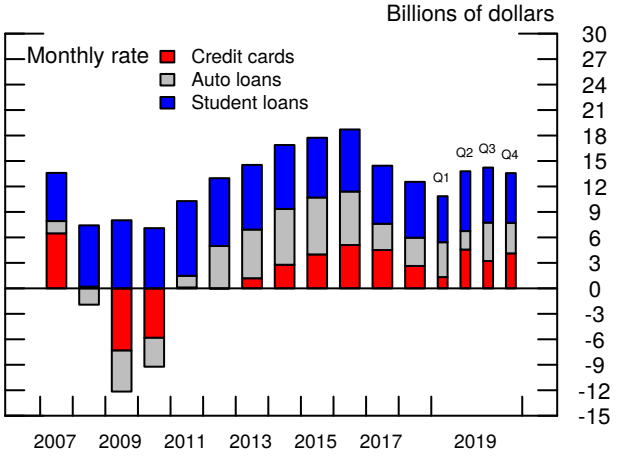
Note: The mortgage-backed securities (MBS) yield is from Fannie Mae through May 31, 2019, and from uniform MBS thereafter.
Source: For mortgage rate, Optimal Blue; for MBS yield, Barclays.

Share of Rate-Sensitive, in-the-Money Borrowers



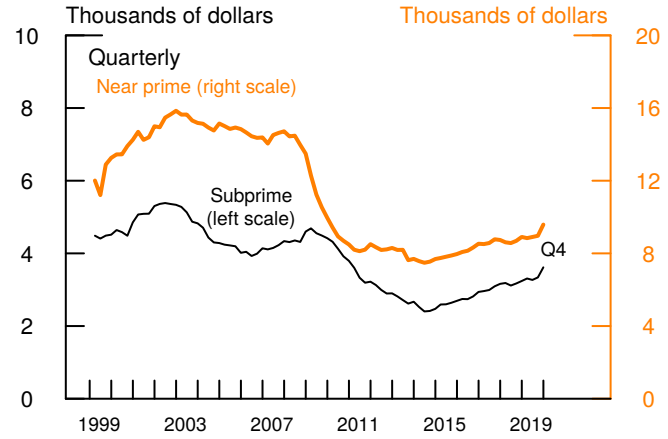
Note: Borrowers are rate sensitive and in-the-money if they recover refinance costs within 2 years, have positive equity, and have not been in-the-money to refinance for more than 2 years.
Source: For in-the-money share, McDash/Black Knight and FRB calculations; for refinance originations, HMDA and FRB calculations.

Consumer Credit Flows



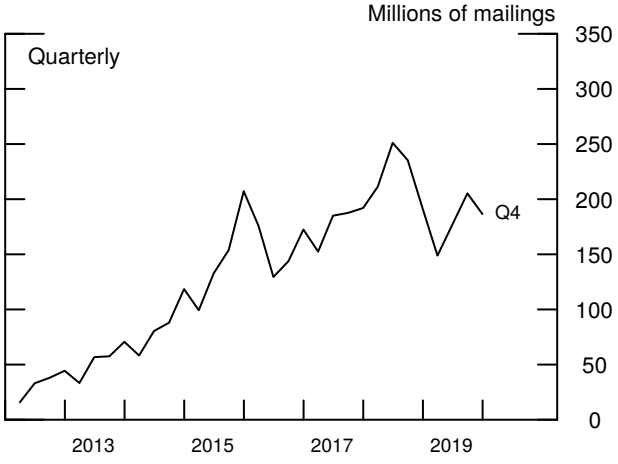
Note: The data are seasonally adjusted by Federal Reserve Board staff.
Source: Federal Reserve Board.

Real Credit Card Limits per Capita for Nonprime Borrowers



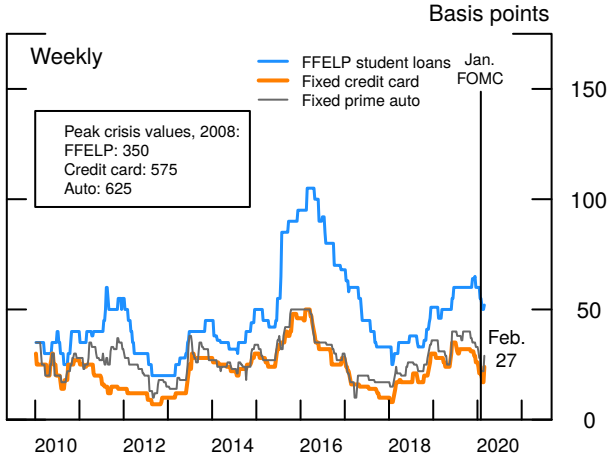
Note: Subprime refers to borrowers with Equifax Risk Scores lower than 620, and near prime, between 620 and 719. Includes those with zero credit limit.
Source: Federal Reserve Bank of New York Consumer Credit Panel/Equifax.

Personal Loan Offers Mail Volume



Source: Mintel Comperemedia.

Selected ABS Spreads (3-Year Triple-A)



Note: Spreads are to swap rate for credit card and auto asset-backed securities (ABS) and to 3-month LIBOR for student loans. FFELP is Federal Family Education Loan Program.
Source: J.P. Morgan.

Financing Conditions

Small Businesses

Our most timely data on credit availability to small businesses cover the fourth quarter, at which time the supply of credit to small businesses remained relatively accommodative. For example, in the most recent reading of the Wells Fargo Small Business Index survey, the share of respondents that reported it had been somewhat or very difficult to obtain credit over the past 12 months moved up but remained in its pre-crisis range. Nonetheless, loan originations ticked down in January, consistent with ongoing reports of weak loan demand.

Commercial Real Estate

CMBS spreads widened modestly during the week of February 24, but issuance appeared to continue apace even at the wider spreads. Data from before the escalation of coronavirus concerns point to accommodative financing conditions for commercial real estate. CMBS issuance remained strong in January after reaching its highest level since the financial crisis in the fourth quarter. CRE loan growth at banks also remained solid through February. When all available data to date are combined, CRE debt outstanding appears to have increased modestly through mid-February after a strong fourth quarter.

Municipal Government Financing Conditions

Credit conditions in municipal bond markets remained accommodative. Municipal bond yields in both the secondary and primary markets declined to historical lows even as their ratios to Treasury yields increased. Gross issuance of municipal bonds was robust in January and February, driven by refundings. Issuance volumes since late February were also reportedly boosted by strong investor demand for low-risk assets. The credit quality of general obligation bonds was solid overall, with the number of credit rating upgrades outpacing that of downgrades in January and February.

HOUSEHOLD FINANCING CONDITIONS

Residential Real Estate

Financing conditions in the residential mortgage market eased somewhat over the intermeeting period. The 30-year conforming fixed mortgage rate fell substantially to historical lows, and there were no reported disruptions in mortgage lending activity. Thus, the estimated share of homeowners who are able to benefit financially from refinancing appeared to have risen further. Indeed, borrower interest in refinancing appeared to increase significantly in late February from already elevated levels, enough

so that some industry chatter indicated that capacity constraints were starting to bind on originators' ability to process applications. Credit standards remained broadly accommodative, continuing to hover at levels somewhat tighter than in the early 2000s. Mortgage originations for both home purchases and refinances remained high through January after increasing substantially over the past year.

Consumer Credit

As in the CMBS market, ABS spreads widened modestly during the week of February 24, but issuance remained solid even for deals collateralized by loans to consumers with lower credit scores.

Data that predate the elevated coronavirus concerns suggest that financing conditions in consumer credit markets remained generally supportive of growth in consumer spending. Overall, credit card balances increased solidly, on net, during the fourth quarter, with bank credit data indicating continued expansion through February. In addition, auto loan balances rose moderately in the fourth quarter, with a noticeable uptick among subprime borrowers. Banks' data suggest auto loan balances rose at a solid pace through February.

Although conditions for subprime credit card borrowers remained relatively tight, some signs of easing were apparent in the data. Credit bureau data indicate that subprime borrowers' credit card balances and account limits moved up appreciably last quarter and that these borrowers' share of all credit card borrowing continued to rise gradually. Meanwhile, data on direct-mail credit offers suggest that lenders were extending more subprime credit card offers to consumers lower in the credit score distribution.

Personal loans—unsecured fixed-term household loans other than student loans—have grown significantly in recent years, with many borrowers using these loans to consolidate credit card and other types of debt. Data on direct-mail credit offers indicate that some households with low credit scores were offered personal loans but not credit card loans, suggesting that personal loans may expand access to credit for constrained borrowers.

Financing and Financial Conditions Indexes

A staff index that provides a measure of financing conditions for nonfinancial corporations indicates that financing conditions have tightened moderately since

February 24, on balance, but remain accommodative relative to historical standards. Of the other financial conditions indexes that we regularly monitor and report in the appendix to this Tealbook section, only about half reflect developments since February 24. These indexes also point to financial conditions that have tightened moderately but still appear about as accommodative as a year ago.

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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.

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]

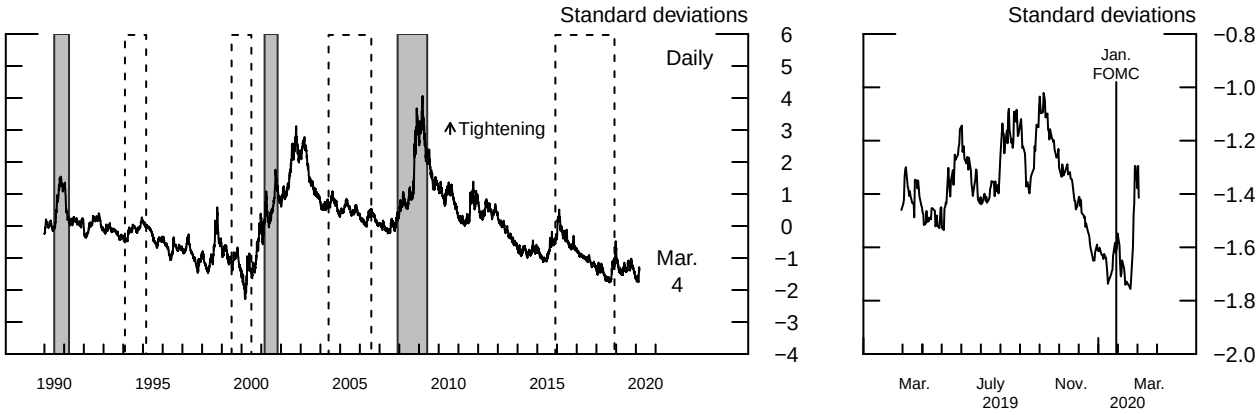
The other FCIs are constructed by aggregating a large set of financial variables into a summary series using various statistical methods. While these indexes provide a useful summary of broad financial market developments, the movements in these indexes may reflect both changes in financing conditions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

[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.

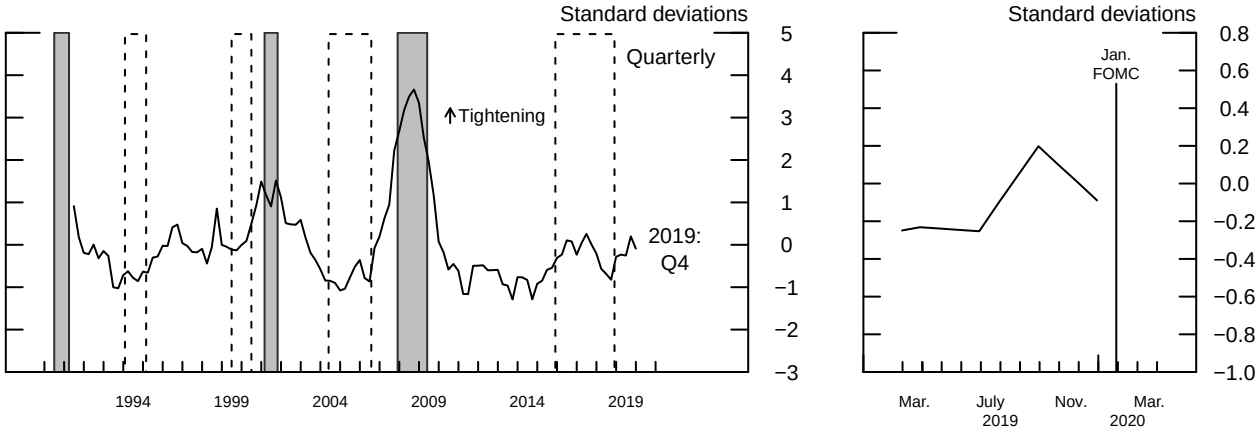
Selected Financial Conditions Indexes

Staff FCI for Nonfinancial Corporations



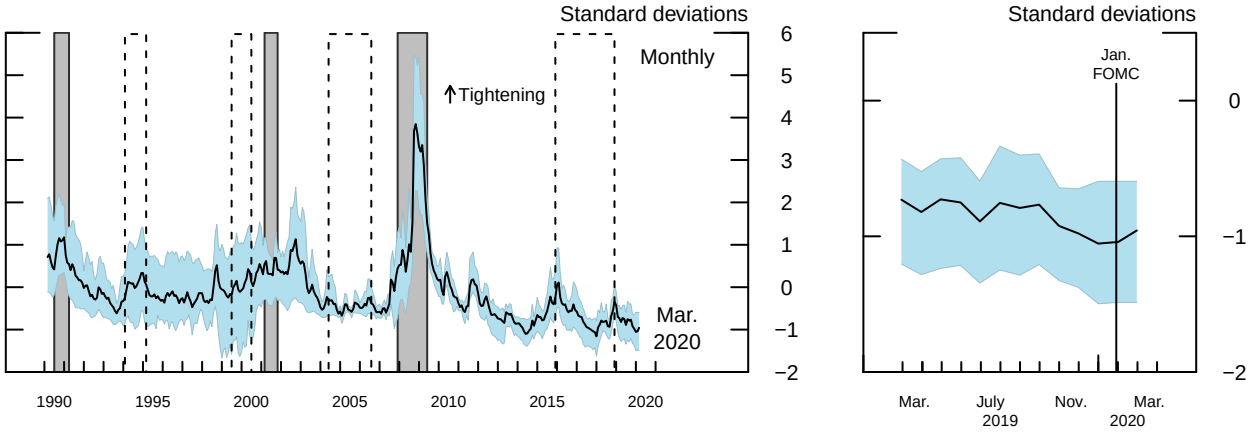
Note: The financial conditions index (FCI) is the deviation from the long−run relation between the systematic components of the cumulative log returns of 2 portfolios of firms with credit ratings above and just below investment grade. The systematic components are derived from the 5−factor Fama−French 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

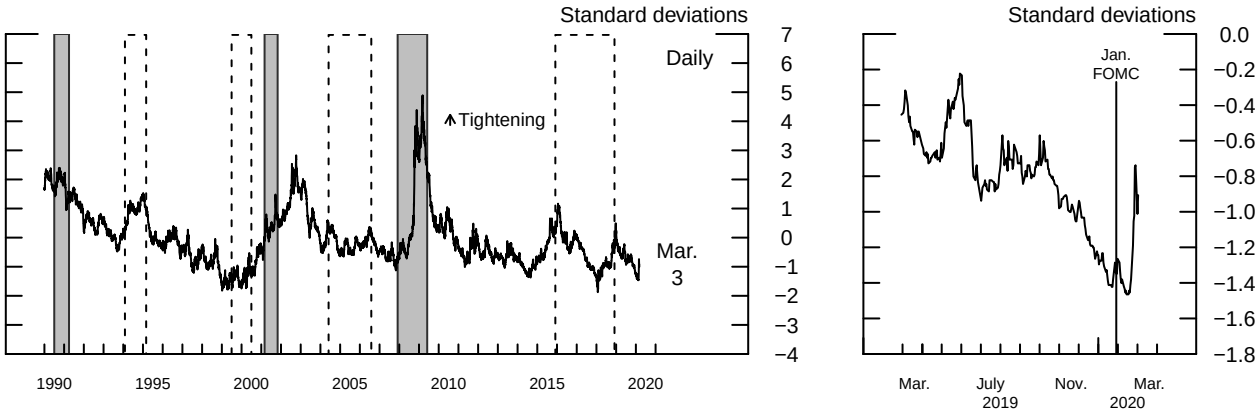


Note: Mean FCI represents the mean of FCIs developed by Goldman Sachs and the Federal Reserve Banks of Chicago, St. Louis, and Kansas City. The blue shaded region represents the range of these 4 standardized FCIs.
Source: Bloomberg; Federal Reserve Banks of Chicago, St. Louis, and Kansas City.

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.

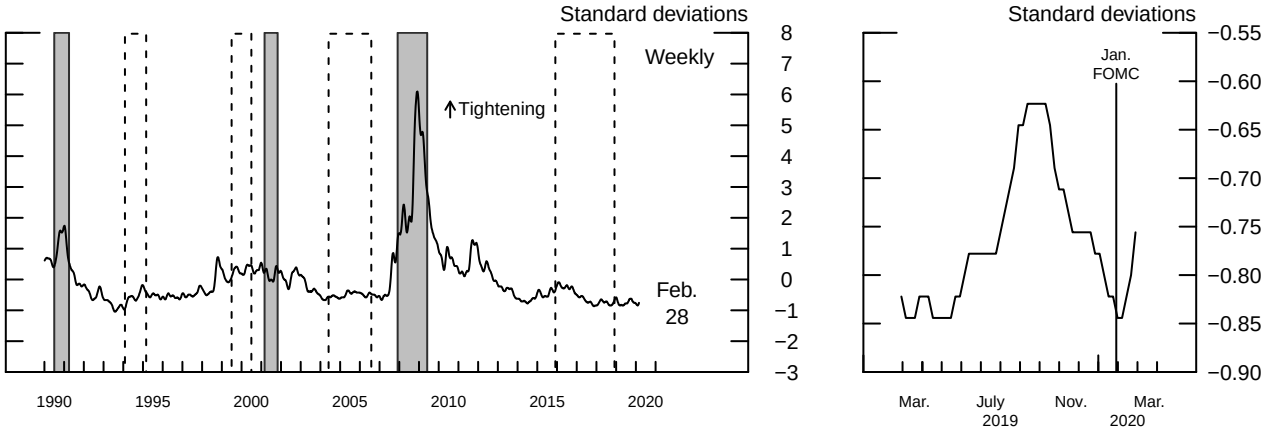
Selected Financial Conditions Indexes (continued)

Goldman Sachs FCI



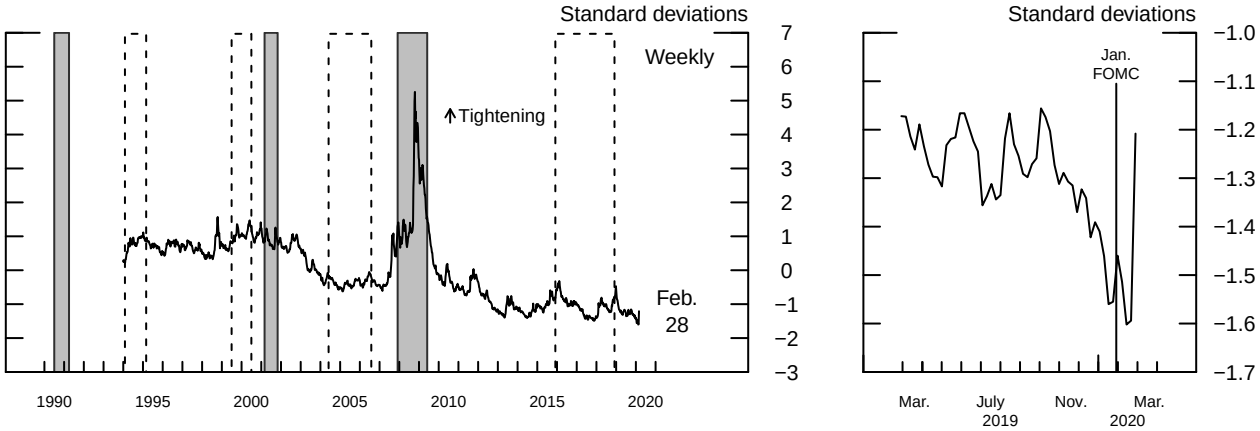
Note: The index is a weighted average of 5 financial variables: the federal funds rate, the 10−year Treasury yield, the triple−B yield spreads to Treasury, the S&P price−to−earnings ratio, and the broad value of the U.S. dollar. Weights are pinned down by the contribution of each financial variable on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

Chicago Fed NFCI



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

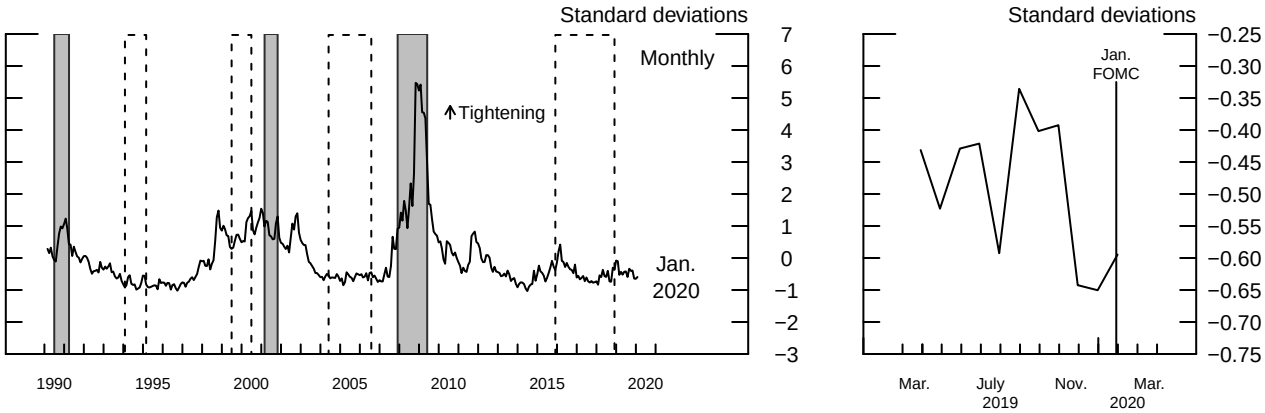


Note: The index is the principal component of 18 variables, including short− and long−term Treasury yields, corporate yields, money market and corporate bond spreads, bond and stock market volatility indicators, breakeven inflation rate, and the S&P 500 index.
Source: Federal Reserve Bank of St. Louis.

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



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.

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.

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Risks and Uncertainty

The COVID-19 outbreak has rendered the global economic outlook extremely uncertain. The Tealbook baseline assumes that the outbreak will be largely contained by midyear, leaving an acute but only short-lived imprint on economic activity. However, the disease may spread more widely than in our baseline, resulting in much higher rates of illness and death. In addition, the associated global economic disruptions may prove deeper and more protracted. Extensive factory shutdowns could put significant strains on global supply chains. A further decrease in commodity prices may exacerbate vulnerabilities in particular sectors and countries. Moreover, consumer and business sentiment may plummet, severe stresses in financial markets or institutions may emerge, and social distancing measures may weigh on economic activity.

