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To: Federal Open Market Committee

From: Matthew M. Luecke

Subject: DSGE Models Update

The attached memo provides an update on the projections of the DSGE models.

System DSGE Project Forecasts

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This memo describes the economic forecasts of the four models that are currently part of the System project on dynamic stochastic general equilibrium (DSGE) models. These are the EDO (Board), New York Fed, Philadelphia Fed, and Chicago Fed models. We first provide a summary of the forecasts and then describe each of them in greater detail.

Summary of Model Forecasts

The current forecasts for real GDP growth, core PCE inflation, and the federal funds rate are displayed in the table and figures at the end of this summary section. The DSGE model forecasts were obtained using actual data through 2019Q4 and nowcasts for 2020Q1. EDO, the New York Fed model, and the Philadelphia Fed model use their estimated policy rules to determine the federal funds rate path. In contrast, the Chicago Fed model uses the federal funds rate from the December Survey of Market Participants (adjusted for the developments in OIS markets since the SMP survey date) to pin down the funds rate for the next ten quarters. Thereafter, the model's estimated interest rate rule governs its policy forecasts. For the sake of comparison, the tables include the March Tealbook forecasts, as well as the DSGE model forecasts prepared for the December FOMC meeting. The tables and figures also present model-based estimates and forecasts of the real natural rate of interest, defined in each model as the equilibrium real rate of interest that would prevail in the absence of sluggish adjustment of nominal prices and wages. Finally, they report estimates and forecasts of model-based output gaps. These are computed as percent deviations of actual output from the natural level of output, the latter defined as the level of output that would prevail if prices and wages were fully flexible.

Turning first to GDP, the profile for growth over the next three years has shifted compared to the December forecast. The median DSGE forecast now has growth equal to 1.7 percent in 2020, rising to 2.3 percent in 2021 and then edging down to 2.1 percent in 2022. In contrast, the December forecast had median growth fairly steady at near 2 percent over the next three years. The Tealbook forecasts are within the range of DSGE forecasts; in particular, output growth equals 2.1 percent in 2020 rising to 2.3 percent in 2021 and then edging down to 1.7 percent in 2022. The Chicago Fed and New York Fed forecasts for 2020 output growth have been revised down compared to December. This is in part due to taking into account assessments of the likely impact of Coronavirus on near-term economic activity. The Philadelphia Fed forecast does not take Coronavirus into account except insofar as anticipated effects are embedded in the low level of medium term interest rates. Nevertheless, the Philadelphia Fed model sees output growth in 2020

that is about unchanged compared to its December projection. For EDO, output growth in 2020 is revised up slightly compared to the December forecast. EDO conditions on a preliminary Tealbook forecast to help pin down 2020Q1 growth. Looking further ahead, The Philadelphia Fed and Chicago Fed models have output growth moving up to 2.7 percent in 2021. The growth acceleration is especially pronounced in the Chicago Fed model which anticipates growth will slip significantly below potential over the first half of 2020 and then quickly rebound in the second half and into 2021. EDO and the New York Fed anticipate more modest growth at about 1.8 percent in 2021. For 2022, the models move closer to their respective medium-term trends. Philadelphia is strongest at 2.5 percent growth while Chicago is weakest at 1.6 percent growth. EDO and the New York Fed are near 2 percent growth.

Turning to inflation, the median forecast is 1.8 percent core inflation in 2020, which is down from 2.2 percent in the December projection. Of the individual forecasts, only New York expects higher inflation for 2020 compared to December – but the upward revision is small at 0.2 percentage points. For 2021 and 2022 the median inflation forecast moves up to 2.2 percent and is unchanged from December. The New York Fed continues to predict a flat path for inflation over the forecast horizon. EDO and the Philadelphia Fed expect a gradual increase in the level of inflation to somewhat above the FOMC target at the end of 2022. The Chicago Fed expects inflation to accelerate to 2.3 percent in 2021 and then pull back to 2.1 percent in 2022. The Tealbook forecast for inflation is at 1.8 percent for 2020. Inflation then rises to 1.9 percent in 2021 and 2022.