In light of the significant risks to the global economy posed by COVID-19, we have decided to focus this section solely on the effects of the virus, and we have run our simulations as joint domestic and international scenarios to provide a unified analysis of how the disease may affect the United States and foreign economies.

POSSIBLE IMPLICATIONS OF COVID-19

COVID-19 is now spreading widely outside of China. At the time of this writing, the virus has spread to over 75 countries, has infected more than 100,000 people, and has begun to spread in the United States. The currently available epidemiological information is consistent with a wide range of plausible scenarios for how extensive the adverse effects of the outbreak might be for the health of the population and for the pace of overall economic activity. The ultimate consequences will depend on how easily and rapidly the virus spreads in the population, the rates at which the virus causes death and serious illness, and measures taken to try to slow its spread and mitigate its economic fallout. Before presenting a range of calibrated simulations from our standard macroeconomic models, we discuss each of these three factors in comparison with previous major influenza outbreaks.

The CDC estimates that, each year, between 3 and 14 percent of Americans contract the seasonal flu, and COVID-19 has potential to become more widespread than that. For one thing, there is currently no vaccine for COVID-19, and it will likely take one to one-and-a-half years to

develop and deploy a vaccine.[1] Moreover, biological differences between the virus that causes COVID-19 and other flu-like viruses mean that immunity in the United States and global populations is likely quite low. Consistent with this perspective, some authorities suggest that the virus may be somewhat more contagious than either the seasonal flu or the pandemic 1918–19 flu.[2] Indeed, one prominent epidemiologist estimates that between 40 and 70 percent of the population could become infected with the virus that causes COVID-19.[3] In contrast, the head of the World Health Organization has recently suggested that it may be possible to contain the spread of the virus.[4]

The lethality of COVID-19 is also highly uncertain. Simple calculations based on the ratio of deaths to the number of confirmed cases suggest that around 2 to 3 percent of people who contract the disease die. Such a rate would be comparable with that of the 1918 flu in the United States. However, it is likely that the denominator of this calculation is understated because of undiagnosed infections.[5] For that reason, Fauci and others (2020) suggest that the fatality rate from COVID-19 infection may well be less than 1 percent. By comparison, the fatality rate of the seasonal flu is around 0.1 percent.

Social distancing and basic hygiene measures can reduce the virus's rate of contagion. In particular, as has been done in other countries, once the virus has become sufficiently prevalent in a locality, public health and other officials would close schools, cancel public events, restrict

[1] See Stephanie Soucheray (2020), "Fauci: Vaccine at Least a Year Away, as COVID-19 Death Toll Rises to 9 in Seattle," Center for Infectious Disease Research and Policy News (Minneapolis), March 3, www.cidrap.umn.edu/news-perspective/2020/03/fauci-vaccine-least-year-away-covid-19-death-toll-rises-9-seattle.

[2] The COVID-19 virus has a wide range of estimates of contagiousness that are mostly within the range of existing estimates for SARS. Estimates for the contagiousness of COVID-19 will continue to evolve as more studies are conducted. For an overview of recent estimates, see Ying Liu, Albert Gayle, Annelies Wilder-Smith, and Joacim Rocklöv (forthcoming), "The Reproductive Number of COVID-19 is Higher Compared to SARS Coronavirus," *Journal of Travel Medicine*, https://doi.org/10.1093/jtm/taaa021. A much larger literature has studied the contagiousness of the seasonal flu and the flu of 1918. For an overview, see Matthew Biggerstaff, Simon Cauchemez, Carrie Reed, Manoj Gambhir, and Lyn Finelli (2014), "Estimates of the Reproduction Number for Seasonal, Pandemic, and Zoonotic Influenza: A Systematic Review of the Literature," *BMC Infectious Diseases*, vol. 14 (September), https://doi.org/10.1186/1471-2334-14-480.

[3] See Marc Lipsitch's comments in James Hamblin (2020), "You're Likely to Get the Coronavirus," *Atlantic*, February 24, https://www.theatlantic.com/health/archive/2020/02/covid-vaccine/607000/.

[4] Tedros Adhanom Ghebreyesus (2020), "WHO Director-General's Opening Remarks at the Media Briefing on COVID-19 - 3 March 2020," speech delivered at the World Health Organization, Geneva, March 3, https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---3-march-2020.

[5] It is likely that there are a large number of infections that have led to only mild symptoms or no symptoms at all and thus are not currently counted as confirmed cases. See Anthony S. Fauci, H. Clifford Lane, and Robert R. Redfield (2020), "COVID-19—Navigating the Uncharted," *New England Journal of Medicine*, February 28, www.doi.org/10.1056/NEJMe2002387.

travel, encourage telework, and quarantine infected people. In addition, people would likely distance themselves voluntarily by avoiding public transportation, shopping malls, restaurants, and entertainment venues, perhaps even in areas in which the virus has not yet been reported in large numbers. Those efforts, along with more severe restrictions, seem to have been successful in slowing the spread of COVID-19 within China, as recent data indicate that the number of new cases may be moving down.[6] In addition, some studies suggest that timely social distancing measures were effective in reducing contagion rates during the 1918 pandemic, which in turn mitigated pressures on the health-care system, thereby permitting more effective medical treatment for people with the disease.[7]

A number of studies have estimated the effects of these three factors—contagion, mortality, and containment measures—on health and economic outcomes following outbreaks. For example, in 2006, the Congressional Budget Office (CBO) published a widely cited report assessing the possible economic effects of a pandemic flu.[8] The CBO considered two specific scenarios—a severe scenario calibrated to contagion and mortality rates associated with the 1918 flu pandemic and a less severe scenario based on pandemics occurring in 1957 and 1968. The CBO study concludes that the hit to output would come through two main channels: the direct effect of illness and mortality on labor supply and additional effects on demand for services such as reduced spending on restaurants and tourism. The CBO's approach informed our formulation of the scenarios that follow. However, we put more emphasis on consumer and financial-market confidence and the global dimension of the COVID-19 crisis, and we also included the reaction of monetary policy.[9] While monetary policy is not well suited to address the supply effects of the disease, it may be helpful in addressing the demand-side factors.

[6] See Ghebreyesus (2020), cited in footnote 4.

[7] See, for example, Martin Bootsma and Neil Ferguson (2007), "The Effect of Public Health Measures on the 1918 Influenza Pandemic in U.S. Cities," *Proceedings of the National Academy of Sciences*, vol. 104 (May), pp. 7588–93. See also Richard Hatchett, Carter Mecher, and Marc Lipsitch (2007), "Public Health Interventions and Epidemic Intensity during the 1918 Influenza Pandemic," *Proceedings of the National Academy of Sciences*, vol. 104 (May), pp. 7582–7.

[8] Congressional Budget Office (2006), *A Potential Influenza Pandemic: An Update on Possible Macroeconomic Effects and Policy Issues* (Washington: CBO), https://www.cbo.gov/system/files/2018-10/05-22-avian-flu.pdf.

[9] A related study estimates that in a global influenza pandemic, U.S. GDP would decline between 1.4 percent and 5.5 percent in the year of the pandemic for the case of a mortality rate of 0.23 percent and 2.3 percent, respectively. See Warwick McKibbin and Alexandra Sidorenko (2006), "Global Macroeconomic Consequences of Pandemic Influenza," Miscellaneous Publications (Canberra: Centre for Applied Macroeconomic Analysis, February), https://cama.crawford.anu.edu.au/pdf/working-papers/2006/262006.pdf.

Alternative Scenarios

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

Measure and scenario	2020		2021	2022	2023	2024	2025
	H1	H2					
Real GDP							
Tealbook baseline and extension	1.4	2.9	2.3	1.7	1.4	1.3	1.3
Moderate COVID-19 outbreak	.4	1.3	2.4	2.1	1.9	1.6	1.5
Severe global pandemic	-1.8	-.8	1.7	2.0	2.2	2.3	2.1
More-favorable resolution	1.9	3.2	2.2	1.6	1.3	1.2	1.2
Unemployment rate[1]							
Tealbook baseline and extension	3.6	3.5	3.2	3.2	3.4	3.6	3.8
Moderate COVID-19 outbreak	3.8	4.3	3.9	3.6	3.6	3.6	3.8
Severe global pandemic	4.3	5.8	5.6	4.9	4.6	4.3	4.2
More-favorable resolution	3.5	3.4	3.1	3.2	3.4	3.6	3.8
Total PCE prices							
Tealbook baseline and extension	.9	1.8	2.0	1.9	1.9	2.0	2.0
Moderate COVID-19 outbreak	.8	1.7	1.8	1.8	1.8	1.9	1.9
Severe global pandemic	.7	1.3	1.5	1.6	1.6	1.8	1.9
More-favorable resolution	1.1	2.0	2.0	1.9	1.9	1.9	1.9
Core PCE prices							
Tealbook baseline and extension	1.6	1.9	1.9	1.9	1.9	2.0	2.0
Moderate COVID-19 outbreak	1.5	1.8	1.8	1.8	1.8	1.9	1.9
Severe global pandemic	1.4	1.4	1.5	1.6	1.6	1.8	1.9
More-favorable resolution	1.7	2.1	2.0	1.9	1.9	1.9	1.9
Federal funds rate[1]							
Tealbook baseline and extension	1.2	1.4	1.8	2.0	2.2	2.3	2.5
Moderate COVID-19 outbreak	1.1	.1	.5	.8	1.3	1.8	2.2
Severe global pandemic	.5	.1	.1	.1	.1	.3	1.0
More-favorable resolution	1.2	1.5	2.0	2.1	2.1	2.2	2.4

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

ALTERNATIVE SCENARIOS

Against that background, this section considers several specific scenarios simulated using the SIGMA and the FRB/US model. The models embed the typical rule-based responses for the federal funds rate used in alternative simulations, including relatively rapid reductions in the funds rate in the two downside scenarios. Of course, the simulations should be thought of as crude approximations meant to portray a range of possible economic effects that vary in their size, duration, and dynamics.

Moderate COVID-19 Outbreak

In the baseline, the coronavirus outbreak is expected to leave an acute but only temporary imprint on global economic activity and is assumed not to spread widely in the United States. Our confidence that we have correctly assessed the effects of COVID-19 on the economic outlook is limited, and a number of alternative, yet not catastrophic, scenarios could be almost as likely. For example, the virus could spread much more widely than we currently assume. In China and some other economies, a lifting of travel restrictions and quarantines, targeted to resume production, could lead to a sharp resurgence in infections. Domestically, our baseline assumption that the virus will not require widespread social distancing measures to address the spread could prove to be wrong.

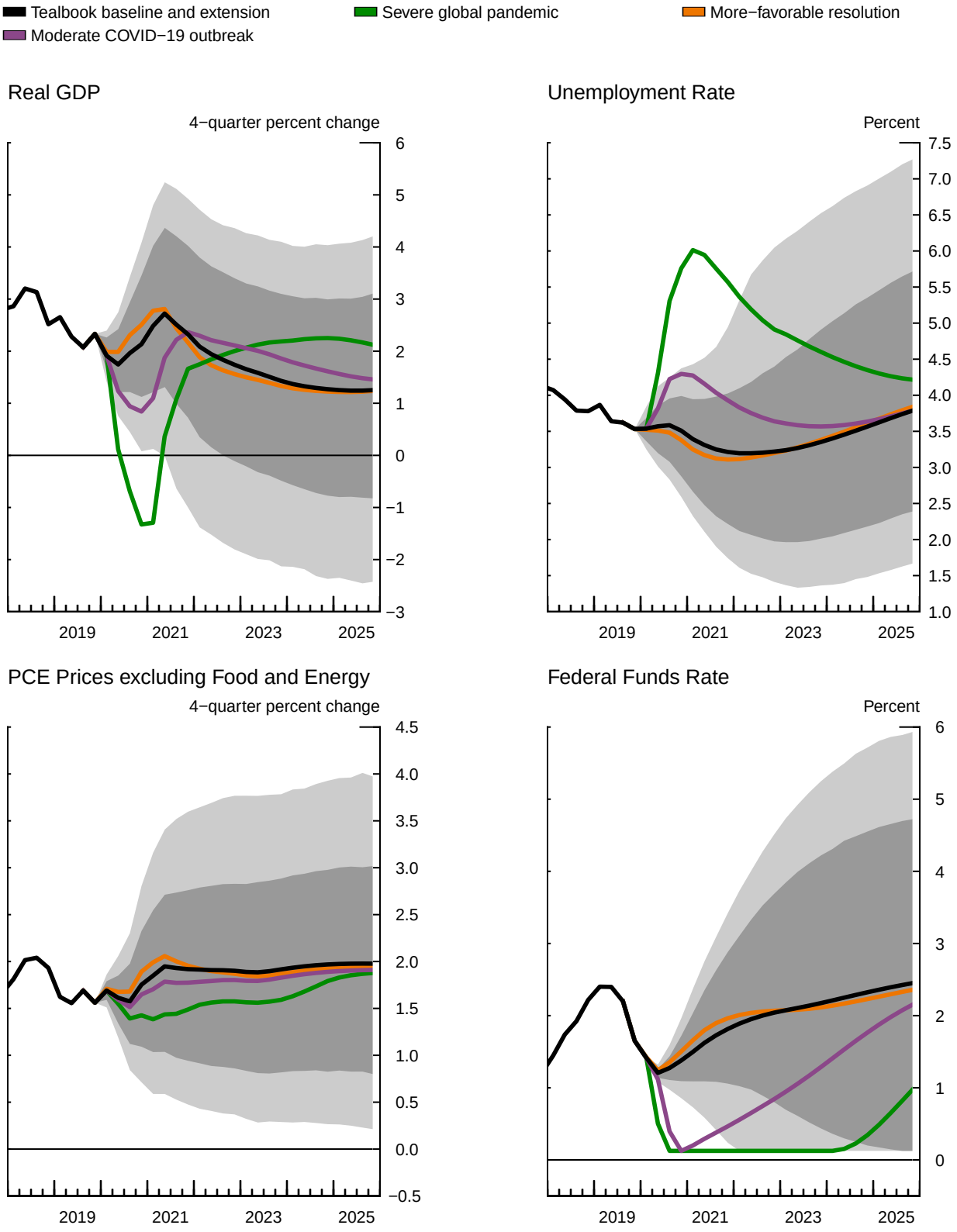
In this scenario, we assume that some of these risks materialize. More extensive factory shutdowns and supply chain disruptions result in a temporary loss in production and weaken business and consumer sentiment globally. We also assume that employers temporarily lose a portion of their workforce as illness and the lack of childcare forces some workers to stay home. Furthermore, we assume authorities across a number of metropolitan areas in the United States and the rest of the world are compelled to implement various social distancing measures to attempt to contain the virus. Despite these measures, in this scenario the virus spreads more widely than assumed in our baseline and ultimately results in greater loss of life.[10] While the

[10] In particular, our scenario is consistent with the assumption that the virus will spread to about 25 percent of the population, while about 50 percent of those are assumed to be either asymptomatic or presenting only very mild symptoms. We assume those with only mild symptoms miss no work while the remainder miss 10 days of work. We further assume a low fatality rate of 0.1 percent, much like the seasonal flu, and so the permanent effects on the labor force are small. We thus assume that the supply of aggregate labor hours over the first four quarters in this scenario is reduced by about ½ percent on average.

Risks & Uncertainty

Forecast Confidence Intervals and Alternative Scenarios

Confidence Intervals Based on FRB/US Stochastic Simulations*



* The dark gray shaded area is the 70 percent interval, and the light gray shaded area is the 90 percent interval from stochastic simulations around the Tealbook baseline.

effects of the virus are more severe than in the baseline, they are only modestly longer lasting, and the situation is assumed to start improving in the latter part of this year.

Under these circumstances, several factors contribute to a slowing in U.S. economic activity. Social distancing measures and related knock-on effects lower domestic demand, while the direct effect of the virus reduces labor supply. In addition, foreign GDP growth declines to just under 1 percent this year, 1.4 percentage points below baseline, the dollar appreciates 3 percent because of flight-to-safety concerns, and commodity prices fall. While these factors worsen economic activity, we assume that they are not adverse enough to disrupt the functioning of credit markets, and, hence, borrowing spreads rise only modestly.

GDP declines in the second quarter, and growth in the second half then picks up to only 1.3 percent. Thereafter, GDP grows at a pace somewhat above baseline. The unemployment rate rises to 4.3 percent by the end of this year and gradually moves back to baseline thereafter. The path for inflation in this scenario reflects the balance of supply and demand factors. While labor supply is curtailed somewhat by the morbidity and the fatalities that the virus inflicts, ultimately the fall in aggregate demand outweighs the supply effects. Lower resource utilization and falling import prices reduce core PCE inflation to 1.8 percent in 2021. In response to the drop in output growth and due to risk management concerns in a highly uncertain environment, the federal funds rate falls close to the effective lower bound (ELB) at the end of 2020 before gradually rising thereafter.[11]

Severe Global Pandemic

In this scenario, we assume that the spread of COVID-19 abroad and at home is wider and more deadly. The more severe outbreak reduces labor supply by more than in the previous scenario; fatalities alone reduce the workforce 0.2 percent, and morbidity reduces hours worked further.[12] Financial conditions tighten globally, and business and consumer sentiment plummet, possibly exacerbated by the existing fragile economic conditions in many advanced economies and existing financial vulnerabilities in China. Specifically, we assume that global equity prices

[11] In this and the subsequent scenario, we assume that the federal funds rate setting departs from the baseline Taylor rule and moves similarly to its typical behavior seen in past recessions. While this scenario does not feature a recession, we nevertheless assume that the interest rate changes are initially similar to those in a recession, as the economic outlook is highly uncertain and includes the possibility of a recession.

[12] In particular, this scenario is consistent with the assumption that half the workforce is infected with the virus, and 80 percent of those have cases severe enough that they miss 10 days of work. We view the workforce mortality rate of 0.2 percent as consistent with a relatively high fatality rate of 2 percent among those infected in the overall population on the assumption that the disease is more severe for the elderly.

decline 20 percent below baseline, corporate borrowing spreads widen 140 basis points, and flight-to-safety flows lead to a 10 percent appreciation of the dollar. All told, foreign GDP growth falls to negative 0.5 percent this year, 2.8 percentage points below baseline.

A drop in domestic demand, the weaker foreign demand, and the stronger dollar cause U.S. GDP to fall 1.3 percent in 2020, 3.4 percentage points below the baseline, and the unemployment rate peaks at 6 percent in early 2021. As in our previous scenario, the effects of the virus on aggregate supply prove to be smaller than those on aggregate demand. Lower resource utilization and falling import prices reduce core PCE inflation to 1.4 percent in 2020. Inflation runs, on average, 0.3 percentage point below baseline from 2021 until 2025. In response to the recession, the federal funds rate is cut quickly, reaches the ELB in the middle of this year, and remains there until the beginning of 2024.[13]

More-Favorable Resolution

Uncertainties around the evolution of the COVID-19 outbreak could also resolve more favorably than assumed in the baseline. In this scenario, we assume that the virus turns out to be much less deadly than feared, foreign countries manage to control the outbreaks relatively quickly, the spread of the virus across the United States is extremely limited, and supply disruptions are largely contained. As a result, positive sentiment boosts aggregate demand in the United States and abroad, while an easing of financial conditions contributes to a global increase in equity prices of 5 percent above baseline. In addition, a reversal of flight-to-safety flows leads to a 1 percent depreciation of the dollar. All told, foreign GDP growth is 2.6 percent this year, 0.4 percentage point above baseline.

U.S. GDP grows nearly 2.0 percent in the first half of 2020. For the year as a whole, growth averages 2.5 percent, 0.4 percentage point above the baseline.[14] The U.S. unemployment rate is 0.1 percentage point below the baseline by the end of 2021. Core PCE inflation reaches 2 percent in 2021. Accordingly, the federal funds rate is a tad higher than in the baseline in the near term, reaching 2.1 percent by 2022.

[13] In this scenario, we have assumed that the SOMA portfolio follows the baseline path and the interest rate rule is the same as in the baseline after liftoff from the ELB. In the event of a severe recession, the FOMC may deploy forward guidance or asset purchases as an active stabilization tool.

[14] The boost to U.S. and foreign GDP in this scenario nearly offsets the downward revisions to the baseline attributed to COVID-19 related disruptions in the current Tealbook going forward.

ASSESSMENT OF RISKS

As is clear from the extensive discussion above, we judge the risks around our baseline projection for GDP and inflation to be tilted substantially to the downside, while the risks to the unemployment rate are skewed to the upside. In addition to the downside risks from the virus, the proximity to the ELB implies that monetary policy has little room to offset substantial shortfalls in aggregate demand via adjustments in the federal funds rate, further contributing to downside risk to activity. Because we have a limited understanding of the severity and persistence of COVID-19 and its economic implications, we judge the level of uncertainty around our baseline projection to be substantially higher than the average over the past 20 years, the benchmark used by the FOMC.

Model-based measures of recession risks have increased. As shown in the bottom table of the exhibit "Assessment of Key Macroeconomic Risks," the estimated probability of moving into recession over the next year based on a term-spread model has risen to 50 percent, up 2 percentage points from the previous Tealbook. The probability estimate from a model-averaging framework that uses a selection of both real and financial variables has risen sharply to 38 percent from 4 percent in the January Tealbook, largely driven by recent movements in the VIX and, to a lesser extent, by corporate bond spreads and the slope of the yield curve.

Two exhibits provide alternative perspectives on the chance of an adverse outcome in the period ahead. According to the exhibit "Conditional Distributions of Staff Forecast Errors 1 Year Ahead," the projected distribution of misses around the Tealbook forecast over the next four quarters does not appear particularly wide or skewed. In contrast, the exhibit "Conditional Distributions of Macroeconomic Variables 2 Years Ahead" suggests that, at the two-year horizon, the risks are skewed to the downside for GDP growth and to the upside for the unemployment rate. These conditional distributions have widened since the previous Tealbook and have become more adversely skewed. One important reason for these different assessments is that the model underlying the two-year-ahead estimate includes the recession probability from the term-spread model as an input.

As indicated in the exhibit "Effective Lower Bound Risk Estimate," the estimated probability of returning to the ELB over the next three years is 34 percent, markedly higher than the estimate in the previous Tealbook, as the path for federal funds rate in this Tealbook is lower.