All of the models have taken on board the 50 basis point cut in the federal funds rate that occurred March 3. Looking ahead, EDO has the most aggressive normalization path for the funds rate--which rises to 2.5 percent by the end of 2020 and then to 3.8 percent by the end of 2022. The New York and Philadelphia models see steady monetary policy tightening over the forecast horizon, but at a less aggressive pace. New York has the funds rate reaching 1.7 percent at the end of 2020, rising to 2.6 percent at the end of 2022. Philadelphia expects the funds rate to hit 1.2 percent in 2020Q4 and then rise to 2.9 percent at the end of 2022. The Chicago Fed forecast is the weakest of the group (recall that Chicago uses SMP and OIS data to pin down the funds rate over the next 10 quarters): the funds rate moves down to 0.6 percent at the end of 2020, stays at about that level in 2021, and then rises to 1 percent by the end of 2022. The Tealbook path calls for the funds rate to rise from 1.4 percent at the end of 2020 to 2 percent at the end of 2022. Of the four models' forecasts, that from New York resembles those from the Tealbook most closely.

The four models' estimates of the real natural rate of interest differ substantially from one another though all of the models have revised down their estimates for this year. For 2020, the estimates range from a low of negative 2.4 percent in the Chicago Fed model to a high of 1.5 percent in EDO model. All the models predict an upward path for the real neutral rate of interest. The Chicago Fed forecast increases to minus 1.2 percent in 2021 and to minus 0.3 percent in 2022. The Philadelphia forecast now shows a full 2 percentage point rise by the end of 2022. The EDO model forecasts the real natural rate moving up from 1.5 percent to 1.8 percent by the end of the forecast horizon. The New York Fed model has the real natural rate forecast rising modestly from 0.7 percent in 2020 to 1.1 percent in 2022. Note that the range of uncertainty surrounding estimates of the natural rate remains quite large.

Estimates of the output gap also show substantial dispersion across the models and the forecasts differ on whether they see the output gap widening or shrinking over the next three years. As with the natural rate estimates, the uncertainty surrounding gap estimates is high. At the end of 2020, estimates range from minus 0.3 for the New York Fed to a high of 2.6 percent for the Chicago Fed model. Both the New York Fed and EDO models expect negative gaps over the next three years. For Philadelphia, the gap remains essentially constant at a small positive 0.1 percent. For Chicago, the gap closes by 1.3 percentage points to reach 1.3 percent at the end of 2022. The Tealbook forecast estimates the output gap at 1.7 percent at the end of 2020, edging up to 2.2 percent by the end of 2021, and settling at 2.1 percent by the end of 2022.

Forecasts

Model	Output Growth (Q4/Q4)					
	2020		2021		2022	
	March	December	March	December	March	December
EDO - Board of Governors	1.8 (0.2, 3.3)	1.6 (-0.2, 3.5)	1.8 (-0.3, 3.8)	1.8 (-0.3, 3.8)	2.2 (0.1, 4.3)	2.2 (0.1, 4.4)
New York Fed	1.4 (-0.5, 3.4)	1.7 (-0.7, 4.1)	1.7 (-0.9, 4.4)	2 (-0.6, 4.7)	1.9 (-0.7, 4.6)	2.2 (-0.6, 4.9)
PRISM - Philadelphia Fed	2.2 (0.3, 4.1)	2.3 (-0.1, 4.6)	2.7 (0.2, 5.3)	2.4 (-0.2, 5.0)	2.5 (-0.1, 5.2)	2.3 (-0.3, 4.9)
Chicago Fed	1.5 (-0.5, 3.5)	2.4 (-1.9, 6.6)	2.7 (-1.9, 7.3)	1.4 (-3.3, 6.1)	1.6 (-3.1, 6.3)	0.8 (-4.0, 5.6)
Median Forecast*	1.7	2.0	2.3	1.9	2.1	2.2
March Tealbook	2.1		2.3		1.7	

Model	Core PCE Inflation (Q4/Q4)					
	2020		2021		2022	
	March	December	March	December	March	December
EDO - Board of Governors	1.9 (1.5, 2.4)	2.2 (1.6, 2.8)	2.3 (1.5, 3.2)	2.4 (1.6, 3.3)	2.4 (1.4, 3.3)	2.4 (1.4, 3.3)
New York Fed	1.5 (1.0, 2.1)	1.3 (0.6, 2.1)	1.4 (0.4, 2.4)	1.3 (0.3, 2.4)	1.4 (0.3, 2.6)	1.4 (0.2, 2.6)
PRISM - Philadelphia Fed	1.7 (0.8, 2.5)	2.2 (1.1, 3.3)	2.1 (0.6, 3.6)	2.4 (0.8, 3.9)	2.2 (0.5, 3.9)	2.4 (0.7, 4.1)
Chicago Fed	1.9 (1.3, 3.6)	2.2 (1.1, 3.4)	2.3 (1.1, 3.5)	2.1 (0.9, 3.2)	2.1 (0.9, 3.3)	2.0 (0.8, 3.2)
Median Forecast*	1.8	2.2	2.2	2.2	2.2	2.2
March Tealbook	1.8		1.9		1.9	

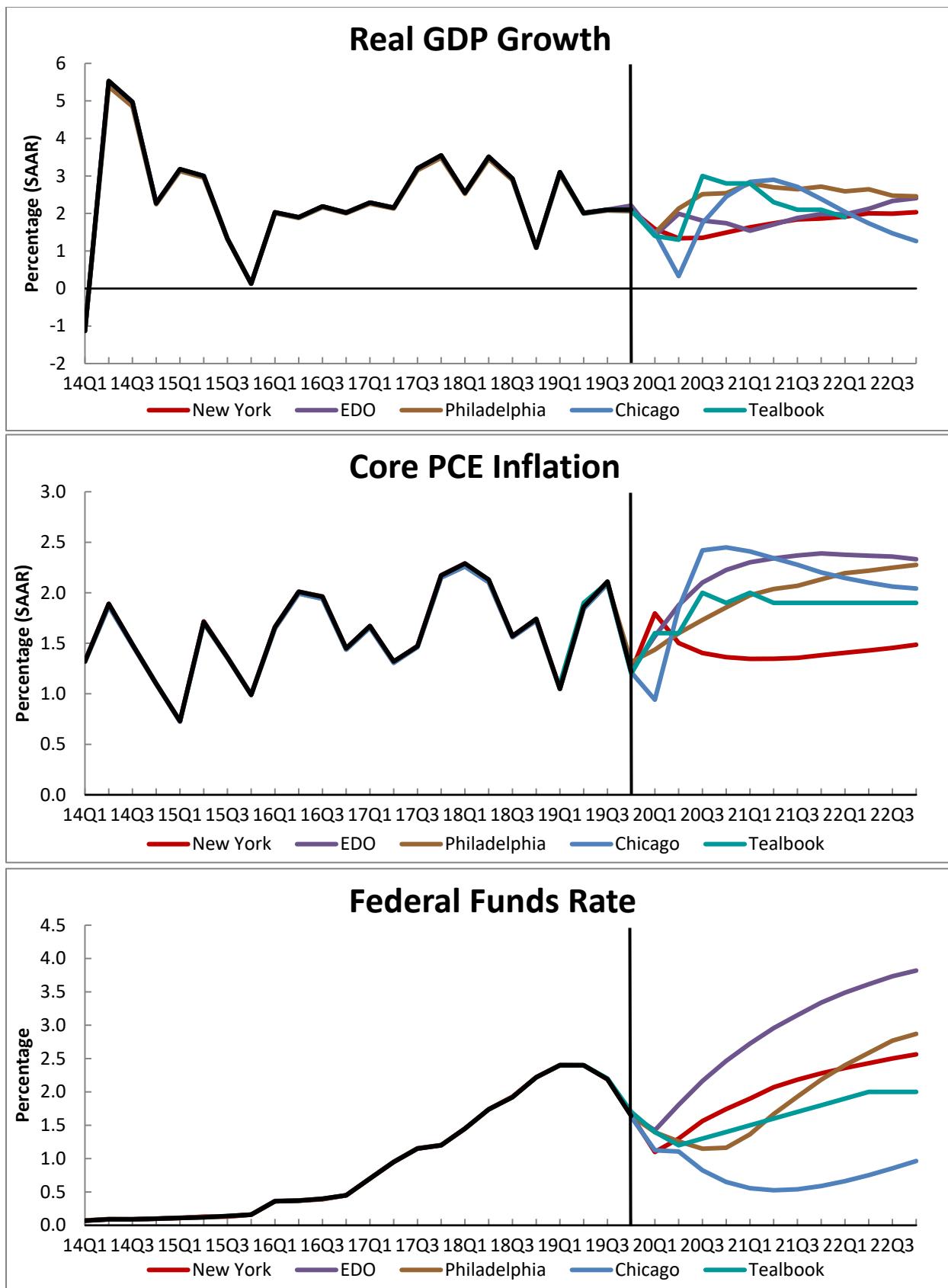
Model	Federal Funds Rate (Q4)					
	2020		2021		2022	
	March	December	March	December	March	December
EDO - Board of Governors	2.5 (1.4, 3.5)	2.9 (1.7, 4.2)	3.3 (1.7, 5.0)	3.6 (1.9, 5.3)	3.8 (1.9, 5.7)	3.9 (2.0, 5.8)
New York Fed	1.7 (0.2, 3.3)	2.0 (0.3, 3.7)	2.3 (0.5, 4.1)	2.4 (0.5, 4.2)	2.6 (0.7, 4.5)	2.6 (0.6, 4.5)
PRISM - Philadelphia Fed	1.2 (-0.8, 3.2)	2.1 (-0.5, 4.6)	2.2 (-1.5, 5.9)	2.9 (-0.9, 6.7)	2.9 (-1.4, 7.2)	3.2 (-1.0, 7.6)
Chicago Fed	0.6 (0.3, 1.0)	1.7 (0.9, 2.5)	0.6 (-0.7, 1.9)	1.8 (0.1, 3.4)	1.0 (-1.0, 2.9)	2.7 (0.5, 4.9)
Median Forecast*	1.5	2.0	2.3	2.6	2.8	3.0
March Tealbook	1.4		1.8		2.0	