Assessment of Key Macroeconomic Risks

Probability of Inflation Events

(4 quarters ahead)

Probability that the 4-quarter change in total PCE prices will be . . .	Staff	FRB/US	EDO	BVAR
Greater than 3 percent				
Current Tealbook	.02	.02	.01	.04
Previous Tealbook	*.05*	*.05*	*.01*	*.02*
Between 1 3/4 and 2 1/4 percent				
Current Tealbook	.16	.16	.39	.25
Previous Tealbook	*.21*	*.21*	*.41*	*.21*
Less than 1 percent				
Current Tealbook	.33	.34	.04	.19
Previous Tealbook	*.24*	*.24*	*.02*	*.27*

Probability of Unemployment Events

(4 quarters ahead)

Probability that the unemployment rate will . . .	Staff	FRB/US	EDO	BVAR
Increase by 1 percentage point				
Current Tealbook	.03	.02	.24	.05
Previous Tealbook	*.03*	*.08*	*.20*	*.03*
Decrease by 1 percentage point				
Current Tealbook	.04	.08	.00	.03
Previous Tealbook	*.10*	*.03*	*.00*	*.07*

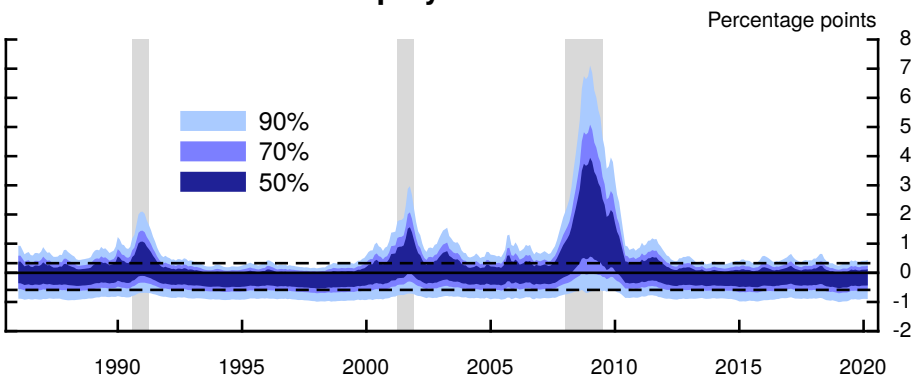
Probability of Recession Over Next 4 Quarters

Probability of transitioning into or remaining in a recession	Staff	FRB/US	MAF	Term Spread	Unconditional
Current Tealbook	.06	.05	.38	.50	.23
Previous Tealbook	*.07*	*.10*	*.04*	*.48*	*.23*

Note: "Staff" represents stochastic simulations in FRB/US around the staff judgmental baseline; baselines for FRB/US, EDO, and BVAR are generated by those models. The "MAF" estimate uses a model averaging framework to infer the probability from a selection of real and financial variables. "Term Spread" shows the probability implied by the spread between the current month's 10-year and 3-month Treasury yields. "Unconditional" is calculated using NBER recession dating from 1973:Q1 to the most recent quarter with a BEA estimate of GDP.

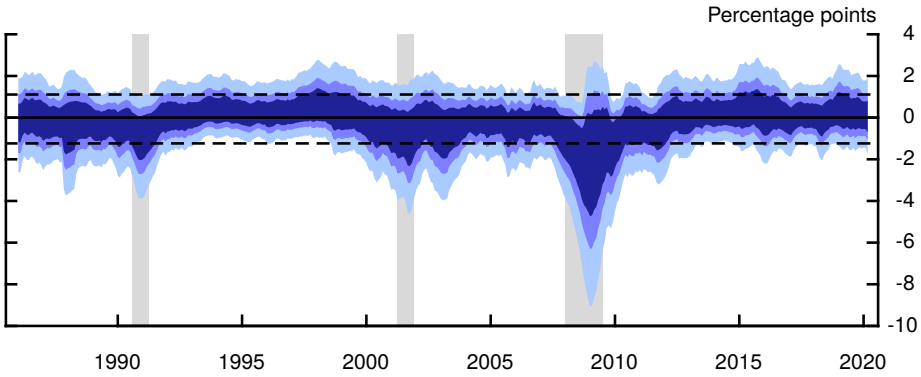
Conditional Distributions of Staff Forecast Errors 1 Year Ahead

Unemployment Rate



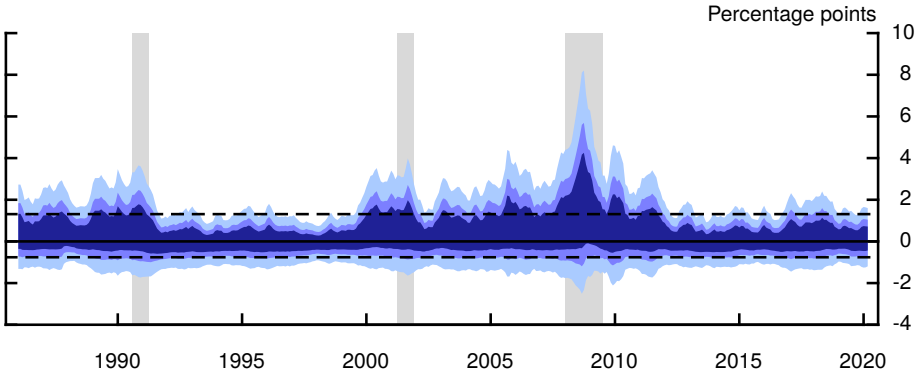
March 2020	
95th	.4
85th	.2
50th	- .1
15th	- .6
5th	- .9

GDP Growth



March 2020	
95th	1.9
85th	1.2
50th	0
15th	-1.1
5th	-1.8

CPI Inflation



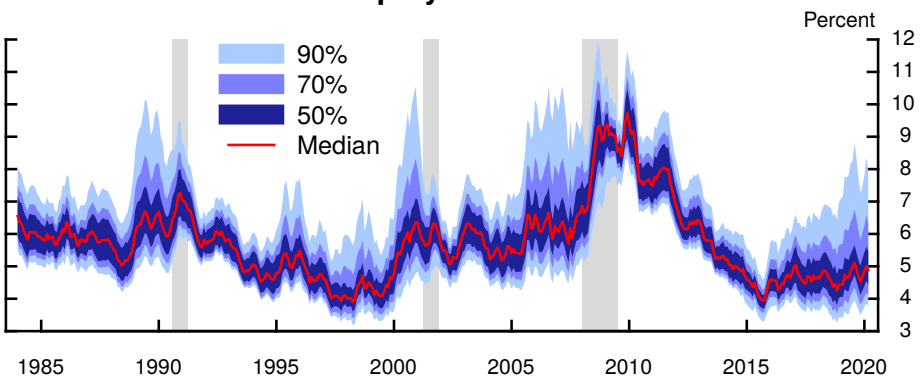
March 2020	
95th	1.6
85th	1.0
50th	.1
15th	- .7
5th	-1.2

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 strain, and the volatility of high-frequency macroeconomic indicators. The tables show selected quantiles of the predictive distributions for the respective variables as of the current Tealbook. Dashed lines denote the median 15th and 85th percentiles. Gray shaded bars indicate recession periods as defined by the National Bureau of Economic Research.

Risks & Uncertainty

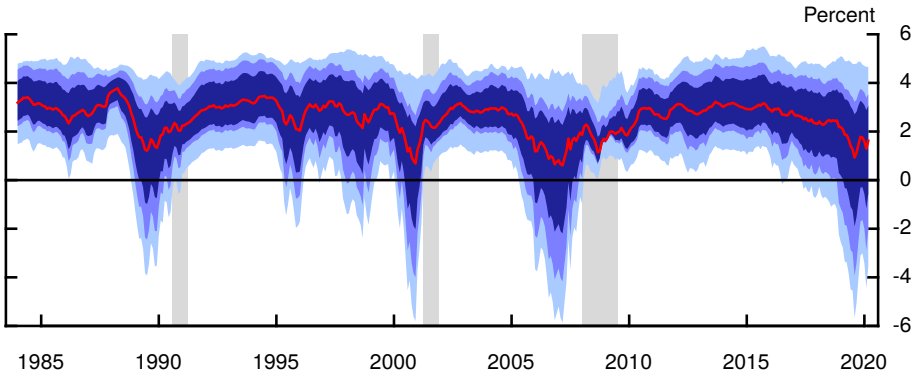
Conditional Distributions of Macroeconomic Variables 2 Years Ahead

Unemployment Rate



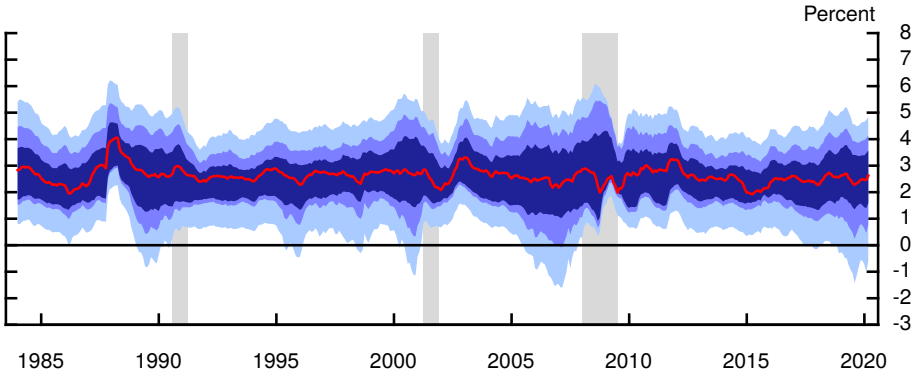
March 2020	
95th	7.9
85th	6.3
50th	4.9
15th	4.1
5th	3.8

GDP Growth



March 2020	
95th	4.7
85th	3.5
50th	1.6
15th	-2.0
5th	-3.5

CPI Inflation

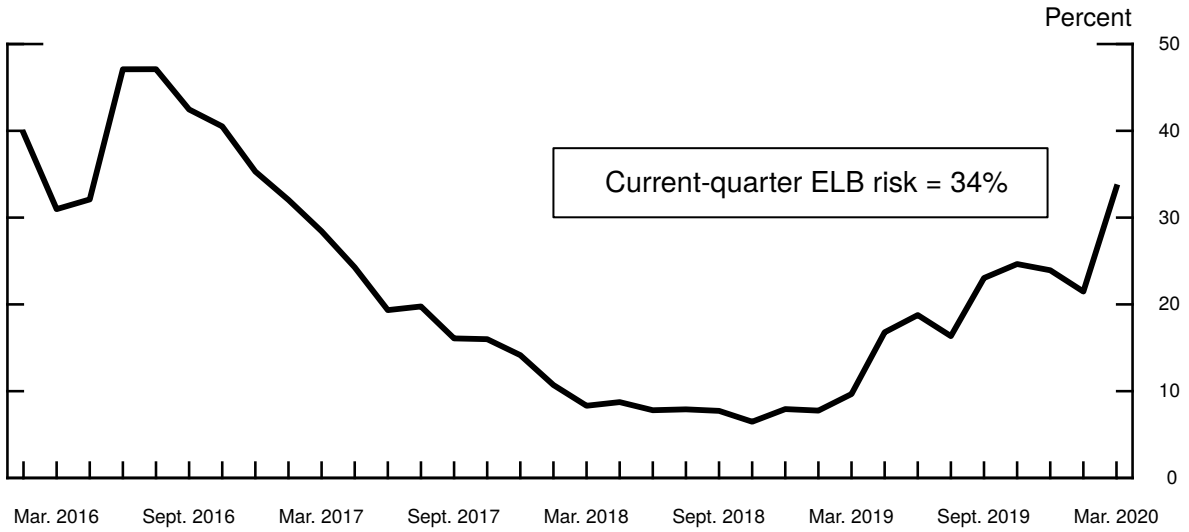


March 2020	
95th	4.8
85th	4.1
50th	2.6
15th	.8
5th	- .6

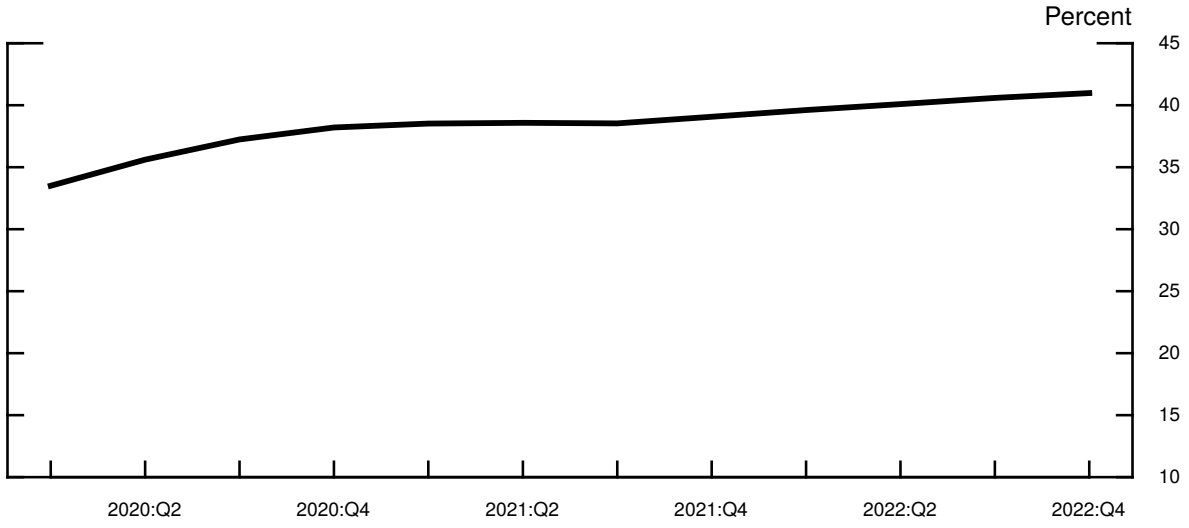
Note: The exhibit shows estimates of quantiles of the conditional distribution of the respective macro variables 2 years ahead. The estimates are conditioned on indicators of real activity, inflation, financial market strain, the volatility of high-frequency macroeconomic indicators, and a term-spread-based recession probability. The tables show selected quantiles of the predictive distributions for the respective variables as of the current Tealbook. Gray shaded bars indicate recession periods as defined by the National Bureau of Economic Research.

Effective Lower Bound Risk Estimate

ELB Risk since Liftoff



ELB Risk over the Projection Period



Note: The figures show the probability that the federal funds rate reaches the effective lower bound (ELB) over the next 3 years starting in the given quarter. Details behind the computation of the ELB risk measure are provided in the box "A Guidepost for Dropping the Effective Lower Bound Risk from the Assessment of Risks" in the Risks and Uncertainty section of the April 2017 Tealbook A. The lower panel computes ELB risk over a forward-looking moving 3-year window using stochastic simulations in FRB/US beginning in the current quarter. The simulations are computed around the Tealbook baseline.

The probability rises to 42 percent by the end of the medium term, as the distribution of outcomes around the baseline naturally widens further into the future.

With regard to inflation, we view the risks to the projection as slanted to the downside, in large part because of the downside risks to economic activity. Moreover, inflation has been running low over the past year, and longer-run inflation expectations could currently be lower than we recognize. Indeed, inflation compensation from TIPS has fallen in recent weeks. There are also risks to the upside. For example, if the supply-side effects of the coronavirus (such as the hit to supply chains) turn out to be more important than we expect relative to demand-side effects, they could put more upward pressure on inflation than we anticipate.[15]

[15] We do not present our usual discussion of the alternative model forecasts this round because the model forecasts do not incorporate the staff's assessment of the effects arising from the COVID-19 outbreak. The usual exhibit is included.

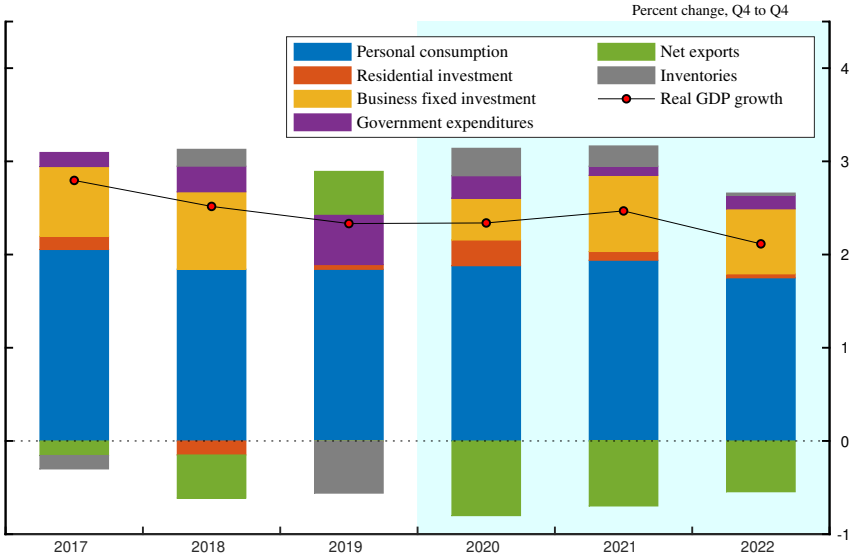
Alternative Model Forecasts

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

Measure and projection	2020		2021		2022	
	Previous Tealbook	Current Tealbook	*Previous Tealbook*	Current Tealbook	*Previous Tealbook*	Current Tealbook
Real GDP						
Staff	*2.3*	2.1	*2.0*	2.3	*1.7*	1.7
FRB/US	*1.9*	2.3	*1.9*	2.5	*1.7*	2.1
EDO[1]	*1.8*	1.7	*1.9*	1.7	*2.3*	2.2
Unemployment rate[2]						
Staff	*3.3*	3.5	*3.3*	3.2	*3.3*	3.2
FRB/US	*3.7*	3.3	*3.8*	3.3	*4.1*	3.4
EDO[1]	*4.1*	4.0	*4.6*	4.5	*4.9*	4.8
Total PCE prices						
Staff	*1.6*	1.3	*1.9*	2.0	*1.9*	1.9
FRB/US	*1.6*	1.3	*2.0*	2.0	*2.0*	2.0
EDO[1]	*2.1*	1.8	*2.4*	2.3	*2.3*	2.3
Core PCE prices						
Staff	*1.9*	1.8	*1.9*	1.9	*1.9*	1.9
FRB/US	*1.9*	1.8	*2.1*	2.0	*2.0*	2.0
EDO[1]	*2.1*	1.9	*2.4*	2.3	*2.3*	2.3
Federal funds rate[2]						
Staff	*1.9*	1.4	*2.3*	1.8	*2.6*	2.0
FRB/US	*2.0*	1.7	*2.4*	2.0	*2.6*	2.2
EDO[1]	*3.0*	2.5	*3.6*	3.3	*3.9*	3.8

1. The EDO projections labeled "*Previous Tealbook*" and "Current Tealbook" integrate over the posterior distribution of model parameters.
2. Percent, average for Q4.

Decomposition of FRB/US Real GDP Growth Forecast



Note: Shading represents the projection period.
Source: Staff calculations.

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

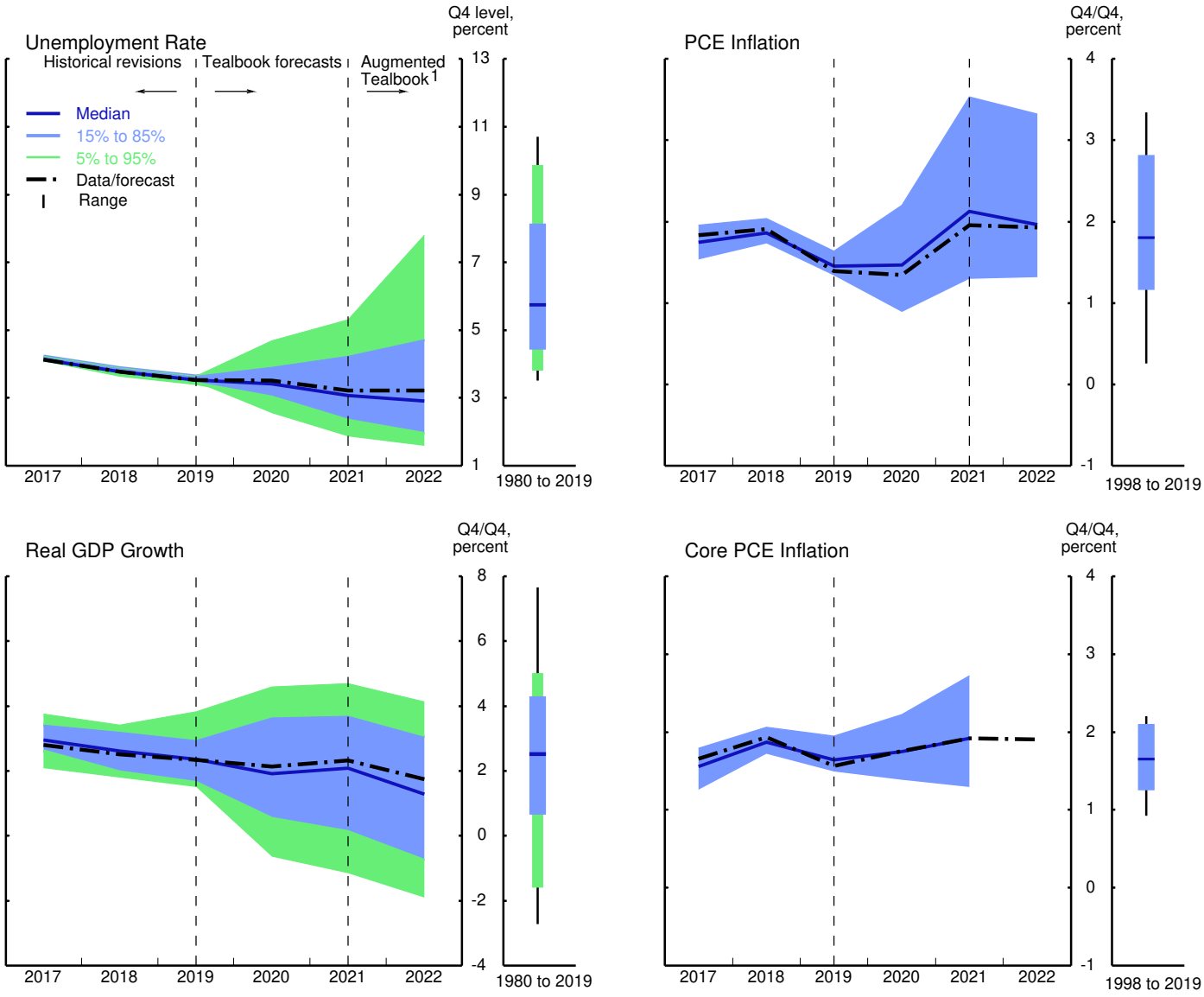
Measure	2020	2021	2022	2023	2024	2025
Real GDP						
(percent change, Q4 to Q4)						
Projection	2.1	2.3	1.7	1.4	1.3	1.3
Confidence interval						
Tealbook forecast errors	.5–3.6	.1–3.7	-.8–3.0	. . .	. . .	. . .
FRB/US stochastic simulations	1.1–3.5	.7–4.0	-.1–3.4	-.5–3.1	-.8–3.0	-.8–3.1
Civilian unemployment rate						
(percent, Q4)						
Projection	3.5	3.2	3.2	3.4	3.6	3.8
Confidence interval						
Tealbook forecast errors	3.0–3.9	2.3–4.2	1.9–4.7	. . .	. . .	. . .
FRB/US stochastic simulations	2.9–4.0	2.2–4.0	2.0–4.4	2.0–4.9	2.2–5.4	2.4–5.7
PCE prices, total						
(percent change, Q4 to Q4)						
Projection	1.3	2.0	1.9	1.9	2.0	2.0
Confidence interval						
Tealbook forecast errors	.9–2.2	1.3–3.5	1.3–3.3	. . .	. . .	. . .
FRB/US stochastic simulations	.6–2.0	.9–2.9	.8–3.0	.7–3.0	.7–3.1	.7–3.1
PCE prices excluding						
food and energy						
(percent change, Q4 to Q4)						
Projection	1.8	1.9	1.9	1.9	2.0	2.0
Confidence interval						
Tealbook forecast errors	1.4–2.2	1.3–2.7	. . .	. . .	. . .	. . .
FRB/US stochastic simulations	1.1–2.3	.9–2.8	.9–2.8	.8–2.9	.8–3.0	.8–3.0
Federal funds rate						
(percent, Q4)						
Projection	1.4	1.8	2.0	2.2	2.3	2.5
Confidence interval						
FRB/US stochastic simulations	1.1–1.7	1.1–2.9	.8–3.7	.4–4.2	.2–4.6	.1–4.7

Note: Shocks underlying FRB/US stochastic simulations are randomly drawn from the 1969–2018 set of model equation residuals. Intervals derived from Tealbook forecast errors are based on projections made from 1980 to 2018 for real GDP and unemployment and from 1998 to 2018 for PCE prices. The intervals for real GDP, unemployment, and total PCE prices are extended into 2022 using information from the Blue Chip survey and forecasts from the CBO and CEA.
. . . Not applicable.