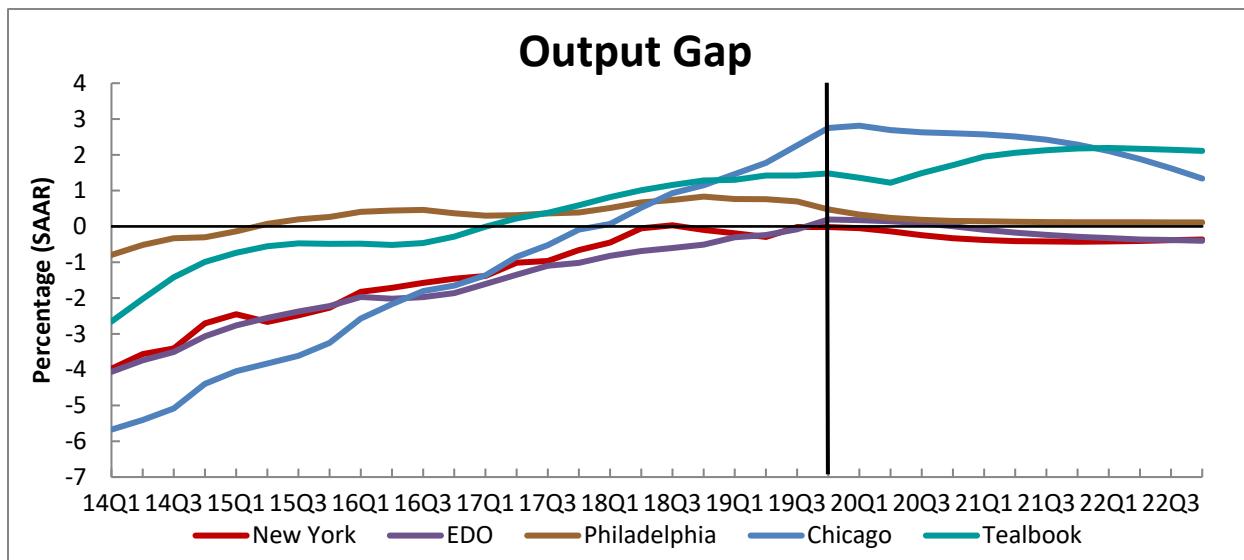
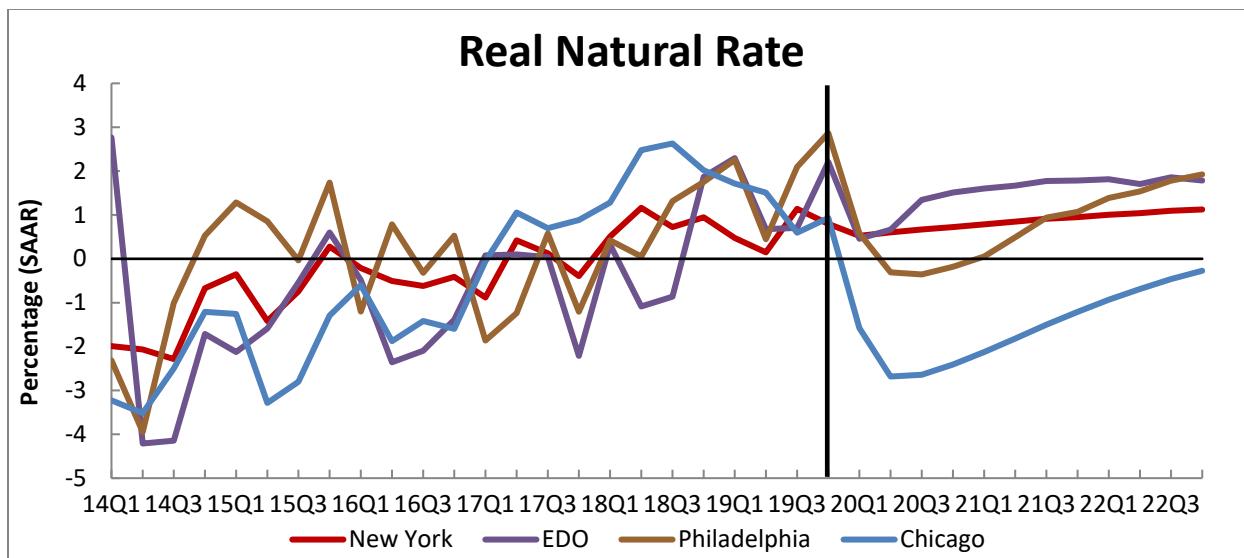
Model	Real Natural Rate of Interest r* (Q4)					
	2020		2021		2022	
	March	December	March	December	March	December
EDO - Board of Governors	1.5 (-3.4, 6.3)	1.7 (-3.1, 6.8)	1.8 (-3.3, 6.8)	1.8 (-3.2, 7)	1.8 (-3.5, 7.0)	1.9 (-3.2, 6.8)
New York Fed	0.7 (-0.7, 2.2)	0.9 (-0.6, 2.4)	1.0 (-0.6, 2.6)	1.0 (-0.5, 2.6)	1.1 (-0.5, 2.8)	1.2 (-0.5, 2.8)
PRISM - Philadelphia Fed	-0.2 (-3.3, 2.9)	0.9 (-2.6, 4.3)	1.1 (-3.1, 5.3)	1.7 (-2.7, 6.1)	1.9 (-2.8, 6.7)	2.1 (-2.6, 6.6)
Chicago Fed	-2.4 (-4.7, -0.2)	-0.1 (-2.9, 2.7)	-1.2 (-4.3, 1.9)	0.3 (-2.9, 3.6)	-0.3 (-3.6, 3.1)	0.5 (-2.8, 3.9)
Median Forecast*	0.3	0.9	1.1	1.4	1.5	1.5