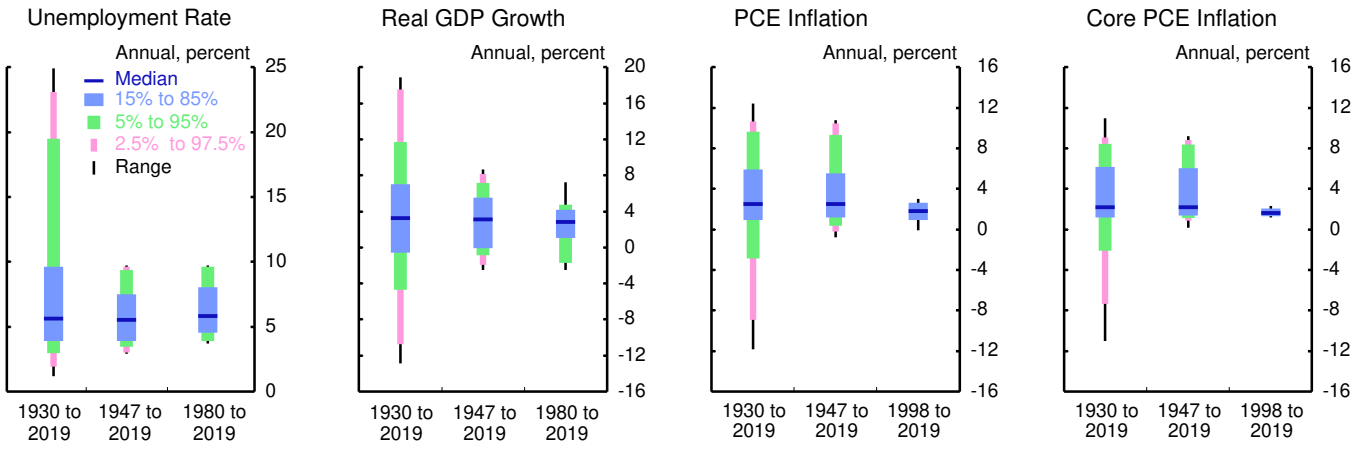
Prediction Intervals Derived from Historical Tealbook Forecast Errors

Forecast Error Percentiles

Historical Distributions



Historical Distributions



Note: See the technical note in the appendix for more information on this exhibit.

1. Augmented Tealbook prediction intervals use 1- and 2-year-ahead forecast errors from Blue Chip, CBO, and CEA to extend the Tealbook prediction intervals through 2022.

Appendix

Technical Note on "Prediction Intervals Derived from Historical Tealbook Forecast Errors"

This technical note provides additional details about the exhibit "Prediction Intervals Derived from Historical Tealbook Forecast Errors." In the four large fan charts, the black dotted lines show staff projections and current estimates of recent values of four key economic variables: average unemployment rate in the fourth quarter of each year and the Q4/Q4 percent change for real GDP, total PCE prices, and core PCE prices. (The GDP series is adjusted to use GNP for those years when the staff forecast GNP and to strip out software and intellectual property products from the currently published data for years preceding their introduction. Similarly, the core PCE inflation series is adjusted to strip out the "food away from home" component for years before it was included in core.)

The historical distributions of the corresponding series (with the adjustments described above) are plotted immediately to the right of each of the fan charts. The thin black lines show the highest and lowest values of the series during the indicated time period. At the bottom of the page, the distributions over three different time periods are plotted for each series. To enable the use of data for years prior to 1947, we report annual-average data in this section. The annual data going back to 1930 for GDP growth, PCE inflation, and core PCE inflation are available in the conventional national accounts; we used estimates from Lebergott (1957) for the unemployment rate from 1930 to 1946.[1]

The prediction intervals around the current and one-year-ahead forecasts are derived from historical staff forecast errors, comparing staff forecasts with the latest published data. For the unemployment rate and real GDP growth, errors were calculated for a sample starting in 1980, yielding percentiles of the sizes of the forecast errors. For PCE and core PCE inflation, errors based on a sample beginning in 1998 were used. This shorter range reflects both more limited data on staff forecasts of PCE inflation and the staff judgment that the distribution of inflation since the mid-1990s is more appropriate for the projection period than distributions of inflation reaching further back. In all cases, the prediction intervals are computed by adding the percentile bands of the errors onto the forecast. The blue bands encompass 70 percent prediction-interval ranges; adding the green bands expands this range to 90 percent. The dark blue line plots the median of the prediction intervals. There is not enough historical forecast data to calculate meaningful 90 percent ranges for the two inflation series. A median line above the staff forecast means that forecast errors were positive more than half of the time.

[1] Stanley Lebergott (1957), "Annual Estimates of Unemployment in the United States, 1900–1954," in National Bureau of Economic Research, *The Measurement and Behavior of Unemployment* (Princeton, N.J.: Princeton University Press), pp. 213–41.

Because the staff has produced two-year-ahead forecasts for only a few years, the intervals around the two-year-ahead forecasts are constructed by augmenting the staff projection errors with information from outside forecasters: the Blue Chip consensus, the Council of Economic Advisers, and the Congressional Budget Office. Specifically, we calculate prediction intervals for outside forecasts in the same manner as for the staff forecasts. We then calculate the change in the error bands from outside forecasts from one year ahead to two years ahead and apply the average change to the staff's one-year-ahead error bands. That is, we assume that any deterioration in the performance between the one- and two-year-ahead projections of the outside forecasters would also apply to the Tealbook projections. Limitations on the availability of data mean that a slightly shorter sample is used for GDP and unemployment, and the outside projections may only be for a similar series, such as total CPI instead of total PCE prices or annual growth rates of GDP instead of four-quarter changes. In particular, because data on forecasts for core inflation by these outside forecasters are much more limited, we did not extrapolate the staff's errors for core PCE inflation two years ahead.

The intervals around the historical data in the four fan charts are based on the history of data revisions for each series. The previous-year, two-year-back, and three-year-back values as of the current Tealbook forecast are subtracted from the corresponding currently published estimates (adjusted as described earlier) to produce revisions, which are then combined into distributions and revision intervals in the same way that the prediction intervals are created.

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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. The policy rate prescriptions described below are lower than in the January Tealbook, reflecting lower near-term inflation and a narrower output gap in the staff forecast. An additional exhibit provides updated estimates of the equilibrium real federal funds rate in the longer run. In the box "Market Participants' Perceptions of the FOMC's Policy Reaction Function," we compare the policy rate expectations of respondents to the Desk's surveys of primary dealers and market participants with the prescriptions arising from the Taylor (1993) rule.

NEAR-TERM PRESCRIPTIONS OF SELECTED SIMPLE POLICY RULES

The top panel of the first exhibit shows the near-term prescriptions for the federal funds rate from four simple policy rules: the inertial version of the Taylor (1999) rule, the Taylor (1993) rule, a first-difference rule, and a flexible price-level targeting (FPLT) rule.[1] These near-term prescriptions take as given the Tealbook baseline projections for the output gap and core inflation, which are shown in the middle panels.[2] To ensure that the rules with a lagged policy rate term account for the intermeeting policy action, their prescriptions for the first quarter shown use the midpoint of the current target range for the federal funds rate as the lagged policy rate term. The top and middle panels also provide the staff's baseline path for the federal funds rate.

- To assess how revisions to inflation and resource utilization in the staff's projection affect the prescriptions of the policy rules, the panel also reports prescriptions based on the previous Tealbook's staff outlook for inflation and resource utilization, abstracting from the effects of the recent intermeeting reduction in the target range in the comparison.[3] These prescriptions show

[1] Except for the first-difference rule, which has no intercept term, the simple rules examined herein use intercept terms that are consistent with a real federal funds rate of 50 basis points in the longer run. The appendix in this Tealbook section provides technical details on these simple policy rules.

[2] Because the FPLT rule responds to the gap between the unemployment rate and the natural rate of unemployment, this rule takes as given the Tealbook baseline projections for these variables instead of the projection for the output gap.

[3] To abstract from the effects of the recent intermeeting reduction in the target range, the prescriptions for the first quarter shown, based on the current Tealbook and the previous Tealbook

Market Participants' Perceptions of the FOMC's Policy Reaction Function

In the January 2020 surveys of primary dealers and market participants, the Desk asked respondents about their expectations for the target federal funds rate at the end of 2021:Q1 under nine hypothetical economic scenarios that pertained to conditions in 2020:Q4. The table presents the mean of the survey responses regarding these scenarios. The scenarios featured combinations of 50 basis point increases, no changes, or 50 basis point decreases in the unemployment rate and in core PCE inflation from their respective median values for 2020:Q4 in the December 2019 Summary of Economic Projections (SEP). In this discussion, we use the mean of the survey responses to extract information about how the respondents viewed the FOMC's policy reaction function.

As a benchmark, we consider a version of the Taylor (1993) rule,

$$R_t = r^{LR} + \pi^{LR} + 1.5\,(\pi_{t-1} - \pi^{LR}) - 1.0\,(u_{t-1} - u^{LR}),$$

where r^{LR} is the longer-run neutral real federal funds rate, π^{LR} is the longer-run inflation objective, and u^{LR} is the longer-run rate of unemployment.[1] We assume that r^{LR} = 0.5 percent, u^{LR} = 4.1 percent, and π^{LR} = 2 percent. These values are consistent with the medians in the December 2019 SEP.

The left panel of the figure shows that the Taylor (1993) rule specified above prescribes one-for-one reactions to both increases and decreases in the unemployment rate (that is, the lines are equally spaced by 50 basis points). In contrast to this rule's prescriptions, the mean of the survey responses, shown in the right panel, implies an asymmetric policy response to movements in the unemployment rate. In response to a 50 basis point increase in the unemployment rate, respondents expected the FOMC to lower the federal funds rate target nearly 50 basis points (measured as the average distance between the blue and red lines). By contrast, in response to a 50 basis point decrease in the unemployment rate, the mean of the survey responses implies an attenuated reaction, with respondents expecting the FOMC to raise the federal funds rate only 16 basis points (measured as the average distance between the blue and cyan lines).

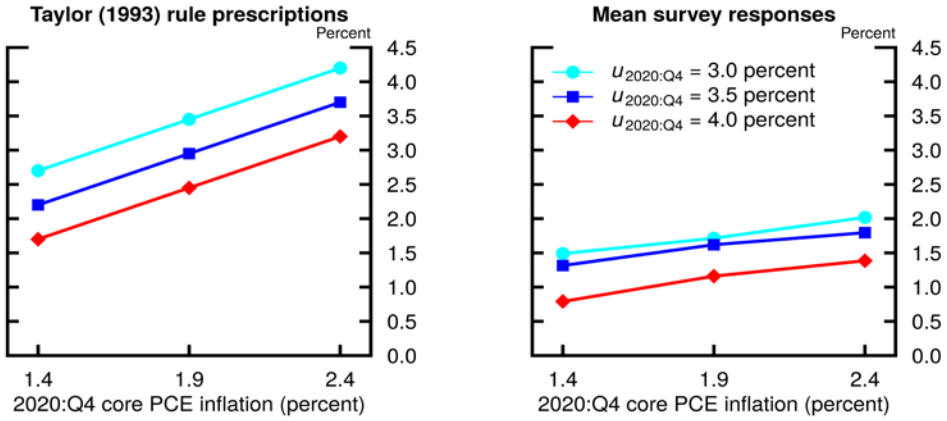
Mean Expected Federal Funds Rate at the End of 2021:Q1 under Hypothetical Scenarios (percent)

2020:Q4 core PCE inflation	2020:Q4 unemployment rate		
	3.0 percent	3.5 percent	4.0 percent
1.4 percent	1.49	1.32	0.79
1.9 percent	1.71	1.62	1.16
2.4 percent	2.02	1.80	1.39

Source: January 2020 surveys of primary dealers and market participants.

[1] This version of the Taylor (1993) rule, which uses a unitary coefficient on the unemployment rate gap, generally leads to rate prescriptions and macroeconomic outcomes similar to those associated with the standard Taylor (1993) rule (a rule considered elsewhere in this section of Tealbook A), which has a coefficient of 0.5 on the output gap. Also, this version of the rule responds with a one-quarter lag to macroeconomic developments, whereas the standard Taylor (1993) rule responds contemporaneously.

Federal Funds Rate at the End of 2021:Q1 under Hypothetical Scenarios



Source: January 2020 surveys of primary dealers and market participants; staff calculations.

The figure also shows that the perceived FOMC response to inflation movements is attenuated relative to the Taylor (1993) rule: The slopes of the lines in the right panel, at about 0.5, are much smaller than the slope of 1.5 implied by the Taylor (1993) rule.[2]

The figure further shows that the level of the expected federal funds rate in the surveys is between 1 and 2.25 percentage points lower than the prescriptions of the Taylor (1993) rule across the nine scenarios. Notably, under the scenario in which the unemployment rate falls to 3 percent and inflation rises to 2.4 percent, the mean expectation of the federal funds rate is only 2 percent. This value is 0.5 percentage point below the median longer-run neutral level in the SEP and only half that prescribed by the Taylor (1993) rule. That is, the mean response is consistent with the FOMC maintaining an accommodative stance of policy even if the economy were to overheat.

There are several complementary reasons why survey respondents might expect the FOMC to set low policy rates and to respond in an attenuated manner to inflation and unemployment rate movements relative to the prescriptions of the Taylor (1993) rule. First, respondents may perceive the FOMC as unresponsive to a tight labor market. Second, they may view the Committee as conducting policy in a manner consistent with values of r^{LR} or u^{LR} (or both) that are significantly lower than the corresponding median values in the SEP.[3] Third, respondents may regard the FOMC as reacting only gradually to economic developments such that the policy rate expected in 2021:Q1 captures only part of the expected cumulative policy response.[4] More generally, respondents may perceive the FOMC as responding to factors beyond realized movements in core inflation and the unemployment rate. When asked what other factors they believe the FOMC reacts to, respondents most frequently cited trade risks, geopolitical uncertainty, and U.S. inflation expectations, as well as general U.S. and global economic and financial conditions.

[2] Respondents also expected the FOMC to react more strongly to a decrease in core inflation than to an increase. However, this asymmetry is not as pronounced as it is for the unemployment rate.

[3] In the January 2020 surveys, the median respondent saw inflation at 2 percent and the neutral real rate at 0.4 percent over the longer run. The surveys did not ask about participants' estimates of u^{LR}. Other surveys, such as the Survey of Professional Forecasters, have median responses for u^{LR} that are similar to the median in the SEP.

[4] For further discussion, see Etienne Gagnon and Carly Schippits (2020), "Market Participants' Understanding of the FOMC's Policy Reaction Function," memorandum, Board of Governors of the Federal Reserve System, Division of Monetary Affairs, March 5.

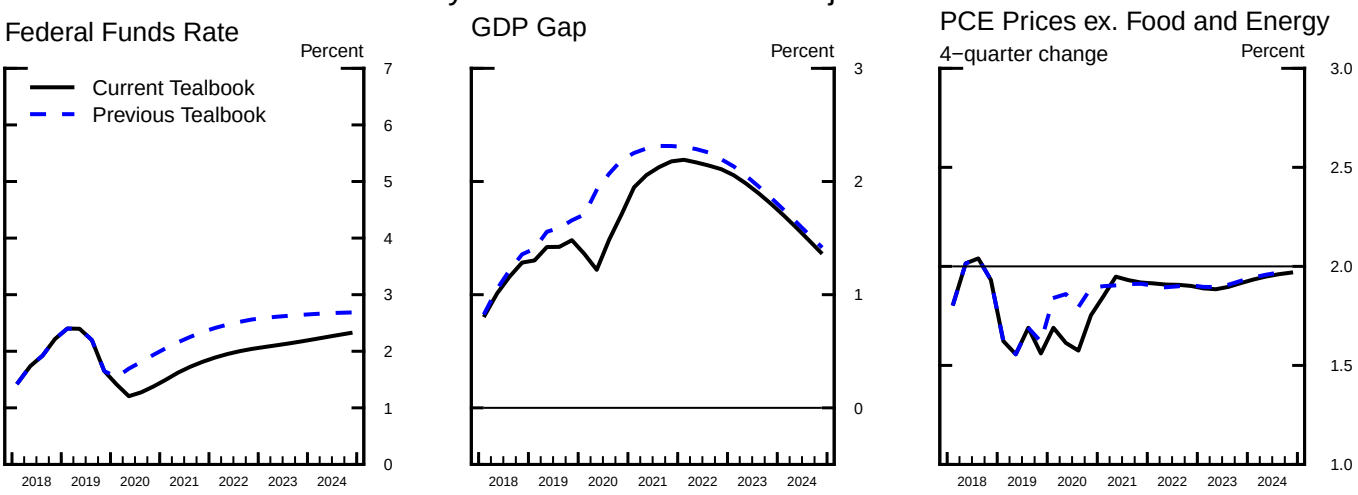
Policy Rules and the Staff Projection

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

(Percent)

	2020:Q2	2020:Q3
Inertial Taylor (1999) rule	**1.42**	**1.71**
Previous Tealbook projection	*1.58*	*1.98*
Taylor (1993) rule	**2.51**	**2.59**
Previous Tealbook projection	*3.23*	*3.20*
First−difference rule	**1.34**	**1.74**
Previous Tealbook projection	*1.35*	*1.48*
Flexible price−level targeting rule	**0.90**	**0.71**
Previous Tealbook projection	*1.00*	*0.90*
Addendum:		
Tealbook baseline	**1.21**	**1.27**

Key Elements of the Staff Projection



A Medium−Term Notion of the Equilibrium Real Federal Funds Rate[2]

(Percent)

	Current Value	*Previous Tealbook*
Tealbook baseline		
FRB/US *r**	0.98	*1.48*
Average projected real federal funds rate	−.16	*.28*
SEP−consistent baseline		
FRB/US *r**	.22	
Average projected real federal funds rate	−.13	

1. The lines denoted "Previous Tealbook projection" report prescriptions based on the previous Tealbook's staff outlook for inflation and resource slack. Where a rule prescription depends on the lagged policy rate, the value of the federal funds rate in 2020:Q1 is set to the midpoint of the current target range throughout this panel.

2. The "FRB/US *r**" is the level of the real federal funds rate that, if maintained over a 12−quarter period (beginning in the current quarter) in the FRB/US model, sets the output gap equal to zero in the final quarter of that period given either the Tealbook or SEP−consistent projection. The SEP−consistent baseline corresponds to the December 2019 median SEP responses. The "Average projected real federal funds rate" is calculated under the Tealbook and SEP−consistent baseline projections over the same 12−quarter period as FRB/US *r**.

that the downward revisions to inflation and the output gap since the January Tealbook result in lower interest rate prescriptions in the near term for all rules except the first-difference rule.

- Compared with the Tealbook baseline, the inertial Taylor (1999) rule prescribes higher policy rates because this policy rule responds more strongly to the positive output gap than does the conditional attenuated rule used in the Tealbook baseline projection.

- The Taylor (1993) rule, which does not feature an interest rate smoothing term, calls for higher policy rates than all of the other simple policy rules and the Tealbook baseline projection.

- The first-difference rule, which reacts to the expected change in the output gap, prescribes increases in the policy rate in the near term because resource utilization is expected to rise over the next year in the staff projection. The prescription of this rule in the third quarter of this year is 26 basis points higher than the corresponding prescription based on the January Tealbook because resource utilization is projected to rise more quickly in this Tealbook.

- The FPLT rule calls for lowering the federal funds rate well below the current target range in an effort to eliminate a cumulative shortfall in the core PCE price index of almost 3 percent of its target path since the end of 2011.

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

The bottom panel of the first exhibit reports estimates of a medium-term concept of the equilibrium real federal funds rate (r^*) generated under two baselines: the Tealbook baseline and a projection consistent with the medians in the December 2019 SEP.[4] This concept of r^*, labeled "FRB/US r^*," corresponds to the level of the real

projection, use the midpoint of the current target range for the federal funds rate as the lagged policy rate term.

[4] To construct a baseline projection consistent with median SEP responses for the FRB/US model, the staff interpolated annual SEP information to a quarterly frequency and assumed that, beyond 2022 (the final year reported in the December 2019 SEP), the economy transitions to the longer-run values in a smooth and monotonic way. The staff also postulated economic relationships to project variables not covered in the SEP. For example, the staff assumed an Okun's law relationship to recover an output gap from the deviation of the median SEP unemployment rate from the median SEP estimate of its longer-run value.

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 in the FRB/US model. This measure is a summary of the projected underlying strength of the real economy and does not take into account considerations such as achieving the inflation objective or avoiding sharp changes in the federal funds rate.

- At 0.98 percent, the current value of the Tealbook-consistent FRB/US *r** is 50 basis points lower than the value consistent with the January Tealbook projection. The downward revision reflects weaker aggregate demand despite a lower projected path for the real federal funds rate in the staff's current projection than in the January projection.

- At 0.22 percent, the December 2019 SEP-consistent FRB/US *r** is lower than the Tealbook-consistent FRB/US *r**. This difference arises because the magnitude of the undershooting of the unemployment rate relative to its longer-run value in the median projection in the December SEP implies lower levels of resource utilization than in the staff's projection, even though the two projections contain similar policy rate paths.

SIMPLE POLICY RULE SIMULATIONS

The second exhibit reports the Tealbook baseline projection and results from dynamic simulations of the FRB/US model under the inertial Taylor (1999) rule, the Taylor (1993) rule, the first-difference rule, and the FPLT rule. These simulations reflect the endogenous responses of resource utilization and inflation to the different federal funds rate paths implied by the policy rules. 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.

- Under the Tealbook baseline, which is constructed using the conditional attenuated policy rule, the federal funds rate rises slowly from its current level.[5] The federal funds rate reaches 2 percent in the third quarter of 2022,

[5] To account for the intermeeting policy action, the lagged value of the federal funds rate that enters the conditional attenuated rule in the second quarter of 2020 is taken to be the midpoint of the current target range for the federal funds rate. This convention is also adopted in the simulations of the

whereas, in the previous Tealbook (not shown), it reached the same level six quarters earlier because of the recent policy action as well as a downward adjustment to the intercept in the conditional attenuated policy rule.[6]

- The inertial Taylor (1999) rule, which embodies the same degree of inertia as the Tealbook baseline rule but responds more strongly to the output gap, calls for the federal funds rate to increase at a faster pace than under the baseline rule. The prescriptions of the inertial Taylor (1999) rule plateau at about 3 percent starting in 2022. These less accommodative monetary conditions result in an unemployment rate path that rises more quickly, inflation that is lower, and a real 10-year Treasury yield that is higher than in the Tealbook baseline projection.

- Because the Taylor (1993) rule has no interest rate smoothing term, it calls for increasing the federal funds rate immediately to just under 2½ percent. Thereafter, the prescribed federal funds rate path is roughly flat, and it remains above the rate path implied by the Tealbook baseline rule throughout the period shown. Under the Taylor (1993) rule, the unemployment rate path is higher and the path for inflation is slightly lower than the corresponding paths in the Tealbook baseline projection.

- The first-difference rule, which reacts to the expected change in the output gap rather than its level, calls for a gradual increase in the federal funds rate that is initially steeper than in the Tealbook baseline, reaching about 2½ percent in 2022. However, beyond the period shown, the path for the real federal funds rate runs below that in the Tealbook baseline for an extended period. Because of the forward-looking nature of financial market participants, price setters, and wage setters in the FRB/US model, this strategy generates higher inflation and, eventually, a lower unemployment rate than in the staff projection.

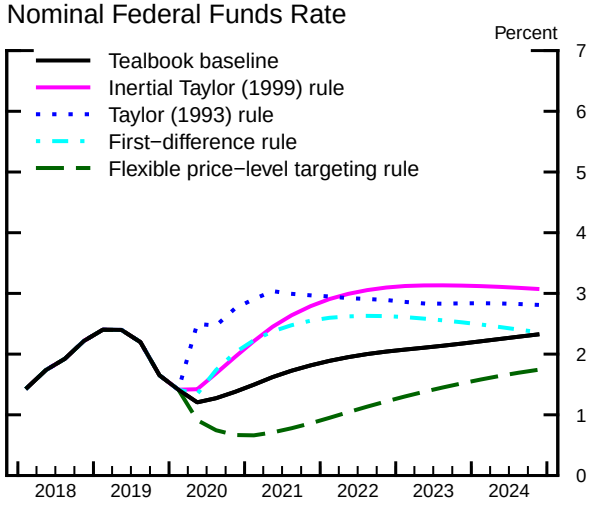
- The FPLT rule responds to, and seeks to eliminate, the cumulative shortfall of the level of core PCE prices from a target path that is defined by the growth of that price level at an annual rate of 2 percent from the end of 2011 onward.

other simple policy rules as well as in the optimal control simulations discussed later. See the appendix for further details.

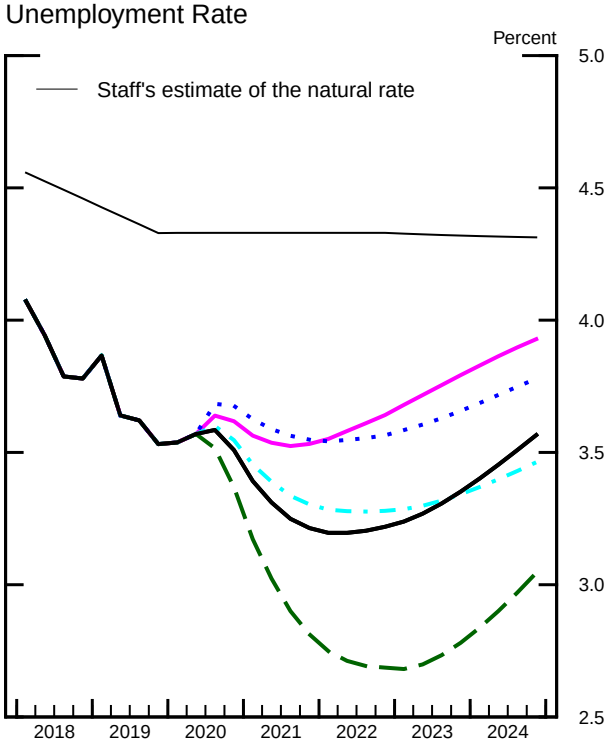
[6] The Domestic Economic Developments and Outlook section of this Tealbook A describes the intercept adjustment in more detail.

Simple Policy Rule Simulations

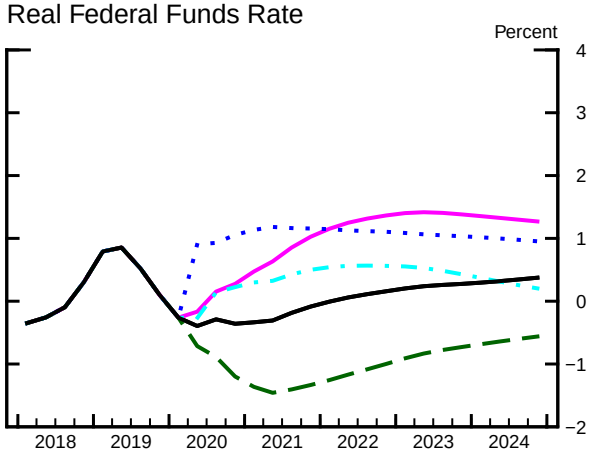
Nominal Federal Funds Rate



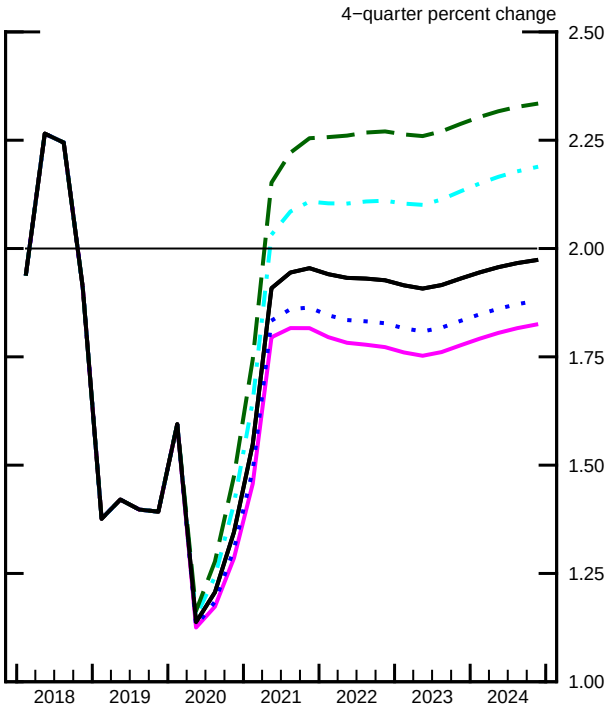
Unemployment Rate



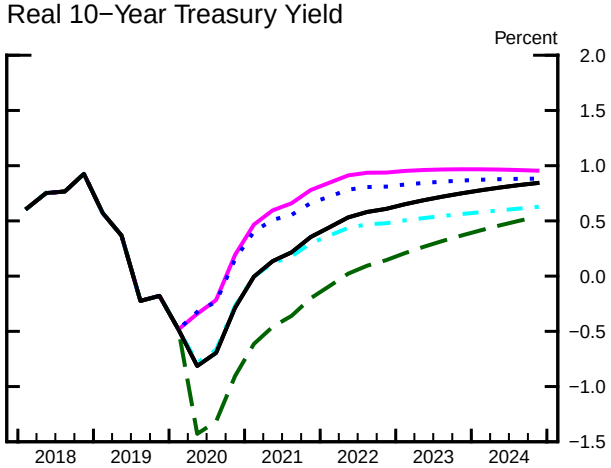
Real Federal Funds Rate



PCE Inflation



Real 10−Year Treasury Yield



Note: The policy rule simulations in this exhibit are based on rules that respond to core inflation rather than to headline inflation. This choice of rule specification was made in light of a tendency for current and near−term core inflation rates to outperform headline inflation rates as predictors of the medium−term behavior of headline inflation.

Eliminating the current shortfall of 3 percent requires inflation to run above 2 percent in coming years. The simulation embeds the assumptions that policymakers can credibly commit to closing this gap over time and that financial market participants, price setters, and wage setters correctly anticipate the ensuing long period of a low federal funds rate. Consequently, the path of the real 10-year Treasury rate immediately drops to almost negative 1½ percent and remains below the corresponding Tealbook baseline path throughout the period shown. The unemployment rate is substantially lower under the FPLT rule than in the Tealbook baseline and all other simulations, dropping below 3 percent in 2021. Inflation exceeds 2 percent by 24 basis points, on average, from 2021 through the end of the period shown.

- The current policy rate prescriptions from the simple policy rules are lower than their corresponding prescriptions in the January Tealbook. Through 2024, the average reduction in the interest rate prescribed by the inertial Taylor (1999) rule, the Taylor (1993) rule, the first-difference rule, and the FPLT rule amounts to 44, 31, 33, and 39 basis points, respectively. These changes, which are slightly smaller than the 48 basis point average reduction over the same period of the federal funds rate baseline path, reflect the staff's lower projected levels of resource utilization and the real federal funds rate through the medium term.

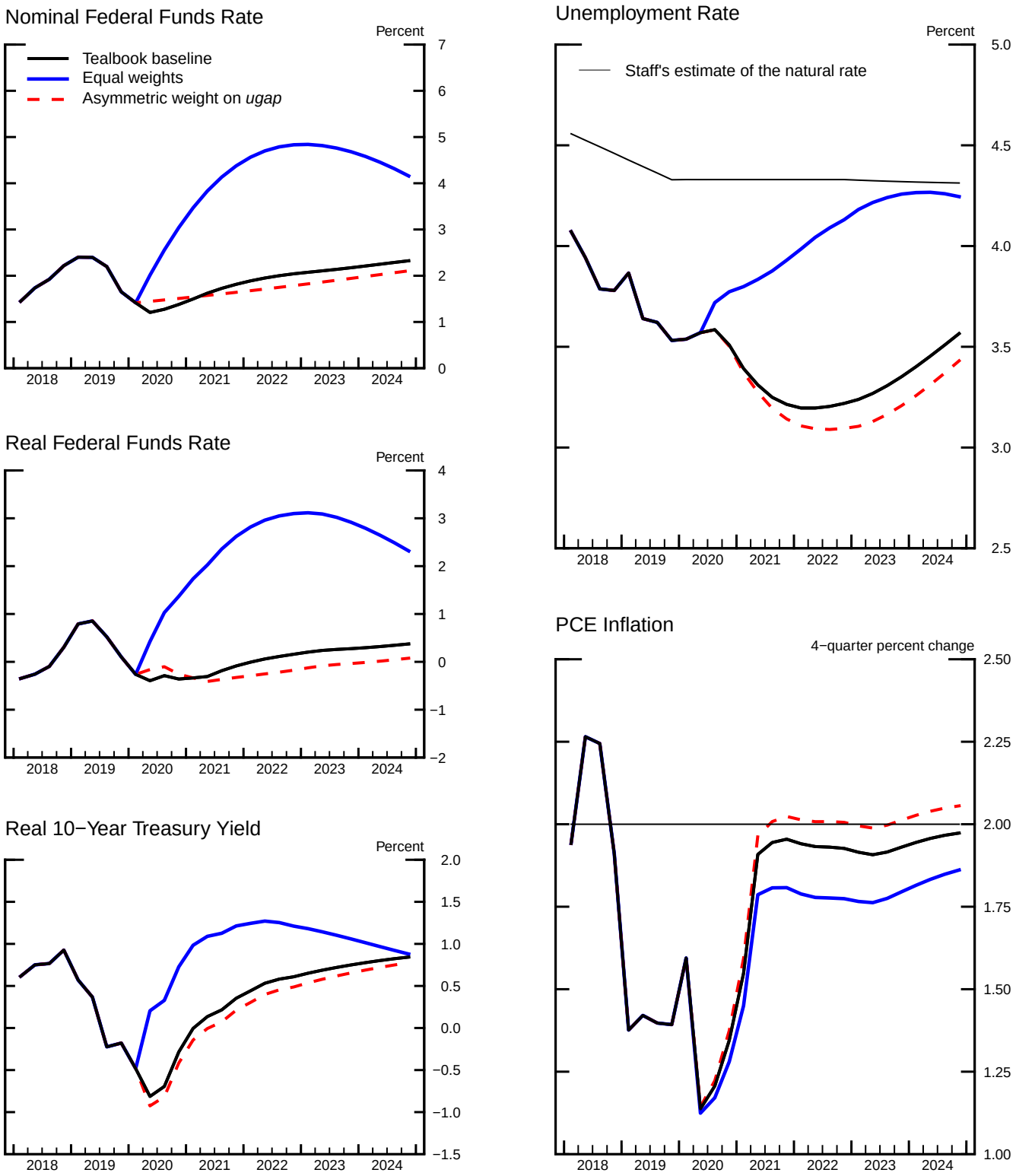
OPTIMAL CONTROL SIMULATIONS UNDER COMMITMENT

The third exhibit displays optimal control simulations conditional on the Tealbook baseline under two different assumptions about policymakers' preferences, as captured by alternative specifications of the loss function.[7] The concept of optimal control employed here is one in which current policymakers are able to commit future policymakers to their plans; such a commitment, when feasible, may lead to improved economic outcomes.[8]

[7] The box "Optimal Control and the Loss Function" in the Monetary Policy Strategies section of Tealbook B for June 2016 offers motivations for these specifications. The appendix to this Tealbook section provides technical details on the optimal control simulations.

[8] Under the optimal control policies, policymakers achieve the displayed economic outcomes by making promises that bind future policymakers to take actions that may not be optimal from the perspective of those future policymakers (that is, the promises are time inconsistent). It is assumed that these promises are taken as credible by wage and price setters and by financial market participants.

Optimal Control Simulations under Commitment



Note: Each set of lines corresponds to an optimal control policy under commitment in which policymakers minimize a discounted weighted sum of squared deviations of 4−quarter headline PCE inflation from the Committee's 2 percent objective, of squared deviations of the unemployment rate from the staff's estimate of the natural rate, and of squared changes in the federal funds rate. The weights vary across simulations. See the appendix for technical details and the box "Optimal Control and the Loss Function" in the June 2016 Tealbook B for a motivation.

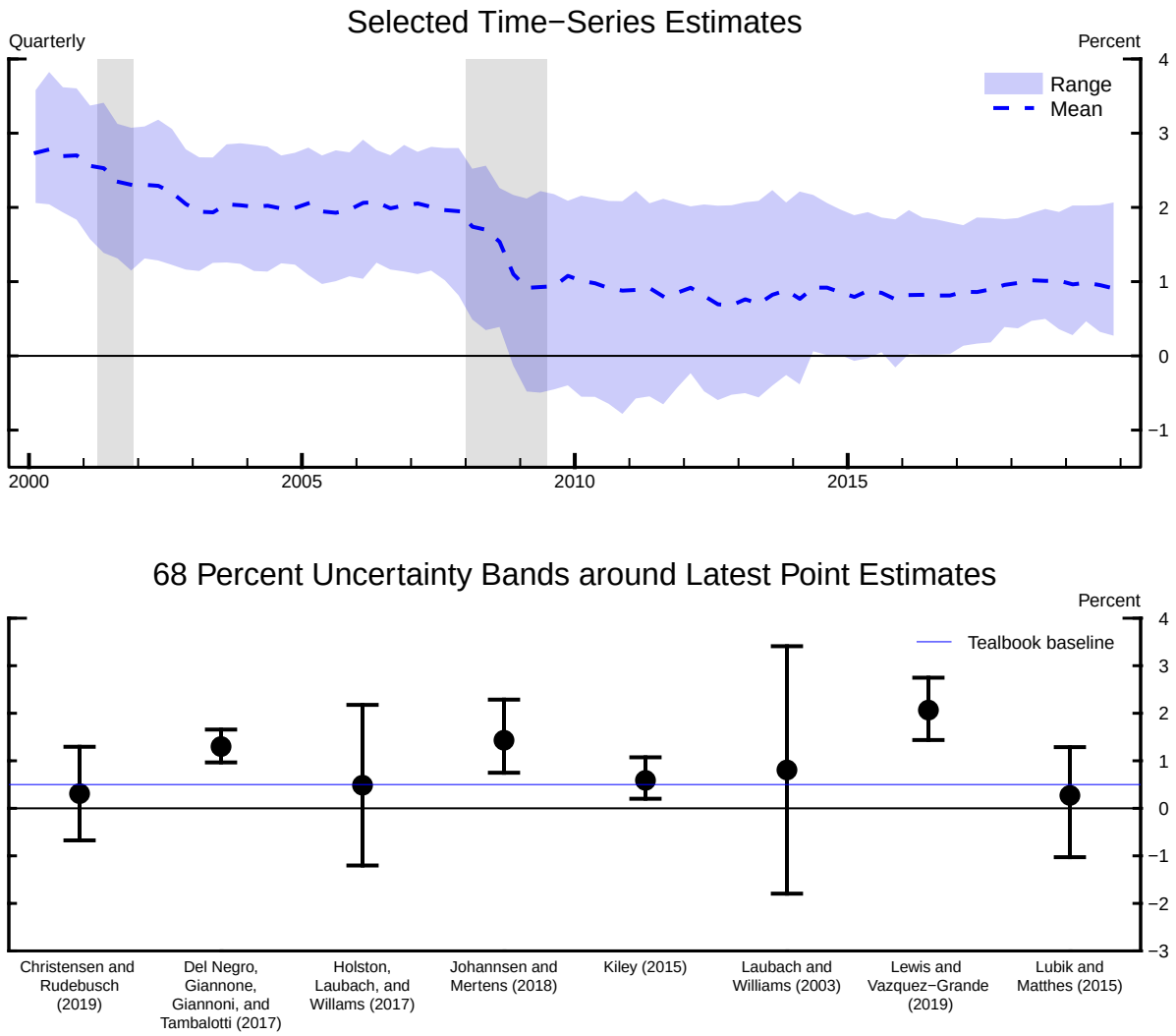
- The simulation labeled "Equal weights" presents the case in which policymakers are assumed to place equal weights on keeping headline PCE inflation close to the Committee's objective of 2 percent, on keeping the unemployment rate close to the staff's estimate of the natural rate of unemployment, and on keeping the federal funds rate close to its previous value. Under this strategy, the federal funds rate runs significantly higher than the Tealbook baseline path, reaching a peak of nearly 5 percent in 2023. By design, this strategy seeks to counter the projected persistent undershooting by the unemployment rate of its natural rate that occurs in the Tealbook baseline—an outcome that policymakers who use the equal-weights loss function judge to be undesirable. The narrower unemployment rate gap implies only a modestly lower path for inflation because, in the FRB/US model, the response of inflation to the level of resource utilization is small.

- The simulation labeled "Asymmetric weight on *ugap*" uses a loss function that assigns no cost to deviations of the unemployment rate from the natural rate when the unemployment rate is below the natural rate, but is otherwise identical to the specification with equal weights. Under this strategy, policymakers' desire to raise inflation to 2 percent does not have to be balanced against a desire to prevent the unemployment rate from running below its natural rate in the next few years. The resulting path for the federal funds rate is similar to the Tealbook baseline rate path. The federal funds rate prescriptions arising from the asymmetric specification in this Tealbook are, on average, 21 basis points lower than those in the January Tealbook through 2024, reflecting the combination of a lower federal funds rate path and a nearly unrevised projection for inflation beyond the next four quarters in the Tealbook baseline. Under the equal-weights specification, the lower levels of resource utilization in the current projection induce a path for the federal funds rate that is, on average, 51 basis points lower than in the January Tealbook through 2024.

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

The next exhibit updates 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.

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



Longer−Run Values from Selected Forecasters

	Release Date	Percent
Tealbook baseline	Mar. 2020	.50
Median SEP	Dec. 2019	.50
Median Survey of Primary Dealers	Jan. 2020	.40
Blue Chip consensus	Oct. 2019	.29
Congressional Budget Office	Jan. 2020	.65

Note: The latest time−series estimates in the top and middle panels are from 2019:Q4. The shaded vertical areas in the top panel are NBER recessions. See the appendix for the construction of the values reported in the bottom panel.

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} is a parameter in many of the simple policy rules, including the staff's baseline policy rule, considered in this and other sections of Tealbook A.

- The top panel of the exhibit shows the range of historical values through 2019:Q4 from several model-based time-series estimates of r^{LR}.[9] The values for 2019:Q4 range from 0.3 to 2.1 percent, with a mean of about 0.9 percent.

- Time-series estimates of r^{LR} are subject to considerable uncertainty, as depicted in the middle panel. The sources of this uncertainty, which vary across the studies, reflect factors such as the choice of econometric approach as well as the uncertainty that exists within each model about the prevailing state of the economy and the model's parameter estimates.

- The lower panel of the exhibit reports longer-term estimates of the real federal funds rate from selected sources. The Tealbook baseline assumption, at ½ percent, is similar to median values reported in a number of surveys as well as the most recent estimate by the Congressional Budget Office.

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 optimal control simulations shown in the exhibit "Optimal Control Simulations under Commitment."

[9] The top panel reports the range of "one-sided" estimates, meaning that the estimates for a particular date are conditioned only on data up to that date. 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} from the co-movement of either macroeconomic series (like inflation, interest rates, and output) or both macroeconomic and financial data (like TIPS yields). See the appendix to this section for sources and methodology.