Model	Output Gap (Q4)					
	2020		2021		2022	
	March	December	March	December	March	December
EDO - Board of Governors	0.0 (-1.0, 1.0)	-0.1 (-1.3, 1.2)	-0.3 (-2.0, 1.4)	-0.4 (-2.2, 1.4)	-0.4 (-2.4, 1.6)	-0.5 (-2.6, 1.5)
New York Fed	-0.3 (-2.2, 1.5)	-0.3 (-2.4, 1.8)	-0.4 (-3.0, 2.2)	-0.3 (-3.1, 2.4)	-0.4 (-3.5, 2.8)	-0.2 (-3.5, 3.0)
PRISM - Philadelphia Fed	0.2 (-0.3, 0.6)	0.5 (0.0, 1.0)	0.1 (-0.7, 0.9)	0.3 (-0.6, 1.2)	0.1 (-0.9, 1.2)	0.2 (-0.9, 1.2)
Chicago Fed	2.6 (1.8, 3.4)	2.4 (0.9, 3.9)	2.3 (0.2, 4.4)	1.5 (-1.0, 4.0)	1.3 (-1.5, 4.1)	0.3 (-2.6, 3.3)
Median Forecast*	0.1	0.2	-0.1	0.0	-0.2	0.0
March Tealbook	1.7		2.2		2.1	

For each individual forecast, the numbers in parentheses represent 68% confidence bands.