Outcomes of Simple Policy Rule Simulations

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

Outcome and strategy	2019 H2	2020	2021	2022	2023	2024
Nominal federal funds rate[1]						
Inertial Taylor (1999)	1.7	2.0	2.8	3.1	3.1	3.1
Taylor (1993)	1.7	2.8	3.0	2.9	2.8	2.8
First-difference	1.7	2.0	2.6	2.6	2.5	2.4
Flexible price-level targeting	1.7	.7	.9	1.2	1.5	1.7
Extended Tealbook baseline	1.7	1.4	1.8	2.0	2.2	2.3
Real GDP						
Inertial Taylor (1999)	2.1	1.9	1.8	1.5	1.4	1.4
Taylor (1993)	2.1	1.8	1.9	1.7	1.5	1.4
First-difference	2.1	2.1	2.2	1.8	1.6	1.5
Flexible price-level targeting	2.1	2.4	2.9	2.1	1.5	1.2
Extended Tealbook baseline	2.1	2.1	2.3	1.7	1.4	1.3
Unemployment rate[1]						
Inertial Taylor (1999)	3.5	3.6	3.5	3.6	3.8	3.9
Taylor (1993)	3.5	3.7	3.5	3.6	3.7	3.8
First-difference	3.5	3.5	3.3	3.3	3.3	3.5
Flexible price-level targeting	3.5	3.4	2.8	2.7	2.8	3.0
Extended Tealbook baseline	3.5	3.5	3.2	3.2	3.4	3.6
Total PCE prices						
Inertial Taylor (1999)	1.4	1.3	1.8	1.8	1.8	1.8
Taylor (1993)	1.4	1.3	1.9	1.8	1.8	1.9
First-difference	1.4	1.4	2.1	2.1	2.1	2.2
Flexible price-level targeting	1.4	1.5	2.3	2.3	2.3	2.3
Extended Tealbook baseline	1.4	1.3	2.0	1.9	1.9	2.0
Core PCE prices						
Inertial Taylor (1999)	1.7	1.7	1.8	1.7	1.8	1.8
Taylor (1993)	1.7	1.7	1.8	1.8	1.8	1.9
First-difference	1.7	1.8	2.1	2.1	2.1	2.2
Flexible price-level targeting	1.7	1.9	2.2	2.2	2.3	2.3
Extended Tealbook baseline	1.7	1.8	1.9	1.9	1.9	2.0

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			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Nominal federal funds rate[1]								
Inertial Taylor (1999)	1.4	1.4	1.7	2.0	2.2	2.5	2.6	2.8
Taylor (1993)	1.4	2.5	2.5	2.8	2.9	3.0	3.0	3.0
First-difference	1.4	1.3	1.7	2.0	2.2	2.4	2.5	2.6
Flexible price-level targeting	1.4	.9	.7	.7	.7	.7	.8	.9
Extended Tealbook baseline	1.4	1.2	1.3	1.4	1.5	1.6	1.7	1.8
Real GDP								
Inertial Taylor (1999)	1.9	1.7	1.8	1.9	2.1	2.2	2.0	1.8
Taylor (1993)	1.9	1.7	1.8	1.8	2.0	2.1	2.0	1.9
First-difference	1.9	1.7	1.9	2.1	2.4	2.6	2.4	2.2
Flexible price-level targeting	1.9	1.7	2.1	2.4	3.0	3.4	3.2	2.9
Extended Tealbook baseline	1.9	1.7	2.0	2.1	2.5	2.7	2.5	2.3
Unemployment rate[1]								
Inertial Taylor (1999)	3.5	3.6	3.6	3.6	3.6	3.5	3.5	3.5
Taylor (1993)	3.5	3.6	3.7	3.7	3.6	3.6	3.6	3.5
First-difference	3.5	3.6	3.6	3.5	3.5	3.4	3.3	3.3
Flexible price-level targeting	3.5	3.6	3.5	3.4	3.2	3.0	2.9	2.8
Extended Tealbook baseline	3.5	3.6	3.6	3.5	3.4	3.3	3.2	3.2
Total PCE prices								
Inertial Taylor (1999)	1.6	1.1	1.2	1.3	1.5	1.8	1.8	1.8
Taylor (1993)	1.6	1.1	1.2	1.3	1.5	1.8	1.9	1.9
First-difference	1.6	1.2	1.2	1.4	1.6	2.0	2.1	2.1
Flexible price-level targeting	1.6	1.2	1.3	1.5	1.7	2.2	2.2	2.3
Extended Tealbook baseline	1.6	1.1	1.2	1.3	1.5	1.9	1.9	2.0
Core PCE prices								
Inertial Taylor (1999)	1.7	1.6	1.5	1.7	1.8	1.8	1.8	1.8
Taylor (1993)	1.7	1.6	1.6	1.7	1.8	1.9	1.8	1.8
First-difference	1.7	1.6	1.6	1.8	1.9	2.1	2.1	2.1
Flexible price-level targeting	1.7	1.6	1.6	1.9	2.0	2.2	2.2	2.2
Extended Tealbook baseline	1.7	1.6	1.6	1.8	1.8	1.9	1.9	1.9

1. Percent, average for the quarter.

Outcomes of Optimal Control Simulations under Commitment

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

Outcome and strategy	2019 H2	2020	2021	2022	2023	2024
Nominal federal funds rate[1]						
Equal weights	1.7	3.0	4.4	4.8	4.7	4.2
Asymmetric weight on *ugap*	1.7	1.5	1.6	1.8	1.9	2.1
Extended Tealbook baseline	1.7	1.4	1.8	2.0	2.2	2.3
Real GDP						
Equal weights	2.1	1.6	1.3	1.2	1.5	1.7
Asymmetric weight on *ugap*	2.1	2.2	2.5	1.9	1.5	1.3
Extended Tealbook baseline	2.1	2.1	2.3	1.7	1.4	1.3
Unemployment rate[1]						
Equal weights	3.5	3.8	3.9	4.1	4.3	4.2
Asymmetric weight on *ugap*	3.5	3.5	3.1	3.1	3.2	3.4
Extended Tealbook baseline	3.5	3.5	3.2	3.2	3.4	3.6
Total PCE prices						
Equal weights	1.4	1.3	1.8	1.8	1.8	1.9
Asymmetric weight on *ugap*	1.4	1.4	2.0	2.0	2.0	2.1
Extended Tealbook baseline	1.4	1.3	2.0	1.9	1.9	2.0
Core PCE prices						
Equal weights	1.7	1.7	1.8	1.7	1.8	1.9
Asymmetric weight on *ugap*	1.7	1.8	2.0	2.0	2.0	2.1
Extended Tealbook baseline	1.7	1.8	1.9	1.9	1.9	2.0

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

Outcomes of Optimal Control Simulations under Commitment, Quarterly

(4-quarter percent change, except as noted)

Outcome and strategy	2020				2021			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Nominal federal funds rate[1]								
Equal weights	1.4	2.0	2.6	3.0	3.5	3.8	4.1	4.4
Asymmetric weight on *ugap*	1.4	1.4	1.5	1.5	1.5	1.6	1.6	1.6
Extended Tealbook baseline	1.4	1.2	1.3	1.4	1.5	1.6	1.7	1.8
Real GDP								
Equal weights	1.9	1.7	1.7	1.6	1.6	1.6	1.4	1.3
Asymmetric weight on *ugap*	1.9	1.7	2.0	2.2	2.5	2.8	2.6	2.5
Extended Tealbook baseline	1.9	1.7	2.0	2.1	2.5	2.7	2.5	2.3
Unemployment rate[1]								
Equal weights	3.5	3.6	3.7	3.8	3.8	3.8	3.9	3.9
Asymmetric weight on *ugap*	3.5	3.6	3.6	3.5	3.4	3.3	3.2	3.1
Extended Tealbook baseline	3.5	3.6	3.6	3.5	3.4	3.3	3.2	3.2
Total PCE prices								
Equal weights	1.6	1.1	1.2	1.3	1.4	1.8	1.8	1.8
Asymmetric weight on *ugap*	1.6	1.1	1.2	1.4	1.6	2.0	2.0	2.0
Extended Tealbook baseline	1.6	1.1	1.2	1.3	1.5	1.9	1.9	2.0
Core PCE prices								
Equal weights	1.7	1.6	1.5	1.7	1.7	1.8	1.8	1.8
Asymmetric weight on *ugap*	1.7	1.6	1.6	1.8	1.9	2.0	2.0	2.0
Extended Tealbook baseline	1.7	1.6	1.6	1.8	1.8	1.9	1.9	1.9

1. Percent, average for the quarter.

Appendix

Implementation of the Simple Rules and Optimal Control Simulations

The monetary policy strategies considered in this section of Tealbook A typically fall into one of two categories. Under simple policy rules, policymakers set the federal funds rate according to a reaction function that includes a small number of macroeconomic factors. Under optimal control policies, policymakers compute a path for the federal funds rate that minimizes a loss function meant to capture policymakers' preferences over macroeconomic outcomes. Both approaches recognize the Federal Reserve's dual mandate. Unless otherwise noted, the simulations embed the assumption that policymakers will adhere to the policy strategy in the future and that financial market participants, price setters, and wage setters not only believe that policymakers will follow through with their strategy, but also fully understand the macroeconomic implications of policymakers doing so. Such policy strategies are described as commitment strategies.

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

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

POLICY RULES USED IN THE MONETARY POLICY STRATEGIES SECTION

The table "Simple Rules" that follows gives expressions for four simple policy rules reported in the first two exhibits of the Monetary Policy Strategies section. It also reports the expression for the conditional attenuated rule that the staff uses in the construction of the Tealbook baseline projection.[1] R_t denotes the nominal federal funds rate prescribed by a strategy

[1] In the staff's construction of the baseline forecast for the federal funds rate, the level of the federal funds rate in the current quarter is a weighted average of the realized daily values to date and the midpoint of the current target range over the remainder of the quarter. Beyond the current quarter, the conditional attenuated rule is used to project the path of the federal funds rate. In the second quarter of

for quarter *t*. For the current quarter, R_t corresponds to the midpoint of the current target range of the federal funds rate to account for the recent intermeeting policy action. The right-hand-side variables of the first four rules include the staff's projection of trailing four-quarter core PCE price inflation for the current quarter and three quarters ahead (π_t and $\pi_{t+3|t}$), the output gap estimate for the current period ($ygap_t$), and the forecast of the three-quarter-ahead annual change in the output gap ($ygap_{t+3|t} - ygap_{t-1}$). The value of policymakers' longer-run inflation objective, denoted π^{LR}, is 2 percent. In the case of the flexible price-level targeting rule, the right-hand-side variables include an unemployment rate gap and a price-level gap. The unemployment gap is defined as the difference between the unemployment rate, u_t, and the staff's estimate of its natural rate, u_t^*, which currently stands at 4.3 percent. The price gap is defined as 100 times the difference between the log of the core PCE price level, p_t, and the log of the target price-level path, p_t^*. The 2011:Q4 value of p_t^* is set to the 2011:Q4 value of the core PCE price index, and, subsequently, p_t^* is assumed to grow at a 2 percent annual rate.

Simple Rules

Taylor (1993) rule	$R_t = r^{LR} + \pi_t + 0.5(\pi_t - \pi^{LR}) + 0.5ygap_t$
Inertial Taylor (1999) rule	$R_t = 0.85R_{t-1} + 0.15(r^{LR} + \pi_t + 0.5(\pi_t - \pi^{LR}) + ygap_t)$
Conditional attenuated rule	$R_t = 0.85R_{t-1} + 0.15(r_t^* + \pi_t + 0.5(\pi_t - \pi^{LR}) + 0.2ygap_t)$
First-difference rule	$R_t = R_{t-1} + 0.5(\pi_{t+3\|t} - \pi^{LR}) + 0.5\Delta^4 ygap_{t+3\|t}$
Flexible price-level targeting rule	$R_t = 0.85R_{t-1} + 0.15(r^{LR} + \pi_t + (p_t - p_t^*) - (u_t - u_t^*))$

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 and rules that depend on a price gap, like the FPLT rule, have been featured prominently in analysis by Board staff.[2] The conditional attenuated rule has the same form as the inertial Taylor (1999) rule but responds less strongly to the output gap. The intercepts of the Taylor (1993), inertial Taylor (1999) and FPLT 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. The intercept of the conditional attenuated rule, denoted r_t^*, is zero over the next few years and then rises to 0.5 percent over time. The prescriptions of the first-difference rule do not depend on the level of the output gap or the longer-run real interest rate; see Orphanides (2003).

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 the output gap. When the

2020, the midpoint of the current target range is used as the lagged value of the federal funds rate in the rule.

[2] For applications, see, for example, Erceg and others (2012). An FPLT rule similar to the one above is also analyzed by Chung and others (2015).

Tealbook is published early in a quarter, the prescriptions are shown for the current and next quarters. When the Tealbook is published late in a quarter, the prescriptions are shown for the next two quarters. 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 alternative baselines: the Tealbook baseline and another one consistent with median responses to the latest Summary of Economic Projections (SEP). The simulations are conducted using the FRB/US model, the staff's large-scale econometric model of the U.S. economy. "FRB/US r^*" is the real federal funds rate that, if maintained over a 12-quarter period (beginning in the current quarter), makes the output gap equal to zero in the final quarter of that period, given either the Tealbook or the SEP-consistent economic projection. 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.[3] The measure is derived under the assumption that agents in the model form VAR-based expectations—that is, agents use small-scale statistical models so that their expectations of future variables are determined solely by historical relationships.

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

FRB/US MODEL SIMULATIONS

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

[3] 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).

simulations begin in that quarter; when the Tealbook is published late in a quarter, all of the simulations begin in the subsequent quarter.

COMPUTATION OF OPTIMAL CONTROL POLICIES UNDER COMMITMENT

The optimal control simulations posit that policymakers choose a path for the federal funds rate to minimize a discounted weighted sum of squared inflation gaps (measured as the difference between four-quarter headline PCE price inflation, π_t^{PCE}, and the Committee's 2 percent objective), squared unemployment gaps ($ugap_t$, measured as the difference between the unemployment rate and the staff's estimate of the natural rate), and squared changes in the federal funds rate R_t. For the current quarter, R_t corresponds to the midpoint of the current target range of the federal funds rate to account for the recent intermeeting policy action. In the following equation, the resulting loss function embeds the assumption that policymakers discount the future using a quarterly discount factor, $\beta = 0.9963$:

$$\boldsymbol{L_t} = \sum_{\boldsymbol{\tau=0}}^{T} \boldsymbol{\beta^{\tau}} \left\{ \lambda_{\pi} \left(\pi_{t+\tau}^{PCE} - \pi^{LR} \right)^{\mathbf{2}} + \lambda_{u,t+\tau} (ugap_{t+\tau})^{\mathbf{2}} + \lambda_R (R_{t+\boldsymbol{\tau}} - R_{t+\boldsymbol{\tau-1}})^{\mathbf{2}} \right\}.$$

The exhibit "Optimal Control Simulations under Commitment" considers two specifications of the weights on the inflation gap, the unemployment gap, and the rate change components of the loss function. The box "Optimal Control and the Loss Function" in the Monetary Policy Strategies section of the June 2016 Tealbook B provides motivations for the specifications of the loss function. The table "Loss Functions" shows the weights used in the two specifications.

Loss Functions

	λ_{π}	$\lambda_{u,t+\tau}$		λ_R
		$ugap_{t+\tau} < 0$	$ugap_{t+\tau} \geq 0$	
Equal weights	1	1	1	1
Asymmetric weight on *ugap*	1	0	1	1

The first specification, "Equal weights," assigns equal weights to all three components at all times. The second specification, "Asymmetric weight on *ugap*," uses the same weights as the equal-weights specification whenever the unemployment rate is above the staff's estimate of the natural rate, but it assigns no penalty to the unemployment rate falling below the natural rate. The optimal control policy and associated outcomes depend on the relative (rather than the absolute) values of the weights.

For each of these specifications 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 path chosen by policymakers today is assumed to be credible, meaning that the public sees this path as a binding commitment on policymakers' future decisions; the optimal control policy takes as

given the initial lagged value of the federal funds rate but is otherwise unconstrained by policy decisions made 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). For comparability, all computations use the latest vintage of historical data through the quarter preceding this Tealbook.[4] Moreover, 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 68 percent uncertainty bands around each model's point estimate for the quarter preceding this Tealbook. The computation and interpretation of these bands are specific to each study.

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" equals the long-run median dealer forecast for the target rate minus the longer-run median dealer forecast of PCE inflation.
- "Blue Chip consensus" equals the five-year forward, five-year average consensus forecast for the three-month Treasury bill rate minus the corresponding average forecast for the annual change in the GDP chained price index. The horizon 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 tenth year after the release year.

[4] In this Tealbook, we have updated the estimates based on the model by Johannsen and Mertens from an earlier working paper version.

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

	Nominal GDP		Real GDP		PCE price index		Core PCE price index		Unemployment rate[1]	
Interval	01/17/20	03/06/20	01/17/20	03/06/20	01/17/20	03/06/20	01/17/20	03/06/20	01/17/20	03/06/20
Quarterly										
2019:Q1	3.9	3.9	3.1	3.1	.4	.4	1.1	1.1	3.9	3.9
Q2	4.7	4.7	2.0	2.0	2.4	2.4	1.9	1.9	3.6	3.6
Q3	3.8	3.8	2.1	2.1	1.5	1.5	2.1	2.1	3.6	3.6
Q4	3.7	3.4	2.0	2.1	1.7	1.3	1.5	1.2	3.5	3.5
2020:Q1	3.5	2.7	2.0	1.4	1.6	1.2	1.9	1.6	3.5	3.5
Q2	4.4	2.5	2.6	1.3	1.5	.6	1.9	1.6	3.5	3.6
Q3	4.4	5.0	2.3	3.0	1.7	1.8	1.8	2.0	3.4	3.6
Q4	4.2	4.8	2.2	2.8	1.7	1.9	1.8	1.9	3.3	3.5
2021:Q1	4.1	4.8	2.1	2.8	1.9	2.0	2.0	2.0	3.3	3.4
Q2	4.2	4.5	2.0	2.3	1.9	2.0	2.0	1.9	3.3	3.3
Q3	4.0	4.2	1.9	2.1	1.8	1.9	1.9	1.9	3.3	3.2
Q4	3.8	4.0	1.8	2.1	1.8	1.9	1.9	1.9	3.3	3.2
Two-quarter[2]										
2019:Q2	4.3	4.3	2.6	2.6	1.4	1.4	1.5	1.5	-.2	-.2
Q4	3.7	3.6	2.1	2.1	1.6	1.4	1.8	1.7	-.1	-.1
2020:Q2	3.9	2.6	2.3	1.4	1.6	.9	1.9	1.6	.0	.1
Q4	4.3	4.9	2.3	2.9	1.7	1.8	1.8	1.9	-.2	-.1
2021:Q2	4.1	4.7	2.1	2.5	1.9	2.0	2.0	2.0	.0	-.2
Q4	3.9	4.1	1.9	2.1	1.8	1.9	1.9	1.9	.0	-.1
Four-quarter[3]										
2018:Q4	4.9	4.9	2.5	2.5	1.9	1.9	1.9	1.9	-.3	-.3
2019:Q4	4.0	3.9	2.3	2.3	1.5	1.4	1.6	1.6	-.3	-.3
2020:Q4	4.1	3.8	2.3	2.1	1.6	1.3	1.9	1.8	-.2	.0
2021:Q4	4.0	4.4	2.0	2.3	1.9	2.0	1.9	1.9	.0	-.3
2022:Q4	3.7	3.8	1.7	1.7	1.9	1.9	1.9	1.9	.0	.0
Annual										
2018	5.4	5.4	2.9	2.9	2.1	2.1	1.9	1.9	3.9	3.9
2019	4.1	4.1	2.3	2.3	1.4	1.4	1.6	1.6	3.7	3.7
2020	4.0	3.5	2.2	1.9	1.7	1.3	1.8	1.7	3.4	3.6
2021	4.1	4.5	2.1	2.5	1.8	1.8	1.9	1.9	3.3	3.3
2022	3.8	4.0	1.8	1.9	1.9	1.9	1.9	1.9	3.3	3.2

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

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

Item	2019 Q2	2019 Q3	2019 Q4	2020 Q1	2020 Q2	2020 Q3	2020 Q4	2021 Q1	2021 Q2	2021 Q3	2021 Q4	2019[1]	2020[1]	2021[1]	2022[1]
Real GDP	2.0	2.1	2.1	1.4	1.3	3.0	2.8	2.8	2.3	2.1	2.1	2.3	2.1	2.3	1.7
Previous Tealbook	*2.0*	*2.1*	*2.0*	*2.0*	*2.6*	*2.3*	*2.2*	*2.1*	*2.0*	*1.9*	*1.8*	*2.3*	*2.3*	*2.0*	*1.7*
Final sales	3.0	2.1	3.3	2.1	1.9	2.8	2.8	2.7	2.1	2.1	2.1	2.7	2.4	2.2	1.6
Previous Tealbook	*3.0*	*2.1*	*2.5*	*2.3*	*3.0*	*2.5*	*2.6*	*2.0*	*2.1*	*1.9*	*1.7*	*2.6*	*2.6*	*1.9*	*1.7*
Priv. dom. final purch.	3.3	2.3	1.5	2.1	1.6	2.7	3.0	3.2	2.6	2.4	2.5	2.2	2.3	2.7	1.8
Previous Tealbook	*3.3*	*2.3*	*1.3*	*2.3*	*2.9*	*2.8*	*2.6*	*2.3*	*2.2*	*2.1*	*2.0*	*2.1*	*2.6*	*2.1*	*1.8*
Personal cons. expend.	4.6	3.1	1.7	1.9	1.4	2.6	2.3	2.9	2.9	2.6	2.6	2.6	2.0	2.8	2.3
Previous Tealbook	*4.6*	*3.1*	*1.5*	*2.4*	*2.6*	*2.5*	*2.5*	*2.4*	*2.4*	*2.3*	*2.3*	*2.6*	*2.5*	*2.4*	*2.3*
Durables	13.0	8.1	2.6	3.6	.5	5.1	4.9	5.5	5.6	5.3	5.3	5.9	3.5	5.4	5.0
Nondurables	6.5	3.9	-.3	.1	2.1	3.0	2.6	3.0	2.9	2.8	2.7	3.0	1.9	2.8	2.5
Services	2.8	2.2	2.2	2.2	1.3	2.1	1.9	2.5	2.5	2.2	2.2	2.0	1.9	2.4	1.9
Residential investment	-3.0	4.6	6.1	10.3	7.2	11.9	7.5	1.6	-3.1	-3.9	-6.0	1.6	9.2	-2.9	-6.4
Previous Tealbook	*-3.0*	*4.6*	*4.3*	*7.0*	*7.6*	*6.2*	*-.7*	*-3.3*	*-3.9*	*-4.2*	*-4.2*	*1.2*	*5.0*	*-3.9*	*-4.3*
Nonres. priv. fixed invest.	-1.0	-2.3	-1.2	.6	1.0	.8	5.3	5.0	3.0	3.5	4.6	.0	1.9	4.0	1.5
Previous Tealbook	*-1.0*	*-2.3*	*-.8*	*.5*	*2.7*	*3.4*	*4.0*	*3.5*	*3.0*	*2.6*	*2.1*	*.0*	*2.6*	*2.8*	*1.1*
Equipment & intangibles	2.1	-.1	-.7	1.9	2.4	2.7	6.9	6.4	3.2	4.1	5.5	1.4	3.4	4.8	2.0
Previous Tealbook	*2.1*	*-.1*	*2.3*	*2.6*	*4.2*	*4.6*	*5.0*	*4.6*	*3.6*	*3.3*	*2.8*	*2.2*	*4.1*	*3.6*	*1.8*
Nonres. structures	-11.1	-9.9	-2.9	-4.0	-3.8	-6.2	-.6	.0	2.1	1.3	.9	-5.2	-3.7	1.1	-.8
Previous Tealbook	*-11.1*	*-9.9*	*-11.5*	*-7.1*	*-2.8*	*-1.3*	*.2*	*-.7*	*.9*	*-.1*	*-.6*	*-7.3*	*-2.8*	*-.1*	*-1.7*
Net exports[2]	-981	-990	-900	-895	-880	-868	-870	-877	-895	-903	-914	-954	-878	-897	-931
Previous Tealbook[2]	*-981*	*-990*	*-926*	*-916*	*-899*	*-902*	*-891*	*-892*	*-889*	*-893*	*-905*	*-960*	*-902*	*-895*	*-914*
Exports	-5.7	1.0	2.0	-3.1	1.5	9.6	8.4	4.1	2.3	3.8	4.1	.3	4.0	3.6	3.4
Imports	.0	1.8	-8.6	-2.8	-.5	5.6	6.5	3.9	3.9	3.7	4.3	-2.2	2.1	3.9	3.2
Gov't. cons. & invest.	4.8	1.7	2.6	1.4	1.7	1.3	.8	.3	.7	.6	.6	3.0	1.3	.5	.8
Previous Tealbook	*4.8*	*1.7*	*2.3*	*1.2*	*1.2*	*1.0*	*.9*	*.4*	*.9*	*.8*	*.8*	*2.9*	*1.1*	*.7*	*.8*
Federal	8.3	3.3	3.8	1.8	3.2	2.0	.6	-1.0	.2	-.1	-.1	4.4	1.9	-.2	.4
Defense	3.3	2.2	5.3	1.5	1.5	.9	.7	.7	.7	.7	.1	4.6	1.2	.5	.6
Nondefense	16.1	5.0	1.7	2.2	5.7	3.5	.4	-3.3	-.6	-1.3	-.2	4.1	2.9	-1.3	.2
State & local	2.7	.7	1.9	1.1	.8	1.0	1.0	1.0	1.0	1.0	1.0	2.2	1.0	1.0	1.0
Change in priv. inventories[2]	69	69	5	-29	-59	-52	-50	-43	-32	-30	-32	65	-48	-34	0
Previous Tealbook[2]	*69*	*69*	*43*	*24*	*5*	*-7*	*-24*	*-21*	*-26*	*-24*	*-15*	*75*	*-1*	*-21*	*-1*