*The median forecast is calculated as the median of the Q4/Q4 projections from the forecasters.





Detailed Descriptions of Individual Model Forecasts

The EDO Model

The EDO model's forecast is conditional on data through the fourth quarter of 2019 and on a preliminary Tealbook forecast for the first quarter of 2020.

Real GDP growth is 1.9 percent, on average, over the projection horizon, just slightly below the average growth rate of potential output. The four-quarter core PCE inflation rate rises from 1.7 percent in the current quarter to 2.4 percent in 2021 and 2022.

Potential GDP growth is 2.0 percent over the projection horizon, held down below-trend by the slow fading of adverse investment shocks.² The output gap is currently estimated to be positive 0.2 percent, is projected to close in the fourth quarter of 2020, and is expected to be negative 0.4 percent at the end of the forecast period. The real natural rate of interest—estimated to be 0.4 percent in the first quarter of 2020—increases to 1.8 percent at the end of 2021 and hovers around this level in 2022, staying below its long-run value of 2.2 percent. Both the output gap and natural rate of interest remain slightly, but stubbornly, below their long-run values as a result of persistent adverse shocks to investment over the past few years. Those shocks have depressed the current capital stock below the level that would have prevailed in the absence of nominal rigidities and are expected to restrain investment spending for quite a while in the forecast.

From the perspective of the model, inflation has been held down by persistently low wage growth, which has been surprisingly weak given the strength of aggregate demand. As unfavorable wage markup shocks progressively fade, and because of the aforementioned adverse investment shocks and the accommodative stance of monetary policy, inflation is expected to rise and overshoot its target from 2020 to 2022. As the positive inflation gap and negative output gap offset, the federal funds rate increases toward its long-run value of 4.1 percent. The pace of the increase is gradual, reflecting the inertia in the Taylor rule.

The staff's forecast of real GDP growth for the first quarter of 2020 is weaker than the EDO model had projected in December. The model attributes this negative surprise to a combination of various adverse shocks, most of which have transitory effects on growth, and the

² Potential GDP is defined as the level of output that would be attained in the absence of nominal price and wage rigidities.

forecast of real GDP growth is little-changed since December. The staff's forecast of core PCE inflation for the first quarter of 2020 is weaker than the EDO model had projected in December. The model interprets this surprise as arising from transitory price-markup shocks. While the core inflation forecast is revised down 20 basis points in 2020, it is little-changed in 2021 and 2022. The output gap is little-changed over the forecast horizon. The natural rate of interest has revised down on average 60 basis points in 2020 but is little-changed in subsequent years. Finally, the path for the federal funds rate revised down 35 basis points, on average, over the forecast horizon.

The NY Fed Model

The New York Fed model forecasts are obtained using data released through 2019Q4, augmented for 2020Q1 with the New York Fed staff forecasts (as of March 3) for real GDP growth and core PCE inflation, and the yields on 10-year Treasuries and Baa corporate bonds based on 2020Q1 averages up to March 3. For the 2020Q1 federal funds rate we use the March 3 level, which reflects the FOMC action taken that day.

The New York Fed DSGE model projects real GDP growth of 1.4 percent in 2020 on a Q4/Q4 basis, which is below the December forecast of 1.7 percent growth for 2020. This projection in part reflects the downward revision of our staff forecast for 2020Q1 real GDP growth, due to weaker-than-expected data released so far for the first quarter and a preliminary assessment of the effect of the ongoing epidemic. In 2021 and 2022, GDP growth is projected to recover to 1.7 and 1.9 percent respectively, below the December projection of 2 and 2.2 percent growth in 2021 and 2022. Despite this weaker growth prospects in the year, core inflation is projected to be higher in 2019, at 1.5 percent relative to 1.3 percent in the December projection. The change in the projection reflects the much higher New York Fed staff judgmental inflation forecast, for this year, relative to the model's unconditional assessment of a 1.1 percent inflation. Inflation is projected to be at 1.4 percent in 2021, only slightly higher than in the December projection and to remain unchanged at 1.4 percent in 2022. Overall, inflation is projected to remain weak throughout the forecast horizon.

The model implied output gap is estimated to be slightly negative throughout the forecast horizon. The real natural rate is 0.7 percent in 2020, 0.2 percentage points lower than the December projection, and rises to 1.0 and 1.1 percent in 2021 and 2022, respectively.

The federal funds rate is projected to follow a shallower path this year than predicted in December. It is expected to move gradually higher in the subsequent years from its predicted level of 1.7 percent by the end 2020, with roughly two and one 25 basis point hikes in 2021 and 2022 respectively. The shallower near term path than the one projected in December largely reflects the effects of recent accommodative monetary policy shocks.

The projections for all variables are surrounded by significant uncertainty. For instance, the 68 percent posterior probability interval for GDP growth includes negative readings for 2020, 2021 and 2022. In comparison, the posterior probability intervals for inflation are tighter, with their upper bound well below 3 percent throughout the forecast horizon.

The model attributes much of the recent unexpected weakness in GDP growth to negative productivity shocks. The effect of these shocks is somewhat counterbalanced by accommodative monetary policy. The combination of negative productivity shocks and accommodative monetary policy contributes to higher inflation in the medium term relative to last quarter's projection.

The Philadelphia Model

The Philadelphia forecast is constructed using data through 2019Q4 that are then supplemented with a 2020Q1 current-quarter forecast based on the most recent data. For 2020Q1, real GDP growth is estimated at 1.5 percent, core inflation is at 1.4 percent, and the federal funds rate is at 1.4 percent. With this nowcast and the historical data in hand, the Philadelphia model estimates the current output gap at 0.3 percent and the natural real rate of interest at 0.6 percent. The model is not add factored to explicitly account for impacts of coronavirus. The forecast embeds any such projected impacts only through the current levels of short-term and medium-term interest rates that are used as inputs to the forecast.

Looking ahead, real GDP is expected to grow at 2.2 percent in 2020, and then moves up to 2.7 percent in 2021. Output growth is expected to be close to our estimate of trend (2.4 percent) over the forecast horizon. Inflation rises from 1.7 percent in 2020 to an average pace of about 2.1 percent in 2021 and 2.2 percent in 2022. The path for the federal funds rate is weaker in this forecast compared to December. Taking on board the 50 basis points cut in early March, the funds rate falls from 1.4 percent in 2020Q1 to 1.2 percent in 2020Q4. Monetary policy becomes less accommodative at 1.4 percent in 2021Q1, and thereafter rises steadily to reach 2.9 percent in 2022Q4.

The natural rate of interest – the rate of interest that would prevail if wages and prices were fully flexible – is now estimated at 0.6 percent in 2020Q1 compared to 2.9 percent in 2019Q4. The natural rate is projected to move down to -0.4 percent in 2020Q3 and then rebound steadily to reach 1.9 percent in 2022Q4. Our estimate of the output gap is derived from the log deviation of real output from its flexible-price counterfactual level. The gap stands at 0.3 percent in 2020Q1, and falls modestly over the forecast horizon – to 0.1 percent by 2022Q4.

According to the Philadelphia model, output growth over the forecast horizon is driven by positive contributions from investment specific technology shocks, mark-up shocks, and matching efficiency shocks that are counterbalanced by negative contributions from TFP shocks and discount factor shocks. Weak output growth in 2020Q1 is attributed to negative investment, TFP, and discount factor shocks. TFP shocks have acted as a drag on growth over the last several years and are expected to continue doing so over the next three years. The model continues to see consumption growth (nondurables and services) as running below trend over the next three years. After a weak reading in 2019Q4, consumption growth decelerates a bit further in the first half of 2020. Thereafter, consumption growth moves up slowly to reach about 2 percent at the end of 2022. Investment growth quickly rebounds from a weak 2019Q4 and runs at an above-trend pace over the next three years, driven largely by contributions from investment shocks that offset downward pressure from TFP and discount factor shocks.

Core inflation is expected to run at a pace somewhat below 2 percent in 2020, but then reach 2 percent in 2021Q1 and rise to 2.3 percent through 2022Q4. Positive contributions to inflation come from TFP, markup, and discount factor shocks and are only partly offset by negative contributions from investment, matching efficiency, and government spending shocks.