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	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Real GDP	2.6	2.9	1.9	2.0	2.8	2.5	2.3	2.1	2.3	1.7
Previous Tealbook	*2.6*	*2.9*	*1.9*	*2.0*	*2.8*	*2.5*	*2.3*	*2.3*	*2.0*	*1.7*
Final sales	2.0	3.2	1.8	2.2	2.9	2.2	2.7	2.4	2.2	1.6
Previous Tealbook	*2.0*	*3.2*	*1.8*	*2.2*	*2.9*	*2.2*	*2.6*	*2.6*	*1.9*	*1.7*
Priv. dom. final purch.	2.6	4.5	2.5	2.8	3.4	2.8	2.2	2.3	2.7	1.8
Previous Tealbook	*2.6*	*4.5*	*2.5*	*2.8*	*3.4*	*2.8*	*2.1*	*2.6*	*2.1*	*1.8*
Personal cons. expend.	1.9	3.8	2.9	2.8	2.9	2.6	2.6	2.0	2.8	2.3
Previous Tealbook	*1.9*	*3.8*	*2.9*	*2.8*	*2.9*	*2.6*	*2.6*	*2.5*	*2.4*	*2.3*
Durables	5.0	9.2	5.8	7.3	7.7	3.8	5.9	3.5	5.4	5.0
Nondurables	2.8	3.2	2.8	1.8	3.7	2.5	3.0	1.9	2.8	2.5
Services	1.1	3.2	2.5	2.4	2.0	2.5	2.0	1.9	2.4	1.9
Residential investment	7.1	7.7	9.1	3.9	4.2	-4.4	1.6	9.2	-2.9	-6.4
Previous Tealbook	*7.1*	*7.7*	*9.1*	*3.9*	*4.2*	*-4.4*	*1.2*	*5.0*	*-3.9*	*-4.3*
Nonres. priv. fixed invest.	5.4	6.9	-.9	2.4	5.4	5.9	.0	1.9	4.0	1.5
Previous Tealbook	*5.4*	*6.9*	*-.9*	*2.4*	*5.4*	*5.9*	*.0*	*2.6*	*2.8*	*1.1*
Equipment & intangibles	5.1	6.1	2.3	1.9	6.6	6.8	1.4	3.4	4.8	2.0
Previous Tealbook	5.1	6.1	2.3	1.9	6.6	6.8	2.2	4.1	3.6	1.8
Nonres. structures	6.7	9.3	-10.9	4.3	1.5	2.6	-5.2	-3.7	1.1	-.8
Previous Tealbook	*6.7*	*9.3*	*-10.9*	*4.3*	*1.5*	*2.6*	*-7.3*	*-2.8*	*-.1*	*-1.7*
Net exports[1]	-533	-577	-722	-784	-850	-920	-954	-878	-897	-931
Previous Tealbook[1]	*-533*	*-577*	*-722*	*-784*	*-850*	*-920*	*-960*	*-902*	*-895*	*-914*
Exports	6.0	2.9	-1.5	1.1	5.5	.4	.3	4.0	3.6	3.4
Imports	3.0	6.5	3.2	3.4	5.6	3.2	-2.2	2.1	3.9	3.2
Gov't. cons. & invest.	-2.4	.3	2.3	1.5	.8	1.5	3.0	1.3	.5	.8
Previous Tealbook	*-2.4*	*.3*	*2.3*	*1.5*	*.8*	*1.5*	*2.9*	*1.1*	*.7*	*.8*
Federal	-6.1	-1.1	1.1	.1	1.7	2.7	4.4	1.9	-.2	.4
Defense	-6.5	-3.4	-.4	-.8	1.9	4.0	4.6	1.2	.5	.6
Nondefense	-5.5	2.7	3.4	1.5	1.4	.7	4.1	2.9	-1.3	.2
State & local	.2	1.2	3.0	2.3	.4	.9	2.2	1.0	1.0	1.0
Change in priv. inventories[1]	109	86	132	23	32	48	65	-48	-34	-0
Previous Tealbook[1]	*109*	*86*	*132*	*23*	*32*	*48*	*75*	*-1*	*-21*	*-1*

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

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

Item	2019			2020				2021							
	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	2019[1]	2020[1]	2021[1]	2022[1]
Real GDP	2.0	2.1	2.1	1.4	1.3	3.0	2.8	2.8	2.3	2.1	2.1	2.3	2.1	2.3	1.7
Previous Tealbook	*2.0*	*2.1*	*2.0*	*2.0*	*2.6*	*2.3*	*2.2*	*2.1*	*2.0*	*1.9*	*1.8*	*2.3*	*2.3*	*2.0*	*1.7*
Final sales	2.9	2.1	3.2	2.1	1.9	2.8	2.8	2.7	2.1	2.1	2.1	2.7	2.4	2.2	1.6
Previous Tealbook	*2.9*	*2.1*	*2.5*	*2.3*	*3.0*	*2.5*	*2.5*	*2.1*	*2.1*	*1.9*	*1.7*	*2.5*	*2.6*	*1.9*	*1.7*
Priv. dom. final purch.	2.8	2.0	1.2	1.8	1.3	2.3	2.6	2.7	2.2	2.1	2.1	1.8	2.0	2.3	1.5
Previous Tealbook	*2.8*	*2.0*	*1.1*	*1.9*	*2.4*	*2.4*	*2.2*	*2.0*	*1.8*	*1.8*	*1.7*	*1.8*	*2.2*	*1.8*	*1.5*
Personal cons. expend.	3.0	2.1	1.2	1.3	.9	1.8	1.6	2.0	2.0	1.8	1.8	1.8	1.4	1.9	1.6
Previous Tealbook	*3.0*	*2.1*	*1.0*	*1.6*	*1.8*	*1.7*	*1.7*	*1.6*	*1.6*	*1.6*	*1.6*	*1.8*	*1.7*	*1.6*	*1.6*
Durables	.9	.6	.2	.3	.0	.4	.3	.4	.4	.4	.4	.4	.2	.4	.3
Nondurables	.9	.5	.0	.0	.3	.4	.4	.4	.4	.4	.4	.4	.3	.4	.3
Services	1.3	1.0	1.0	1.0	.6	1.0	.9	1.2	1.2	1.0	1.0	1.0	.9	1.1	.9
Residential investment	-.1	.2	.2	.4	.3	.4	.3	.1	-.1	-.2	-.2	.1	.3	-.1	-.3
Previous Tealbook	*-.1*	*.2*	*.2*	*.3*	*.3*	*.2*	*.0*	*-.1*	*-.2*	*-.2*	*-.2*	*.0*	*.2*	*-.2*	*-.2*
Nonres. priv. fixed invest.	-.1	-.3	-.2	.1	.1	.1	.7	.6	.4	.5	.6	.0	.3	.5	.2
Previous Tealbook	*-.1*	*-.3*	*-.1*	*.1*	*.4*	*.4*	*.5*	*.5*	*.4*	*.3*	*.3*	*.0*	*.3*	*.4*	*.1*
Equipment & intangibles	.2	.0	-.1	.2	.2	.3	.7	.6	.3	.4	.6	.2	.4	.5	.2
Previous Tealbook	*.2*	*.0*	*.2*	*.3*	*.4*	*.5*	*.5*	*.5*	*.4*	*.3*	*.3*	*.2*	*.4*	*.4*	*.2*
Nonres. structures	-.4	-.3	-.1	-.1	-.1	-.2	.0	.0	.1	.0	.0	-.2	-.1	.0	.0
Previous Tealbook	*-.4*	*-.3*	*-.3*	*-.2*	*-.1*	*.0*	*.0*	*.0*	*.0*	*.0*	*.0*	*-.2*	*-.1*	*.0*	*.0*
Net exports	-.7	-.1	1.5	.1	.2	.3	.1	-.1	-.3	-.1	-.1	.4	.2	-.1	-.1
Previous Tealbook	*-.7*	*-.1*	*1.0*	*.2*	*.4*	*.0*	*.2*	*.0*	*.1*	*.0*	*-.1*	*.2*	*.2*	*.0*	*.0*
Exports	-.7	.1	.2	-.4	.2	1.1	.9	.5	.3	.4	.5	.0	.5	.4	.4
Imports	.0	-.3	1.3	.4	.1	-.7	-.9	-.5	-.5	-.5	-.6	.3	-.3	-.5	-.4
Gov't. cons. & invest.	.8	.3	.5	.2	.3	.2	.1	.1	.1	.1	.1	.5	.2	.1	.1
Previous Tealbook	*.8*	*.3*	*.4*	*.2*	*.2*	*.2*	*.2*	*.1*	*.2*	*.1*	*.1*	*.5*	*.2*	*.1*	*.1*
Federal	.5	.2	.3	.1	.2	.1	.0	-.1	.0	.0	.0	.3	.1	.0	.0
Defense	.1	.1	.2	.1	.1	.0	.0	.0	.0	.0	.0	.2	.0	.0	.0
Nondefense	.4	.1	.0	.1	.2	.1	.0	-.1	.0	.0	.0	.1	.1	.0	.0
State & local	.3	.1	.2	.1	.1	.1	.1	.1	.1	.1	.1	.2	.1	.1	.1
Change in priv. inventories	-.9	.0	-1.1	-.6	-.5	.1	.0	.1	.2	.0	.0	-.4	-.3	.1	.2
Previous Tealbook	*-.9*	*.0*	*-.5*	*-.4*	*-.3*	*-.2*	*-.3*	*.0*	*-.1*	*.0*	*.2*	*-.2*	*-.3*	*.0*	*.0*

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

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

Item	2019			2020				2021							
	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	2019[1]	2020[1]	2021[1]	2022[1]
GDP chain-wt. price index	2.4	1.8	1.3	1.3	1.1	2.0	2.0	2.0	2.2	2.0	1.9	1.6	1.6	2.0	2.0
Previous Tealbook	*2.4*	*1.8*	*1.6*	*1.5*	*1.7*	*2.0*	*1.9*	*1.9*	*2.1*	*2.0*	*1.9*	*1.7*	*1.8*	*2.0*	*2.0*
PCE chain-wt. price index	2.4	1.5	1.3	1.2	.6	1.8	1.9	2.0	2.0	1.9	1.9	1.4	1.3	2.0	1.9
Previous Tealbook	*2.4*	*1.5*	*1.7*	*1.6*	*1.5*	*1.7*	*1.7*	*1.9*	*1.9*	*1.8*	*1.8*	*1.5*	*1.6*	*1.9*	*1.9*
Energy	18.4	-8.2	4.9	-6.6	-19.7	-2.1	.0	1.7	1.8	1.7	1.6	-1.3	-7.5	1.7	1.8
Previous Tealbook	*18.4*	*-8.2*	*8.6*	*-3.0*	*-8.1*	*-2.7*	*-1.4*	*-.1*	*.1*	*.1*	*.4*	*-.4*	*-3.8*	*.1*	*.7*
Food	.6	-.5	.5	.9	-.1	1.5	2.0	2.9	2.6	2.4	2.3	.9	1.1	2.5	2.3
Previous Tealbook	*.6*	*-.5*	*.6*	*.7*	*.9*	*1.7*	*1.9*	*2.3*	*2.3*	*2.3*	*2.3*	*.9*	*1.3*	*2.3*	*2.3*
Ex. food & energy	1.9	2.1	1.2	1.6	1.6	2.0	1.9	2.0	1.9	1.9	1.9	1.6	1.8	1.9	1.9
Previous Tealbook	*1.9*	*2.1*	*1.5*	*1.9*	*1.9*	*1.8*	*1.8*	*2.0*	*2.0*	*1.9*	*1.9*	*1.6*	*1.9*	*1.9*	*1.9*
Ex. food & energy, market based	1.4	1.8	1.0	1.7	1.5	1.8	1.8	1.8	1.8	1.7	1.7	1.5	1.7	1.8	1.8
Previous Tealbook	*1.4*	*1.8*	*1.1*	*1.7*	*1.9*	*1.7*	*1.7*	*1.8*	*1.8*	*1.7*	*1.7*	*1.5*	*1.7*	*1.8*	*1.8*
CPI	3.0	1.8	2.4	1.5	.4	2.0	2.2	2.3	2.3	2.2	2.2	2.0	1.5	2.3	2.3
Previous Tealbook	*2.9*	*1.8*	*2.6*	*1.6*	*1.4*	*1.9*	*2.0*	*2.3*	*2.2*	*2.2*	*2.2*	*2.0*	*1.7*	*2.2*	*2.3*
Ex. food & energy	2.2	2.8	2.0	2.2	2.0	2.3	2.3	2.3	2.3	2.2	2.2	2.3	2.2	2.3	2.3
Previous Tealbook	*1.8*	*3.0*	*2.1*	*2.0*	*2.2*	*2.3*	*2.3*	*2.4*	*2.4*	*2.3*	*2.3*	*2.3*	*2.2*	*2.4*	*2.4*
ECI, hourly compensation[2]	2.1	3.3	2.6	2.7	2.7	2.7	2.7	2.8	2.8	2.7	2.7	2.7	2.7	2.8	2.7
Previous Tealbook[2]	*2.1*	*3.3*	*2.8*	*2.7*	*2.7*	*2.7*	*2.7*	*2.8*	*2.8*	*2.7*	*2.7*	*2.7*	*2.7*	*2.8*	*2.7*
Business sector															
Output per hour	2.9	-.4	.6	-1.1	.2	2.7	2.2	1.7	1.2	1.1	1.0	1.7	1.0	1.2	1.2
Previous Tealbook	*2.8*	*-.3*	*.7*	*.5*	*1.6*	*1.4*	*1.4*	*1.3*	*1.3*	*1.4*	*1.4*	*1.7*	*1.2*	*1.3*	*1.3*
Compensation per hour	2.9	-.1	1.9	2.4	3.9	3.9	3.9	3.8	3.8	3.8	3.8	3.6	3.5	3.8	3.7
Previous Tealbook	*2.8*	*2.3*	*2.7*	*3.4*	*3.8*	*3.9*	*3.8*	*3.8*	*3.8*	*3.8*	*3.8*	*4.3*	*3.7*	*3.8*	*3.7*
Unit labor costs	.1	.3	.9	3.5	3.7	1.1	1.7	2.0	2.6	2.6	2.8	1.7	2.5	2.5	2.5
Previous Tealbook	*.1*	*2.5*	*2.0*	*2.9*	*2.2*	*2.5*	*2.4*	*2.4*	*2.4*	*2.4*	*2.4*	*2.5*	*2.5*	*2.4*	*2.3*
Core goods imports chain-wt. price index[3]	-.6	-1.0	-1.2	.8	.6	.2	.7	1.0	1.0	.9	.9	-1.1	.6	1.0	.8
Previous Tealbook[3]	*-.6*	*-1.0*	*-.4*	*1.7*	*1.9*	*.8*	*.9*	*1.0*	*.8*	*.8*	*.8*	*-.9*	*1.3*	*.9*	*.8*

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.

Changes in Prices and Costs

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

Item	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
GDP chain-wt. price index	1.8	1.5	.9	1.5	2.0	2.3	1.6	1.6	2.0	2.0
Previous Tealbook	*1.8*	*1.5*	*.9*	*1.5*	*2.0*	*2.3*	*1.7*	*1.8*	*2.0*	*2.0*
PCE chain-wt. price index	1.2	1.1	.3	1.5	1.8	1.9	1.4	1.3	2.0	1.9
Previous Tealbook	*1.2*	*1.1*	*.3*	*1.5*	*1.8*	*1.9*	*1.5*	*1.6*	*1.9*	*1.9*
Energy	-2.9	-7.1	-16.4	2.0	8.0	3.9	-1.3	-7.5	1.7	1.8
Previous Tealbook	*-2.9*	*-7.1*	*-16.4*	*2.0*	*8.0*	*3.9*	*-.4*	*-3.8*	*.1*	*.7*
Food	.7	2.8	.3	-1.8	.7	.5	.9	1.1	2.5	2.3
Previous Tealbook	*.7*	*2.8*	*.3*	*-1.8*	*.7*	*.5*	*.9*	*1.3*	*2.3*	*2.3*
Ex. food & energy	1.6	1.5	1.2	1.8	1.7	1.9	1.6	1.8	1.9	1.9
Previous Tealbook	*1.6*	*1.5*	*1.2*	*1.8*	*1.7*	*1.9*	*1.6*	*1.9*	*1.9*	*1.9*
Ex. food & energy, market based	1.1	1.1	1.1	1.4	1.2	1.7	1.5	1.7	1.8	1.8
Previous Tealbook	*1.1*	*1.1*	*1.1*	*1.4*	*1.2*	*1.7*	*1.5*	*1.7*	*1.8*	*1.8*
CPI	1.2	1.2	.4	1.8	2.1	2.2	2.0	1.5	2.3	2.3
Previous Tealbook	*1.2*	*1.2*	*.4*	*1.8*	*2.1*	*2.2*	*2.0*	*1.7*	*2.2*	*2.3*
Ex. food & energy	1.7	1.7	2.0	2.2	1.8	2.2	2.3	2.2	2.3	2.3
Previous Tealbook	*1.7*	*1.7*	*2.0*	*2.2*	*1.8*	*2.2*	*2.3*	*2.2*	*2.4*	*2.4*
ECI, hourly compensation[1]	2.0	2.3	1.9	2.2	2.6	3.0	2.7	2.7	2.8	2.7
Previous Tealbook[1]	*2.0*	*2.3*	*1.9*	*2.2*	*2.6*	*3.0*	*2.7*	*2.7*	*2.8*	*2.7*
Business sector										
Output per hour	1.8	.3	.7	1.3	1.1	1.4	1.7	1.0	1.2	1.2
Previous Tealbook	*1.8*	*.3*	*.6*	*1.4*	*1.1*	*1.1*	*1.7*	*1.2*	*1.3*	*1.3*
Compensation per hour	-.3	3.0	2.4	2.0	3.8	2.4	3.6	3.5	3.8	3.7
Previous Tealbook	*-.2*	*3.0*	*2.3*	*2.2*	*3.7*	*2.1*	*4.3*	*3.7*	*3.8*	*3.7*
Unit labor costs	-2.0	2.7	1.7	.8	2.6	1.0	1.7	2.5	2.5	2.5
Previous Tealbook	*-2.0*	*2.7*	*1.7*	*.8*	*2.6*	*1.0*	*2.5*	*2.5*	*2.4*	*2.3*
Core goods imports chain-wt. price index[2]	-2.2	-.4	-4.3	-.9	.9	.2	-1.1	.6	1.0	.8
Previous Tealbook[2]	*-2.2*	*-.4*	*-4.3*	*-.9*	*.9*	*.2*	*-.9*	*1.3*	*.9*	*.8*

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

Other Macroeconomic Indicators

Item	2019 Q2	2019 Q3	2019 Q4	2020 Q1	2020 Q2	2020 Q3	2020 Q4	2021 Q1	2021 Q2	2021 Q3	2021 Q4	2019[1]	2020[1]	2021[1]	2022[1]
Employment and production															
Nonfarm payroll employment[2]	159	203	210	249	202	20	135	140	135	135	130	178	152	135	111
Unemployment rate[3]	3.6	3.6	3.5	3.5	3.6	3.6	3.5	3.4	3.3	3.2	3.2	3.5	3.5	3.2	3.2
Previous Tealbook[3]	*3.6*	*3.6*	*3.5*	*3.5*	*3.5*	*3.4*	*3.3*	*3.3*	*3.3*	*3.3*	*3.3*	*3.5*	*3.3*	*3.3*	*3.3*
Natural rate of unemployment[3]	4.4	4.4	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Previous Tealbook[3]	*4.4*	*4.4*	*4.4*	*4.4*	*4.4*	*4.4*	*4.4*	*4.4*	*4.4*	*4.4*	*4.4*	*4.4*	*4.4*	*4.4*	*4.4*
Employment-to-Population Ratio[3]	60.6	60.8	61.0	61.1	61.0	61.0	61.0	61.1	61.2	61.2	61.2	61.0	61.0	61.2	61.2
Employment-to-Population Trend[3]	60.2	60.3	60.3	60.3	60.3	60.3	60.3	60.2	60.2	60.2	60.2	60.3	60.3	60.2	60.1
Output gap[4]	1.4	1.4	1.5	1.4	1.2	1.5	1.7	1.9	2.1	2.1	2.2	1.5	1.7	2.2	2.1
Previous Tealbook[4]	*1.6*	*1.6*	*1.7*	*1.7*	*1.9*	*2.1*	*2.2*	*2.3*	*2.3*	*2.3*	*2.3*	*1.7*	*2.2*	*2.3*	*2.2*
Industrial production[5]	-2.3	1.1	.1	.2	.9	2.1	2.9	2.8	1.9	2.0	1.7	-.7	1.5	2.1	1.0
Previous Tealbook[5]	*-2.3*	*1.2*	*-.5*	*.1*	*4.5*	*1.6*	*1.0*	*1.2*	*1.4*	*1.2*	*1.0*	*-.9*	*1.8*	*1.2*	*.7*
Manufacturing industr. prod.[5]	-3.3	.7	-.5	1.6	-.8	2.8	4.2	3.2	1.5	1.8	1.7	-1.2	1.9	2.0	.9
Previous Tealbook[5]	*-3.3*	*.8*	*-1.0*	*1.5*	*2.9*	*1.5*	*1.4*	*1.1*	*1.0*	*1.0*	*1.1*	*-1.3*	*1.8*	*1.1*	*.6*
Capacity utilization rate - mfg.[3]	75.5	75.4	75.0	75.1	74.8	75.2	75.9	76.4	76.7	77.0	77.2	75.0	75.9	77.2	77.8
Previous Tealbook[3]	*75.5*	*75.4*	*74.9*	*75.1*	*75.6*	*75.8*	*75.9*	*76.1*	*76.3*	*76.4*	*76.6*	*74.9*	*75.9*	*76.6*	*77.0*
Housing starts[6]	1.3	1.3	1.4	1.5	1.4	1.5	1.5	1.5	1.5	1.5	1.4	1.3	1.5	1.5	1.3
Light motor vehicle sales[6]	17.0	17.0	16.7	16.9	16.8	16.9	17.0	16.9	16.9	16.9	16.8	17.0	16.9	16.9	16.7
Income and saving															
Nominal GDP[5]	4.7	3.8	3.4	2.7	2.5	5.0	4.8	4.8	4.5	4.2	4.0	3.9	3.8	4.4	3.8
Real disposable pers. income[5]	1.5	2.1	1.7	4.5	1.8	2.2	1.5	3.4	2.0	1.8	.8	2.4	2.5	2.0	2.2
Previous Tealbook[5]	*1.5*	*2.9*	*2.3*	*3.5*	*2.7*	*1.8*	*1.5*	*2.9*	*1.8*	*1.9*	*1.2*	*2.8*	*2.3*	*1.9*	*2.1*
Personal saving rate[3]	7.8	7.7	7.7	8.2	8.3	8.2	8.1	8.2	8.0	7.8	7.4	7.7	8.1	7.4	7.2
Previous Tealbook[3]	*7.8*	*7.8*	*8.0*	*8.3*	*8.3*	*8.2*	*7.9*	*8.0*	*7.9*	*7.8*	*7.5*	*8.0*	*7.9*	*7.5*	*7.3*
Corporate profits[7]	16.0	-.9	6.2	-6.5	-8.5	7.2	7.9	3.8	3.6	3.4	1.2	1.1	-.2	3.0	2.6
Profit share of GNP[3]	9.6	9.5	9.6	9.3	9.1	9.1	9.2	9.2	9.2	9.1	9.1	9.6	9.2	9.1	9.0
Gross national saving rate[3]	17.9	17.5	17.5	17.6	17.8	17.9	18.0	18.1	18.1	18.1	18.0	17.5	18.0	18.0	17.8
Net national saving rate[3]	2.3	1.9	2.2	2.3	2.4	2.6	2.8	2.9	2.9	2.8	2.7	2.2	2.8	2.7	2.3

1. Change from fourth quarter of previous year to fourth quarter of year indicated, unless otherwise indicated.
2. Average monthly change, thousands.
3. Percent; annual values are for the fourth quarter of the year indicated.
4. Percent difference between actual and potential 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.