The forecast is implemented with a rule-based federal funds rate path that sets the funds rate based on the lagged interest rate, inflation, and output growth. The funds rate edges down to 1.1 percent in 2020Q3 but then begins rising, reaching 2.9 percent at the end of the forecast horizon in 2022Q4. The model currently has the steady state federal funds calibrated to 3.75 percent. Over the medium term, negative contributions from investment shocks, government spending shocks, and trend interest rate shocks pull the funds rate below its longer-run value. As these shocks wane, the funds rate rises and so moderates the rise in inflation over the medium term.

The Chicago Fed Model

The FRB Chicago DSGE model forecast is constructed using data through 2019Q4 supplemented by a number of assumptions based on market expectations, soft data and judgments for the first two quarters of 2020. We include the 50 bps rate cut announced by the FOMC on March 3 so that the federal funds rate settles at 1.125 percent in 2020Q1. We use data on expected future funds rates from the December Survey of Market Participants augmented with OIS rate changes since then to determine the federal funds rate path for the next 10 quarters. Since mid-February, the markets have been factoring in the economic losses associated to the spread of COVID-19; consequently, the path of interest rates has flattened significantly. In particular, our assumed path has two additional 25 bps rate cuts in 2020 and then flat through 2021. The markets' perception of the economy's prospects (via the interest rate term structure) are in stark contrast with GDP *nowcasts* based on the most recent available hard data. This leads us to introduce judgmental plugs for GDP, consumption and investment growth for 2020Q1 and for 2020Q2 based on a review of market analysts' estimates; in particular, we assume that GDP growth is below potential in the first quarter of the year and slips down to almost zero growth in second quarter. Our conditioning assumptions also include 2020Q1 expected inflation, both one-quarter ahead and over the next 10 years, taken from the first quarter SPF survey.

The model interprets the mechanically induced economic slowdown for the first half of the year as a combination of liquidity preference shocks (an increase in the appetite for safe and liquid assets) and negative technology shocks. However, the momentum generated in 2019 quickly offsets these negative forces and the model sees a quick recovery in the second half of 2020, which extends to 2021. As a result, GDP growth forecast is 1.5 percent in 2020 and 2.7 percent in 2021. Relative to our previous round's forecasts, the projections have been revised substantially, downward for 2020 and upward for 2021. The model interprets the new federal funds rate path as due to the economic weakening and to monetary policy accommodation which contributes to lift growth above potential in 2021. The monetary stimulus ends in 2022; and the removal of this accommodation acts as a drag for the real economy in 2022.

Our forecast for Q4/Q4 core PCE inflation is about 10 bps below target in 2020. The model continues to interpret this deviation from target as temporary, mostly driven by markup shocks and

by measurement errors, which have little persistence out of sample. Consequently, inflation is forecast to revert to target relatively quickly and we do not foresee subdued inflation dynamics for the coming years; on the contrary, inflation is forecast to slightly overshoot target over the next couple of years. In particular, inflation averages 2.3 percent in 2021 and 2.1 percent in 2022. The strength in inflation comes from a sequence of negative shocks to the marginal efficiency of investment (MEI). While the numbers of consumption, hours and GDP have been relatively strong in 2019, investment has not been in alignment and to account for this the model has resorted to MEI shocks. These shocks influence the rate at which investment translates into new capital. With investment disappointing over the last year the model has identified several large negative MEI shocks. These turn out to be inflationary since they exert upward pressure on the rental rate of capital and therefore marginal cost. However, over the medium term the model suggests that inflation will be close to the FOMC's target.

We also forecast the natural rate of interest and the output gap. The natural rate is the contemporaneous spot rate on 3-month government bonds that would prevail if wages and prices were fully flexible. We measure the output gap as the log deviation of output from its flexible wage and price counterfactual. The model forecasts positive end-of-year output gaps for 2020 through 2022, at 2.6 percent, 2.3 percent and 1.3 percent respectively. These gaps have been revised upwards relative to the analogous forecasts we reported in the previous DSGE memo. We forecast the (real) natural rate of interest at the end of the year for 2020 through 2022 to equal -2.4 percent, -1.2 percent, -0.3 percent. Our estimate and forecast of the natural rate has come down significantly; this revision is mostly explained by the large increase in the desire for safe and liquid assets.