Other Macroeconomic Indicators

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

Item	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Employment and production										
Nonfarm payroll employment[1]	192	250	227	195	176	193	178	152	135	111
Unemployment rate[2]	7.0	5.7	5.0	4.8	4.1	3.8	3.5	3.5	3.2	3.2
Previous Tealbook[2]	*7.0*	*5.7*	*5.0*	*4.8*	*4.1*	*3.8*	*3.5*	*3.3*	*3.3*	*3.3*
Natural rate of unemployment[2]	5.4	5.1	4.9	4.8	4.6	4.5	4.3	4.3	4.3	4.3
Previous Tealbook[2]	*5.4*	*5.1*	*4.9*	*4.8*	*4.6*	*4.4*	*4.4*	*4.4*	*4.4*	*4.4*
Employment-to-Population Ratio[2]	58.5	59.3	59.4	59.7	60.1	60.6	61.0	61.0	61.2	61.2
Employment-to-Population Trend[2]	60.4	60.3	60.2	60.2	60.2	60.2	60.3	60.3	60.2	60.1
Output gap[3]	-3.0	-1.0	-.5	-.3	.6	1.3	1.5	1.7	2.2	2.1
Previous Tealbook[3]	*-3.0*	*-1.0*	*-.5*	*-.3*	*.6*	*1.4*	*1.7*	*2.2*	*2.3*	*2.2*
Industrial production	2.3	3.4	-3.4	-.3	3.6	4.0	-.7	1.5	2.1	1.0
Previous Tealbook	*2.3*	*3.4*	*-3.4*	*-.3*	*3.6*	*4.0*	*-.9*	*1.8*	*1.2*	*.7*
Manufacturing industr. prod.	1.1	1.4	-1.7	.3	2.5	2.2	-1.2	1.9	2.0	.9
Previous Tealbook	*1.1*	*1.4*	*-1.7*	*.3*	*2.5*	*2.2*	*-1.3*	*1.8*	*1.1*	*.6*
Capacity utilization rate - mfg.[2]	74.5	75.8	74.9	74.2	75.8	77.0	75.0	75.9	77.2	77.8
Previous Tealbook[2]	*74.5*	*75.8*	*74.9*	*74.2*	*75.8*	*77.0*	*74.9*	*75.9*	*76.6*	*77.0*
Housing starts[4]	.9	1.0	1.1	1.2	1.2	1.2	1.3	1.5	1.5	1.3
Light motor vehicle sales[4]	15.5	16.5	17.4	17.5	17.1	17.2	17.0	16.9	16.9	16.7
Income and saving										
Nominal GDP	4.4	4.5	2.8	3.5	4.9	4.9	3.9	3.8	4.4	3.8
Real disposable pers. income	-2.5	5.3	3.0	1.6	3.4	3.9	2.4	2.5	2.0	2.2
Previous Tealbook	*-2.5*	*5.3*	*3.0*	*1.6*	*3.4*	*3.9*	*2.8*	*2.3*	*1.9*	*2.1*
Personal saving rate[2]	6.3	7.5	7.5	6.5	6.8	7.8	7.7	8.1	7.4	7.2
Previous Tealbook[2]	*6.3*	*7.5*	*7.5*	*6.5*	*6.8*	*7.8*	*8.0*	*7.9*	*7.5*	*7.3*
Corporate profits[5]	3.9	6.7	-10.8	3.3	-.6	4.2	1.1	-.2	3.0	2.6
Profit share of GNP[2]	11.8	12.1	10.5	10.5	9.9	9.9	9.6	9.2	9.1	9.0
Gross national saving rate[2]	19.2	20.3	19.6	18.1	18.0	17.9	17.5	18.0	18.0	17.8
Net national saving rate[2]	4.0	5.3	4.5	2.7	2.7	2.4	2.2	2.8	2.7	2.3

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	2017	2018	2019	2020	2021	2022	2019 Q4	2020 Q1	2020 Q2	2020 Q3
Unified federal budget[1]				Nominal dollars, billions						
Receipts	3,316	3,330	3,462	3,592	3,773	4,000	807	776	1,137	872
Outlays	3,982	4,109	4,447	4,601	4,769	5,038	1,163	1,168	1,156	1,113
Surplus/deficit	-665	-779	-984	-1,009	-997	-1,039	-357	-392	-19	-241
				Percent of GDP						
Surplus/deficit	-3.5	-3.8	-4.6	-4.6	-4.3	-4.4	-6.7	-7.2	-.4	-4.4
Previous Tealbook	*-3.5*	*-3.8*	*-4.6*	*-4.4*	*-4.3*	*-4.7*	*-6.7*	*-7.4*	*.2*	*-4.1*
Primary surplus/deficit	-2.1	-2.2	-2.9	-2.9	-2.7	-2.7	-4.8	-5.4	1.6	-3.3
Net interest	1.4	1.6	1.8	1.6	1.6	1.7	1.9	1.8	1.9	1.1
Cyclically adjusted surplus/deficit	-3.5	-4.2	-5.2	-5.3	-5.2	-5.4	-7.3	-7.9	-1.0	-5.1
Federal debt held by public	76.0	77.5	79.2	81.5	82.9	84.4	80.1	81.3	80.7	81.5
Government in the NIPA[2]				Real percent change, annual rate						
Purchases	.8	1.5	3.0	1.3	.5	.8	2.6	1.4	1.7	1.3
Consumption	.6	1.6	2.2	1.2	.2	.6	1.7	1.3	1.7	1.2
Investment	2.0	1.5	6.2	1.8	2.0	1.8	6.7	1.8	1.6	1.9
State and local construction	-1.8	-1.5	7.2	.5	.9	.9	5.1	2.0	-.7	.4
Real disposable personal income	3.5	3.9	2.4	2.5	2.0	2.2	1.7	4.5	1.7	2.2
Contribution from transfers[3]	.2	.4	1.1	.7	.5	.8	.3	1.6	.5	.1
Contribution from taxes[3]	-.9	.4	-.8	-.8	-.7	-.6	-.4	-1.3	-.7	-.8
Government employment				Average net change in monthly payrolls, thousands						
Federal	-2	1	3	1	1	1	-3	20	81	-99
State and local	8	8	12	15	9	9	13	31	12	9
Fiscal indicators[2]				Percentage point contribution to change in real GDP, annual rate						
Fiscal effect (FE)[4]	.2	.4	1.0	.6	.3	.3	.8	.7	.8	.6
Discretionary policy actions (FI)	.3	.6	.8	.5	.1	.1	.7	.5	.5	.5
Previous Tealbook	*.3*	*.6*	*.8*	*.4*	*.2*	*.1*	*.6*	*.5*	*.4*	*.4*
Federal purchases	.1	.2	.3	.1	.0	.0	.3	.1	.2	.1
State and local purchases	.0	.1	.2	.1	.1	.1	.2	.1	.1	.1
Taxes and transfers	.1	.3	.3	.2	.0	.0	.2	.2	.2	.2
Cyclical	-.1	-.1	-.1	.0	-.1	.0	-.1	.0	.0	.0
Other	.0	-.1	.3	.2	.3	.2	.2	.3	.2	.1

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).

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

Measure and country	2019 Q1	2019 Q2	2019 Q3	2019 Q4	Projected 2020 Q1	2020 Q2	2020 Q3	2020 Q4	2021 Q1	2021 Q2	2021 Q3	2021 Q4
***Real GDP*[1]**												
Total foreign	1.6	2.0	1.2	.8	-.6	2.3	2.9	2.9	2.9	2.8	2.6	2.5
Previous Tealbook	*1.6*	*2.0*	*1.4*	*.8*	*2.0*	*2.2*	*2.3*	*2.3*	*2.4*	*2.4*	*2.4*	*2.4*
Advanced foreign economies	1.6	1.9	1.2	-.3	.1	.3	1.2	1.9	2.2	2.1	1.9	1.7
Canada	1.0	3.4	1.1	.3	.9	.8	1.3	1.9	2.4	2.2	2.0	1.8
Japan	2.6	1.9	.5	-6.3	-2.4	.4	1.5	1.8	1.6	1.3	1.1	1.0
United Kingdom	2.6	-.4	2.0	.1	.4	-.2	.7	.9	1.7	1.6	1.4	1.4
Euro area	1.8	.6	1.1	.2	-.2	-.4	1.0	2.0	2.4	2.3	1.9	1.8
Germany	1.9	-1.0	.8	.1	-.2	-.1	.9	1.8	2.0	2.1	1.7	1.6
Emerging market economies	1.6	2.0	1.3	2.0	-1.4	4.3	4.5	4.0	3.5	3.5	3.4	3.3
Asia	3.5	3.9	2.1	4.4	-4.2	7.8	7.2	5.8	4.8	4.6	4.5	4.4
Korea	-1.5	4.2	1.7	5.1	-5.2	3.9	5.3	4.1	3.2	3.0	2.8	2.6
China	6.5	5.9	5.5	6.1	-8.0	15.0	10.5	7.3	5.8	5.8	5.8	5.7
Latin America	-.3	.2	.3	-.7	1.4	.9	1.8	2.1	2.1	2.3	2.2	2.2
Mexico	-.5	-.4	-.3	-.5	1.1	.9	1.7	1.9	1.9	2.1	2.0	2.0
Brazil	.0	2.1	2.5	2.0	1.0	1.9	2.3	2.7	2.9	2.9	2.8	2.8
Addendum												
Emerging market economies ex. China	.6	1.3	.5	1.2	.1	2.2	3.3	3.3	3.0	3.0	2.9	2.8
***Consumer prices*[2]**												
Total foreign	.8	3.2	2.2	3.5	3.0	1.8	2.2	2.2	2.3	2.2	2.3	2.3
Previous Tealbook	*.9*	*3.2*	*2.3*	*3.5*	*2.8*	*2.1*	*2.3*	*2.3*	*2.3*	*2.3*	*2.3*	*2.3*
Advanced foreign economies	.7	2.1	.9	1.1	.9	.8	1.3	1.4	1.4	1.4	1.5	1.5
Canada	1.7	3.3	1.6	1.7	1.4	1.8	2.0	2.0	2.0	2.0	2.0	2.0
Japan	.3	.5	.4	.8	.6	.4	.5	.5	.6	.6	.7	.7
United Kingdom	1.1	2.5	1.8	.3	2.2	1.2	1.7	1.9	1.9	1.9	1.9	1.8
Euro area	.3	1.9	.7	1.1	.4	.2	1.0	1.3	1.3	1.3	1.4	1.4
Germany	.1	2.5	.3	1.9	.7	.4	1.2	1.6	1.7	1.7	1.8	1.8
Emerging market economies	.9	4.0	3.1	5.2	4.5	2.5	2.8	2.8	2.8	2.8	2.8	2.8
Asia	.5	3.7	3.3	5.9	5.0	2.2	2.6	2.6	2.6	2.6	2.6	2.6
Korea	-2.0	1.9	-.5	1.7	1.8	.7	2.1	2.1	2.1	2.1	2.1	2.1
China	.6	4.3	4.6	7.6	5.7	2.0	2.5	2.5	2.5	2.5	2.5	2.5
Latin America	1.6	4.8	3.1	3.9	3.7	3.3	3.4	3.3	3.3	3.3	3.3	3.3
Mexico	1.1	4.5	2.8	3.4	3.2	3.1	3.2	3.2	3.2	3.2	3.2	3.2
Brazil	2.9	5.2	2.2	3.2	5.5	3.8	3.8	3.8	3.7	3.7	3.7	3.7
Addendum												
Emerging market economies ex. China	1.1	3.8	2.1	3.4	3.6	2.9	3.1	3.0	3.0	3.0	3.0	3.0

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	2013	2014	2015	2016	2017	2018	Projected 2019	Projected 2020	Projected 2021	Projected 2022
***Real GDP*[1]**										
Total foreign	3.0	3.0	2.1	2.9	3.2	2.2	1.4	1.9	2.7	2.4
Previous Tealbook	*3.0*	*3.0*	*2.1*	*2.9*	*3.2*	*2.2*	*1.4*	*2.2*	*2.4*	*2.4*
Advanced foreign economies	2.4	2.0	.9	1.8	2.9	1.4	1.1	.9	2.0	1.7
Canada	3.4	2.8	-.4	1.7	3.2	1.8	1.5	1.2	2.1	1.8
Japan	2.8	-.4	1.0	1.1	2.5	-.3	-.4	.3	1.2	.8
United Kingdom	2.7	2.5	2.4	1.8	1.6	1.4	1.1	.4	1.5	1.5
Euro area	.7	1.6	2.0	2.1	3.0	1.2	.9	.6	2.1	1.6
Germany	1.5	2.3	1.3	1.9	3.4	.6	.5	.6	1.8	1.6
Emerging market economies	3.7	3.9	3.2	4.0	3.6	3.0	1.7	2.8	3.4	3.2
Asia	5.5	5.1	4.7	5.4	5.4	4.4	3.5	4.0	4.6	4.2
Korea	3.7	2.6	3.4	2.7	2.8	3.0	2.3	1.9	2.9	2.3
China	7.6	7.2	6.8	7.3	6.9	6.5	6.0	5.8	5.7	5.6
Latin America	1.7	2.8	1.9	2.5	1.9	1.3	-.1	1.6	2.2	2.2
Mexico	1.2	3.4	2.8	3.3	1.7	1.5	-.4	1.4	2.0	2.0
Brazil	2.6	-.1	-5.5	-2.2	2.4	1.3	1.7	2.0	2.8	2.8
Addendum										
Emerging market economies ex. China	2.8	3.1	2.4	3.2	2.8	2.2	.9	2.2	2.9	2.7
***Consumer prices*[2]**										
Total foreign	2.4	2.0	1.4	1.9	2.5	2.4	2.4	2.3	2.3	2.3
Previous Tealbook	*2.4*	*2.0*	*1.4*	*1.9*	*2.5*	*2.4*	*2.5*	*2.3*	*2.3*	*2.3*
Advanced foreign economies	1.0	1.2	.5	.9	1.5	1.8	1.2	1.1	1.4	1.5
Canada	1.0	2.0	1.3	1.4	1.8	2.1	2.1	1.8	2.0	2.0
Japan	1.4	2.5	.1	.3	.6	.8	.5	.5	.6	.8
United Kingdom	2.1	.9	.1	1.2	3.0	2.3	1.4	1.7	1.9	1.8
Euro area	.8	.2	.3	.7	1.4	1.9	1.0	.7	1.3	1.5
Germany	1.4	.4	.5	1.0	1.6	2.1	1.2	1.0	1.7	1.8
Emerging market economies	3.4	2.6	2.0	2.6	3.2	2.9	3.3	3.2	2.8	2.8
Asia	3.2	1.8	1.5	2.1	2.0	2.1	3.3	3.1	2.6	2.6
Korea	1.1	1.0	.9	1.4	1.4	1.7	.3	1.6	2.1	2.1
China	2.9	1.5	1.4	2.1	1.8	2.2	4.3	3.2	2.5	2.5
Latin America	4.0	4.7	3.2	4.0	6.4	5.0	3.4	3.4	3.3	3.2
Mexico	3.6	4.2	2.3	3.3	6.6	4.8	2.9	3.2	3.2	3.2
Brazil	5.8	6.5	10.4	7.1	2.8	4.1	3.4	4.2	3.7	3.5
Addendum										
Emerging market economies ex. China	3.8	3.5	2.4	3.0	4.2	3.4	2.6	3.1	3.0	2.9

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

U.S. Current Account

Quarterly Data

	2019				2020				2021			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
	Billions of dollars, s.a.a.r.											
U.S. current account balance	**-549.9**	**-506.0**	**-501.5**	**-421.8**	**-411.8**	**-360.2**	**-338.2**	**-336.6**	**-344.6**	**-343.1**	**-349.8**	**-372.4**
Previous Tealbook	*-544.8*	*-500.8*	*-496.4*	*-439.3*	*-432.7*	*-394.3*	*-395.7*	*-393.0*	*-404.5*	*-392.4*	*-401.3*	*-430.7*
Current account as percent of GDP	-2.6	-2.4	-2.3	-1.9	-1.9	-1.6	-1.5	-1.5	-1.5	-1.5	-1.5	-1.6
Previous Tealbook	*-2.6*	*-2.3*	*-2.3*	*-2.0*	*-2.0*	*-1.8*	*-1.8*	*-1.7*	*-1.8*	*-1.7*	*-1.7*	*-1.8*
Net goods & services	-631.1	-641.6	-634.6	-559.8	-547.0	-510.8	-484.1	-475.8	-481.4	-488.6	-490.1	-499.2
Investment income, net	240.4	279.6	288.5	303.5	301.4	304.5	304.4	304.7	303.0	299.4	298.8	292.4
Direct, net	312.9	343.5	348.3	368.0	367.7	368.3	369.2	374.9	380.7	386.0	395.6	400.2
Portfolio, net	-72.5	-63.9	-59.8	-64.4	-66.3	-63.8	-64.8	-70.2	-77.7	-86.7	-96.8	-107.8
Other income and transfers, net	-159.3	-144.0	-155.4	-165.6	-166.2	-153.9	-158.5	-165.6	-166.2	-153.9	-158.5	-165.6

Annual Data

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	Billions of dollars									
U.S. current account balance	**-348.8**	**-365.2**	**-407.8**	**-428.3**	**-439.6**	**-491.0**	**-494.8**	**-361.7**	**-352.5**	**-378.1**
Previous Tealbook	*-348.8*	*-365.2*	*-407.8*	*-428.3*	*-439.6*	*-491.0*	*-495.3*	*-403.9*	*-407.2*	*-446.4*
Current account as percent of GDP	-2.1	-2.1	-2.2	-2.3	-2.3	-2.4	-2.3	-1.6	-1.5	-1.6
Previous Tealbook	*-2.1*	*-2.1*	*-2.2*	*-2.3*	*-2.3*	*-2.4*	*-2.3*	*-1.8*	*-1.8*	*-1.9*
Net goods & services	-461.1	-489.6	-498.5	-503.0	-550.1	-627.7	-616.8	-504.4	-489.8	-506.1
Investment income, net	215.4	228.9	214.7	211.1	238.7	266.9	278.0	303.8	298.4	289.1
Direct, net	283.3	284.2	284.6	278.0	304.0	330.3	343.2	370.0	390.6	423.0
Portfolio, net	-67.9	-55.3	-70.0	-66.9	-65.3	-63.4	-65.1	-66.2	-92.2	-134.0
Other income and transfers, net	-103.1	-104.6	-123.9	-136.4	-128.2	-130.2	-156.1	-161.0	-161.0	-161.0

Abbreviations

ABS	asset-backed securities
AFE	advanced foreign economy
BEA	Bureau of Economic Analysis
BFI	business fixed investment
BLS	Bureau of Labor Statistics
BOC	Bank of Canada
BOE	Bank of England
CBO	Congressional Budget Office
CCM	Cajner, Coglianese, and Montes (2019)
CDC	Centers for Disease Control and Prevention
CES	Current Employment Statistics
C&I	commercial and industrial
CMBS	commercial mortgage-backed securities
COVID-19	coronavirus disease 2019
CPI	consumer price index
CRE	commercial real estate
ECB	European Central Bank
ECI	employment cost index
E&I	equipment and intellectual property products
ELB	effective lower bound
EME	emerging market economy
FCI	financial conditions index
FOMC	Federal Open Market Committee; also, the Committee
FPLT	flexible price-level targeting
FRB	Federal Reserve Board

FRBNY	Federal Reserve Bank of New York
FRB/US	A large-scale macroeconometric model of the U.S. economy
GDP	gross domestic product
IMF	International Monetary Fund
IOER	interest on excess reserves
IPO	initial public offering
ISM	Institute for Supply Management
JOLTS	Job Openings and Labor Turnover Survey
LFPR	labor force participation rate
MMF	money market fund
NIPA	national income and product accounts
OASI	Old-Age and Survivors Insurance
OIS	overnight index swap
ON RRP	overnight reverse repurchase agreement
OPEC	Organization of the Petroleum Exporting Countries
PCE	personal consumption expenditures
PMI	purchasing managers index
SARS	severe acute respiratory syndrome
SEP	Summary of Economic Projections
SIGMA	A calibrated multicountry DSGE model
SLOOS	Senior Loan Officer Opinion Survey on Bank Lending Practices
S&P	Standard & Poor’s
SPF	Survey of Professional Forecasters
TIPS	Treasury Inflation-Protected Securities
VAR	vector autoregression
VIX	one-month-ahead option-implied volatility on the S&P 500 index
WHO	World Health Organization